Climate Assembly UK
THE PATH TO NET ZERO

The path to net zero

Climate Assembly UK
Full report

A project by

House of Commons

With

involve

SORTITION FOUNDATION

mySociety

Preface – a guide to this report

Welcome to **The path to net zero: Climate Assembly UK report**. This information is designed to help you navigate the pages that follow and find quickly the content of most interest to you.

This report contains:

- **Forewords from the commissioning select committee Chairs and the assembly's Expert Leads** that place the assembly and its report in context;
- **An opening statement from the assembly members themselves** that highlights the key themes emerging from their recommendations. This statement is an excellent place to start for anyone wanting an overarching picture of the assembly's results;
- **The executive summary** lists the assembly's main recommendations in each of the ten areas that it considered. It also contains a brief introduction to the assembly itself. Alongside the opening statement, it is designed to give an overview of the assembly's recommended path to net zero;
- **Chapter 1** provides details of the assembly's process and membership;
- **Chapters 2–11** outline in depth the assembly's recommendations and the rationale behind them. These chapters are organised by policy area: for example, how we travel, heat and energy use in the home, and what we buy. They will be particularly useful to policy-makers, researchers and others working in detail on the areas considered by the assembly. These chapters are designed to stand alone so that readers can go straight to the chapters of most interest to them.

About the detailed chapters

Chapters 2–11 each contain:

- A **quick summary of key recommendations on the relevant theme** at the chapter's start, for ease of reference;
- The **assembly's formal recommendations**, decided by secret ballot. This includes full results of all votes;
- **Assembly members' rationale for their decisions**, captured through notes from their small group conversations and responses on their ballot papers. Assembly members have checked these sections to verify their accuracy;

  Please note: Assembly members were asked to think about both the advantages and disadvantages of potential recommendations, and we have included full accounts of what they said. This means there are disadvantages listed for recommendations the assembly strongly supported, and advantages listed for recommendations that they did not. We have also left in contradictory opinions, where they existed. Assembly members' votes show the relative importance that they placed on the advantages and disadvantages they identified, and their final decisions having considered all points of view.

- Some assembly members noted **conditions to their support** for recommendations, or **points for decision-makers to bear in mind** around their implementation. We have included these in full.

This report does not contain transcripts of the information presented to the assembly by the forty-seven speakers who gave evidence to it. You can find these, alongside videos of the presentations and the speakers slides, at climateassembly.uk/resources/.

The Climate Assembly UK team

Foreword

from Committee Chairs

When Parliament agreed in June 2019 to set in law a commitment to reach net zero carbon emissions by 2050 that was the easy part. The hard bit is to determine how we get there and then do it.

How should we go about making those choices? What is the contribution of each sector to achieving a decarbonised economy?

Because whatever combination of policy choices is made, there will be an impact on every taxpayer, every business, on the way every one of us lives our lives. No government in a democracy can address climate change on its own; it is a communal effort requiring the input, understanding and support of the people. Almost every facet of life and policy area will be affected.

That is why six select committees joined together last year to set up a citizens' assembly on climate change. When Parliament legislated on net zero, the committees decided to make the focus of the assembly how this target should be reached. We asked it to consider the complex trade-offs involved in reaching decisions on issues including: how we travel; what we eat; what we buy; how we heat our homes; how we generate our electricity; how we use the land.

The voice of Climate Assembly UK is important because it is unique: a body whose composition mirrors that of the UK population. People from all walks of life taking the time to inform themselves on complex issues, discussing the topics with experts and each other, and reaching conclusions.

On behalf of the six select committees that established Climate Assembly UK, we want to express our gratitude to all the 108 assembly members who gave up their time to take part. We have been enormously impressed by their commitment, not least in wanting to complete the assembly online after the outbreak of the Covid-19 pandemic made it impossible to hold the final weekend in Birmingham.

We also want to thank the assembly for giving us such a clear set of recommendations on the path to take. Assembly members were clear on the underlying principles that should govern our policy choices, including the importance of information and education and the need for fairness, to support those who might be adversely affected by the transition to net zero. They were clear on the need for Government to lead the debate and take the actions necessary to reach net zero. And they were clear on the need for a cross-party consensus, to give long-term certainty on the policy choices made.

Forging consensus is what we do on our cross-party select committees, on the basis of the evidence and what in our judgement is acceptable to the public. That is why the considered view of the assembly is so important. In each of our committees, we will study the relevant recommendations of the assembly and the reasons behind them, to inform our work in advising the Government on how to make progress in our respective policy areas and holding it to account for any slacking.

The path to net zero must be a joint endeavour, between Parliament, the people, Government and business. The assembly has more than delivered on the task we set it last year. The challenge is now for us in Parliament and for Government to navigate the pathways that have been set out in order to reach our agreed destination of net zero by 2050.

Darren Jones MP
Chair, Business, Energy and Industrial Strategy Committee

Mel Stride MP
Chair, Treasury Committee

Foreword

from the Expert Leads[1]

The UK is one of the first countries to commit to achieving net zero emissions, and will host next year's international climate summit, COP26. This is an important period to show how leadership on climate change can be sustained at a time when the world is dealing with the impacts of the global coronavirus pandemic.

The UK has already made good progress with emissions reductions, but meeting future carbon budgets and the net zero target will be very challenging. Action is needed to transform our economy and society.

This transformation will not only be achieved through ramping up investment in technologies such as electric cars, offshore wind farms and home insulation. Citizens also have a crucial role to play. The way we live our lives, what we buy, how we travel and what we eat will all have an influence. So it is essential to work with citizens to make sure their views are heard, and develop strategies that fit with people's lives and aspirations.

Climate Assembly UK is a unique process that has helped to meet this need. It has brought together a representative group of 108 citizens and provided them with the space to understand, discuss and prioritise actions the UK should take.

The assembly took many hours of planning. We worked closely with Involve and the assembly's advisory groups to ensure that members would be provided with fair, balanced and comprehensive evidence on the different ways in which net zero could be achieved. This included a lot of time for the members to ask questions, discuss the evidence with each other, and to reach conclusions. There was also an opportunity to discuss topics that assembly members themselves considered to be important.

The value of all the planning became clear once the assembly began to meet in January. The 108 participants were no longer just a statistical sample of the population – but a real, diverse group of citizens from all over the UK. They were fully engaged from start to finish: questioning speakers, debating and testing different points of view. The team from Involve[2] did a fantastic job of facilitating this process, and ensuring a wide range of views were heard in a respectful and balanced way.

This report provides detailed insights into the discussions and decisions of assembly members. The results of the votes will inevitably catch the eye. But the report also shows how nuanced the discussions were – including the reasons for assembly members' views, and the all-important conditions attached to some of the decisions.

This report provides vital new intelligence about the views of the UK public on the way forward. We strongly encourage decision-makers in government, industry and other organisations to read it in detail – and to take these views into account.

Chris Stark
Committee on Climate Change

Professor Jim Watson
University College London

Professor Lorraine Whitmarsh
University of Bath

Professor Rebecca Willis
Lancaster University

1 For more information about the role of the Expert Leads in Climate Assembly UK, please see Chapter 1.
2 The Involve Foundation ('Involve') is the public participation charity that led the delivery of Climate Assembly UK.

Opening statement from Assembly Members

We come from all walks of life and all across the UK. We have, between us, many different values, views and experiences. But we have worked together in an atmosphere of respect, co-operation, tolerance and humour to arrive at the considered recommendations in this report.

Our recommendations and the reasons for them are necessarily numerous and detailed. But there are a number of themes that have recurred throughout our discussions that we believe should be at the heart of government's and Parliament's approach to achieving net zero:

- **Education and information:** there is a need for information and education for everyone – individuals, businesses, government and others – about climate change and the steps needed to tackle it. It is essential for buy-in to the changes that are needed.
- **Fairness:** as with most things in life, the solutions to climate change are neither easy nor free, but they need to be fair. Fair to people with jobs in different sectors. Fair to people with different incomes, travel preferences and housing arrangements. Fair to people who live in different parts of the UK.
- **Freedom and choice:** we believe it is important to maintain, wherever possible, freedom and choice for both individuals and local areas so that they can choose the solutions that work best for them. This should not be at the expense of taking the steps necessary to ensure a safe and healthy environment for future generations. We have outlined in this report where we believe an acceptable balance lies.
- **Co-benefits:** tackling climate change could bring with it many advantages. It could see benefits for local communities, high streets and local businesses. It could boost our economy and promote innovation, including in technology. And it could improve our health and reduce pollution. The UK should take advantage of these potential rewards.
- **Nature:** we need to protect and restore our natural environment, and our access to it. We strongly support measures that have a positive impact on biodiversity and wildlife, whilst also helping the UK move towards its net zero goal.

Above: Assembly members listen to a speaker.

Some of our strongest views centre on leadership and roles. **It is imperative that there is strong and clear leadership from government** – leadership to forge a cross-party consensus that allows for certainty, long-term planning and a phased transition. This is not the time nor the issue for scoring party political points. The Covid-19 pandemic that has caused so much suffering brings with it new considerations, but it does not change the need for progress towards the UK's climate goals.

Alongside government leadership, we recognise that achieving net zero will require a **joined-up approach across society** – all of us will have to play our part. Our recommendations take account of this reality. They seek to provide individuals, communities and organisations with the information, incentives and conditions to make change possible. We hope that our report will be an invaluable resource to government and Parliament as they work to ensure that the UK reaches net zero by 2050.

Executive summary


Brenda


APOSTOLOS

About Climate Assembly UK

In June 2019, the UK Government and Parliament agreed that the UK should do more to tackle climate change. They passed a law committing the UK to reaching net zero greenhouse gas emissions by 2050. Decisions about how the target is reached will affect many aspects of people's lives.

1 Climate Assembly UK was commissioned by six select committees of the House of Commons[1] to examine the question:

> **"How should the UK meet its target of net zero greenhouse gas emissions by 2050?"**

The committees aim to use the assembly's results to inform their work in scrunitising government.

2 The assembly's **108 members come from all walks of life**. Together they are **representative of the UK population** in terms of: age, gender, ethnicity, educational level, where in the UK they live, whether they live in an urban or a rural area, and their level of concern about climate change.[2] The Sortition Foundation recruited assembly members using a process known as 'sortition' (please see Chapter 1). Access, inclusion and assembly members' wellbeing were a priority for the Climate Assembly UK team.

> "I was a bit worried that it would just be the people who were most passionate about the crisis – that you'd get an influx of people so it would be very one-sided and biased. So to come in and find it is a complete representation: I've spoken to people for who it's a complete crisis – to complete denial or don't believe it's a real thing, that end of the spectrum. So to see that representation was quite a surprise and really refreshing for someone like myself."
>
> *Assembly member – Chris, 32, from Oxford*

3 **The assembly met for six weekends between late January and mid-May 2020** – the first three took place face-to-face in Birmingham; the last three online after the arrival of Covid-19 in the UK. At the weekends, assembly members heard **balanced, accurate and comprehensive** information about

1 The six commissioning select committees were: Business, Energy and Industrial Strategy; Environmental Audit; Housing, Communities and Local Government; Science and Technology; Transport; and Treasury. The committees announced their plans for the assembly on 20 June 2019.

2 For full figures comparing assembly members to the UK population, please see Chapter 1.

Above: Sir David Attenborough addresses Climate Assembly UK.

how the UK could meet its net zero target.[3] They then engaged in detailed discussions about the best way forwards, before reaching their recommendations.

4 The assembly considered ten topics in total:

- **Underpinning principles for the path to net zero** (Chapter 2);
- **How we travel on land** (Chapter 3);
- **How we travel by air** (Chapter 4);
- **Heat and energy use in the home** (Chapter 5);
- **What we eat and how we use the land** (Chapter 6);
- **What we buy** (Chapter 7);
- **Where our electricity comes from** (Chapter 8);
- **Greenhouse gas removals** (Chapter 9);
- **The changed context created by Covid-19** (Chapter 10).
- **Additional recommendations** (Chapter 11).

5 The assembly was open and transparent, whilst protecting assembly members' identities. Speakers' presentations were publicly available via online live-stream as they happened, and can now be found on the Climate Assembly UK website.[4] The assembly was open to a wide range of media, stakeholders, officials and politicians so that they could observe its proceedings.

6 The assembly was funded by the House of Commons, with additional funding from two philanthropic organisations: the Esmée Fairbairn Foundation and the European Climate Foundation. The two philanthropic organisations did not have a say in how the assembly was run or what it covered. Delivery of the assembly was led by The Involve Foundation ('Involve'), with the Sortition Foundation and mySociety (please see Chapter 1).

The path to net zero: Climate Assembly UK report recounts the assembly's detailed and considered view of its recommended path to net zero by 2050. Taken together the recommendations provide an internally consistent and coherent vision, and are designed to be considered as a whole.

3 For more information about the assembly's 47 speakers and how they were chosen, including the roles of the assembly's **Expert Leads**, **Advisory Panel** and **Academic Panel** please see Chapter 1.

4 The website also contains a wealth of other information about the assembly, including how it was funded and who was involved. See climateassembly.uk

Underpinning principles

Assembly members' first decision was on the principles that should underpin the UK's path to net zero. They worked in small groups to discuss and draft the principles, before using a vote to prioritise them.

In total, **assembly members agreed twenty-five underpinning principles for the path to net zero**.

Votes indicate how many assembly members felt a principle should be a priority, not how many supported it.[5]

Principles for the path to net zero, in order of priority

1. **Informing and educating everyone** (the public, industry, individuals and government) – 74 votes
2. **Fairness within the UK**, including for the most vulnerable (affordability, jobs, UK regions, incentives and rewards) in actions, not just words – 65 votes
3. **Leadership from government** that is clear, proactive, accountable and consistent – 63 votes
4. **Protecting and restoring the natural world** – 59 votes
5. **Ensuring solutions are future-proofed** and sustainable for the future – 45 votes
6. **A joined-up approach** across the system and all levels of society (working together, collaborating, sharing) – 40 votes
7. **Long-term planning and a phased transition** – 39 votes
8. **Urgency** – 37 votes
9. **Support for sustainable growth** (including pioneering innovation) – 37 votes
10. **Local community engagement** embedded in national solutions – 33 votes
11. **Think about our impact globally and be a global leader** – 32 votes
12. **Use of mix of natural and technological solutions** – 32 votes
13. **Transparency and honesty** – 32 votes
14. **Underpinned by scientific evidence and focused on the big wins** – 29 votes

5 Each assembly member could vote for eight principles.

Above: Assembly members listen to a speaker at the first assembly weekend.

15. **Equality of responsibility** for individuals, government and business – 28 votes
16. **Achievable** – 27 votes
17. **Everyone should have a voice** (e.g. via local representation and participation, or in holding government to account) – 27 votes
18. **Regular independent checks on progress** – 27 votes
19. **Fairness for the most vulnerable globally** (less developed countries) – 24 votes
20. **Making the most of potential benefits for everyone** (e.g. health, wellbeing and the economy) – 24 votes
21. **Enabling and not restricting individual choice** – 23 votes
22. **Protect the UK economy**, including from global competition – 18 votes
23. **Compromise about changing lifestyles** – 15 votes
24. **Those who bear the most responsibility should act** – 13 votes
25. **Not negatively impacting other institutions** – 4 votes

Assembly members returned to these principles, and considerations related to them, throughout the assembly.

How we travel on land

The ways we travel on land include cars, vans and lorries, as well public transport like buses, coaches and trains. They also include 'active transport', for example walking, cycling and scootering. Together these ways of moving around account for 70% of the UK's total greenhouse gas emissons from transport and 23% of the UK's greenhouse gas emissions overall.[6]

Key recommendations

1 Assembly members recommended a future which **minimises restrictions on travel and lifestyles, placing the emphasis on shifting to electric vehicles and improving public transport**, rather than on large reductions in car use. They recommended:

- A ban on the sale of new petrol, diesel and hybrid cars by 2030–2035;
- A reduction in the amount we use cars by an average of 2–5% per decade;
- Improved public transport.

2 Assembly members identified **18 considerations that they would like government and Parliament to bear in mind when looking at how we travel on land and the path to net zero**. A full list can be found in Chapter 3. Assembly members' ten highest priority considerations were:

- Ensure solutions are **accessible and affordable** to all sections of society;
- Help create **significant change at an individual level**, including through education, incentives and disincentives;
- Achieve **cross-party support** for decisions so that they are not changed by successive governments;
- Follow the principle that **the polluter should pay**;
- Check and **be careful about side effects**, including moral, ethical and environmental implications;
- **Invest in and develop public transport** to make it accessible and affordable;
- Invest more and faster in **research and development for technologies**;
- Ask an **independent regulator to assess long-term consequences** of the science and policies;

6 Climate Assembly UK considered our travel on land for personal uses such as shopping, the school run and commuting. The assembly did not look at transport used for services and to move goods, also known as freight. This followed guidance from Parliament about where to focus if there was not time to consider all aspects of land travel.

Above: An assembly member asks a speaker a question.

- **Protect jobs and industry**, and support them to transition;
- **Free bus travel, as introduced in Dunkirk.**[7]

3 In addition, assembly members recommended fifteen policies aimed at **moving quickly to low carbon vehicles, increasing public and active transport**, or **discouraging car ownership and use.** Policies supported by at least two-thirds of assembly members were:

On public transport

- Government investment in low carbon buses and trains (91%);[8]
- Adding new bus routes and more frequent services (86%);
- Making public transport cheaper (83%);
- Bringing public transport back under government control (75%);
- Increasing investment to make buses faster and more reliable (66%).

On the cars we drive

- Quickly stop selling the most polluting vehicles (86%);
- Grants for businesses and people to buy low carbon cars (74%);
- Car scrappage scheme (66%).

On active transport

- Investing in cycling and scootering facilities (70%).

On travelling less

- Localisation (72%).[9]

7 This refers to a case study presented by one of the speakers, Lynn Sloman, during weekend two of the assembly. It showed the impact of introducing free bus travel in Dunkirk in autumn 2018. Bus trips increased by 85% on some routes, and half of the new bus users previously travelled by car.

8 % of assembly members who 'strongly agreed' or 'agreed' that the policy should be part of how the UK gets to net zero.

9 'Localisation' was described as involving (1) changing regulations to ensure that new houses can only be built with good public transport links, and (2) including or putting back into local areas services such as post offices, local shops, health centres and schools.

How we travel by air

Air travel accounts for 22% of the UK's total greenhouse gas emissions from transport, and 7% of the UK's total greenhouse gas emissions overall. Emissions from flying have grown significantly in the last 30 years.[10]

Key recommendations

1 Assembly members identified **14 considerations that they would like government and Parliament to bear in mind when looking air travel and the path to net zero**. A full list can be found in Chapter 4. Assembly members' ten highest priority considerations were:

- Speed up technological progress;
- Influence the rest of the world;
- Even out the costs of air travel compared to alternatives;
- Frequent fliers and those that fly further should pay more;
- Stay competitive and protect the economy;
- Engage the population in making the necessary changes;
- Take account of different travel needs (e.g. people with family far away);
- Promote and incentivise UK holidays;
- Scrap incentives to make people fly more (e.g. air miles, first class);
- Ban polluting private jets and helicopters, moving to electric when possible.

What the future should look like

2 Assembly members would like to see **a solution to air travel emissions that allows people to continue to fly**. Assembly members felt that this would protect people's freedom and happiness, as well as having benefits for business and the economy.

3 **Assembly members' support for continued flying did, however, have limits.** Assembly members resoundingly rejected a future in which air passenger numbers would rise by as much as 65% between 2018 and 2050, labelling it "counterproductive". Instead, **assembly members sought to find an acceptable balance between achieving the net zero target, impacts on lifestyles, reliance on new technologies, and investment in alternatives**.

10 Climate Assembly UK considered air travel for personal use. The assembly did not look at air travel for the transportation of goods. This followed guidance from Parliament on where to focus, if there was not time to consider both.

4 Assembly members recommended a future in which:

- Growth in air passenger numbers is limited to 25–50% between 2018 and 2050, depending on how quickly technology progresses. This is a lower rate of growth per year than was seen in recent times prior to Covid-19;
- 30m tonnes of CO_2 is still emitted by the aviation sector in 2050 and requires removing from the atmosphere;
- There is investment in alternatives to air travel.

How change should happen

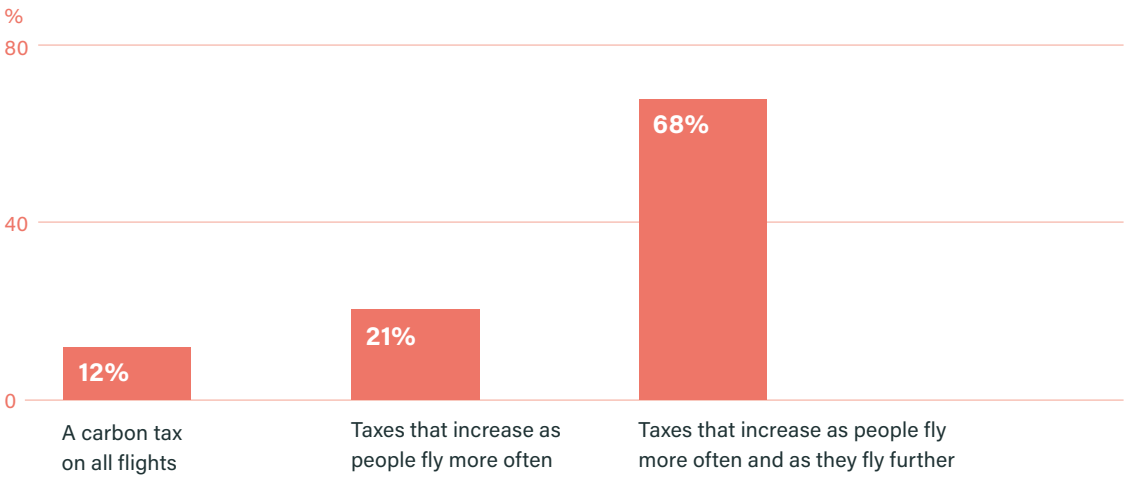
5 80% of assembly members 'strongly agreed' or 'agreed' that **taxes that increase as people fly more often and as they fly further** should be part of how the UK gets to get zero (see Figure 1). Assembly members saw these taxes as fairer than alternative policy options. They also suggested a number of points around their implementation for policy-makers to bear in mind.

6 Assembly members would like to see the **airline industry invest in greenhouse gas removals**. 75% of assembly members 'strongly agreed' or 'agreed' that this should be part of how the UK gets to net zero. There was **also significant support for financial incentives from government to encourage a wide range of organisations to invest**. Assembly members tended to feel that 'the polluter should pay', although some suggested a need to monitor, scrutinise and perhaps enforce airline industry investment to ensure it actually takes place.

7 Assembly members strongly supported the **need to invest in the development and use of new technologies for air travel**. 87% of assembly members 'strongly agreed' or 'agreed' that this should be part of how the UK gets to net zero. These technologies could include electric aircraft and synthetic fuels.

Figure 1

Please rank the following policy options in order of preference
(% 1st preference votes)



In the home

Around 15% of the UK's greenhouse gas emissions come from the residential sector. Reducing these emissions means changes to the use of heating, hot water and electricity in the home.[11]

Key recommendations

Assembly members' recommendations on heat and energy use in the home show a strong push for action. They also consistently emphasised their support for:

- **Tailored solutions**, enabling local authorities and other local organisations to chose solutions suited to their local areas, and householders to pick the options best for them;
- **Increased choice**, including through steps to increase competition;
- **Reliable and clear information** for the public;
- A need for solutions to **work for all income groups and housing types**.

Some assembly members noted **concerns about the influence and behaviour of big companies** and around the **use of personal data.**

What the future should look like

1. On **home retrofits**, assembly members emphasised the need to **minimise disruption in the home, put in place support around costs**, and **offer flexibility and choice to homeowners**. They had a slight preference for upgrading each home all in one go (56%), compared to upgrading each home gradually (44%) but attached conditions to the former around how it is financed. Some assembly members stressed that the choice between gradual and all-in-one retrofits should be one for homeowners.

2. The best technology to use for **zero carbon heating** is a matter of significant policy debate. However at least 80% of assembly members 'strongly agreed' or 'agreed' that each of **hydrogen** (**83%**), **heat pumps** (**80%**), and **heat networks** (**80%**) should be part of how the UK gets to net zero.

3. **94% of assembly members 'strongly agreed' or 'agreed' that "people in different parts of the country should be offered different solutions to zero carbon heating"** (see Figure 2 overleaf). They argued that areas should be able to choose the technologies best suited to their needs.

11 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/862887/2018_Final_greenhouse_gas_emissions_statistical_release.pdf

How change should happen

Assembly members emphasised the need for a **long-term strategy** with a wide range of actors taking steps to move the sector towards net zero. Assembly members strongly supported roles for **government investment** (80%), **local solutions** (80%), **individual responsibility** (80%) and **market innovation** (80%).

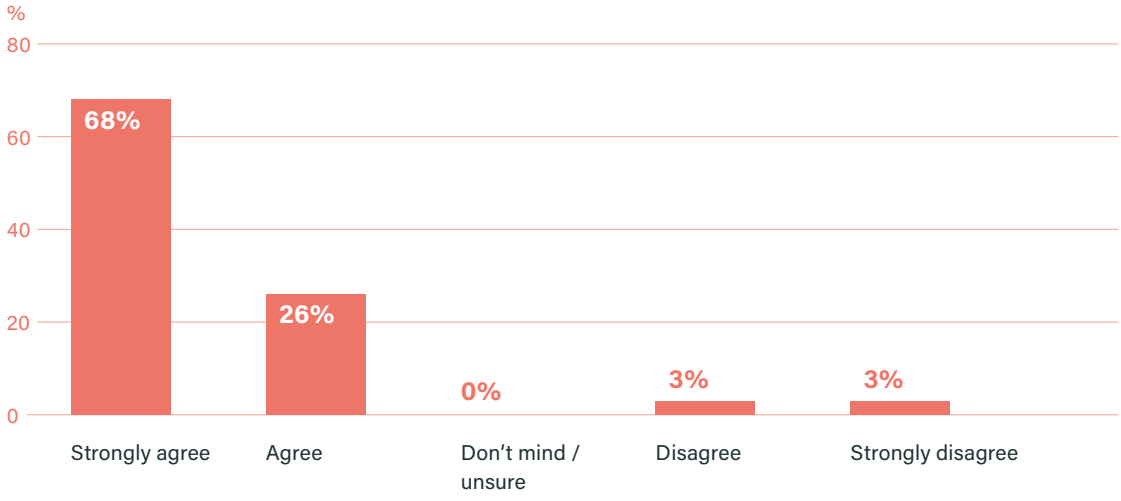
4 Assembly members also backed a wide range of specific measures to create change. **A majority of assembly members 'strongly agreed' or 'agreed' that 19 policy measures should be part of how the UK gets to net zero**. Policies supported by at least two-thirds of assembly members were:

- Support for smaller organisations to offer energy services (94%);
- Simpler consumer protection measures (92%);
- Changes to product standards to make products more energy efficient and 'smart' (91%);
- Local plans for zero carbon homes (89%);
- A ban on sales of new gas boilers from 2030 or 2035 (86%);
- Changes to energy market rules to allow more companies to compete (86%);
- Changes to VAT on energy efficiency and zero carbon heating products (83%);
- Information and support funded by government (83%), or information and support provided by government (72%);
- Government help for everyone (69%), or government help for poorer households (68%);
- Enforcing district heating networks (66%).

Above: One of the speakers, Dr Modi Mwatsama from Wellcome, presents to the assembly.

Figure 2

"People in different parts of the country should be offered different solutions to zero carbon heating" (%)



What we eat and how we use the land

Assembly members looked at food, farming and land use together because of the impact they have on one another. In total, about a tenth of the UK's greenhouse gas emissions currently come from farming and ways we use the land.

Key recommendations

1 Assembly members put forward **eight considerations for government and Parliament to bear in mind when making decisions about food, farming, land use and the path to net zero**. These focussed on (for the full, detailed wording please see Chapter 6):

1. Providing support to farmers;
2. Information and education;
3. Using land efficiently;
4. Rules for large retailers and supermarkets;
5. More local and seasonal food;
6. Making low carbon food more affordable;
7. Some, just less, meat;
8. Considering net zero as part of planning policy and new developments, including support for allotments.

What the future should look like

2 Assembly members recommended a future for food, farming and land use in the UK centred around:

- **Local produce and local food production** – assembly members noted potential community benefits, fairer prices for farmers, a 'feel good factor' and reduced environmental impacts;
- **A change in diet to reduce meat and dairy consumption by between 20% and 40%** – the assembly stressed the significance of education, saying these changes should be voluntary rather than compulsory;
- **A "managed diversity" of land use**, including steps such as restoring woodlands, peatlands and gorselands.

Assembly members highlighted the need for the above to be combined with measures to **support farmers to make the transition**, and ensure changes do **not disproportionately affect the less well off**. Assembly members said changes

Above: One of the speakers, Professor Paul Ekins from University College London, takes questions from assembly members.

should **not compromise animal welfare**, and expressed **strong concerns about GM and lab grown food**. They asked for policy-makers to take into account the **implications for smaller farms**, the **suitability of different land** for different uses, and **differences in impact between UK regions**.

How change should happen

3 Assembly members recommended **policies to change both farming, food production and land use,** and **retail and individuals' behaviour**. At least two-thirds 'agreed' or 'strongly agreed' that nine policies should be part of how the UK gets to net zero. These were:

- **Labelling food and drink products** to show the amount of emissions that come from different foods (94%);
- **Information and skills training** for people who manage the land in order to encourage low carbon farming practices and reduce emissions (91%);
- **Low carbon farming regulations**, for example, making farm payments conditional on low carbon practices and other public benefits, like protecting biodiversity (89%);
- **Paying farmers and other landowners to use their land to absorb and store carbon**, for example by restoring peatland or planting trees (87%);
- **Amending the procedure for awarding government contracts** to give preference to low carbon food producers (77%) and carbon storing products such as those from forestry (84%);
- **Changing planning rules** so that food can be produced sustainably in a wider range of areas (83%);
- **Taxes and incentives for reducing food waste**, for example to encourage shops to reduce waste; penalise food waste by businesses and individuals; and encourage supermarkets, restaurants and shops to serve smaller portion sizes (72%);
- **Taxes and incentives for low carbon foods** (66%).

Full details of assembly members' views on these policies can be found in Chapter 6.

What we buy

The things we buy are linked to climate change because they use energy, and some of that energy comes from fossil fuels like oil, coal and gas.

Products use energy while they are being made, through services we use when we buy them and because of how they reach us. Some products also need energy to run. When we then throw products away that has implications for climate change too. The UK has traditionally sent most of its waste to landfill sites. Some of this waste generates potent greenhouse gases as it rots.

Key recommendations

Assembly members' recommendations on 'what we buy' entail changes for **businesses in particular, but also for individuals**. Assembly members identified five areas as key:

1 Assembly members strongly supported a future in which **businesses make products using less – and lower carbon – energy and materials**. They backed a range of specific policies to support this aim, including 'resource efficiency targets and standards' (91%), an 'amended procedure for awarding government contracts that gives preference to low carbon companies and products' (83%), taxes on producers, products and services (83%), and 'extended producer responsibility' (79%).

2 Assembly members supported the idea of **individuals repairing and sharing more**, with less purchasing of new products. They backed **'measures to enable product sharing'** (77%) including technical and financial support to businesses who offer sharing or renting services.

3 Assembly members felt strongly about the need for **better information to promote informed choice and changes in individual behaviour**. They supported 'labelling and information about the carbon emissions caused by different products and services' (92%) and 'product labelling and information campaigns about what can be recycled and why it's important' (92%). They also backed 'advertising bans and restrictions' on high emissions products or sectors (74%).

4 Assembly members supported a range of **measures aimed at increasing recycling**, including 'deposit return schemes' (86%), 'increased doorstep recycling' (85%), and 'grants and incentives for businesses' to improve recycling, develop new materials and make goods from recycled materials (77%).

5 Assembly members called for **long-term commitment from government and Parliament**. They emphasised the importance of cross-party support to prevent policies changing when governments change, as well as the need to look at both quick wins and long-term solutions.

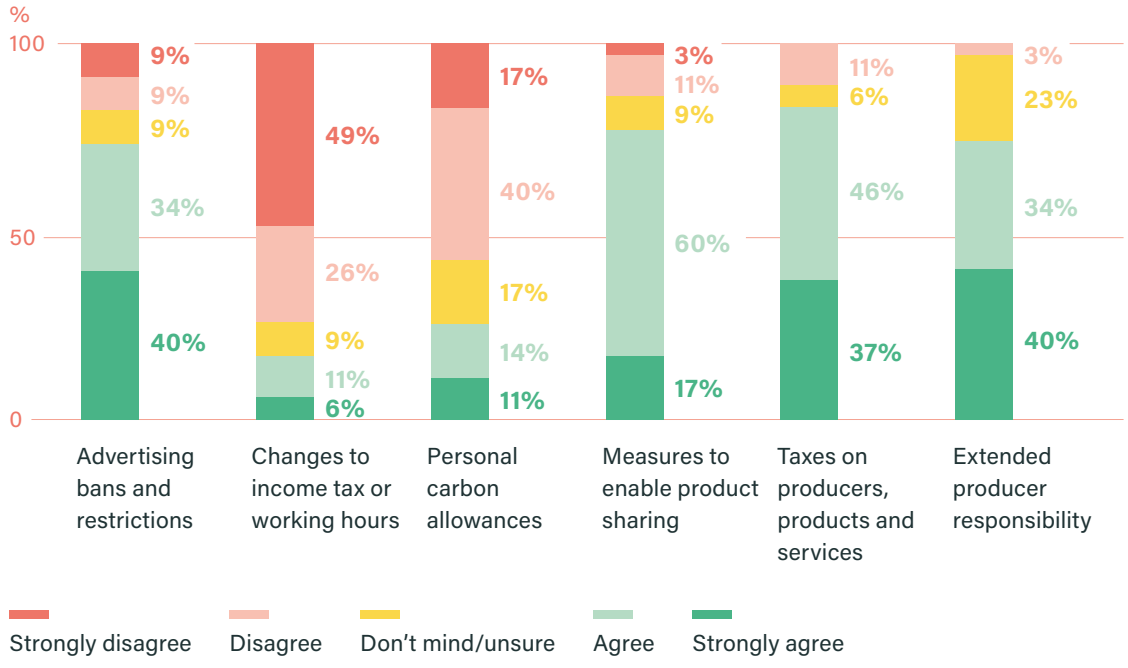
Above: Assembly members listen to a speaker.

In addition to these five areas, some assembly members raised points for government and Parliament to consider around **imports, ring-fencing any tax revenue generated by the above policies,** and **protecting consumers from increased costs**. Some also highlighted **trust and compliance issues relating to business**, asking for transparency, honesty, strong enforcement, and reliable and independent information and schemes.

Assembly members did not support policies around changing income tax or working hours, personal carbon allowances, voluntary agreements, recycling requirements and pay-as-you-throw schemes.

Figure 3

How much do you agree or disagree that each of the following policy options should be part of how the UK gets to net zero? (%)



Where our electricity comes from

How the UK generates its electricity is a central question on the path to net zero. The UK still produces a significant amount of its electricity from fossil fuels, particularly gas. This emits carbon dioxide, which contributes to global warming and climate change.

All the UK's electricity generation will need to come from low carbon sources if it is to meet its net zero target. The UK is also likely to need more electricity in future due to an increase in electric vehicles and electric heating.

Key recommendations

1 Large majorities of assembly members 'strongly agreed' or 'agreed' that **three ways of generating electricity should be part of how the UK gets to net zero**:

- **Offshore wind** (95%);
- **Solar power** (81%);
- **Onshore wind** (78%).

Assembly members tended to see these technologies as **proven**, **clean** and **low cost**, with wind-based options suitable for a "windy" UK. Offshore wind had key additional benefits, particularly being **"out of the way"**. Solar power was viewed as **flexible** in terms of where it can be located, among other advantages.

Some assembly members suggested a range of points to bear in mind when implementing all three technologies. These included their location and environmental impact, progress on electricity storage, ways to incentivise and facilitate uptake, visual design, and where they are manufactured.

2 **Assembly members were much less supportive of bioenergy, nuclear and fossil fuels with carbon capture and storage** – although, particularly for bioenergy, significant numbers of assembly members were unsure about its use:

- 40% of assembly members 'strongly agreed' or 'agreed' that **bioenergy** should be part of how the UK gets to net zero, 36% were 'unsure', and 24% 'strongly disagreed' or 'disagreed';
- The equivalent figures for **nuclear** were 34%, 18% and 46%;
- **For fossil fuels with carbon capture and storage** the results were 22%, 22% and 56%.

For some assembly members, their view on **bioenergy** would depend on how bioenergy is produced, including what is being burnt, how production is regulated, and therefore what its environmental and CO_2 impacts are. Assembly members' concerns about bioenergy included burning trees and crops, land use, environmental effects, and a feeling that better alternatives exist.

Assembly members saw three main disadvantages to **nuclear**: its cost, safety, and issues around waste storage and decommissioning.

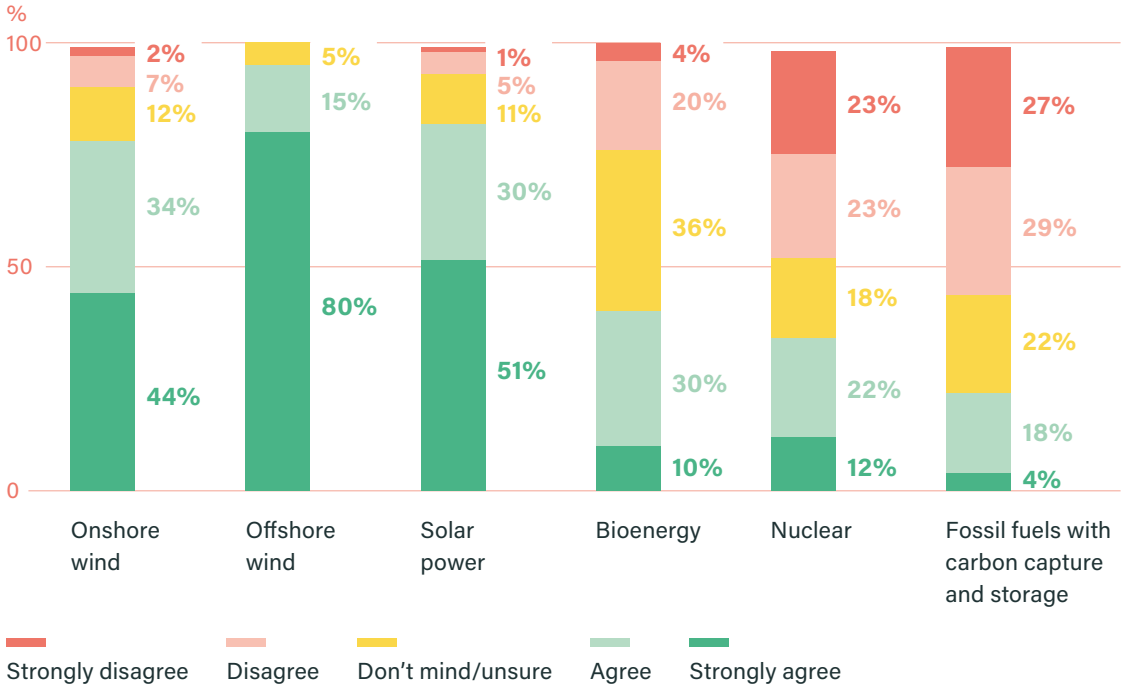
Their concerns about **fossil fuels with carbon capture and storage** centred on safety risks (if carbon leaked during storage or transfer), the continued use of fossil fuels, and a feeling that it only provides a "short-term", expensive solution when better alternatives are available.

Above: A question and answer session is live-streamed online.

3 Assembly members did not hear detailed evidence about **tidal, wave, hydro and geothermal** technologies. However, assembly members were in principle supportive of the use of these final four ways of generating electricity, particularly for suitable local areas.

Figure 4

How much do you agree or disagree that each of the following technologies should be part of how the UK generates electricity? (%)[12]



12 Where bars in the graph don't add up to 100% this is because some assembly members abstained.

Greenhouse gas removals

Achieving the UK's climate change target requires reducing greenhouse gas emissions as much as possible. However reducing emissions alone will not be enough.

By the middle of this century some emissions will still remain. For the themes considered by Climate Assembly UK, this is particularly true of air travel and farming. The assembly's recommendations in these areas suggest remaining emissions by 2050 of between 45–55 million tonnes per year. The assembly therefore considered how best to remove these remaining emissions from the atmosphere.

Key recommendations

Assembly members suggested that **a combination of greenhouse gas removal methods will be needed** to achieve the UK's net zero target.

1 Assembly members recommended that **four greenhouse gas removal methods should be part of how the UK gets to net zero:**

- **Forests and better forest management** (99%);[13]
- **Restoring and managing peatlands and wetlands** (85%);
- **Using wood in construction** (82%);
- **Enhancing the storage of carbon in the soil** (62%).

Assembly members saw these methods as the most **"natural"** and as **having significant co-benefits**, including around preventing flooding and erosion, promoting biodiversity, access to nature and enjoyment. Assembly members also set out a number of conditions around their implementation, including that it is planned and managed well (for example, planting the right trees in the right places), support for farmers, sustainability, and the balance of land use.

2 Assembly members were **less supportive of Bioenergy with Carbon Capture and Storage (BECCS)** and **Direct Air Carbon Capture and Storage (DACCS)**. Only 42% of assembly members 'strongly agreed' or 'agreed' that each of these methods should be part of how the UK gets to net zero, while 36% (BECCS) and 39% (DACCS) 'strongly disagreed' or 'disagreed'.

Common concerns about BECCS and DACCS included the potential for **leaks from carbon storage sites** and a feeling that they **failed to address the problem**, including a risk that they are "treated as [a] magic solution" that "takes the focus off the amount that we are emitting in the first place." Assembly members also saw these

13 % assembly members who 'strongly agreed' or 'agreed' that this greenhouse gas removal method should be part of how the UK gets to net zero.

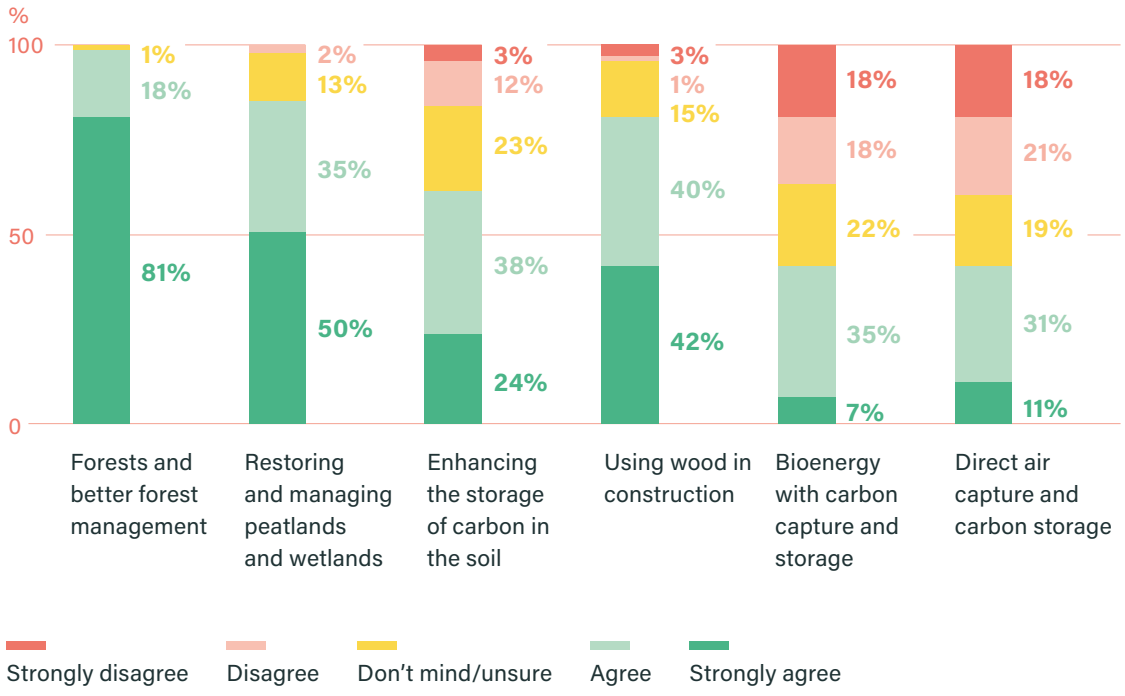
Above: Assembly members discuss the issues.

methods, particularly DACCS, as being **less natural, costly** and **unproven** in terms of the technology they require.

Whilst BECCS and DACCS received limited support, some assembly members are keen that further research and development takes place. Some noted that these technologies could perhaps then be used more in the future or that they might be needed to "mop up" remaining CO_2.

Figure 5

How much do you agree or disagree that each of the following greenhouse gas removal methods should be part of how the UK gets to net zero? (% votes)



Covid-19, recovery and the path to net zero

The arrival of Covid-19 in the UK saw an additional item added to the assembly's agenda. At the request of both Parliament and assembly members themselves, space was made for consideration of the changed context for reaching net zero created by the pandemic, lockdown and their economic impacts.[14]

Assembly members' views on this topic are significant. There is no other group that is at once representative of the UK population, and well-acquainted with the sorts of measures required to reach net zero.

Recovery

1 **A large majority of assembly members (79%) 'strongly agreed' or 'agreed' that, 'steps taken by the government to help the economy recover should be designed to help achieve net zero'.** When giving their rationale, they most frequently recommended that the government:

- Limit, or put conditions on, investment in high carbon industries;
- Rethink and invest in infrastructure;
- Support low carbon industries;
- Make the most of the economic opportunities presented by the path to net zero;
- Deal with Covid-19 and climate change together where possible;
- Take advantage of the current opportunities for change.

Assembly members who were unsure or who disagreed with the statement tended to emphasise a need to focus on economic recovery first and foremost.

2 **Another large majority of assembly members (93%) 'strongly agreed' or 'agreed' that, 'as lockdown eases, government, employers and/or others should take steps to encourage lifestyles to change to be more compatible with reaching net zero'.** Assembly members expressed support for encouraging homeworking and changes to how we travel, and again noted that this "tough and sad time" presents an opportunity for change. They also saw a key role for government in providing leadership and information, alongside roles for business and local areas.

14 The resulting session took place at the final assembly weekend on 16th May. At the time, strict lockdown measures were in place in all four UK nations.

Impact on the assembly's thinking

Assembly members **tended to avoid expressing 'strong'[15] views about whether Covid-19 and the lockdown had made them think or feel differently about how the UK should get to net zero.** In general their comments reflected the changed context created by Covid-19 rather than requests for alterations to specific recommendations.

3 Overall assembly members **tended to agree that their thoughts and feelings about the path to net zero *in general* had changed** (62%). They talked about a new sense of opportunity for change, and altered perceptions of what is possible (e.g. what government can do). They also noted lifestyle changes that are already happening. Some highlighted the **economic impacts** of the pandemic, suggesting, for example, that they make reaching net zero more difficult.

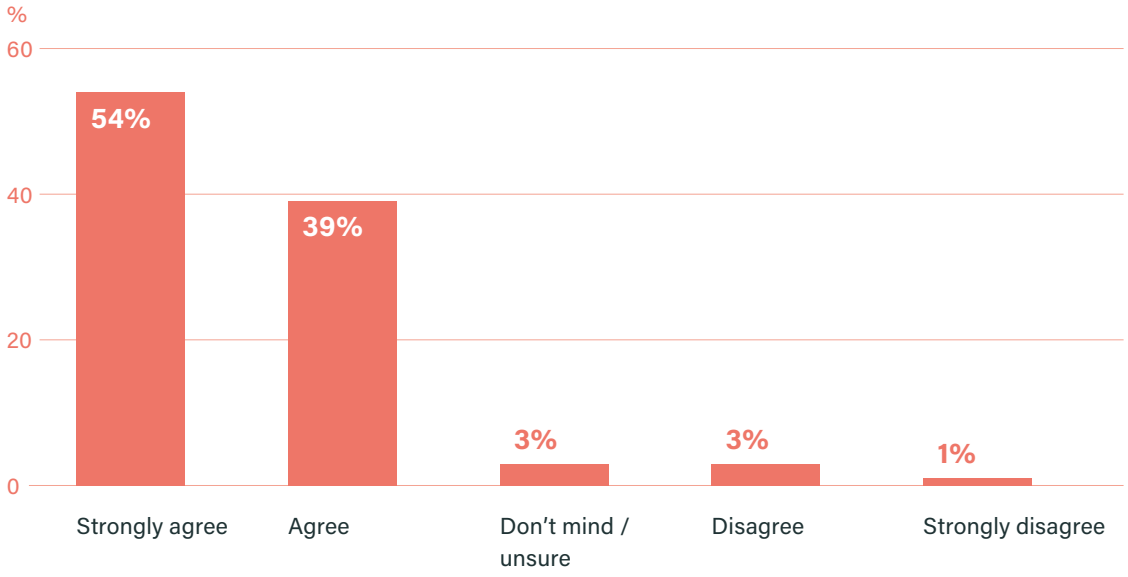
4 **73% of the assembly members who had looked at 'how we travel' during assembly weekends two and three said that Covid-19 and lockdown had changed their thoughts and feelings about how to get to net zero in this area.** They noted:

- **The changes happening to air travel**, with some assembly members suggesting that people may continue to fly less;
- **Homeworking** becoming more acceptable;
- The **impact on public transport**, with people currently less willing to use it and questions about whether or not that will last long-term;
- **Increases in cycling and walking**, although some questioned whether these would hold during the winter.

5 Only a minority of assembly members said that their thoughts and feelings had changed about the other assembly themes discussed prior to lockdown: 'in the home' (35%), 'what we eat and how we use the land' (36%), and 'what we buy' (36%).

Figure 6

"As lockdown eases, government, employers and/or others should take steps to encourage lifestyles to change to be more compatible with reaching net zero" (%)



15 They tended to choose 'agree' or 'disagree' in all four relevant votes, rather than 'strongly agree' or 'strongly disagree'.

Additional recommendations

On the final assembly weekend, all assembly members discussed what further recommendations they wanted to make to Parliament and government. Assembly members worked together to draft suggested additions, which could be on any aspect of the path to net zero. The suggestions were then put to a vote of the whole assembly.

Assembly members did not hear any new evidence to inform their votes. Their decisions were based on their own experiences, values, views and knowledge, and the information they had heard throughout the assembly. They had the option to abstain or choose 'unsure'.

In total, assembly members voted in favour of thirty-nine additional recommendations. They did not pass two further proposals.

The recommendations touch on themes including: transparency, accountability and decision-making; education, communication and engagement; international action and impacts; and incentives, payments, conditions, and taxes.

Additional recommendations passed by the assembly

For the full list and wording of each recommendation – some are detailed – please see Chapter 11. The ten recommendations that received most support were:

1. The transition to net zero should be a cross-political party issue, and not a partisan one (**96% support**[16]);
2. More transparency in the relationship between big energy companies and government (**94% support**);
3. Get to net zero without pushing our emissions to elsewhere in the world (**92% support**);
4. Incentives to accelerate progress to net zero and conditions attached for organisations seeking government financial support (**91% support**);

16 % of assembly members who 'strongly agreed' or 'agreed' with the recommendation.

Above: Assembly members discuss the issues.

5 A robust media strategy on the outcomes of the Assembly (**90% support**);

6 An independent neutral body that that monitors and ensures progress to net zero, including citizens assemblies and independent experts (**89% support**);

7 Move away from fossil fuels and transition to new energy sources (**89% support**);

8 Products and services labelled to include their carbon footprint (**89% support**);

9 A follow up on the outcomes of the Assembly covering what has been taken into account, what hasn't and why (**88% support**);

10 Harness the response to Covid-19 and COP26 to drive international coordinated action on climate change (**87% support**).

Proposals not passed by the assembly

The assembly did not pass two proposals. Both focussed on reaching net zero by an earlier date than 2050. Slightly more assembly members opposed such a move than supported it, with the balance held by those who were 'unsure' or 'didn't mind.'

Assembly members' views of the assembly

An independent evaluation of Climate Assembly UK will be published in Spring 2021. However, initial results suggest that assembly members viewed the assembly positively.

Statement about the assembly, from the survey completed by assembly members after all six weekends	% assembly members 'strongly agreed' or 'agreed'	% assembly members 'don't know / unsure'	% assembly members 'strongly disagreed' or 'disagreed'
'I have understood almost everything that the other members of my small group said during our discussions'	98	1	1
'I have understood almost everything that was presented by the speakers'	95	4	1
'I have had enough information to participate effectively'	91	5	4
'The information I have received has been fair and balanced between different view points'	78	16	6
'The assembly has helped me clarify my views about how to reach net zero'	96	1	3
'I have learned a lot during the assembly about how UK can achieve net zero by 2050'	95	3	2
'My fellow participants have respected what I had to say, even when they didn't agree with me'	94	5	0
'I have had ample opportunity in the small group discussions to express my views'	95	2	3

Above: Assembly members listen to a speaker.

The initial results also:

- Show that 90% of assembly members 'strongly agree' or 'agree' that **'assemblies like this should be used more often to inform government and parliament decision making'**.
- Suggest that **taking part in the assembly has impacted positively on assembly members' appetite and confidence to engage in political decision-making**. 88% of assembly members 'strongly agreed' or 'agreed' that 'I feel more confident to engage in political decision making as a result of being involved in this citizens' assembly'. The same percentage 'strongly agreed' or 'agreed' that 'taking part in this citizens' assembly has made me want to be more involved in other aspects of decision making'.

> "Like everyone else, I really enjoyed the entire experience, and I am sorry that it has now come to an end. It was a once in a lifetime opportunity, and I am truly grateful to have been given the chance to take part."
>
> *Assembly member*

About Climate Assembly UK

Chapter 1

In June 2019, the UK Government and Parliament agreed that the UK should do more to tackle climate change. They passed a law committing the UK to reaching net zero greenhouse gas emissions by 2050.

The target means that by 2050 the UK will have to reduce the amount of greenhouse gases it produces to a much lower level than today, and balance its remaining emissions by removing the same amount from the atmosphere. Decisions about how the target is reached will affect many aspects of people's lives.

It is against this backdrop that six select committees[1] of the House of Commons decided to commission Climate Assembly UK[2] – the first UK-wide citizens' assembly on climate change. The committees asked the assembly to examine the question:

> *"How should the UK meet its target of net zero greenhouse gas emissions by 2050?"*

The committees aim to use the assembly's results to inform their work in scrunitising government.

Climate Assembly UK has 108 members, who together are representative of the UK population in terms of both demographics and their level of concern about climate change (please see Section A below). They met as an assembly over six weekends between the end of January and the middle of May 2020. This report presents their recommendations – assembly members' detailed and considered views on the path to net zero.

About this chapter and citizens' assemblies

Governments and parliaments around the world are increasingly using citizens' assemblies in their work. The assemblies enable decision-makers to understand people's informed and considered preferences on issues that are complex, controversial, moral or constitutional. The UK Parliament commissioned its first citizens' assembly, the Citizens' Assembly on Social Care, in 2018.

1 The six commissioning select committees were: Business, Energy and Industrial Strategy; Environmental Audit; Housing, Communities and Local Government; Science and Technology; Transport; and Treasury.
2 The committees announced their plans for the assembly on 20 June 2019.

Citizens' assemblies have a number of key features including:[3]

- **Who takes part:** assembly members are representative of the wider population;
- **The assembly process:** assembly members go through a three stage process of learning, discussion, and decision-making;
- **The information provided:** the evidence presented to assembly members during the learning phase is balanced, accurate and comprehensive;
- **Independent facilitation:** the assembly is not facilitated by the organisation that commissioned the assembly.

This chapter looks at how Climate Assembly UK worked across each of these areas. It also includes a brief introduction to how the assembly's results are presented in the rest of this report.

A. Introducing the assembly members

> "I felt like I'd won the lottery when I got the letter. I'd be daft not to do it – it's amazing to get the chance to have a say and influence what may happen in the future. I was in the army for 22 years so I've not got a problem meeting new people and learning new things, I'm really looking forward to it. I hope Britain can take a leading role with making the changes we need to secure our future."
>
> *Assembly Member – Marc, 46, from Newcastle*

Climate Assembly UK's members come from all walks of life, and all across the UK – from Belfast to Bolton. They include parents, grandparents, and people without children; health workers, engineers, and full-time carers. At the time we first heard from them, the oldest was 79 years old; the youngest 16. None of them had ever met before.

Together they are representative of the UK population in terms of:

- Age;
- Gender;
- Ethnicity;
- Educational level;
- Where in the UK they live;
- Whether they live in an urban or a rural area;
- Their level of concern about climate change.

3 For a broader discussion on citizens' assembly features and standards in a UK context please see https://www.involve.org.uk/resources/blog/news/when-citizens-assembly-not-citizens-assembly-towards-some-standards.

Above: Sir David Attenborough addresses Climate Assembly UK.[4]

The Sortition Foundation[5] recruited assembly members using a process known as 'sortition' or a 'civic lottery.' Sortition is recognised internationally as the gold standard method for recruiting citizens' assembly members.

> "I am grateful to the 110 people from all corners of the United Kingdom who are giving up their weekends to take part in this very important discussion of how we in the UK reach our net zero emissions target. These people have been picked to represent our population as a whole, they come from all walks of life, and together they will deliberate carefully on behalf of us all. We should listen closely to their recommendations."
>
> *Sir David Attenborough, Naturalist & Broadcaster*

A.1 How recruitment worked

The recruitment process for assembly members had three stages.

Stage one – letters to a randomly selected households

> "I was quite intrigued by the letter. To be asked for my opinion is unusual so it was certainly interesting."
>
> *Assembly member*

4 Sir David did not give evidence to the assembly, instead he came to meet assembly members before dinner at the first assembly weekend. He thanked assembly members for giving up their time to be part of the assembly, and took questions about his life and work – but not about his views on the path to net zero.

5 Please see Section D below.

The recruitment process started with Parliament sending out letters to addresses randomly selected from Royal Mail's Postcode Address File: 80% of the addresses were randomly selected from the whole file; 20% from the most deprived areas within the file.[6]

The letters[7] invited those aged 16 years or over, who are permanent UK residents[8], living at an address that received a letter, to take part in the assembly.[9] Recipients had the option to respond online or by phone to say that they were free on the relevant dates and would be interested in taking part.[10] When they replied, we asked them a small number of demographic and attitudinal questions – those needed to be able to ensure that the assembly's eventual membership was representative of the UK population across the seven criteria described above.

Stage two – random stratified sampling, done by computer

> "I do hope there will be an opportunity for us all to meet up again. The Climate Assembly has been an extremely interesting and worthwhile experience for me and one which I feel very privileged to have participated in. Thank you computer!!!"
>
> *Assembly member*

Once the deadline for responses had passed, the Sortition Foundation used random stratified sampling by computer[11] to generate a list of 110 people to become assembly members.[12] The computer selected no more than one person from any single household.

Sortition Foundation contacted these 110 individuals to let them know that they had been selected and to confirm their availability. They replaced anyone who dropped out at this stage, ensuring the assembly's overall membership continued to be representative. They also contacted all other respondents to let them know they were on a reserve list and could be contacted if anyone withdrew before the first assembly weekend.

6 Responses to invitation letters can be lower from more deprived areas. Weighting where letters are sent in this way helps ensure that enough people from these areas respond for the assembly's eventual make-up to be representative of the wider population.

7 The invitation letter explained information including when the assembly would be held, the assembly's remit, who had commissioned it, and what the commissioning committees would do with its results. It also covered information about the assembly team's ability to meet different access needs and the support we could provide.

8 We defined this as anyone that had stayed, or intended to stay, in the UK for a period of 12 months or more at the date on the invitation letter.

9 The following people could not apply to be part of the assembly: Members of either Houses of the UK Parliament, the Welsh Parliament, the Scottish Parliament, or the Northern Ireland Assembly – and the staff of any of these Members; Local Authority Councillors; elected mayors; paid employees of any political party or of UK Parliament.

10 We received positive responses from 1,748 people. This response rate of 5.8% is within the typical range for citizens' assemblies in the UK (3–7%).

11 The code for the selection is open source, and can be found on GitHub. Those who contributed to the code include Professor Ariel Procaccia and his team at Harvard University and Carnegie Mellon University.

12 105 assembly members were selected to be strictly representative of the UK population. The final five assembly members were used to over-sample groups that are either very small (meaning that an assembly member being ill for a weekend, for example, would leave them poorly represented) or which are more likely to drop out of the assembly process. For example, we slightly over-sampled people from Northern Ireland. Similarly, taken together, people in the attitudes to climate change poll who are 'not at all' or 'not very concerned' about climate change are slightly over-represented (+3 people) amongst assembly members.

Above: Assembly members discuss the issues.

Stage three – liaison and final replacements

> “I’m looking forward to taking part in the assembly and learning a lot more, and I think I have some great ideas to contribute.”
>
> *Assembly Member – Maia, 44, from London*

Involve, the public participation charity that would run the assembly weekends (please see Section D), took over contact with assembly members from this point. They focussed on ensuring that everyone had everything they needed ready for the first assembly weekend. This included providing any necessary support, for example with booking travel.

A number of assembly members had to withdraw during this stage for a variety of personal reasons. Involve replaced these assembly members with people from the reserve list, ensuring that the assembly’s membership overall remained representative of the UK population.

A.2 The assembly's make-up

> "I was a bit worried that it would just be the people who were most passionate about the crisis – that you'd get an influx of people so it would be very one-sided and biased. So to come in and find it is a complete representation: I've spoken to people for who it's a complete crisis – to complete denial or don't believe it's a real thing, that end of the spectrum. So to see that representation was quite a surprise and really refreshing for someone like myself."
>
> *Assembly member – Chris, 32, from Oxford*

All but two of the 110 assembly members arrived at the Climate Assembly UK venue for the assembly's first weekend. This made a total assembly membership of 108 people.[13] The table below shows how these 108 assembly members compare to the UK population:

Criteria	UK population[14] %	Assembly members %	No. of assembly members
Age			
16–29	21.7	23.1	25
30–44	23.9	25.9	28
45–59	25.0	24.1	26
60+	29.4	26.9	29

Data Source: ONS estimate mid-2018.

Gender			
Male	49.1	48.1	52
Female	51	50.9	55
Other	No data	0.9	1

Data Source: ONS estimate mid-2018.

Ethnicity			
White	87	83.3	90
BAME	13	16.7	18

Data Source: ONS UK Census 2011.

13 One assembly member withdrew from the assembly process after the first weekend for personal reasons. As this happened so early in the assembly process, and all the talks and Q&A sessions from weekend one were available online, we decided to replace them from the assembly's reserve list. A new assembly member joined from weekend two and remained with the assembly throughout its duration.

14 The data sources for these figures are included in the table underneath each criteria.

Criteria	UK population[14] %	Assembly members %	No. of assembly members
Education			
No Qualifications / Level 1	36.3	36.1	39
Level 2 / Level 3 / Apprenticeship / Other	36.5	34.3	37
Level 4 and above	27.2	29.6	32

Date source for England and Wales: ONS 2011 UK Census. Data source for Scotland: Scottish Government's Scottish Surveys Core Questions 2013. Data source for Northern Ireland: Northern Ireland Statistics and Research Agency, Northern Ireland Census 2011.

Geography			
England			
North East	4.0	4.6	5
North West	11.0	11.1	12
Yorkshire and The Humber	8.3	8.3	9
East Midlands	7.2	7.4	8
West Midlands	8.9	8.3	9
East of England	9.3	9.3	10
London	13.4	12.0	13
South East	13.8	12.0	13
South West	8.4	8.3	9
Wales	4.7	5.6	6
Scotland	8.2	9.3	10
Northern Ireland	2.8	3.7	4

Data Source: ONS estimate mid-2018.

Rural/Urban			
Urban	82	79.6	86
Rural	18	20.4	22

Data source for England and Wales: UK Government, Rural population 2014/2015. Data source for Scotland: Scottish Government, Rural Scotland – key facts 2018. Data source for Northern Ireland: Northern Ireland Statistics and Research Agency, Northern Ireland Census 2011.

Criteria	UK population[14] %	Assembly members %	No. of assembly members
Climate views			
Very concerned	52	49.1	53
Fairly concerned	33	32.4	35
Not very concerned	9	14.8	16
Not at all concerned	5	2.8	3
Other	1	0.9	1

Data Source: Ipsos/Mori, July 2019 (Q: How concerned, if at all, are you about climate change, sometimes referred to as 'global warming'?

Assembly members' attendance throughout the assembly remained high. Ill-health and other personal reasons occasionally meant that one or more assembly members missed a weekend.[15] However this never had a significant effect on the percentages in the table above.

Assembly members spent much of their time at the assembly working in small groups. We created seating plans to make sure there were a diverse range of assembly members at each table, in line with the seven recruitment criteria. We changed the seating plan every day during the offline weekends and for each session during the online weekends.

A.3 Access, inclusion and wellbeing

> "Edd, Rebecca and the rest of the red [support] team you've made me feel so welcomed, relaxed and at ease on all three of the hotel weekends. You answered all of my queries, questions and emails no matter how trivial it may have been. You've all been so friendly and chatty. You've been with me every step of this whole experience, even when I've been tired and emotional. I stepped completely out of my comfort zone and [taking part] wouldn't have been possible without all of you."
>
> *Assembly member*

Access and inclusion were key considerations throughout the assembly.[16] Prior to the first weekend, they influenced decisions such as our venue choice (a fully accessible venue), the venue's location, and the timings of the events. We gave assembly members an honorarium of

15 One assembly member missed weekend two for health reasons. One (not the same person) missed weekend three for health reasons. When the assembly moved online due to coronavirus (please see Section B), two assembly members got in touch to tell us that they may have difficulty attending assembly sessions for Covid-19 related reasons. They asked to receive all the assembly information and said they would take part if they could. We aimed to facilitate their involvement by, for example, sharing speakers' pre-recorded presentations with them to watch in their own time. Sadly, however, these two assembly members did not take part in the online weekends. One further assembly member, who had previously missed a weekend for health reasons, also did not take part. Two further assembly members missed the final assembly weekend for personal reasons. The final weekend therefore had the lowest attendance of any weekend, with 103 out of the 108 assembly members present.

16 The measures described here are not an exhaustive list but they give an indication of the kinds of steps taken by the assembly team. We made it clear to assembly members that we could provide these, and other, types of support in the invitation letter. We also checked all assembly members' needs and preferences during stage three of recruitment.

£150 per weekend[17] for their participation, as well as covering their travel, accommodation and food/drink. Where relevant we covered costs such as childcare and the attendance of parents/guardians. We paid all costs relating to assembly members bringing carers with them to the weekends. We also met other access needs by, for example, providing hearing loops, headsets and materials in large print.

> "The tone set by Involve was perfect. It was welcoming, open and yet firm and assertive. It encouraged people to behave well and to take the assembly very seriously. It created an atmosphere of respect, co-operation, tolerance and humour. People from all walks of life were able to discuss and share with each other in a way they wouldn't have managed in a different setting."
>
> *Assembly member*

Access and inclusion remained key considerations at the assembly venue. In the first assembly session, assembly members drafted conversation guidelines for themselves. Examples included "respect others' backgrounds and opinions", "ensure everyone can participate", "be calm and polite", and "be honest and don't be afraid to give your opinion." The facilitators[18] at the weekends helped to ensure that assembly members were mindful of the guidelines at all times. They also used facilitation techniques that helped ensure everyone had a voice. We worked with the Expert Leads and speakers (please see Section D) to make the information presented to assembly members as accessible and digestible as possible.

We took a number of additional steps around access and inclusion when the assembly moved online due to Covid-19. These included minimising the amount of time assembly members, including those with young children, had to spend online at any one point, and ensuring that all assembly members had a way to participate in the sessions for free. We provided technical support and a guided chance to get to know the platforms we would be using. We provided flexible arrangements, where needed, for how and when assembly members could participate.

> "They were all so mindful of our needs and sympathetic to the different levels of confidence we had. A particular mention of the 'Quiet Room' staff. I hadn't expected to find this facility and was impressed that it had been thought of. I used it myself on a couple of occasions and found it to be an oasis of calm."
>
> *Assembly member*

Another critical consideration was assembly members' **wellbeing.**[19] There was a support team both at and between weekends whose focus was to look after assembly members. We asked assembly members to fill out feedback forms at the end of every assembly weekend so that we could check for any issues. We also checked-in with each assembly member individually after each event to make sure all was well.

17 We advised assembly members receiving welfare benefits to check with their advisor about whether or not the honorarium would negatively affect them and, if yes, whether it would help if the honorarium was paid in vouchers for a shop of their choice. Assembly members could also choose to waive the honorarium entirely, although no one did. Some assembly members did choose to receive vouchers rather than bank transfers.

18 There was a professional facilitator at each table, as well as at the front of the room.

19 Again this list is not exhaustive, but it gives a flavour of the measures put in place.

At the assembly venue in Birmingham we created a designated Quiet Room, staffed by a trained member of the team. Assembly members could use it at any time if they were feeling unwell, distressed, in need of some space, or for any other reason. When the assembly moved online, we instead provided a phone number that assembly members could use to reach trained members of staff.

B. The assembly weekends

The assembly was originally intended to run over four weekends in Birmingham, between the end of January and the end of March 2020. Three of these weekends happened as planned. The arrival of Covid-19 in the UK led to the fourth and final weekend being postponed and then moved online.

> "It was disappointing that weekend four didn't go ahead, but obviously we have to protect everybody's health, so it was the right thing to do. I am glad that it is going forward in some capacity and I think that doing it virtually is the best way to do this."
>
> *Assembly member – Sharon, from Yorkshire*

We split the intended content for the offline weekend four over three online weekends to ensure the assembly remained accessible (please see Section A.3 above).[20] Following requests from assembly members, Parliament and the Expert Leads, we also added a session on the implications of Covid-19 for the path to net zero.[21]

The content of each weekend was as follows:

Weekend one

> "Being here and seeing all these people, from all walks of life, representing the UK population, all so involved and willing to help make a change is really inspiring."
>
> *Assembly Member – Ibrahim, 42, from Surrey*

All assembly members heard from, and questioned, three panels of speakers. The panels covered an introduction to climate change and the net zero target; and overarching ethical, practical and strategic questions about the path to net zero.

Assembly members also reached their first decisions, on principles that should underpin the UK's approach to meeting its climate target (please see Chapter 2).

20 Each weekend in Birmingham ran from Friday evening to Sunday lunchtime. The online weekends each had short sessions on Saturday morning, Saturday afternoon and Sunday morning.

21 Please see Chapter 10 for the results of this session.

Weekend two

> “It’s an eye-opener all the new things I’m learning – incredible.”
>
> *Assembly Member – Amanda, from Kent*

On the Friday evening of weekend two, assembly members focussed on ways to consider the information they would receive throughout the assembly process.[22] On Saturday morning, all assembly members heard an introduction to where our energy comes from, and questioned the speakers. The assembly then split into three groups to examine:

- How we travel (please see Chapters 3 and 4);
- Heat and energy use in the home (please see Chapter 5);
- What we eat and how we use the land (please see Chapter 6) and What we buy (please see Chapter 7).

We divided assembly members into the three groups using random stratified sampling based on the seven recruitment criteria listed in Section A. This ensured each group remained representative of the UK population. Assembly members spent the remainder of weekend two in these groups, hearing evidence, questioning speakers and beginning to discuss what they had heard.

Weekend three

> “I feel like attitudes are constantly changing among who I’m sitting with and I’m enjoying it. Figuring out how we’re going to balance finance and technology and trying to grasp how we’re going to be able to fund these things but make sure things are getting done... It’s pretty special, especially as I’m only 21. It’s something I didn’t think I’d be able to get involved in, this early on. It’s going to have such a big impact on my future and hopefully, my children’s future so it’s really lovely to be asked to be involved in such a massive but valuable project.”
>
> *Assembly Member – Ellie, 21, from Buckinghamshire*

Weekend three started with a chance for assembly members to feed in their thoughts on the topics that their group had not considered at the previous weekend. We wrote these thoughts up overnight on the Friday and provided them to assembly members in the relevant groups on Saturday morning.

Assembly members spent the rest of weekend three in their topic groups, discussing the evidence they had heard at weekend two and reaching their decisions on these issues.

22 Assembly members heard a short presentation on this topic from Dr Alan Renwick, (Constitution Unit, University College London). All speakers’ presentations are available as slides, videos and transcripts at climateassembly.uk/resources/.

Above: An assembly member takes notes.

Weekend four (online)

> “Going online was another experience I had never had before. It worked really well. It was well organised and well done.”
>
> *Assembly member*

All assembly members spent weekend four focussed on the issue of ‘where our electricity comes from’ (please see Chapter 8). Assembly members heard from a panel of speakers on Saturday morning, questioned them on Saturday afternoon and discussed their views on Sunday morning. They made their final decisions by vote online, in a secure way, at the close of the weekend.

Weekend five (online)

> “The facilitation team has been amazing. They’ve kept us engaged and focused throughout the weekends which can’t have been easy when your dealing with 110 opinionated human beings … and they’ve done it in a friendly and respectful way.”
>
> *Assembly member*

Weekend five followed the same format as weekend four, with all assembly members considering the topic of ‘removing greenhouse gases from the atmosphere’ (please see Chapter 9).

Weekend six (online)

> “As a member of Climate Assembly UK I am proud that, despite the many challenges faced by us all during the Covid-19 pandemic, we have still managed to finish the work needed to successfully provide the six select committees with proposals to meet the target of net zero carbon emissions by 2050. I hope Parliament will take time to consider these proposals with due care and respect.”
>
> *Assembly member – Adrian, 52, from Northern Ireland*

Weekend six was split into three parts:

- On Saturday morning, all assembly members considered early drafts of sections of the assembly report, and provided feedback on them;
- On Saturday afternoon, all assembly members explored the implications of Covid-19 for the path to net zero (please see Chapter 10). They voted on some questions around this topic online at the end of the day;
- On Sunday morning, all assembly members discussed whether there were any additional recommendations that they wanted to add to the report (please see Chapter 11). Again, decisions on this area were made by vote online.

Assembly members continued to provide feedback on drafts of this report, and on the assembly’s interim briefing released in June 2020,[23] after the end of weekend six.

How the assembly reached its decisions

Assembly members learnt about each topic they considered and discussed them in-depth. They then made their decisions. This decision-making phase took two different forms:

- Sometimes assembly members drafted options to vote on themselves, in an entirely bottom-up process;
- Sometimes they voted on pre-prepared options, occasionally modifying these in advance of the vote.[24]

Citizens’ assemblies often primarily use the first kind of entirely bottom-up decision-making process. Climate Assembly UK supplemented this with votes on scenarios and options for a number of reasons:

- **The target** – it provided a guide to assembly members about how to construct packages of recommendations across the ten themes that together were capable of achieving net zero by 2050;
- **Key trade offs** – it meant that the assembly was able to explore and explicitly take a view on the key options and trade-offs facing decision-makers;

23 The assembly released its key recommendations on ‘Covid-19, recovery and the path to net zero’ in June 2020, in advance of government announcements on this issue.

24 The Expert Leads also used assembly members’ comments at previous weekends to help shape the options.

- **Time** – it enabled the assembly to cover a broader range of topics and issues in the time available to it.

The process for deciding on the options and scenarios used at the assembly was the same as the one for ensuring the information assembly members heard was balanced, accurate and comprehensive (please see Section C of this chapter).

Which decision-making process was used for which decisions is described clearly throughout this report.

C. Balanced, accurate and comprehensive information

The assembly team worked hard to ensure that the information presented to assembly members was balanced, accurate and comprehensive.

The Expert Leads

This work started with the assembly's Expert Leads: **Chris Stark**, Committee on Climate Change; **Professor Jim Watson**, University College London; **Professor Lorraine Whitmarsh**, University of Bath; and **Professor Rebecca Willis**, University of Lancaster.[25]

The role of the Experts Leads was to ensure that Climate Assembly UK was:

- Balanced, accurate and comprehensive in terms of its content on climate change;
- Focussed on the key decisions facing the UK about how to get to net zero by 2050.

They worked closely with Involve (please see Section D below) to draft the assembly's structure, including the themes it would consider, and the focus of each panel of speakers. They also drafted briefs for each speaker slot on each panel, and suggested names of speakers against each brief.

The Expert Leads all attended the assembly weekends as speakers and to provide balanced answers to questions that arose during assembly members' discussions. They were supported in this role by **Jenny Hill**, Committee on Climate Change, and **Professor Jillian Anable**, University of Leeds.

25 Involve (please see Section D) contacted the Expert Leads to ask if they would be interested in principle in being involved before submitting a proposal for Parliament's tender for contract. The team at Parliament working on Climate Assembly UK approved these individuals as the assembly's Expert Leads when awarding the contract, on the basis of their clear expertise in addressing climate change.

Advisory Panel

The Expert Leads' suggestions for the content of the assembly went first to its Advisory Panel for feedback. Members of the Advisory Panel were, in alphabetical order:[26]

- Fernanda Balata, New Economics Foundation
- Tanisha Beebee, Confederation of British Industry (CBI)
- Patrick Begg, National Trust
- Allen Creedy, Federation of Small Businesses (FSB)
- Audrey Gallacher, Energy UK
- Professor Michael Grubb, University College London (UCL) Institute for Sustainable Resources
- Eamonn Ives, Centre for Policy Studies
- Ann Jones, National Federation of Women's Institutes
- Ceris Jones, National Farmers Union (NFU)
- Chaitanya Kumar, Green Alliance[27]
- Kirsten Leggatt, 2050 Climate Group
- Matthew Lesh, Adam Smith Institute
- Nick Molho, Aldersgate Group
- Luke Murphy, Institute for Public Policy Research (IPPR)
- Tim Page, Trades Union Congress (TUC)
- Doug Parr, Greenpeace
- Dr Alan Renwick, Constitution Unit, University College London (UCL)
- Dhara Vyas, Citizens' Advice
- Rebecca Williams, RenewableUK

Panel members commented on every part of the plans, suggesting additional content, amended structures for panels, and alternative speakers. Minutes of Advisory Panel meetings are published on the Climate Assembly UK website. Advisory Panel members also commented on all written briefings provided to assembly members.

26 Advisory Panel members were chosen to represent stakeholders with an interest or expertise in the areas of emissions reduction that Parliament and the Expert Leads felt Climate Assembly UK should examine. The organisations were chosen to make the panel balanced across a broad range of political and ideological standpoints, representing different parts of society (e.g. business, trade unions, NGOs and civil society groups). A climate change specialist in the Parliamentary Office of Science and Technology (POST) drew up an initial list of members. The Climate Assembly UK team at Parliament then worked with the Expert Leads to ensure that this group met the above criteria.

27 Chaitanya has since changed roles but was at Green Alliance at the point when Advisory Panel meetings took place.

Academic Panel

Members of Climate Assembly UK's academic panel were, in alphabetical order:[28]

- Jillian Anable, Professor of Transport and Energy, University of Leeds
- John Barrett, Professor of Energy and Climate Policy, University of Leeds
- John Barry, Professor of Green Political Economy, Queen's University Belfast
- Jason Chilvers, Professor of Environment and Society, University of East Anglia
- Nick Eyre, Professor of Energy and Climate Policy, University of Oxford
- Dr Clair Gough, Senior Research Fellow with the Tyndall Centre for Climate Change Research, University of Manchester
- Dr Rosie Green, Assistant Professor in Nutrition and Sustainability, London School of Hygiene & Tropical Medicine
- Dr Jo House, Reader in Environmental Science and Policy, University of Bristol
- Tahseen Jafry, Professor of Climate and Social Justice and Director The Centre for Climate Justice, Glasgow Caledonian University
- Carly McLachlan, Professor of Climate and Energy Policy, University of Manchester
- Dale Southerton, Professor in Sociology of Consumption and Organisation, University of Bristol
- Benjamin Sovacool, Professor of Energy Policy at the Science Policy Research Unit (SPRU), University of Sussex

The Expert Leads drew on the expertise of individual members of this panel when drafting and finalising the assembly's suggested content. Academic panel members also commented on written briefings provided to assembly members within their respective areas of specialism.

Wider society

Climate Assembly UK is grateful for the engagement and input of a number of prominent business, faith and civil society leaders from across UK society.

These individuals received a briefing on Climate Assembly UK in December 2019 and had the opportunity to provide comments:

- Dame Carolyn Fairbairn, Director-General, CBI
- Joanna Haigh CBE FRS, Emeritus Professor of atmospheric physics and recent co-director of the Grantham Institute on climate change at Imperial College London

28 Academic Panel members were chosen on the basis of their expertise on areas of climate change that Parliament and the Expert Leads felt Climate Assembly UK should examine. A climate change specialist in the Parliamentary Office of Science and Technology (POST) drew up an initial list of members. The Climate Assembly UK team at Parliament then worked with the Expert Leads to ensure that this group met the above criteria.

- Rt Rev Nicholas Holtam, Lord Bishop of Salisbury and Church of England lead on the environment
- Anabel Hoult, CEO, Which?
- Geraldine Howley OBE, CEO, Incommunities Group and Chair of the Chartered Institute of Housing's governing board
- Minette Batters, President, National Farmers' Union
- Harun Khan, Secretary General, Muslim Council of Britain
- Edmund King OBE, AA President
- Professor Lord Krebs, Emeritus Professor of Zoology Oxford University, Former Member of the Climate Change Committee and Chair of the Adaptation Sub Committee
- Martin Lewis OBE, Founder, MoneySavingExpert.com
- Dr Helena McKeown, Chair of the BMA's Representative Body
- Deirdre Michie OBE, Chief Executive, OGUK
- Ephraim Mirvis, Chief Rabbi
- Nick Molho, Executive Director, Aldersgate Group
- His Eminence Cardinal Vincent Gerard Nichols, Archbishop of Westminster
- Frances O'Grady, General Secretary, Trades Union Congress
- Stephen Phipson CBE, Chief Executive, Make UK
- Jonathon Porritt, Founder Director, Forum for the Future
- Dr Nina M Skorupska CBE FEI, Chief Executive, REA – The Association for Renewable Energy and Clean Technology
- Beccy Speight, Chief Executive, RSPB
- Matt Wrack, General Secretary, Fire Brigades Union
- Sir Simon Stevens, Chief Executive, NHS

Parliament

Sign off[29] on the assembly's plans rested with Parliament, including House of Commons select committee staff and officials from the Parliamentary Office of Science and Technology (POST). These individuals have considerable experience of putting together balanced panels and evidence for Members of Parliament and select committees.

29 Parliamentary officials were also able to input to all aspects of the assembly's plans at earlier stages in their development.

Speakers

The assembly's final design included presentations from forty-seven speakers, including the Expert Leads. Some speakers were asked to act as 'informants', meaning they needed to cover the range of views and available evidence on a topic. Others were asked to be 'advocates', giving their own view or that of their organisation. At the start of each chapter we have included in a footnote a list of the speakers who presented on that topic and noted whether they were advocates or informants. We also gave assembly members this information before they heard from the relevant individuals.

In addition to the forty-seven speakers, and the opportunity to hear from Sir David Attenborough, Chairs of two of the commissioning select committees – Rachel Reeves MP,[30] and Mel Stride MP – addressed the assembly. They thanked assembly members for taking part and explained why they see Climate Assembly UK as important.

A full list of speakers, including the two MPs, can be found on the Climate Assembly UK website.

Transparency

Transparency was a key consideration for the Climate Assembly UK team. The Climate Assembly UK website (www.climateassembly.uk) contains information including:

- Videos of all speakers' presentations to the assembly, along with their slides and transcripts of what they said;
- Videos of question and answer sessions with speakers that took place in plenary, along with transcripts of those sessions;
- All written briefings given to assembly members;
- Full lists of the assembly's Expert Leads, Advisory Panel members, Academic Panel members and the organisations involved in delivering the assembly, along with minutes of Advisory Panel meetings.

We live-streamed all speaker presentations to the assembly online. We also opened the assembly to a wide range of media, stakeholders, officials and politicians so that they could observe the assembly's proceedings.

We were careful to balance our wish for complete transparency against the need to protect assembly members' identities. Assembly members all had a choice about whether or not to take part in media interviews, photos and audio/video footage of the assembly. It was also their decision whether or not to reveal their identity on social media.

30 Rachel Reeves MP has since left her role as a committee chair to become Shadow Chancellor of the Duchy of Lancaster and Shadow Minister for the Cabinet Office.

Above: Assembly members discuss the issues.

D. The delivery team and funding

After a competitive tendering process, in September 2019 Parliament awarded a contract for the delivery of Climate Assembly UK to:

- **The Involve Foundation** (**'Involve'**) – a public participation charity, whose vision is of a vibrant democracy with people at the heart of decision-making. Involve was responsible for ensuring that Climate Assembly UK was a high quality citizens' assembly. It also recruited and led the facilitation team for the assembly and managed the project overall. It was the main point of contact for assembly members. www.involve.org.uk
- **Sortition Foundation** – a not-for-profit company that promotes the use of randomly selected groups of people in decision-making. Sortition Foundation was responsible for recruiting assembly members. www.sortitionfoundation.org
- **mySociety** – a not-for-profit social enterprise that provides technology, research and data that help people to be active citizens. It was responsible for Climate Assembly UK's branding and website. www.mysociety.org

Climate Assembly UK was funded by the House of Commons, with additional funding from two philanthropic organisations: the Esmée Fairbairn Foundation and the European Climate Foundation.[31] The two philanthropic organisations did not have a say in how the assembly was run or what it covered.

The Energy and Climate Intelligence Unit worked with Parliament to support communications outreach around the Climate Assembly UK weekends and results. www.eciu.net

31 The House of Commons provided £120,000 in funding. The Esmée Fairbairn Foundation and the European Climate Foundation contributed a further £200,000 each, rising to £220,000 each to help cover the additional costs incurred due to Covid-19.

E. Assembly members' views of the assembly

An independent evaluation of Climate Assembly UK will be published in Spring 2021. However, initial results suggest that assembly members viewed the assembly very positively:

Statement about the assembly, from the survey completed by assembly members after all six weekends	% assembly members 'strongly agreed' or 'agreed'	% assembly members 'don't know / unsure'	% assembly members 'strongly disagreed' or 'disagreed'
'I have understood almost everything that the other members of my small group said during our discussions'	98	1	1
'I have understood almost everything that was presented by the speakers'	95	4	1
'I have had enough information to participate effectively'	91	5	4
'The information I have received has been fair and balanced between different view points'	78	16	6
'The assembly has helped me clarify my views about how to reach net zero'	96	1	3
'I have learned a lot during the assembly about how UK can achieve net zero by 2050'	95	3	2
'My fellow participants have respected what I had to say, even when they didn't agree with me'	94	5	0
'I have had ample opportunity in the small group discussions to express my views'	95	2	3
'Assemblies like this should be used more often to inform government and parliament decision-making'	90	7	3

The interim results also suggest that **taking part in the assembly has impacted positively on assembly members' appetite and confidence to engage in political decision-making.** 88% of assembly members 'strongly agreed' or 'agreed' that they 'feel more confident to engage in political decision-making as a result of being involved in this citizens' assembly.' The same percentage 'strongly agreed' or 'agreed' that 'taking part in this citizens' assembly has made me want to be more involved in other aspects of decision-making.'

> "Like everyone else, I really enjoyed the entire experience, and I am sorry that it has now come to an end. It was a once in a lifetime opportunity, and I am truly grateful to have been given the chance to take part."
>
> *Assembly member*

> "Concern about climate change is as high as ever, and it's clear we all need to play our part to achieve the net zero emissions target that was passed into UK law by Parliament last year. This is why I welcome the work of Climate Assembly UK, a great example of parliamentarians engaging with the public to help influence their work and proposals for action. I am very grateful to the assembly members for their time. I look forward to hearing the outcome of their discussions – and to chairing House of Commons debates on a topic that is so relevant to us all."
>
> *Right Honourable Sir Lindsay Hoyle, Speaker of the House of Commons*

The rest of this report recounts the assembly's detailed and considered view of its recommended path to net zero by 2050. Taken together the recommendations provide a internally consistent and coherent vision, and are designed to be considered as a whole.

Underpinning principles

Chapter 2

Assembly members' first decision focussed on the principles that should underpin the UK's path to net zero. They agreed twenty-five underpinning principles, then used a vote to prioritise them.

The principles form part of the assembly's recommendations to government and Parliament. Assembly members also used them to inform their own work.

What did the assembly consider?

All assembly members took part in the discussions about underpinning principles, which took place at the first assembly weekend. They drew on their own experiences, values and views, as well as evidence from the assembly's first three panels of speakers.[1] These panels covered an introduction to climate change, and different perspectives on overarching ethical, practical and strategic questions about the path to net zero. All the speakers gave presentations to the assembly and were then questioned by its members.

How did the assembly reach its decisions?

Assembly members began their decision-making process after the first two panels of speakers. They started by considering individually how they would finish the sentence:

> *"The UK's path to net zero by 2050 should be underpinned by the principles of…."*

They then discussed their views in small groups at their tables, with each table agreeing their four priority responses. These responses had to, between them, represent the range of opinions at the table.

While assembly members listened to and questioned the third panel of speakers, facilitators took these responses and grouped similar ideas together to form a draft

1 The assembly heard from nine speakers across its first three panels: Professor Joanna Haigh, Imperial College London (informant); Professor Ed Hawkins, University of Reading (informant); Professor Rebecca Willis, University of Lancaster (informant); Chris Stark, Committee on Climate Change (informant); Fernanda Balata, New Economics Foundation (advocate); Professor Paul Ekins, University College London (advocate); Modi Mwatsama, Wellcome (advocate); Tony Juniper, Natural England (advocate); Kirsten Leggatt, 2050 Climate Group (advocate). All speakers' presentations are available as slides, videos and transcripts at climateassembly.uk/resources/. An 'informant' is a speaker who we asked to cover the range of views and available evidence on a topic. An 'advocate' is a speaker who we asked to give their own view, or the view of their organisation. Assembly members knew whether speakers were informants or advocates.

ballot paper, overseen by an official from Parliament. They presented the draft back to assembly members, who had the opportunity to note any omissions or suggest changes. Facilitators then made these amends. Tables also discussed and added additional ideas based on the evidence they heard from Panel Three.

The final ballot paper included twenty-five principles that assembly members believe should underpin the path to net zero.

Prioritised principles

The vote asked assembly members to prioritise the twenty-five principles that they had developed. Each assembly member could vote for the eight options that they saw as the highest priority.

It is important to note that the results of the vote therefore show priorities not levels of support. A lack of votes does not necessarily signal that assembly members disagreed with an idea, just that they saw it as less important.

The results of the vote were as follows.

Principles prioritised by over half of all assembly members

1. Informing and educating everyone (the public, industry, individuals and government) – 74 votes
2. Fairness within the UK, including for the most vulnerable (affordability, jobs, UK regions, incentives and rewards) in actions, not just words – 65 votes
3. Leadership from government that is clear, proactive, accountable and consistent (cross-party consenus) – 63 votes
4. Protecting and restoring the natural world – 59 votes

Principles prioritised by over a third of all assembly members

5. Ensuring solutions are future-proofed and sustainable for the future – 45 votes
6. A joined up approach across the system and all levels of society (working together, collaborating, and sharing) – 40 votes
7. Long-term planning and a phased transition – 39 votes
8. Urgency – 37 votes
9. Support for sustainable growth (including pioneering innovation) – 37 votes

Additional principles agreed by the assembly

10. Local community engagement embedded in national solutions – 33 votes
11. Think about our impact globally and be a global leader – 32 votes

Above: Assembly members discuss the issues.

12. Use of mix of natural and technological solutions – 32 votes
13. Transparency and honesty – 32 votes
14. Underpinned by scientific evidence and focused on the big wins – 29 votes
15. Equality of responsibility for individuals, government and business – 28 votes
16. Achievable – 27 votes
17. Everyone should have a voice (e.g. via local representation and participation, or in holding government to account) – 27 votes
18. Regular independent checks on progress – 27 votes
19. Fairness for the most vulnerable globally (less developed countries) – 24 votes
20. Making the most of potential benefits for everyone (e.g. health, wellbeing and the economy) – 24 votes
21. Enabling and not restricting individual choice – 23 votes
22. Protect the UK economy, including from global competition – 18 votes
23. Compromise about changing lifestyles – 15 votes
24. Those who bear the most responsibility should act – 13 votes
25. Not negatively impacting other institutions – 4 votes

The top nine principles – those prioritised by over a third of assembly members – were displayed in the assembly rooms throughout the remaining weekends. We also gave assembly members hard copies of the full vote results to refer to during their discussions.

Assembly members returned to these principles, and considerations related to them, throughout the rest of the assembly.

How we travel on land

Chapter 3

Summary of recommendations

1 Assembly members identified **18 considerations that they would like government and Parliament to bear in mind when looking at surface transport and the path to net zero.** These included that solutions must be accessible and affordable to all sections of society, the need to "help create massive change at an individual level", and a wish for cross-party action.

2 Assembly members aimed to **minimise restrictions on travel and lifestyles**, placing the emphasis on shifting to electric vehicles and improving public transport, rather than on large reductions in car use.

3 Assembly members recommended a **future for surface transport in the UK** that includes:

- A ban on the sale of new petrol, diesel and hybrid cars by 2030–2035;
- A reduction in the amount we use cars by an average of 2–5% per decade;
- Improved public transport.

4 In terms of **how the UK should make these changes**, assembly members recommended a wide range of policies aimed at moving quickly to low carbon vehicles, increasing the use of public and active transport, and discouraging car ownership and use. These included:

- Government investment in low carbon buses and trains;
- Quickly stop selling the most polluting vehicles;
- Adding new bus routes and more frequent services;
- Making public transport cheaper;
- Bringing public transport back under government control;
- Grants for businesses and people to buy low carbon cars;
- Localisation;
- Investing in cycling and scootering facilities;
- Increasing investment to make buses faster and more reliable;
- Car scrappage scheme.

5 As well as the wish to minimise restrictions on lifestyles, **assembly members' rationale for their decisions** included points around the speed of change, feasibility, practicalities, cost (both personal and overall), and co-benefits such as improved air quality, reduced congestion and impacts on local areas and high streets. Assembly members consistently raised the importance of accessibility and affordability, stressing the need to avoid negative consequences for rural areas, mental health and isolation, people with a disability, and those on low incomes.

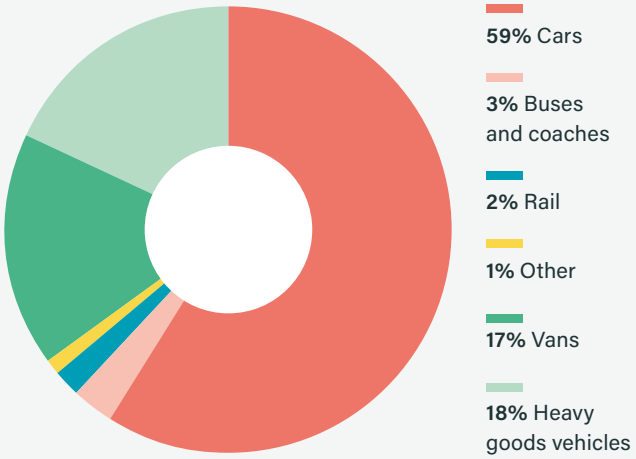
How we travel on land

The ways we travel on land are collectively known as 'surface transport'. Surface transport includes cars, vans and lorries, as well as public transport like buses, coaches and trains. It also includes 'active transport' – for example, when we walk, cycle or scoot.

Surface transport accounts for 70% of the UK's total greenhouse gas emissions from transport[1] and 23% of the UK's greenhouse gas emissions overall.[2] Most of these emissions come from cars, with just 5% arising from public transport.

Figure 1

Proportion of greenhouse gases from each type of surface transport (2017)[3]



Surface transport includes both passenger or 'personal' transport, and freight. Personal transport is what people use to travel for pleasure, for everyday activities (like going shopping)

1 With the rest made up of air travel (22%) and sea travel (8%).
2 BEIS (2019) Final UK greenhouse gas emissions national statistics 1990–2017.
3 BEIS (2019) Final UK greenhouse gas emissions national statistics 1990–2017.

and for almost all work. Freight is transport used to move goods. It includes goods for everything, including farming, industry, shops and online shopping deliveries. It also includes transport used for services, for example the vans used by decorators, plumbers or to deliver the post.

Climate Assembly UK considered personal transport only. It did not look at freight. This followed guidance from Parliament that, if there was not time to consider both, its committees most wanted to hear assembly members' views on personal transport. Personal surface transport accounts for 15% of the UK's greenhouse gas emissions overall.

What did the assembly consider?

Thirty-six assembly members considered the topic of surface transport in-depth. We selected these assembly members from the assembly as a whole using random stratified sampling. This ensured that they remained reflective of the wider UK population in terms of both demographics[4] and their level of concern about climate change.

These assembly members heard a wide range of views both on what the future of surface transport could look like for the UK, and how we might move towards that future. They had the opportunity to question each speaker[5] in detail. These evidence sessions took place at weekend two of the assembly.

Assembly members spent weekend three of the assembly discussing the evidence they had heard and their own views in-depth, before reaching conclusions on three separate areas:

A. **Considerations:** the overarching considerations that government and Parliament should bear in mind when making decisions about surface transport and the path to net zero;

B. **Futures**: what the future of surface transport in the UK should look like;

C. **Policy options:** how the UK should move toward this future.

Assembly members also had the opportunity to discuss and add **anything else they wanted to say** to government and Parliament about surface transport and the path to net zero. Assembly members' views on the implications of Covid-19 for this topic are touched on in Chapter 10.

4 Age, gender, ethnicity, educational qualification, where in the UK they live and whether they live in an urban or rural area.

5 The assembly heard from six speakers on surface transport: Professor Jillian Anable, University of Leeds (informant); Ellie Davies, Committee on Climate Change (informant); Lynn Sloman, Transport for Quality of Life (informant); Jason Torrance, UK100 (informant); Steve Melia, University of West England (advocate); John Siraut, Jacobs (advocate). All speakers' presentations are available as slides, videos and transcripts at climateassembly.uk/resources/. An 'informant' is a speaker who we asked to cover the range of views and available evidence on a topic. An 'advocate' is a speaker who we asked to give their own view, or the view of their organisation. Assembly members knew whether speakers were informants or advocates.

Contents of this chapter

A. Considerations

Assembly members reached their first decisions on surface transport by discussing their answers to the following question:

> *What considerations should government and Parliament bear in mind when making decisions about surface transport and the path to net zero?*

Assembly members thought about their answers to this question individually. They then discussed their views in small groups, with each table agreeing their five top considerations. These top considerations had to, between them, represent the range of views at the table.

Facilitators took the top considerations from each table and grouped similar options together to create a list on which assembly members could vote. They checked this list back with assembly members to make sure they had accurately reflected their views. This included making any necessary adjustments. Each assembly member could then vote for the four options that they felt to be most important.

The results were as follows. The wording of the considerations in the table is either word for word what assembly members wrote on their option cards or, where facilitators combined similar options from several tables, how we described the options to assembly members prior to the vote. Where applicable, we have also included in italics further detail on what assembly members wrote on their option cards.

Rank	Consideration	% assembly members who chose it as a priority
1	Solutions must be accessible and affordable to all sections of society	56
2	Help create massive change at an individual level, including: ▪ Carrot and stick approach ▪ Education ▪ Information ▪ Be prepared to make unpopular decisions *Some assembly members talked about the need to "enable behaviour change AND get a wider public understanding of [the] imposed chang[e] through public education/information." Others felt that "education is critical to demonstrate the co-benefits to society such as health" or suggested "public education videos."*	47
3	Make decisions in a way that means they cannot be changed by every new government (cross-party support)	39
4	The polluter pays *Some assembly members noted specifically that this applied to "companies that have the most negative impact", while others stated more generally that "those who pollute should pay more." Some advocated "introduc[ing] laws/regulation as soon as possible."*	36
5	Check and be careful about side effects and unintended consequences (moral, ethical and environmental implications, and the effect on the rest of the world) *Some assembly members noted particular risks around new technologies and mining.*	33
=6	Invest in and develop public transport/infrastructure to make it accessible *Some assembly members stated that "transport options should be accessible to everyone" and "regular."*	25
=6	Greater investment in R&D from Government and private companies for both new and existing technologies (sooner rather than later) *Some assembly members suggested that new technologies could be "better and safer" or suggested that "the Government['s] role is to enable and incentivise the adoption of new technologies."*	25
8	Invest in and develop public transport/infrastructure to be affordable (free?) for people using it	22
9	Long-term consequences of science, claims, decisions, policies assessed by an independent regulator	19
=10	Protect jobs and industry – and support them to transition *Some assembly members noted that "transition to low carbon options risks losing jobs which needs to be managed by initiatives to re-train [the] workforce."*	17

=10	Dunkirk example *Note: This referred back to a case study presented by one of the speakers, Lynn Sloman, during Weekend Two. It showed the impact of introducing free bus travel in Dunkirk in autumn 2018. Bus trips on some routes increased by 85%, and half of the new bus users previously travelled by car.*	17
12	Realism of planned change	14
=13	Joined up public transport planning with service level reliability	11
=13	Long-term and phased transition in a way/manner that benefits people and causes minimal disruption to their lives	11
=13	Charging infrastructure (especially for high-density housing) and ensure it works – e.g. adapters, charge points etc	11
16	Safe, more and good infrastructure for cycling	8
17	In considering cost think about what is reasonable for individuals, governments and business and both users and non-users of particular transport	6
18	Enable maintaining quality of life for all (including people with disabilities, rural communities)	3

Note: It is worth noting that considerations specifically around improving public transport – ranked 6, 8, 10 and 13 above – together received 27 votes, which would have placed them first. However it is possible that individual assembly members voted for more than one option within this group, which is why we have treated them separately.

B. Futures

After deciding on their most important considerations, assembly members moved on to look at what the future of surface transport should be for the UK.

To aid them in this process, the Expert Leads presented assembly members with three scenarios:

1. Fast action to change the cars we drive;
2. Changing the cars we drive and how much we use them;
3. Reducing the amount travelled across all transport types.

Together these scenarios covered a broad range of views about what could happen to surface transport to help the UK meet its 2050 net zero target.

Assembly members discussed each of the scenarios or 'possible futures' in turn, before voting on them by secret ballot.

We start by presenting the rationale for their views, taking each possible future in turn.

Jump to the vote results on page 75

B.1 Fast action to change the cars we drive

The emphasis of this possible future was on changing the types of car that we drive. It would involve:

- Banning the sale of new petrol, diesel and hybrid cars by 2030;
- Quickly stopping the sale of the most polluting vehicles, for example some SUVs;
- Reducing the amount we use cars by about 2% per decade, for example stopping car use in the centre of large urban areas;
- Faster uptake of electric buses and trains;
- Strictly limiting new road building until virtually all petrol, diesel and hybrid cars are gone from the roads (around 2045).

Assembly members discussed this possible future in small groups. They identified the following pros and cons.

⊕ Pros

+ **Doesn't require reduced car use** – some assembly members liked that you "do not have to reduce car use", or that this option involves "less car use reduction than other options – so people get to keep their (beloved) cars."
+ **Less authoritarian** – some assembly members felt that this option involved "fewer restrictions on individuals", or described it as the "least authoritarian route to reductions."
+ **Impactful and quick** – some assembly members said there would be "guaranteed change – through legislation" or "fast, decisive action that will make an immediate impact." Others said we would "reach [the] target of net zero sooner", or that this was the "quickest way to effectuate change."
+ **Co-benefits including air quality** – some assembly members suggested that this future would bring "benefits for all: e.g. air quality, saving money on new roads, car running costs reduce." Others suggested that there would be "air quality improvement in city centres", that "air quality will improve quickly", or that "in society change is possible to make [a] cleaner/ pleasant atmosphere, starting with active transport."
+ **Stopping selling the most polluting vehicles** –some assembly members said they supported "stop[ping] selling the most polluting vehicles" including because they "will encourage greener choices."
+ **No road building** – some assembly members said that the "ban [on] road building is positive" or that "not building new roads would save money that could be spent on greener solutions."
+ **Better and more used public transport** – some assembly members said that "making cars more expensive should help [the] push on fixing public transport" or that "no cars in [the] city centre [would]... encourage public transport."
+ **Electric public transport** – some assembly members liked the idea of "more electric trains and buses", or a "faster uptake on [electric] buses and trains."

+ **Feasible** – some assembly members described this future as "feasible – more achievable", or said that "no more car use in city centres is cost effective and can be done tomorrow."
+ **"Shot in the arm for car industry"**
+ **"The running costs [of cars] will be improved with electric cars"**
+ **"Allows people time to adjust to changes"**

⊖ Cons

– **Price, affordability and rural areas** – some assembly members suggested that the "price[s] [of electric cars] would need to be more realistic than they are now" or worried about "affordability – being forced to upgrade your car before you need to." Others asked "how/what to buy if [you] need a car in 2025? Electric car probably too expensive?" Some assembly members expressed concerns that if it's "more expensive to travel by car, people in rural areas may be penalised."

– **Congestion** – some assembly members suggested it would "not solve [the] problem of congestion" or that "there would be just as many cars on the road". Others commented "don't like banning road building – concern will result in more congestion."

– **Feasibility and readiness** – some assembly members questioned "is it technically feasible (2030 is only 10 years away)?", or "will EV infrastructure be there?"to." Others said the "infrastructure [is] not ready yet." or stated that their support was conditional on 'charging infrastructure ...[being] in place."

– **Job losses –** some assembly members asked "what would happen to petrol stations and the jobs they create?" or said "not building roads will impact jobs and also mean regional poverty (southeast only benefit)." Some others questioned the "time frame", suggesting it was "very soon" and would result in "job loss."

- **Banning hybrids** – some assembly members disliked "banning hybrids" or asked "why are petrol, diesel and hybrid grouped together? They are different."
- **Scrapping cars** – some assembly members asked "is it fair to scrap cars early, if people have just bought them?" or suggested there might be problems "managing high volumes of scrapped cars."
- **Fewer benefits** – some assembly members said there would be "no urban improvement which has [positive] effects on health which should be [a] priority!" or that there would be "no benefit for non-car users, no improvement in public transport."
- **"Quickly stop selling most polluting vehicles – reduction in choice"**
- **"Demonised for driving classic cars and motorbikes"**
- **"Need to build electric rail to compensate for no road building"**
- **"Shuts down consideration of alternative fuels option"**
- **"Overall eventual footprint worse because of EV production"**
- **"Not enough solutions to replace petrol, diesel and hybrid cars (electric cars)"**

Some assembly members attached conditions to their support for this possible future, suggesting that:

- "Renewable energy sources [would need to be] in place";
- "Government fleets should be converted first as an example of leadership (charging point at No. 10)." Other assembly members stated more generally that "all [car] fleets should be converted";
- We should "star[t] with active transport."

When we asked assembly members to rank the possible futures in their order of preference, this scenario received significant support from assembly members. Please see below for the results of the vote.

B.2 Changing the cars we drive *and* how much we use them

This scenario would involve a combination of changing the types of car that we drive and reducing the amount we drive. It would include:

- Banning the sale of new petrol, diesel and hybrid cars by 2032–2035;
- Reducing the amount we use cars by an average of 5% per decade, meaning for example that only half the people who drove to work pre Covid-19 would be able to do so;
- One or more of:
  - Improving public and active transport (e.g. trains, buses, cycling, e-biking, walking);

- Helping people to travel shorter distances by planning the location of houses and shops etc better;
- Making it more expensive to travel by car compared to other transport types;

- Strictly limiting new road building until virtually all petrol, diesel and hybrid cars were gone from the roads (around 2050)

Assembly members discussed this possible future in small groups. They identified the following pros and cons.

⊕ Pros

+ **Public and active transport** – some assembly members liked the idea of "improved public transport" or suggested there would be "improvement in quality of life by improving public transport." Others backed "increasing active travel" or a "focus on expanding correct infrastructure / creating new infrastructure to include options for cyclists and walkers." Some said more generally that this future "considers options for non-car users."
+ **Air quality, pollution and health** – some assembly members cited the "health benefits from active travel, air quality improvement, [and] better urban environments", with some stating that "all health will improve." Some noted "air quality improvement" specifically, or suggested that electric cars would resolve problems caused by people not turning their engines off at traffic lights.
+ **Support for localisation** – some assembly members said this future would "benefit [the] localisation of services" or "improve local shopping." Others noted that "new estates do not have local amenities (shops/doctors etc) so you are forced to use [a] car – [they] need better public services."
+ **Longer until ban** – some assembly members said that the ban on petrol, diesel and hybrid cars was "not completely straightaway reducing people's options – good option for car users" or that there was a "longer time to adapt to change."
+ **Encouraging behaviour change** – some assembly members said it would "encourage a behaviour change" or "encourage choosing EV so [as] not to be penalised." Others suggested that "making it [car use] more expensive will make people travel by public transport to save money" or that "reducing car use by 5% will improve use of public greener transport."
+ **Emissions reduction** – some assembly members liked that it would "reduce CO_2 use" or said the "reduction in emissions begins earlier."
+ **Feasibility** – some assembly members liked the "realism – e.g. 5%" or suggested that "no more car use in city centres [is] easy to do, cost effective and can be done tomorrow."
+ **"Greater sense of personal choice – more choice in how you make specific journeys e.g. car/public transport/cycle"**
+ **"Planning – better town centre"**
+ **"Reduction of cars should result in quieter roads – making it easier to get around"**
+ **"Strictly limiting sale of petrol, diesel and can help the new industry to fund/fix new tech"**

⊖ Cons

- **Unachievable** – some assembly members suggested that "changing ingrained behaviour is very hard" or asked, "how do we know [a] 5% reduction is achievable?". Others asked "banning – is 2032/2035 realistic" or said "people will continue to buy second hand petrol/ diesel cars – they will be cheaper than buying a new electric car within the 2032–2035 period." Some assembly members felt that "improving public transport will not stop people driving their own cars" or said they were "sceptical that public transport [would be] good enough to reduce car use by 5%."
- **Increased costs, including for particular groups** – some assembly members disliked "making it more expensive to travel by car ", suggesting that it "penalises car users by increasing costs to them [when an] increase in green solutions shouldn't take choices away from them (independence)." Some assembly members worried increased costs "may price people out of essential travel", with some particularly noting the "impact on disabled [people] of increased costs." Others said it is "not practical to increase cost… Rural areas need to drive to health centre – school etc." Some assembly members asked "how much price change increase [is] needed to change behaviour – big stick."
- **Lifestyles and flexibility** – some assembly members said it would "make it harder for people to live as they do today", or noted that people would "have to change their transport." Others questioned whether "people really mak[e] journeys now that they consider unnecessary?" or worried that "not driving to work takes away flexibility e.g. if child is ill."
- **Banning road building** – some assembly members said "limiting new road build[ing] will have [a] negative effect on rural/non-accessible areas" or would result in "increased congestion; reduced growth; poorer quality of life."
- **"Will lead to more carbon emissions lasting longer – because diesel and petrol on the road longer"**
- **"Particulate emissions from EV – still an issue"**
- **"Where do we find the £28 billion generated by fuel tax?"**
- **"What happens to [e.g.] Ikea deliveries?"**

Some assembly members noted conditions to their support for this future, stating that:

- "Public transport [in rural areas] would need to be as good as city transport";
- It would have to be "easier to bring shopping back by public transport";
- There would need to be "new estates planned";
- They would want the ban on petrol, diesel and hybrid cars to be 2032 not 2035.

When we asked assembly members to rank the possible futures in their order of preference, this scenario received significant support from assembly members. Please see below for the results of the vote.

B.3 Reducing the amount travelled across all transport types

This scenario places the emphasis on reducing the total amount we travel, including significant reductions in car use. It would involve:

- Leaving the phase out of petrol, diesel and hybrid cars and buses to happen naturally as car companies start to offer electric cars into the marketplace;
- The option to introduce a ban on sales of petrol, diesel and hybrid cars later if the sale of electric cars is too slow;
- Reducing car use by an average of 10% per decade, meaning for example that less than half of those driving to work pre Covid-19 would be able to do so and double the number of people would need to holiday by train instead of by car;
- All of:
  - Improving public and active transport (e.g. trains, buses, cycling, e-biking, walking);
  - Helping people to travel shorter distances by planning the location of houses and shops etc better;
  - Making it more expensive to travel by car compared to other transport types;
- No building roads until virtually all petrol, diesel and hybrid cars are gone from the roads (around 2050)

Assembly members discussed this possible future in small groups. They identified the following pros and cons.

⊕ Pros

+ **Localisation** – some assembly members liked the "local community focus" or the idea of "services available locally", suggesting there would be "better local planning and amenities" or "more local services improved." Some felt it would lead to "more mobile services (e.g. medical services)." Others said localisation would mean "more leisure time as less travel time."
+ **Improved public and active transport** – some assembly members liked the idea of "improving public transport", or an "improvement of public transport and cycling routes." Others said "a big investment in electric public transportation benefits communities."
+ **Behaviour change and a greater range of options** – some assembly members stated that "much improved public transport, car sharing, cycling and walking means less need to own a car." Others suggested there would be "positive behavioural change" or said the scenario included "many options to reduce car use e.g. public transport, shorter distances to shops." Some said it "reduces the need for any kind of transport [beyond walking]."
+ **Co-benefits –** some assembly members suggested that "with public transport you will interact more and meet people" or that there would be "health benefits – mental." Others felt there would be "less congestion overall, more open spaces" or noted we would be "reducing polluting car use by 10% per decade."

+ **Flexibility of approach** – some assembly members said that they "like the idea of delaying the ban on petrol and diesel but [with the] option to use [a ban later] if needed." Some said the approach had "more flexibility... in case electric vehicle development does not progress as expected."
+ **Time for technology to develop** – some assembly members said the fact there was "no date to stop sales of new cars, allows time for technology to develop replacements" or stated the "ban is later – more time for technology to develop."
+ **"Increase of jobs in businesses"**
+ **"Phase out of cars would be easier for people to accept"**
+ **"Less fuel dependency on Middle East"**

⊖ Cons

– **Impact on quality of life, particularly for certain groups** – some assembly members said this option "may increase isolation and loneliness", worried about the "impact of increased costs on rural and disabled communities" or said it would lead to "reduced mobility, poorer life aspirations [and a] poorer standard of life." Others talked about the "social impact on mental health" or noted that "travel has mental health and psychology benefits." Some labelled the scenario "oppressive", suggesting that "the impact of road closures would affect people disproportionately."
– **Restricted choice** – some assembly said it would "take choice away from consumers", or "force people to reduce their travel options." Others disliked "restrictions on travel – because they are looking at reducing travel on all transport (you can only go so far on a bike)." Some suggested that "many people will not want [a] decrease in car use, on only pollution."
– **Lack of emphasis on technology** – some assembly members disliked the "lack of emphasis on technological solutions" or noted "less reliance on technology / restricting travel."
– **Feasibility** – some assembly members felt a 10% reduction in car use per decade "will be hard" or queried "10% reduction in car use per decade – achievable?" Others asked "can the planning/rebuilding be done in time? How much shift is needed?"
– **Cost** – assembly members had a variety of concerns around cost, including the affordability of public transport compared to alternatives. Some commented that "if public transport is not affordable it will cost more to use for holidays etc" or that the "train is expensive compared to alternatives." Others worried about the "devaluation of current cars – or cars brought in the near future" or the "rebuilding costs" of towns.
– **Emissions** – some assembly members said that this option would "take longer to achieve net zero emissions" or that "we will still be producing emissions from cars until later."
– **"Impact on car building industry – reduces jobs"**
– **"Reducing car use puts strain on other transport services"**
– **"It would mean alternative ways to reduce emissions if EV is relaxed"**

When we asked assembly members to rank the possible futures in their order of preference, this scenario received very limited support from assembly members. Please see below for the results of the vote.

General comments

Some assembly members made cross-cutting comments about all the possible futures:

- **Freedom versus restrictions:** some assembly members wanted to emphasise the "need for personal freedom." Others suggested that "we are already dealing with restrictions in our everyday lives so this is just one more."
- **Roles:** some assembly members noted that the "government has to take the lead to make things happen…. Onus needs to be on government to enable the policies – e.g. on public transport, better active travel." Others noted that there is also an important role for business in creating change.
- **Public transport:** some assembly members commented that "the train situation needs improving, people will be put off using the trains if they are stranded."
- **Car industry:** some assembly members noted that "the car industry will be affected across all scenarios." Others said that "all [the futures] are bad [for the car industry]…. The car industry needs more time to adjust."
- **Car size:** some assembly members suggested that "some small cars are now only available in electric, because they don't meet EU emission requirements. That means the cheapest cars won't be the smallest." Others said they were concerned that "people would buy a mid-sized petrol car because they can't afford a smaller car, which would have a greater environmental impact."
- **Synthetic fuels:** some assembly members were unhappy that "we heard about the use of synthetic fuels for planes, but not cars."
- **Hybrid cars:** others noted that "all three futures talk about banning hybrid cars, but … some assembly members didn't think that they were bad."
- **Future generations:** some assembly members commented that "the implications will impact some more than others – think future generations! Urgency matters!"
- **IT use:** some assembly members asked "what about IT to reduce travel e.g. virtual reality."

Vote results

Assembly members voted on the possible futures by secret ballot. The ballot paper asked them to rank the possible futures in their order of preference.

The votes were counted in two ways:

- **Counting assembly members' first preference votes only.** This tells us what assembly members would and wouldn't choose if they could have their preferred future.
- **Using Borda count.** This involves allocating points for preferences – a first preference vote scored two points, a second preference vote one point. A third preference vote scored no points. Counting the votes like this tells us which futures are most acceptable to the greatest number of assembly members.

'Fast action to change the cars we drive' received most first preference votes. Assembly members gave two reasons more than any others for this choice on their ballot papers. The first was around the **lack of restriction on travel and lifestyles.** Comments included:

> "We should be free to travel when and where we like – options 2 and 3 are restricting."

> "The less government led social engineering the better. Restricting or imposing individual behaviour undermines the liberal principle that everyone has the right to make choices and self-determination."

> "It focuses on introducing greener solutions but without taking the choice or car owners' independence away."

> "Least restrictions on mobility (standard of life)."

The other frequently given rationale was **the speed of change**. Comments included:

> "If we are going down this route (a must) then [the] quicker the better. Will be "hiccups" therefore [we need] time to "mend" problems."

> "This guarantees fast action that I believe is required."

> "The faster the better in spite of it being challenging. But don't force a reduction in travel, [stop] polluting transport only."

> "Rapid movement to electrified (low CO_2) transport."

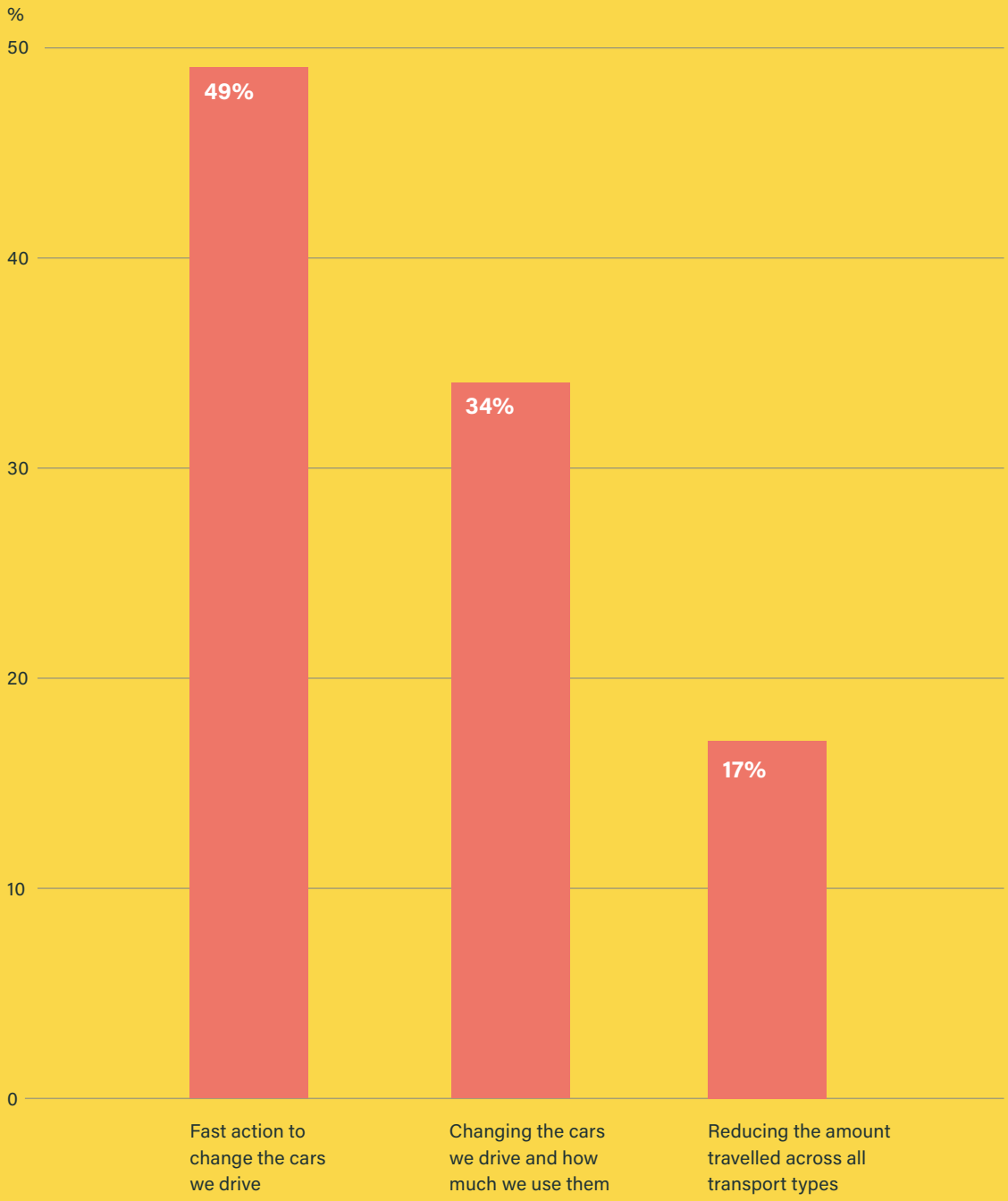
Some assembly members' rationale was multifaceted. For example:

> "Fast decisive, immediate action – no time wasted planning on building new things so we can quickly start to reduce emissions and then focus on other things. Realistic, not a drastic change that is hard for everyone to adjust to. Benefits everyone – air quality improves, money saved on cars."

Figure 2: Possible futures

Please rank the possible futures in order of preference

(% 1st preference votes)

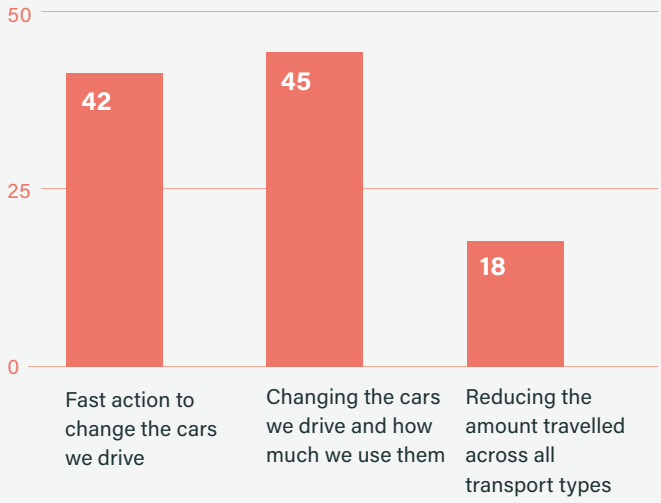


> “(I don’t actually think any option seems completely viable, but…) I think action has to be taken on current cars ASAP (although don’t necessarily agree with hybrid). If everyone could afford electric vehicles then this wouldn’t prevent people travelling as they currently do – ergo standard of living shouldn’t be compromised. Concerned other options don’t give enough time to fix other transport options. Also don’t believe people will reduce the amount they travel by car.”

Other reasons highlighted by one or two assembly members included support for the take up of electric buses and trains, support for banning SUVs, a suggestion that this future has fewer downsides than the alternatives, and a belief that the “health benefits for people who have asthma would be important.” One assembly member commented that “social change is much harder than technological change.”

Figure 3: Possible futures

Please rank the possible futures in order of preference
(Borda count)



‘Fast action to change the cars we drive’ also did well in the Borda count, but the future that scored highest by a small margin was **‘changing the cars we drive and how much we use them’**. Assembly members who chose this latter option as their first preference gave a range of reasons for their choice.

There was a feeling amongst some assembly members that this option presented **a balanced middle ground that was more viable and less radical**:

> “Most viable option – middle ground – more comprehensive approach that considers reducing and banning petrol/diesel and offers improvement and alternatives to how we can travel (instead of driving).”

> “There needs to be a balance and this seems to be the best balance.”

> “Less radical compared to other options. More practical and positive.”

Others talked about the **impact this future would have on emissions and congestion**:

> "I think that by reducing car use we will reduce carbon emissions and maybe … focus on only using transport as a way from getting from A to B rather than being lazy!"

> "It will cut emissions and have health benefits."

> "Less cars, less pollution, less congestion."

Some assembly members said that they felt this future was **less restrictive and offered more choice**:

> "I'm not supportive of restricting travel, improving public transport so citizens have more options is a positive step rather than an authoritarian move towards dictatorship I'm not supportive of."

> "The perception of greater personal freedom to choose the most appropriate mode of transport for any given journey."

Other comments included that this future "gives people time to adjust, whilst still taking positive action", or that it "encourages public transport improvements and allows more time for the charging infrastructure to be sufficient for the uptake required."

'Reducing the amount travelled across all transport types' scored poorly in terms of both first preference votes and the Borda count. It was assembly members' least preferred option by some distance.

One assembly member abstained from the votes, stating that the options were "not comprehensive and not objective."

Futures – conclusions

Taken together, assembly members' discussions and votes suggest a future involving:

- **A ban on the sale of new petrol, diesel and hybrid cars by 2030–2035;**
- **A reduction in the amount we use cars by an average of 2–5% per decade;**
- **Improvements to public transport** – the idea of better public transport was overwhelmingly mentioned as a positive in assembly members' discussions. Some assembly members also welcomed the idea of improvements to the infrastructure for active transport.

Assembly members' discussions show that many felt it was important to **minimise restrictions on travel and lifestyles**. They often saw a quick ban on the sale of new petrol, diesel and hybrid cars as the best way to do this: people could continue to travel by car as long as the car was electric. Some assembly members also raised doubts about whether greater reductions in car use were feasible in terms of behaviour change. For a smaller number of assembly members the least restrictive future was one that gave them the greatest choice of transport modes.

Speed of change was also an important factor for some assembly members. Those who supported an earlier ban on the sale petrol, diesel and hybrid cars felt "the faster, the better". Others felt that a slightly later ban within the 2030–2035 range would give people longer to adapt and allow more time to prepare the necessary infrastructure.

Assembly members saw **co-benefits**, particularly around improvements in air quality and reductions in congestion as positives. They also raised a **range of concerns around affordability,** including the need to not "price people out of essential travel." Some assembly members particularly noted the need to avoid negative consequences for rural areas and people with a disability, as well as around mental health and isolation.

C. Policy options

After considering what the future of surface transport in the UK could look like, assembly members moved on to consider how we might get there. Specifically they looked at policy options in three areas:

1. Moving quickly to low carbon vehicles;
2. Discouraging car ownership and use;
3. Increasing the use of public and active transport.

For each of these areas, the Expert Leads recapped and explained potential policy options. Assembly members discussed these ideas in their groups before voting by secret ballot. They were also able to note additional suggestions for steps that could be taken.

C.1 Moving quickly to low carbon vehicles

Assembly members looked at seven options for moving quickly to low carbon vehicles:

- Quickly stop selling the most polluting cars;
- Grants for businesses and people to buy low carbon cars;
- Car scrappage scheme;
- Advertising restrictions on certain cars;
- Access to longer range cars for electric car owners;
- Government investment in low carbon buses and/or trains;
- Lowering speed limits on dual carriage ways and motorways.

We start by presenting the rationale for their views, taking each policy option in turn.

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Quickly stop selling the most polluting cars

This would involve telling car companies that they could not sell their most polluting cars in the UK from a certain date. The government has already told car companies that they will not be able to sell new petrol and diesel cars in future. The date of this ban was originally 2040 when it was announced in 2019, but was brought forward to 2035 in February 2020.

Assembly members identified the following pros and cons about a quick stop to selling the most polluting cars.

Pros

+ **Co-benefits** – some assembly members suggested there would be "improved air quality" or an "immediate decrease in pollution." Others said that we would "quickly start cutting down pollution", "reduce pollution more quickly" or "decrease the polluting cars on the road drastically." Some noted benefits for "health and safety e.g. in schools – air quality" or "improvement for other road users."
+ **Swift and simple** – some assembly members suggested it is "very easy to implement ASAP", "simple to implement", "swift and simple to implement" or that it "gets the whole process going – no 'faffing' around – just do it." Others labelled it a "fast and effective solution that does not require a lot of new tech." Some commented that the "quicker these cars are removed from the roads the better."
+ **Good cost-benefit ratio** – some assembly members described it as a "quick fix that's not really that detrimental to anyone's way of life" or commented "we don't need SUVs on the road." Others said there was "large benefit, lowish cost."

+ **Impact on emissions** – some assembly members said it "will accelerate [the] net zero target", create a "big drop in emissions" or result in a "quicker reduction in average CO_2 emissions."
+ **Certainty for business** – some assembly members liked that "car manufacturers [would] know where they stand" or that there would be "certainty for manufacturers."
+ **Progress on electric car manufacture and uptake** – some assembly members felt it would "encourage manufacturers to improve electric cars" or that "uptake of electric cars would increase dramatically."

⊖ Cons

– **Loss in revenue from fuel duty** – some assembly members worried about a "fuel tax deficit". Others commented "loss in revenues – how to replace?", "fuel tax will need to be replaced by other taxes – fairness", or "government will need to find the lost revenue from fuel tax elsewhere."
– **Impact on business and jobs** – some assembly members noted that "car companies will have to adjust" or that "if car companies are losing money there will be jobs lost."
– **"Reduction in personal choice of vehicles"**
– **"What will happen to all unwanted vehicles?"**
– **"[Need to] define polluting"**
– **"No willingness to change!"**

Grants for businesses and people to buy low carbon cars

Since 2011, the government has given car dealerships money to discount the price of brand-new electric and hydrogen cars. In the budget in March 2020, the plug-in car grant was extended for another three years, but the amount available per car was reduced to £3,000 from £3,500, and it is only available for pure battery electric cars that cost £50,000 or less.

Assembly members identified the following pros and cons about grants for businesses and people to buy low carbon cars.

⊕ Pros

+ **Accessibility** – some assembly members felt that it would mean "owning EV is more accessible" or commented that "off-setting initial costs can make electric vehicles more accessible for the general public." Others said that *"it needs to be affordable to everyone."*
+ **"Kick start market for electric cars"**
+ **"Fleet vehicles should be EV"**

⊖ Cons

– **Grants not enough** – some assembly members said that the "grants aren't high enough for purchasing a new EV", that the "grant's not enough at £3,500", or that the "grant [is] not big enough." Others commented that "electric cars [are] still expensive, even with grants" or that "£3,500 is not that big an incentive to buy an electric car!"

– **Impact on EV prices** – some assembly members asked "won't car companies put prices up if [they are] receiving a grant?" or suggested it was a "disincentive for manufacturers to reduce cost." Others labelled it "good for the dealer, not the buyer; benefit should go direct to the buyer."

– **"Cars will [still] be unaffordable to the less well off"**

– **"Not everyone wants to drive so do they get taxed extra?"**

– **"Rapid collapse of value of diesel, petrol cars"**

– **"No incentives for 2nd hand EV"**

Some assembly members also noted conditions around their support for this policy option, or additional ideas:

- **Comparative price**: some assembly members said that the "grant has to take it to same or below [the] price of petrol/diesel", that it's a "good incentive if [the] price is similar to current cars", or that their support "depends on [the] size of grant;"
- **Tax incentives**: some assembly members suggested there should be "more incentives i.e. no VAT on EV for 5 years" or that there should be "tax incentives to buy low carbon cars."
- **Who the grants help:** some assembly members said policy-makers should "relate [the] grant to people's income" or that the grants "need to be aimed at low income families and those in hard to reach rural areas and not for business for it to be fair;"
- Others disagreed saying they would support the policy "if the grant is only for business;"

Car scrappage scheme

This would involve incentivising owners of older, high CO_2 vehicles to scrap them, by offering cash or credit towards electric cars, bikes or public transport season tickets. The amount people received towards an electric car is likely to be around £2,000.

Assembly members identified the following pros and cons about a car scrappage scheme.

⊕ Pros

+ **"Provides financial incentive to sell polluting vehicles"**
+ **"Great if your car is worth less than the payment receive"**
+ **"Will encourage more electric car sales"**
+ **"Gives the ability to use money on bikes or public transport"**
+ **"Improvements with air pollution"**
+ **"Only one that has an impact on CO_2 immediately"**
+ **"Can still reuse/recycle vehicle"**

⊖ Cons

– **Waste** – some assembly members worried about a "lack of capacity to process recycling of removed cars." Others asked "where will they go" or "what % of scrapped cars can be recycled? Working cars being scrapped feels wasteful."

– **Costs and pricing** – some assembly members suggested that it "only works for cars valued below £2k", that it's "only applicable for old/low value cars", or that you "might not get [the] full value of [the] car." Others said "have to buy a new car – price inflated."

– **Subsidising foreign manufacturers** – some assembly members said "public expenditure [would be] used to subsidise manufacturers yet most new cars are manufactured overseas" or that "you need to focus the credit on bikes and public transport so you don't subsidise foreign manufacturers."

– **"Even with the car scrappage scheme a lot of people still can't afford electric cars"**

As with the previous policy option, some assembly members suggested that the grant should "relate … to people's income."

Advertising restrictions on certain cars

Advertising restrictions would make it illegal for car manufacturers to advertise their most polluting cars.

Assembly members identified the following pros and cons about advertising restrictions on certain cars.

⊕ Pros

+ **Proven** – some assembly members commented that it's "proven to work" or "it works very well." Others said "people are more likely to buy when they are advertised" or that adverts are "proven techniques to reach large populations."
+ **Discouraging production of most polluting cars** – some assembly members said it "would hopefully discourage production of polluting cars" or that it "removes [an] incentive to make more SUVs as demand should reduce."
+ **Cost** – some assembly members liked that there is "no cost to [the] tax payer" or that there's "no cost to introduce." Others suggested it is "very easy to implement tomorrow at low cost for a lowering of emissions."
+ **"Doesn't impact on people's options"**
+ **"Stops pollution/sets rules"**
+ **Some assembly members said it worked well with the policy option to 'quickly stop selling the most polluting cars', suggesting that the "advertising will follow."**

⊖ Cons

– **"Should discourage production – not ban advertising – this is wasteful and punitive"**
– **"I don't think this would have much impact. I think people buy based on what they see driven around rather than on TV"**
– **"Ways around it – petrol heads are clued up"**
– **"Does it give [the] wrong message?"**
– **"It doesn't go far enough"**
– **"Negative impact on the economy"**

Access to longer range cars for electric car owners

A scheme like this would mean that, when a customer buys an all-electric car, it would be compulsory for the car company to loan a longer-range vehicle to them for several days a year.

Assembly members identified the following pros and cons about access to longer range cars for electric car owners.

⊕ Pros

+ **Freedom** – some assembly members said it would provide "long-distance access outside cities" or that it "lessens restrictions, helps in keeping current freedoms."
+ **Addresses a key problem / may increase take-up** – some assembly members felt it "solves a key issue that many people raise. A very good option that incentivises people to buy electric cars." Others felt it would "increase use of electric vehicles" or, more cautiously, that "maybe it would make EV an option."
+ **"Cost"**
+ **"If you legislate that car sellers must do this, it costs nothing to implement"**

⊖ Cons

– **Practical issues** – some assembly members felt there would be practical issues. Comments included:

  "Needs planning ahead – not always an option"

  "What about emergencies? Not practical"

  "Limit to how long you can have them for?"

  "Not long enough. Would need weeks or more occasions"

  "Availability: -Christmas -Half-term"

  "Booking availability, holiday at same time etc."

– **Feasibility and bureaucracy** – some assembly members feared it would be "bureaucratic" or suggested "car dealers [are] highly unlikely to loan cars and [it would be] very difficult to manage [the] process."
– **Limits to freedom unless more charging points** – some assembly members said it "wouldn't give range of freedom as you are limited to charging points" or that "electric cars only have a short range (120 miles) so would need more charging points."
– **Not needed?** – some assembly members suggested it "may not be needed e.g. hire, rail" or asked "why can't they all be long range?"
– **"Only benefits those with money for new cars"**

Some assembly members asked "would there be a scheme for 2nd hand EV?"

Government investment in low carbon buses and/or trains

The government already subsidises some electric and hydrogen buses. There is also currently a programme to electrify the railways, but it has recently slowed.[6]

Assembly members identified the following pros and cons about government investment in low carbon buses and/or trains.

⊕ Pros

+ **Better, more accessible public transport** – some assembly members suggested that "investment is absolutely necessary to make these options more affordable and accessible", or that this is an "opportunity for radical redesign of buses (accessibility)." Others commented that the "more efficient public transport, [the] more people would use it."
+ **Needed** – some assembly members said "we need it!" or it "needs to be done sooner rather than later." Others said it's "self-explanatory really and needs to be done."
+ **Jobs and industry** – some assembly members suggested it would "revitalise [the] train industry" or said it "would be good if government investment in low carbon jobs can create skills and careers."
+ **Leadership and responsibility** – some assembly members said it "doesn't push the responsibility for change on [to the] public only. It initiates the process of change." Similarly, others commented that it would involve "lead[ing] by example."
+ **"Improves air quality for commuters"**
+ **"Focusing on investing more in public transport will reduce emissions a lot as the number of users is high"**
+ **"Will help speed up the understanding of hydrogen power"**

⊖ Cons

– **Cost and who pays** – some assembly members asked "who pays", "where is the money coming from?", or "how much would it cost, would it be economically viable?
– **Tech issues and practicalities** – some assembly members suggested that the "battery range for a bus surely won't be long enough for most journeys", or that it "will take a long time to charge." Others asked "what happens with a power cut?"
– **"How realistic is it to electrify the rails? And how soon can these changes be implemented?"**
– **"More electricity is needed so better infrastructure"**
– **"Would take a very long time to actually reduce emissions"**

6 HC Deb, 20 July 2017, col 72WS. The Government announced the cancellation of many newly electrified lines in favour of hybrid (bi-modal) trains.

Some assembly members said they would support this policy option if we "move quickly to low carbon vehicles", or "if [it's] quicker (speed)." Others noted that "if Government/Parliament implement public transport to run for longer and at later times people would use it more."

Lowering speed limits on dual carriage ways and motorways

This would involve lowering the speed limit for cars on roads where it is 70mph to 60mph.

Assembly members identified the following pros and cons about lowering speed limits on dual carriageways and motorways.

⊕ Pros

+ **Immediate effect** – some assembly members described it as "immediate" or suggested it's "very easy to do tomorrow and immediately reduces emissions." Another commented: *"I like lowering speed limits on dual carriageways and motorways because it seems like a straightforward enough method that has immediate positive impacts."*
+ **Reducing accidents** – some assembly members noted it would "reduce accidents" or "also [have] benefits in reducing RTAs [Road Traffic Accidents]."
+ **Impact on emissions** – some said it would "reduce carbon" or result in "decreased carbon emissions."
+ "Lowers the speed limit thus cutting down on the use of fuel"
+ "Increased fines for the treasury – voluntary tax"

⊖ Cons

– **Compliance and enforcement** – some assembly members said they "don't believe people would stick to this at all" or that "no one will abide [by it] anyway." Others said "no one sticks to [the] limit as it is so I can't see it working without a lot of intervention" or "it won't work unless you're going to restrict the cars and have someone policing it – people will carry on going 70+." Some assembly members queried "do [the] police have resources to enforce this" or suggested there is "insufficient capacity for enforcement." Some said it would be "difficult to enforce."
– **Journey times** – some assembly members said they disliked the impact on "journey times", or that it "increases journey time. The limits may not be needed on electric cars?" Others felt that "lowering speed will affect productivity, [and] impact on people's working day, [and] free time."
– **"It is a con for electric cars. It would put people off buying electric cars because there is no benefit to using them"**
– **"Will surely increase concertina effect and increase standing traffic and pollution"**
– **"Still isn't going to lower emissions enough!"**

Some assembly members said this policy option would need to be accompanied by "advice and education on how to drive more efficiently." Others said the premise should be that "EVs are run on 100% (90%) green energy by 2030."

Additional ideas

During their discussions, assembly members noted a range of additional points and suggestions:

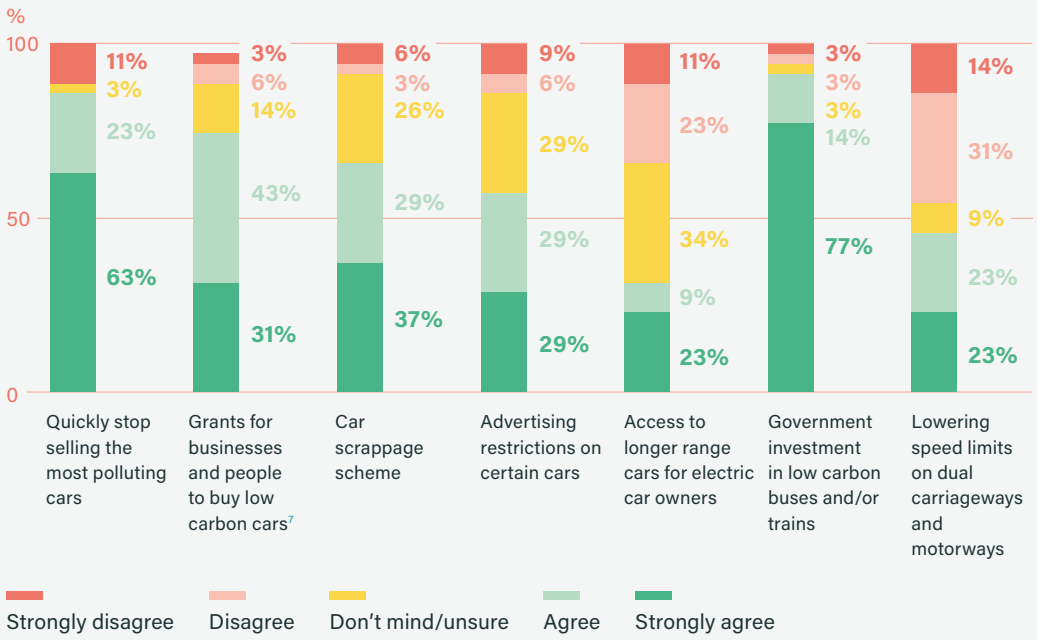
- "You need to address [electricity] supply before EVs"
- "You must get people on your side"
- "Need [for] education"
- "Make city centres car free (with free public transport to replace it)"
- "Congestion charging"
- "Synthetic fuels"
- "Wealth tax on high end polluters/vehicles"
- "Legislate that businesses (such as Uber, car clubs, hire cars etc) must only use EVs going forward and legislate that going forward all delivery vehicles must be EVs"
- "More criteria to get a driver's licence → less people, alter behaviour"
- "Car scrappage scheme to support the purchase of 2nd hand EVs."

Vote results

Assembly members voted by secret ballot on the seven policy options for moving quickly to low carbon vehicles. There were two ballot papers. The first ballot paper asked assembly members how much they agreed or disagreed that each policy option should be part of how the UK gets to net zero. The second ballot paper asked them to rank the options in their order of preference. The votes from this second ballot paper were counted both in terms of first preference votes and via Borda count.

Figure 4: Moving quickly to low carbon vehicles

How much do you agree or disagree that each of the following policy options should be part of how the UK gets to net zero? (%)



Two policy options stood out for their popularity amongst assembly members. Large majorities of assembly members 'strongly agreed' or 'agreed' that **'government investment in low carbon buses and/or trains'** (91%) and **'quickly stop selling the most polluting vehicles'** (86%) should be part of how the UK gets to net zero.[7]

Two options also stood out for their lack of popularity. Under half of assembly members 'strongly agreed' or 'agreed' that **'access to longer range cars for electric car owners'** (32%) and **'lowering speed limits on dual carriageways and motorways'** (46%) should be part of how the UK gets to net zero. There was also significant opposition to both measures, with 34% and 45% of assembly members 'strong disagreeing' or 'disagreeing' that they should be used. Although a large number of assembly members (34%) said they 'didn't mind' or 'were unsure' about access to longer range vehicles, these results do suggest it was less popular than other options.

7 One assembly member abstained from the vote on 'grants for business and people to buy low carbon cars' so the figures for this option add up to 97% not 100%.

Smaller majorities of assembly members supported the three other policy options. In order of assembly members' preference, these were:

- **Grants for businesses and people to buy low carbon cars – 74%** 'strongly agreed' or 'agreed' that they should be part of how the UK gets to net zero; 14% said they were 'unsure' or 'don't mind';
- **Car scrappage scheme – 66%** 'strongly agreed' or 'agreed'; 26% said they were 'unsure' or 'don't mind';
- **Advertising restrictions on certain cars – 58%** 'strongly agreed' or 'agreed'. 29% said they were 'unsure' or 'don't mind'.

The preference voting largely reinforced the results of the first vote, but provided two additional insights. The results suggest that:

- 'Quickly stop selling the most polluting cars' was the most important policy to assembly members by some distance, followed by 'government investment in low carbon buses and/or trains';
- Amongst options that a majority of assembly members supported in the first vote, 'advertising restrictions on certain cars' was their least preferred policy by some distance.

'Access to longer range cars' and 'lowering speed limits' again scored more poorly than the other policy options.

Figure 5: Moving quickly to low carbon vehicles

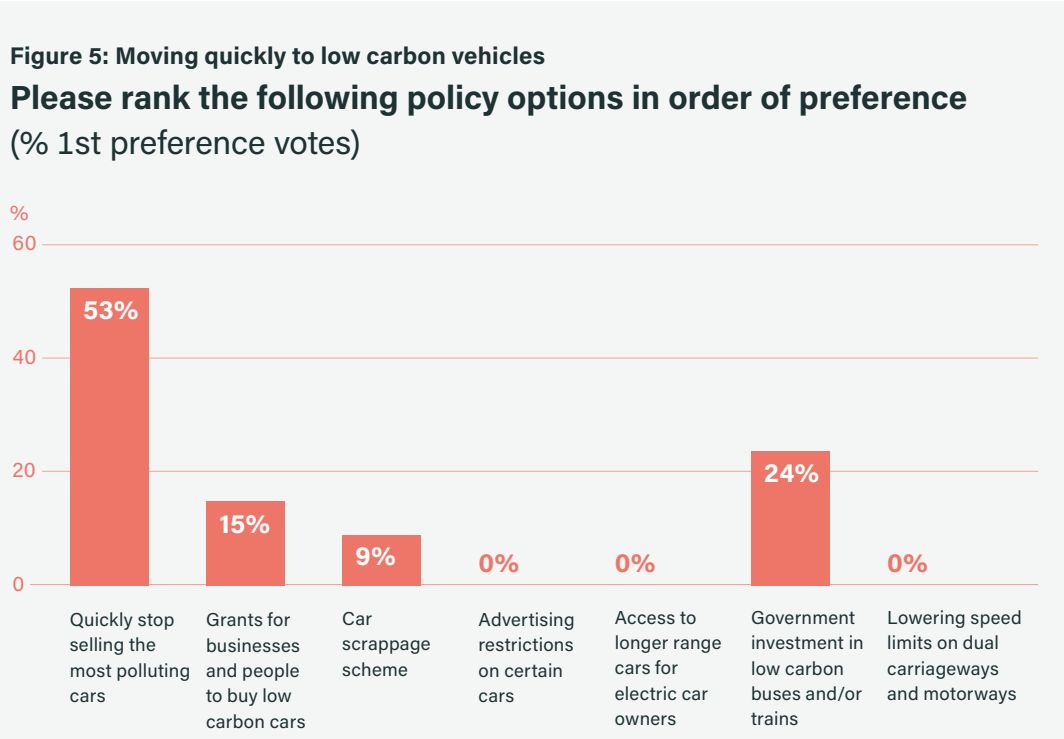
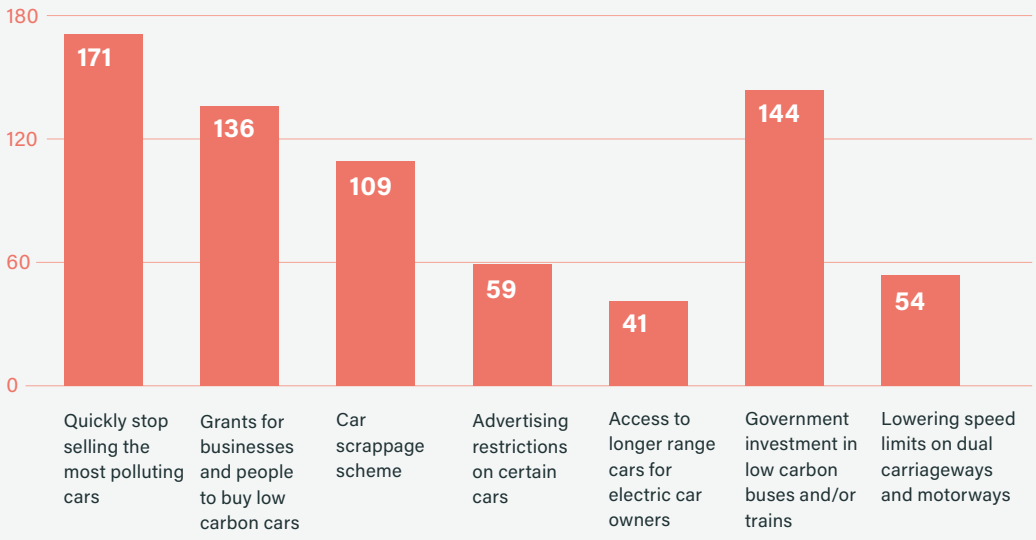


Figure 6: Moving quickly to low carbon vehicles

Please rank the following policy options in order of preference
(Borda count)



C.2 Discouraging car ownership and use

Assembly members looked at eight options for discouraging car ownership and use:

- Closing roads to cars;
- Charging to use the roads;
- Increasing fuel duty;
- Local business levy;
- Reducing parking space;
- Car sharing;
- Car clubs;
- Localisation.

We start by presenting the rationale for their views, taking each policy option in turn.

Jump to the vote results on page 101

Closing roads to cars

This would involve restricting cars in certain lanes, roads or zones. It could eventually mean that cars are not allowed in most town centres. There could also be temporary closures, such as regular car free days.

Assembly members identified the following pros and cons about closing roads to cars.

⊕ Pros

+ **Reduced pollution and health benefits** – some assembly members said it would "cu[t] pollution", result in "cleaner air", or make a "fast improvement to air quality." Others suggested it would be "better for pedestrians' and residents' health."
+ **Other uses for roads and safer spaces** – some assembly members commented that you "may be able to utilise the roads that were shut" or that "closure would make a lot of sense e.g. times when children are playing." Others said it would create "safer spaces" or liked "keeping cars off the road legally! For safe walking/cycling." Some assembly members said it would result in "more pedestrian areas."
+ **Benefits for towns, cities, high streets –** some assembly members felt it "would create more environment friendly towns and cities", or suggested that areas would "need to have better public services which could lead to a revival of the high street."
+ **Feasible / achievable** – some assembly members commented that "park and ride in cities is shown to work" or suggested that it "can be done very quickly by investing in electric buses."
+ **"More active travel in towns/cities"**
+ **"This would make people think of other options; they might end up preferring this"**

⊖ Cons

– **Impact on certain groups and essential activities** – some assembly members said it "can unduly impact disabled [people]" or asked "what about people with disabilities?" Others suggested it would "discourage certain groups of people from visiting", "may limit people from doing things they need to do", or that "exemptions [would be] needed for some workers."
– **Congestion and emissions** – some assembly members suggested that "closing down roads would congest roads therefore increasing emissions", that there would be "more traffic jams" or "more congestion, more emission, more pollution." Others said it would simply result in "more traffic/business elsewhere" or "higher carbon emissions in other areas."
– **"It would not provide an opportunity for cycling lanes"**
– **"People taking longer journeys to get to the same place"**
– **"Supporting local businesses – may suffer if people can't drive into town"**

Some assembly members said this policy option is "only good if transport infrastructure is good."

Charging to use the roads

This would involve charging drivers according to (a) which roads they use at which times of day; and (b) how polluting their car is. This could be done either nationally or locally.

Assembly members identified the following pros and cons about charging to use the roads.

⊕ Pros

+ **Increasing awareness and behaviour change –** some assembly members felt this would "make people more considerate of the pollution their car is giving off." Others said it "may make people change!" or "would cut out unimportant journeys."
+ **The polluter pays** – some assembly members liked that it "would make the drivers who use the roads pay more for the privilege" or that "the polluter pays." Others said that it "seems fairer than other propositions", that it's "potentially fair (depending on how implemented)", or that it's an "even and fair approach between those who need to use cars because they live in rural areas where public transport is not common and those who don't have to because they live in cities."
+ **Money for government** – some assembly members commented that "government can get a lot of money from the charges, especially from busy crossings." Others liked that the "duty is not ring-fenced. Politicians should spend [the money] where needed."
+ **Flexibility to help low paid** – some assembly members suggested that as it's a "simple usage tax [you] can have a free allowance (mileage free) for low paid." Others said they liked that "low income families are subsidised."
+ **"Would be in favour of temporary charging times to ease congestion/pollution"**
+ **"Very quickly reduces emissions"**
+ **"Toll roads used abroad"**
+ **"You decide how much you spend"**

⊖ Cons

– **Data and privacy** – some assembly members asked "will the government abuse the data, sell it etc" or cautioned "big brother – concern about being tracked and where data goes."
– **Impact on low paid** – some assembly members said it risked "causing a rich/poor rift – everything needs to be affordable for everyone." Others commented that the "increased cost would put a strain on the lower paid" or that "if people are on a tight budget it would put people off going [to] places if they are going to get a road users' bill."
– **"Creates unintended traffic blight through diverting to other routes"**
– **"Could inflate the cost of delivered goods massively"**
– **"Impact on small businesses"**

- **"Important to consider all aspects of travel. Car type, mpg, road, time etc"**
- **"Fairness issues"**
- **"Need choice to use 'toll'"**

Some assembly members noted conditions that would need to be met for them to support this policy, or additional suggestions for how it could work:

- "If selective about what times of day, like rush hour"
- "If just towns and cities"
- "Providing they get rid of the road tax"
- "Must subsidise lower income families to make it fair"
- "It has to go hand in hand with affordable public transport"
- "Good, but must be used for right reasons (Big Brother)"
- "Using new tech, cars should be charged per mile"

Increasing fuel duty

This would involve increasing fuel tax on petrol and diesel. The money raised could be used to improve alternatives to travelling by car, although this isn't the case at the moment.

Assembly members identified the following pros and cons about increasing fuel duty.

⊕ Pros

+ **"Would make drivers reduce their travel and consider alternative transport"**
+ **"Easier for individuals to budget for than road charging"**
+ **"Used to value travel by car – more use, more pay"**
+ **"Very quickly reduces emissions"**
+ **"The polluter pays"**
+ **"Potentially fair. Most closely related to CO_2 emissions"**

⊖ Cons

- **Impact on certain groups** – some assembly members felt it would "price people out of driving ...[who] may not have other alternatives." Others said "only the wealthy will [be able to] afford to drive."
- **Problems with how it would work** – some assembly members disliked the "uneven distribution of charges" or stated that "all cars should pay the same tax regardless of age etc."[8]
- **Lack of impact** – some assembly members commented that "we already pay a high fuel duty compared to other countries and it hasn't reduced car use" or that the "duty [is] already high and had no impact."
- **What money gets spent on** – some assembly disliked that the money raised "doesn't get spent on improving public transport" or that the "money isn't ring-fenced."
- **Prices** – some assembly members worried that "prices will rise" or asked "will it affect bus prices? Delivery costs go up?"
- **"Impact on small businesses/delivery vehicles"**
- **"[Ring-fencing] Will cause a large hole in government funding streams"**

Some assembly members noted conditions that would need to be met for them to support the policy, or additional suggestions for how it could work:

- **Ring-fence money:** some assembly members said they would support it "only if [the] increase [is] hypothecated and used to fund CO_2 emission reduction." Others said the money raised it "needs to be spent on net zero;"
- **Help for certain groups:** some said they would support it "if [there is a] reduced tax in the countryside/rural areas because fuel [is] more expensive" or "as long as low income families are subsidised and it is ring-fenced for sustainable spending."

Some assembly members said it should **"provide more incentive for electric car usage"** or was **"okay on [the] worst polluters."**

Local business levy

This would involve charging businesses for each parking space that they own, or for each person that they employ. The money would be used to improve alternatives to travelling by car in that area.

Assembly members identified the following pros and cons about a local business levy.

8 The Expert Leads had noted that cars that use less fuel and therefore produce less carbon emissions would pay less duty.

⊕ Pros

+ **Charge to business not individuals** – some assembly members liked the "cost being passed to the business not [the] individual" or "taking it off the individual – only if businesses pay!"
+ **Raising money** – others suggested it "helps the government cover costs" or is a "very easy way to raise money for green spending as long as it is relative to business size."
+ **"Would encourage staff/businesses to use alternative transport e.g. cycles, car share, buses"**
+ **"It works in Dunkirk"**[9]
+ **"The land can be used for other businesses (encourage public/shared transport)"**

⊖ Cons

– **Impact on certain groups** – some assembly members said that "exemptions [would be] needed for disabled employees reliant on cars" or that it is "bad for shift and key workers where public transport [is] not available."

– **Impact on businesses and fairness between different businesses** – some assembly members said that a "business levy for parking is tax on business" or suggested "some businesses could struggle to find extra money." Others labelled it an "extra expense for small businesses" or said it "could see small businesses going under." Some assembly members made additional points:

> *"Businesses with private land and lots of spaces will be penalised"*
>
> *"Very unfair: employee density vs business profitability e.g. supermarket vs bit-barn"*
>
> *"Companies will struggle to hire employees if they find it inconvenient to travel to work or have to find alternate transportation when they have a car"*

– **Cost to employee (passing on the cost)** – some assembly members said that businesses "will charge employees to go to work" or disliked "employees having to pay to go to work" or the "cost to [the] employee."

– **Disincentive to employ staff** – some assembly members felt it would act as a "disincentive to employ staff" or a "disincentive for employment."

– **Where people end up parking** – some assembly members felt it "encourages parking away from work in residential areas" or suggested that a "lack of parking spaces creates conflict between local businesses and residents."

Some assembly members said they would support the policy "as long as it [the levy] is relative to business size."

9 As previously noted, this referred back to a case study presented by one of the speakers, Lynn Sloman, during Weekend Two of the assembly. It showed the impact of introducing free bus travel in Dunkirk in autumn 2018. Bus trips increased 85%, and half of the new bus users previously travelled by car. Lynn's talk is available at climateassembly.uk/resources/

Reducing parking space

This would involve reducing parking space through double yellow lines, residential parking zones, removing car parks, making car parks smaller and/or liming parking space for new houses.

Assembly members identified the following pros and cons about reducing parking space.

⊕ Pros

+ **"Will reduce vehicles going into towns/city [with people] using public transport [instead]"**
+ **"There should be areas free from parking such as schools and elderly people's homes"**
+ **"More space for growing natural sources and more pleasant societies"**
+ **"Very easy to do. Loss in revenue can be balanced by a business levy"**

⊖ Cons

- **Where people would park** – some assembly members predicted a "displacement of parking on to side roads or pavements." Others said that "people tend to park illegally if there is no parking space."
- **Impact on high streets** – some assembly members stated that "reducing car spaces could result in lost revenue to high streets" or that "removing car space will impact on town shopping." Others felt there would be a "big impact on local businesses e.g. retail shops."
- **Impact on certain groups** – some assembly members suggested that "people who are reliant on cars would not be able to get around" or that it "punishes residents who may need a car for any number of reasons."
- **Compatibility with other changes needed** – some assembly members asked "if we're encouraging people to have electric cars, but decreasing parking – how will people charge their cars?" Others queried "if we reduce space where will the electric cars, car club cars and car sharing cars go that we are trying to incentivise?"
- **Congestion** – some assembly members said "reducing parking space leads to congestion" or that "reducing parking spaces would cause more congestion on the roads."
- **"Conflates parking shortage with climate change issues"**
- **"People need to go places, so need to park"**
- **"Business park car parks – what would the space be used for?"**
- **"Could affect house prices"**
- **"Personal experience of conflict between local businesses and residents over employee parking"**

Some assembly members said decision-makers would need to be "careful how you apply [the policy] – don't conflate [it] with revenue raising" or that it "could increase the use of public transport (need better infrastructure)."

Car sharing

This would involve getting more people to share vehicles through 'match-making' apps and incentives like carpool lanes and exemptions from parking charges. This may require some financial support for businesses and local authorities to set up and operate the software, and to develop and enforce car pool lanes and car parking spaces.

Assembly members identified the following pros and cons about car sharing.

⊕ Pros

+ **"Alternative to owning a car but still have independence"**
+ **"Share petrol costs, parking"**
+ **"Affordable for those on lower income"**
+ **"Can cut emissions cheaply if done by an app or employers"**
+ **"Carpool fares – can incentivise the use of car sharing"**

⊖ Cons

– **Loss of independence** – some assembly members disliked the "loss of independence" or "being reliant on someone else. What if ill? Car trouble? Insurance?"

– **People not keen** – some assembly members said "people aren't keen" or that "many people would feel uncomfortable car-sharing – we have this option already but there is a reason why it is so unpopular."

– **Safety** – some assembly members raised concerns about "security/personal safety", "safety concerns, who am I getting into a car with?" or "safeguarding." Others noted you "could be sharing your car with anyone."

– **Abusing the system and enforcement** – some assembly members worried about the "potential to abuse the system" with others suggesting "ways would have to be found of enforcing/checking car share" or asking "does the app pay the driver? How do you enforce sharing cash?"

– **"May increase journey time and CO_2 output"**

– **"Time/cost"**

– **"Car insurance issues"**

Some assembly said they would support this policy "if organised by a company – they could pay." Similarly, others said it "needs to be well organised" or that we "need to use apps/methods so [it's] organised."

Car clubs

This would involve pay-as-you-go renting of cars that are available throughout your area. These would be booked through an app and could be used for short periods of time. At the moment car clubs tend to be run by commercial operators. They do however need local authority funds to dedicate car parking spaces to them, promote them, and provide some subsidy for electric vehicles.

Assembly members identified the following pros and cons about car clubs.

⊕ Pros

+ **Benefits for certain groups** – some assembly members felt it would be "especially good for retired people who don't use their car, very often" or would result in "cheaper insurance for young people than owning a car." Others felt it would "help lower income holders to also have this option" or that it could be "use[d] for shift workers' systems."
+ **Less car ownership** – some assembly members felt it would result in "less car ownership" or labelled it a "great idea for reducing the need for buying a car."
+ **Cost effective, easy, convenient and clean** – some assembly members suggested it is a "cost effective solution", or that it "could be [a] cost effective and easier solution." Others said it is "very easy to implement and clean if car clubs must use EVs." Some assembly members commented that it is "convenient, easy", or "excellent in cities – works with Zipcar and in Paris."
+ **"I like this because I think it is viable. There is a rise in popularity of renting things and subscriptions because there is less responsibility and commitment. If they are renting the car they also don't need to worry about managing and repairing the car"**

Cons

- **Practical issues** – some assembly members raised "concern about what happens if [you] damage [the car]" or queried "insurance issues?" or "insurance?"
- **Doesn't work in rural areas** – some assembly members said they were "concerned about how many cars there would need to be in rural areas" or that it "only works practically in urban [areas]."
- **"Requires lots of organisation to plan booking a car to presume when you need it"**
- **"Time to pick up/drop off"**
- **"More people drive that don't already"**
- **"People become less able, less confident drivers"**
- **"Money isn't ring-fenced"**
- **"Variable costs? If so then accessibility?"**
- **"What's the difference between car clubs and traditional car rental?"**

Some assembly members commented that it "needs to be affordable" or that it "works better in some areas than others e.g. urban vs rural."

Localisation

This would involve changing regulation to ensure that new houses can only be built with good public transport links. It would also involve including or putting back into local areas services such as post offices, local shops, health centres and schools.

Assembly members identified a number of pros and cons about localisation.

Pros

- **Better community ties** – some assembly members said localisation "could create better community ties in new developments", "could improve social isolation as they need shops/ doctors." Others noted that "many new developments have little community amenities so this would improve community engagement in local areas."
- **Better amenities and accessibility** – some assembly members felt that "town planning needs to include services and transport" or liked the idea of "post office revival." Some said that "all society would have accessibility."
- **Reduction in car dependency and ownership –** some assembly members felt it would "discourage car dependency" or "reduce the need for private car ownership" or "encourage people to walk leaving the car at home and exercise"
- **"A good long-term solution. Legislate property developer to invest in transport infrastructure"**
- **"Seems like an obvious action to implement"**

⊖ Cons

- **Difficult to make work** – some assembly members raised queries about "feasibility", asking "how would this be implemented?" or saying they "don't think this will happen." Others suggested it would be "difficult to recruit doctors" or "difficult to encourage business." Some said thinking was needed on "how to get 'services' to back 'localisation'."
- **Green belt loss** – some assembly members suggested it would "upset environmentalists and [to] expect opposition if you want to build on green belts." Others suggested there would be "green belt loss" with "wildlife affected", or that "green belt loss will result in [an] urban spiral."
- **"High density living is low quality of life"**
- **"Unsure about time frame"**
- **"Loss of economies of scale of distribution means higher price of goods"**
- **"Not always optional for everyone!"**

Additional ideas

During their discussions on discouraging car ownership and use, some assembly members noted additional points or suggestions:

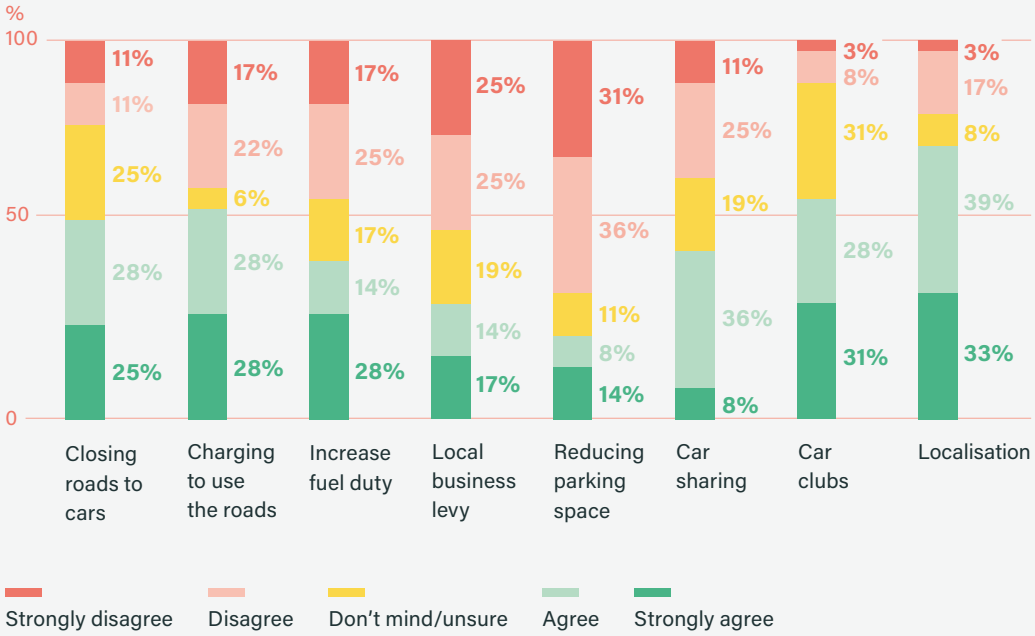
- Carbon zones in every city/town;
- If car use is to be discouraged then "public transport infrastructure … must be in place";
- "Car ownership per se isn't the problem. An (e.g. old) polluting car that does little/no miles isn't polluting";
- "Amazon deliveries – should be delivered to work or [we need] localisation. We know this is freight but [it] has impacts on localisation and what we buy and how."

Vote results

Assembly members voted by secret ballot on the eight policy options for discouraging car ownership and use. There were two ballot papers. The first ballot paper asked assembly members how much they agreed or disagreed that each policy option should be part of how the UK gets to net zero. The second ballot paper asked them to rank the options in their order of preference. The votes from this second ballot paper were counted both in terms of first preference votes and via Borda count.

Figure 7: Discouraging car ownership and use

How much do you agree or disagree that each of the following policy options should be part of how the UK gets to net zero? (%)



Overall, these policy options were less popular amongst assembly members than those for moving quickly to low carbon vehicles. In general, levels of agreement were lower and levels of disagreement significantly higher. Many assembly members had been clear when discussing the future of surface transport in the UK (see Section B above) that they wanted to minimise restrictions on travel and lifestyles. Their comparative dislike of policy options for discouraging car ownership and use is consistent with that view.

A majority of assembly members supported four of the policy options for discouraging car ownership and use. In assembly members' order of preference these were:

- **Localisation – 72%** of assembly members 'strongly agreed' or 'agreed' that this should be part of how the UK gets to net zero. 20% 'strongly disagreed' or 'disagreed';
- **Car clubs – 59%** 'strongly agreed' or 'agreed'. Levels of disagreement were low, with more assembly members (31%) saying they 'didn't mind' or 'were unsure';
- **Charging to use the roads – 56%** 'strongly agreed' or 'agreed'. 39% 'strongly disagreed' or 'disagreed';
- **Closing roads to cars – 53%** 'strongly agreed' or 'agreed'. 22% 'strongly disagreed' or 'disagreed'.

Only a minority of assembly members supported the other policy options. The **least popular was 'reducing parking space'**; a sizeable majority of assembly members (67%) strongly disagreed or disagreed with this proposal.

Figure 8: Discouraging car ownership and use

Please rank the following policy options in order of preference

(% 1st preference votes)

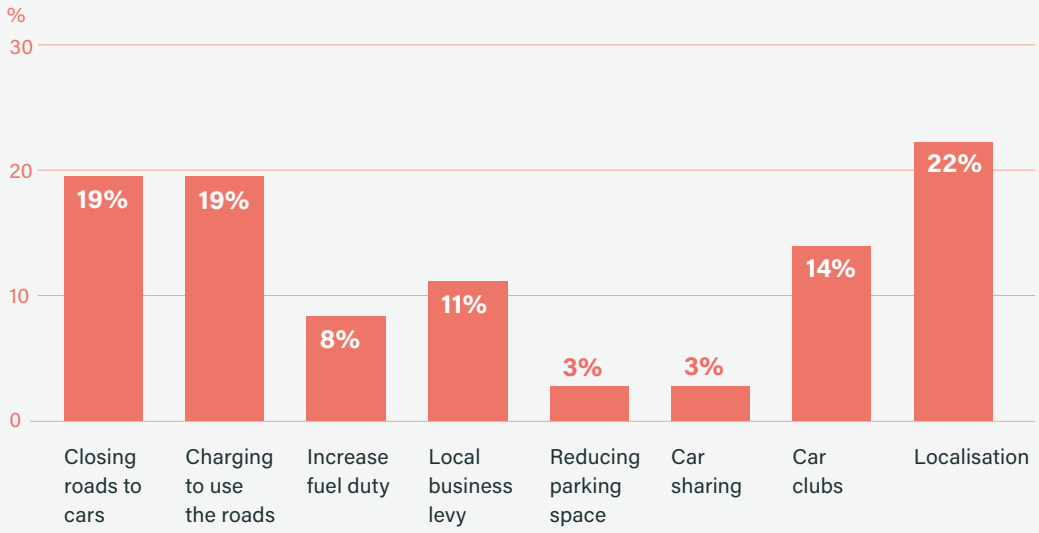
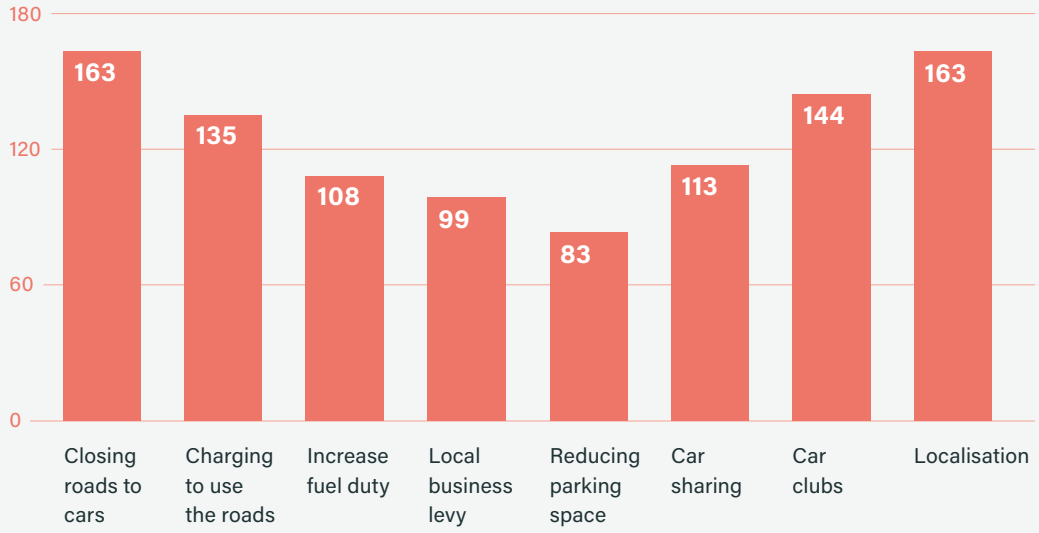


Figure 9: Discouraging car ownership and use

Please rank the following policy options in order of preference

(Borda count)



The same four policy options scored most highly in the preference voting, with 'localisation' and 'closing roads to cars' jointly topping the Borda count. These results suggest that 'closing roads to cars' is more acceptable to a greater number of assembly members than 'charging to use the roads' or 'car clubs'.

C.3 Increasing the use of public and active transport

Assembly members looked at seven options for increasing the use of public and active transport:

- Adding new routes and more frequent services;
- Increasing investment to make buses faster and more reliable;
- On-demand buses;
- Making public transport cheaper;
- Bringing public transport back under government control;
- Investing in cycling and scootering facilities;
- Grants to buy electric bikes.

We start by presenting the rationale for their views, taking each policy option in turn.

Jump to the vote results on page 112

Adding new routes and more frequent services

This would involve increasing relevant government funds paid to local authorities, so that the latter could add new routes and/or provide more buses on existing routes. There are many services that private bus companies will not operate because they are not profitable. Government funding to plug this gap has been cut in recent years.

Assembly members identified the following pros and cons about adding new routes and more frequent services.

Pros

+ **Reduced car use** – some assembly members liked the idea of "new routes to areas that feel the need to drive as there is no alternative." Others noted that "people would not have to use cars for essential journeys."
+ **More people would use the service** – some assembly members felt that it "would encourage more people to use the service" or that "improvement would increase use."
+ **"Increase government funding should enable more routes... and bring back closed down routes"**

⊖ Cons

- **Unrealistic** – some assembly members suggested that "people who live in places with no bus route will already have cars, so not use buses." Others said that "bus services are still unusable in rural areas – unrealistic to make [them] comparable to [a] car."
- **Cost and use of money** – some assembly members worried about the "cost to [the] taxpayer", or asked "how much would it cost? Would it effect investment in other areas?" Others said that "if [it] remains in [the] private sector then [it] will cost more money" or that "private companies currently waste money on routes that are empty."
- **"Relies on infrastructure to implement"**
- **"Needs enough people using it for it to be a benefit"**

Some assembly members advocated "research [on] where routes are most needed" or said they would support this idea "if bus routes run earlier and later." Others said it "would only be worth doing if price of travel reduces."

Increasing investment to make buses faster and more reliable

This would involve investment in bus priority lanes and better interchanges such as bus stations.

Assembly members identified the following pros and cons about increasing investment to make buses faster and more reliable.

⊕ Pros

+ **Increasing public transport use** – some assembly members said that "if [the] bus service is faster, more people will use the bus", that "faster bus services will be an incentive for people who drive for faster travel" or that it "would encourage people to use public transport."
+ **Reducing car use and congestion** – some assembly members suggested that "full buses reduce road congestion" or that "more bus lanes = more buses = less cars."
+ **Support for particular technologies** – some assembly members suggested "investing in hydrogen buses – no CO_2" or that an "increase in investment [in] bus infrastructure in cities could include overhead electric rail to reduce emissions as well."

⊖ Cons

- **Feasibility** – some assembly members said it "sounds great, but don't see it being feasible because of space being taken up." Others suggested that "not all roads are capable of being converted to include bus lanes especially where cycle lanes already exist." Some assembly members queried "is congestion an issue? If so, they won't be reliable."
- **"Would it be worth the investment? Smart motorways have caused massive travel disruption for little benefit"**
- **"Faster buses = more CO_2?"**

Some assembly members commented that implementation would be "reliant on develop[ing] infrastructure."

On-demand buses

This would involve buses in rural areas and smaller towns that you can call through an app or phone. These buses would pick you up from where you are and drop you where you need to go, or to another bus or rail interchange.

Assembly members identified the following pros and cons about on-demand buses.

⊕ Pros

+ **Benefit to certain groups** – some assembly members suggested that it "could help people in more isolated areas, especially the elderly who need to get to doctors appointments etc." Others said it "hopefully will be a benefit to [the] elderly and people in rural areas."
+ **Stopping empty buses** – some assembly members said that it "could ensure buses are full (depending on how it works)" or that it "stops empty buses from driving around taking space and polluting."
+ **"Gives people more independence (may give up car)"**
+ **"On-demand (small) buses could be electric"**
+ **"Shared (Uber)"**
+ **"Cheap solution"**

⊖ Cons

- **Not accessible to everyone** – some assembly members said it "may not be suitable for disabled [people]" or that "it might be harder for older or disabled people to use as it requires a smart phone and app etc."

- **Feasibility, including signal and internet access** – some assembly members noted "issues with internet access" or said that "if you need to get somewhere in an emergency and there's no signal you won't be able to use the app." Others said they "can't see how it could effectively work e.g. rural areas."
- **Practicalities for passengers** – some assembly members said there would be the "worry [you] might not get one and then [have] no transport." Others said they are "concerned people [would be] inconvenienced because [they] have to wait." Others queried "time – it would take longer if picking people up?"
- **Costs – some assembly members said it "could be loss making" or that "i**ncrease[d] cost for on demand buses would be an additional cost to [the] tax payer."
- **"Concerned empty buses sitting around"**
- **"Don't think really it is on demand"**

Some assembly members said it would be "good if you can call up as well (older people like to phone)" or felt "there will be an element of trial and error."

Making public transport cheaper

This would involve discounted or free buses or trains.

Assembly members identified the following pros and cons about making public transport cheaper.

⊕ Pros

+ **More people would use / consider it** – some assembly members suggested that "making public transport cheaper and more reliable could result in more users" or that "making it free would encourage way more people to use it." One assembly member commented "this could convince me to get public transport more even if the journey takes longer." Other assembly members suggested that it "would make bus/train travel more of [a] considered option" or that it "would be a good financial incentive for commuters."
+ **Reducing car use** – some assembly members said it "might encourage people to give up their cars" or that "currently people are priced out of public travel. [This is an] [i]ncentive not to drive." Others noted "free travel = convenient for everyone and replaces cars."
+ **Benefits to economy** – some assembly members suggested that "affordability allows people to travel more. Could boost economy as more spending" or that it would "improve [the] economic well-being of society (increased wealth)."
+ **Support for free use or cheaper fares** – some assembly members stated "make it free at point of use", or "free public transport for all." Others noted that "currently bus fares have gone up higher than inflation – instead it should be lower."
+ **"Improve wellness (increased health)"**
+ **"Massive drop in emissions"**

Cons

- **Experience** – some assembly members felt that "free travel on buses is still not as nice as going in [a] car" or that it's "got to be nicer than [going by] car before [it can] have an impact on CO_2."
- **Cost** – some assembly members noted that "it has to be paid for" or disliked the "cost to [the] taxpayer."

Some assembly members said they would support this policy "if [the] infrastructure is there/ readily available."

Bringing public transport back under government control

This would involve national government, local government or groups of local authorities controlling bus, tram and/or train services.

Assembly members identified the following pros and cons about bringing public transport back under government control.

Pros

+ **Integration and planning** – some assembly members suggested it "will enable the implementation of an integrated system", would create "possibilities for [the] better integration of public transport" or "would allow all bus and rail networks to be integrated – improv[ing] connections and use." Others said that "hopefully [those responsible would] get planning right i.e. [the] right hand [would] know what [the] left hand is doing."
+ **Better services** – some assembly members said that "bringing public transport back under the control of government could result in better services" or that "public transport under government control [is] better than private, because it works."
+ **Price and payments** – some assembly members suggested it is a "clear way to drop rail fairs and make it more affordable" or predicated there would be a "cost benefit to the user (private companies charge what they like)." Others said it "will improve consistency with price and could [lead to]... subsidised travel" or that "by putting public transport under Government, there can be a standardised payment system."
+ **Known to work** – some assembly members described it as a "proven effective policy. European and other countries are well run." Others said that it "works in London – we can use TfL model", or that the "Dunkirk option is best."[10]
+ **Less profit focussed** – some assembly members said it meant "routes can be determined by necessity instead of profit" or that it would "help 'less profitable' routes."

10 As previously noted, this referred back to a case study presented by one of the speakers, Lynn Sloman, during Weekend Two of the assembly. Lynn's talk is available at climateassembly.uk/resources/

+ **"Easier to regulate and control under government control"**
+ **"Government managed school bus system – for all school kids"**
+ **"Ensures that money is being used for transport, not local authorities"**

⊖ Cons

– **Not in favour of nationalisation** – some assembly members said they are "not convinced nationalisation works" or that "we should be moving to smaller more efficient government and nationalisation is moving in the wrong direction."

– **Cost to taxpayer** – some assembly members noted it "has to be paid for", asked "how much will it cost to buy back routes?" Others said they had "concerns about government ownership bringing value for money or being a money pit for tax payer money."

– **"Union problems"**

– **"Do we currently have true competition in transport services?"**

– **"Who monitors quality and standards?"**

Investing in cycling and scootering facilities

This would involve investment in cycle lanes, cycle parking, free cycling lessons and shared 'pay as you go' bikes. It would also include segregated cycle lanes and cycle lanes outside urban areas.

Assembly members identified the following pros and cons about investing in cycling and scootering facilities.

⊕ Pros

+ **Safety and accessibility** – some assembly members said it "ensures cyclist safety", that "safer cycling would improve accessibility for users" or that it would "mak[e] bikes safe [and people] more confident about riding a bike." Others said it would be "safer for pedestrians and cyclists if cyclists have their own cycle super highways."
+ **Health benefits** – some assembly members liked that it "has a huge benefit for health" or that "it is healthier for the public, reduces car use." Some said there would be "positive health improvements IF done right – physical and mental."
+ **Meeting a need** – some assembly members commented that "investing in cycle lane infrastructure is necessary to enable greater cycle use." Others stated "joined up cycle lanes [are] needed", "need storage" or "training is important = confidence and safety." Some liked the idea of "safe places to store bikes when shopping/at work."
+ **Important** – some assembly members said "it is as important [as] reading and writing!" or that "Councils must invest."
+ **"Would prefer more cycle lanes and pedestrian spaces than roads"**
+ **"Drop in emissions"**

⊖ Cons

– **Cost and affordability** – some assembly members disliked the "cost of implementing infrastructure for cycling", suggesting "it costs £700k per 1km for the best cycle lanes." Others said "local councils can't afford to do it."
– **"Would need to make new cycle lanes in all rural areas as it is quite dangerous to cycle there and this puts people off"**
– **"Difficult to cycle in bad weather"**
– **"Pay as you go may result in increased bike theft"**
– **"Competition for limited road – bus/cycle lanes"**
– **"Bike users should be made to take a proficiency test as quite a few are a danger on the road"**
– **"Many cyclists refuse to use existing cycle lanes and insist on road use!"**
– **"No health benefits if you are cycling next to traffic"**

Grants to buy electric bikes

This could involve both a UK national grant scheme and local authorities offering grants to enable experimentation with different approaches. Grants of about £250 per e-bike are effective in other countries.

Assembly members identified the following pros and cons about grants to buy electric bikes.

⊕ Pros

+ **Viable and affordable** – some assembly members commented that "grants for e-bikes [are] large enough to be useful" or that it "makes buying an e-bike much more viable – grant money is very good in comparison to the average price." Others said it "makes cycling more affordable for longer distances."
+ **Incentivising uptake** – relatedly, others liked the "financial incentive for the general public to engage in cycling", or said "grants are good – [they] encourage use of e-bikes." Some suggested grants might result in people "getting a bike when you might not have thought about it before."
+ **"Encourages exercise"**
+ **"Really good if it benefits [those on] low incomes and people with health issues"**
+ **"Safer than racing bikes"**

⊖ Cons

– **Safety** – some assembly members worried about "safety for pedestrians (people cycle on pavements!)", said "e-bikes [are] more dangerous than motorbikes in rural areas – e.g. for pedestrians", or highlighted "increased risks to pedestrians, particularly [those who are] visually impaired and elderly."
– **No impact on emissions?** – some assembly members suggested e-bikes would "most likely only [be] bought for leisure – therefore no carbon decrease." Others queried "will this really have much of an impact on emissions?"
– **Not possible for everyone** – some assembly members noted "not everyone can" or said "even with grants [it's] still too costly for low income families."
– **"Subsidising manufactures"**
– **"Insurance and licencing"**

Some assembly members said the "grant has to be large enough to make a difference."

Additional ideas

During their discussions about increasing the use of public and active transport, some assembly members noted additional suggestions:

- “Legislate for all schools to teach cycling”
- “Make more guided bus and rail”[11]
- “Sensor systems to control/manage train routes” allowing for a greater bunching of trains and a reduction in delays. This would “replace any pollution if [the trains are] electric!”
- “Smart buses” that have more sensors, for example to avoid the bunching of services or automatically count passengers to know if extra buses are needed;
- “One ticket system with no penalty”
- “There must be subsidies for low income areas and people”

Others commented “this is all part of a joined up approach to transport – we like them all, so ranking [them on our ballot papers] is hard.”

Vote results

Assembly members voted by secret ballot on the seven policy options for increasing the use of public and active transport. There were two ballot papers. The first ballot paper asked assembly members how much they agreed or disagreed that each policy option should be part of how the UK gets to net zero. The second ballot paper asked them to rank the options in their order of preference. The votes from this second ballot paper were counted both in terms of first preference votes and via Borda count.

Assembly members supported a wide range of policies to increase the use of public and active transport. This is consistent with their earlier preferences for improvements in these areas (see Sections A and B above).

Large majorities of assembly members ‘strongly agreed’ that four of the policies should be part of how the UK gets to net zero. Levels of ‘strong agreement’ with these policies were high (at least 50% in all cases):

- **Adding new routes and more frequent services: 86%** ‘strongly agreed’ or ‘agreed’, including 50% who ‘strongly agreed’;
- **Making public transport cheaper: 83%** ‘strongly agreed’ or ‘agreed’, including 64% who ‘strongly agreed’;
- **Bringing public transport back under government control: 75%** ‘strongly agreed’ or ‘agreed’, including 58% who ‘strongly agreed’;
- **Investing in cycling and scootering facilities: 70%** ‘strongly agreed’ or ‘agreed’, including 53% who ‘strongly agreed’.

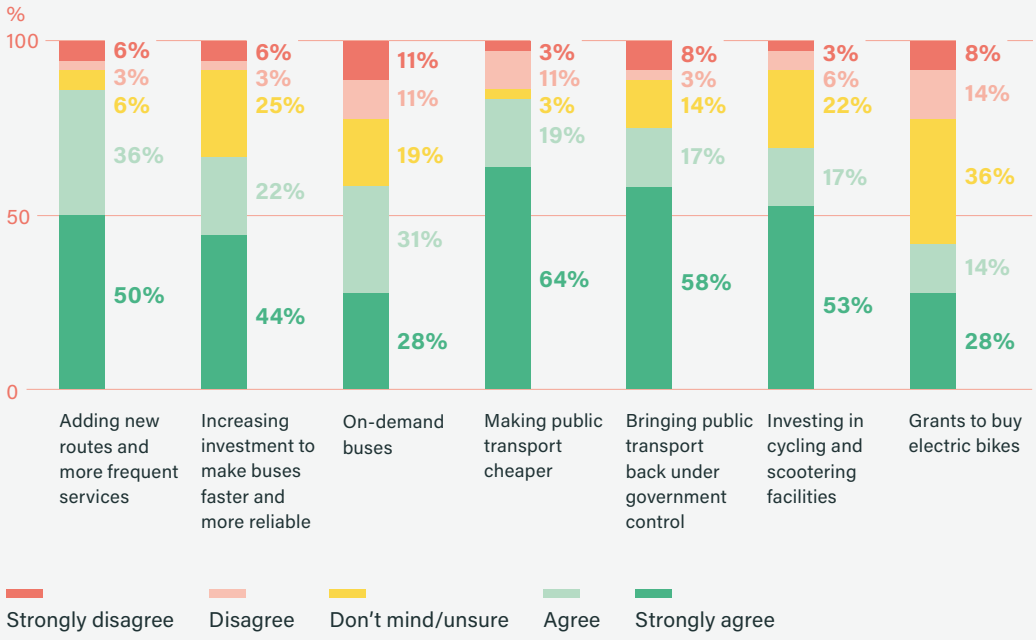
11 This is where buses or trains are guided automatically along a purpose-built track. The driver controls the speed. Guided buses are flexible in that they can also be driven on normal roads.

A majority of assembly members 'strongly agreed' or 'agreed' with the introduction of two further policies:

- **Investing in faster and more reliable buses: 66%** 'strongly agreed' or 'agreed';
- **On-demand buses: 59%** 'strongly agreed' or 'agreed'.

Figure 10: Increasing the use of public and active transport

How much do you agree or disagree that each of the following policy options should be part of how the UK gets to net zero? (%)



The only policy option that a majority of assembly members failed to support was 'grants to buy electric bikes.' Only 22% of assembly members 'disagreed' or 'strongly disagreed' with this policy. However, a large percentage (36%) 'didn't mind' or were 'unsure', leaving the percentage of those 'agreeing' or 'strongly agreeing' at just 42%.

The ranking votes shed some additional light on assembly members' views: all the policies about public transport (except on-demand buses) scored more highly than those about active transport.

Figure 11: Increasing the use of public and active transport

Please rank the following policy options in order of preference

(% 1st preference votes)

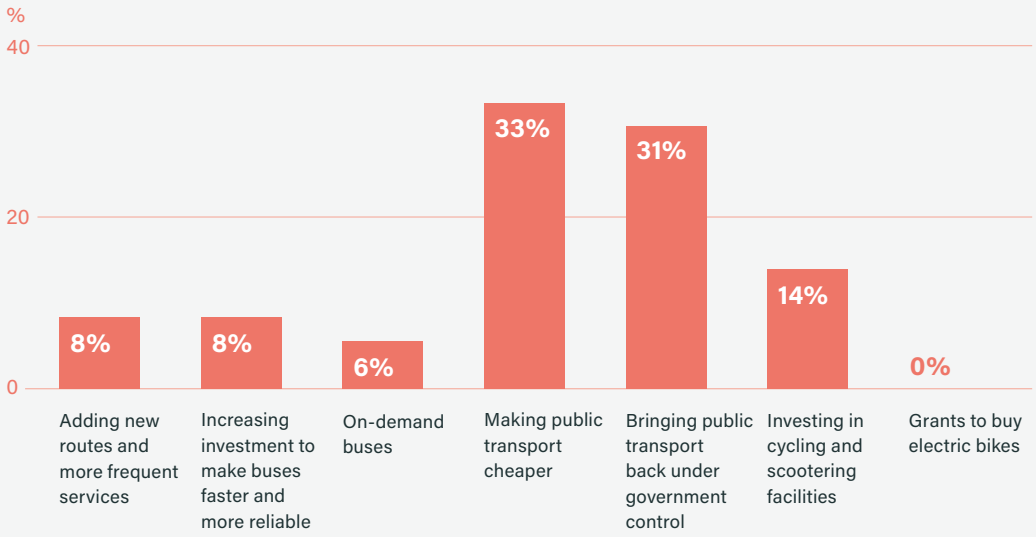
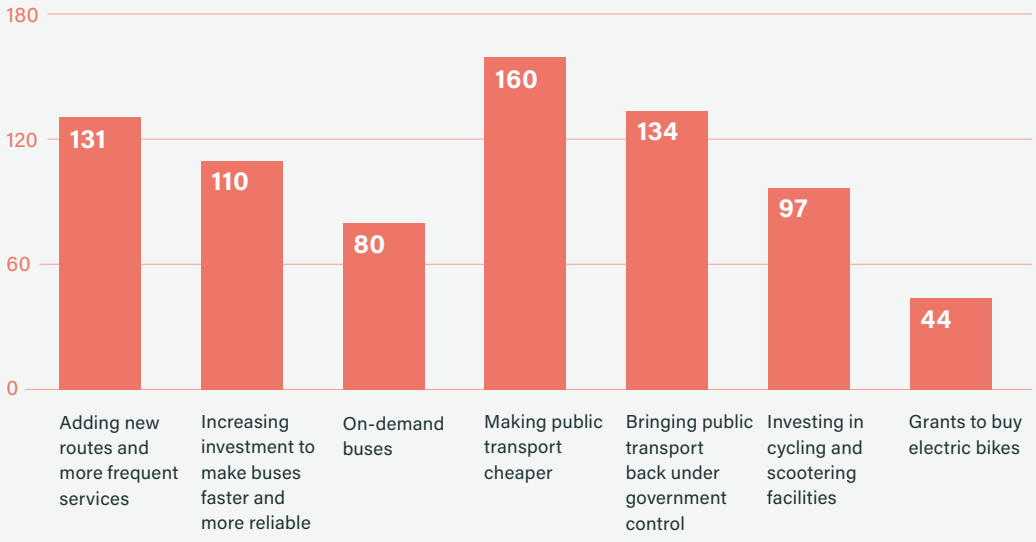


Figure 12: Increasing the use of public and active transport

Please rank the following policy options in order of preference

(Borda count)



Policy options – conclusions

Assembly members' policy recommendations reinforced their earlier preferences. Assembly members had already indicated support for moving quickly to low carbon vehicles and improving public transport. Their broad support for policies in these areas was consistent with that view (please see the table below).

Conversely, many assembly members had been clear that they wanted to minimise restrictions on travel and lifestyles. Their comparative lack of support for policy options to discourage car ownership and use reaffirms that preference.

% Assembly members who agreed or disagreed with policy options

Policy option	Policy objective	% strongly agree or agree	% strongly disagree or disagree
Government investment in low carbon buses and trains	Moving quickly to low carbon vehicles	91%	6%
Quickly stop selling the most polluting vehicles	Moving quickly to low carbon vehicles	86%	11%
Adding new bus routes and more frequent services	Increasing the use of public and active transport	86%	9%
Making public transport cheaper	Increasing the use of public and active transport	83%	14%
Bringing public transport back under government control	Increasing the use of public and active transport	75%	11%
Grants for businesses and people to buy low carbon cars	Moving quickly to low carbon vehicles	74%	9%
Localisation	Discouraging car ownership and use	72%	20%
Investing in cycling and scootering facilities	Increasing the use of public and active transport	70%	9%
Increasing investment to make buses faster and more reliable	Increasing the use of public and active transport	66%	9%
Car scrappage scheme	Moving quickly to low carbon vehicles	66%	9%
On-demand buses	Increasing the use of public and active transport	59%	22%
Car clubs	Discouraging car ownership and use	59%	11%
Advertising restrictions on the most polluting cars	Moving quickly to low carbon vehicles	58%	15%
Charging to use the roads	Discouraging car ownership and use	56%	39%
Closing roads to cars	Discouraging car ownership and use	53%	23%

Note: this table only includes policy options that at least 50% of assembly members supported

On **moving quickly to low carbon vehicles**, assembly members were particularly supportive of options to **'quickly stop selling the most polluting vehicles'** and **'government investment in low carbon buses and/or trains'**. There was also significant support for **'grants for businesses and people to buy low carbon cars'**. Assembly members did not support 'access to longer range cars for electric car owners' or 'lowering speed limits on dual carriageways or motorways.' Assembly members' rationale for their decisions included factors around:

- Personal costs and affordability, including for those on low incomes;
- Overall costs, who pays and who benefits;
- Practicalities around implementation;
- The impact on emissions;
- And potential co-benefits.

Assembly members' preferred options for **increasing the use of public and active transport** were: **'making public transport cheaper'**; **'bringing public transport back under government control'**; and **'adding new bus routes and more frequent services'**. They also backed the introduction of other policy initiatives. In general, assembly members were more supportive of policies to improve public – as opposed to active – transport. Assembly members did not support grants to buy electric bikes. Assembly members' rationale for their decisions around public and active transport included a wish to see increased use of public transport, and considerations around cost (both personal and overall) and accessibility. For individual policies, impacts around safety, health and the ability to plan a better service were also important.

As already noted, assembly members were overall less supportive of policies to **discourage car ownership and use**. However a large majority of assembly members (72%) supported one policy option, **'localisation'**, with **'closing roads to cars'** also performing well in the Borda count. Small majorities of assembly members supported two further policies, 'charging to use the roads' and 'car clubs'. Assembly members' rationale included whether or not they thought policies would benefit local areas including local high streets, and their potential impacts on people with low incomes, who live in rural areas and/or who have a disability.

D. Anything else to tell government or Parliament

At the end of weekend three, assembly members had the opportunity to add any further thoughts on surface transport and the path to net zero. A small number of assembly members chose to add additional points.

Some assembly members talked about the need for **education and information**:

> "Generic education in schools about carbon neutrality – kids now [are the] adults of 2030"

> "Public information booklet – why important to take action and what"

> "Focus on the provenance of information"

Others focussed on **synthetic fuels:**

> "Consider other power sources apart from electricity (e.g. synthetic fuels)"

> "Think long-term i.e. is electricity really the best? Should we go hydrogen/synthetic now? If freight going that way – don't have 2 tier system – go for least disruptive tech"

> "We have been demonising the wrong thing, it is fossil fuels that are the demon and yet we didn't spent much time discussing alternative fuels. People like me love their cars…. Some of my grandchildren are learning to drive and love the experience. […] There is no need to take this away from people."

Others suggested a need to **"consider implications for electricity generation/stability and power cuts"**, provide **"incentives to buy 2nd hand electric vehicles"** and **"address Amazon deliveries."**

Conclusions

Assembly members expressed clear and consistent views about surface transport and the path to net zero.

Assembly members' aimed to **minimise restrictions on travel and lifestyles**, placing the emphasis on shifting to electric vehicles and improving public transport, rather than on large reductions in car use.

In terms of what the future of surface transport should look like in the UK, assembly members recommended:

- **A ban on the sale of new petrol, diesel and hybrid cars by 2030–2035;**
- **A reduction in the amount we use cars by an average of 2–5% per decade;**
- **Improved public transport.**

In terms of how the UK should make these changes, assembly members considered policies aimed at moving quickly to low carbon vehicles, increasing public and active transport, and discouraging car ownership and use. A majority of assembly members backed[12] fifteen policies:

- **Government investment in low carbon buses and trains (91%)**
- **Quickly stop selling the most polluting vehicles (86%)**
- **Adding new bus routes and more frequent services (86%)**
- **Making public transport cheaper (83%)**
- **Bringing public transport back under government control (75%)**
- **Grants for businesses and people to buy low carbon cars (74%)**
- **Localisation[13] (72%)**
- **Investing in cycling and scootering facilities (70%)**
- **Increasing investment to make buses faster and more reliable (66%)**
- **Car scrappage scheme (66%)**
- **On-demand buses (59%)**
- **Car clubs (59%)**
- **Advertising restrictions on the most polluting cars (58%)**
- **Charging to use the roads (56%)**
- **Closing roads to cars[14] (53%)**

12 Figures given are for the % of assembly members who 'strongly agreed' or 'agreed' that a policy should be part of how the UK gets to net zero.

13 The Expert Leads described 'localisation' as involving (1) changing regulations to ensure that new houses can only be built with good public transport links, and (2) including or putting back into local areas services such as post offices, local shops, health centres and schools.

14 The Expert Leads described this as involving restricting cars in certain lanes, roads or zones. They said it could eventually mean that cars are not allowed in most town centres. There could also be temporary closures, such as regular car free days.

Overall assembly members were less supportive of policies to discourage car ownership and use, in-line with their vision for the future of surface transport in the UK.

As well as the wish to minimise restrictions on lifestyles, assembly members' rationale for their policy decisions included points around the **speed of change**, **feasibility, practicalities**, **cost** (both personal and overall), and **co-benefits**. They saw potential co-benefits as including improved air quality, reduced congestion and positive impacts for local areas and their high streets.

Assembly members also consistently raised the importance of **accessibility** and **affordability**, stressing the need to avoid negative consequences for rural areas, people with a disability, and those on low incomes, as well as for mental health and isolation.

Assembly members' list of key considerations for government and Parliament to bear in mind when looking at surface transport (see Section A) provides an overarching framework within which to view the assembly's decisions. It also includes a number of additional recommendations – for example, around **information and education**, **who should pay** for the changes needed, and **avoiding potential side effects**.

How we travel by air

Chapter 4

Summary of recommendations

1 Assembly members identified **14 considerations that they would like government and Parliament to bear in mind when looking at air travel and the path to net zero.** These included speeding up progress on technology, influencing the rest of the world, and evening out the cost of air travel versus alternative forms of transport by making the latter cheaper and better.

2 Assembly members would like to see a **solution to air travel emissions that allows people to continue to fly**. Assembly members felt that this would protect people's freedom and happiness, as well as having benefits for business and the economy. However their **support for continued flying had limits.** Assembly members resoundingly rejected a future in which air passenger numbers would rise by as much as 65% between 2018 and 2050, labelling it "counterproductive". Instead, assembly members sought to find an **acceptable balance between achieving the net zero target, impacts on lifestyles, reliance on new technologies, and investment in alternatives**. Their preferences point to a future in which:

- **Air passenger numbers increase by 25–50% between 2018 and 2050**, depending on how quickly technology progresses. This is a lower rate of growth per year than was seen in recent times[1] prior to Covid-19;
- **30m tonnes of CO_2 is still emitted by the aviation sector in 2050** and requires removing from the atmosphere;
- There is **investment in alternatives to air travel.**

3 80% of assembly members 'strongly agreed' or 'agreed' that **taxes that increase as people fly more often and as they fly further** should be part of how the UK gets to net zero. Assembly members saw these taxes as **fairer** than alternative policy options.

4 Assembly members would like to see the **airline industry invest in greenhouse gas removals**. 75% of assembly members 'strongly agreed' or 'agreed' that this should be part of how the UK gets to net zero. There was also significant support for **financial incentives from government to encourage a wide range of organisations to invest**. Assembly members' tended to feel that 'the polluter should pay', although some suggested a need to monitor, scrutinise and perhaps enforce airline industry investment to ensure it actually takes place.

5 87% of assembly members strongly agreed that we **need to invest in the development and use of new technologies for air travel**. These technologies could include electric aircraft and synthetic fuels.

1 A 25–50% increase between 2018 and 2050 is equivalent to a growth in passenger numbers of between 0.7% and 1.3% per year. Between 2000 and 2018, the annual rate of growth in passenger numbers was 2.8%. Department for Transport (2019) Aviation Statistics: data table AVI0101: https://www.gov.uk/government/statistical-data-sets/aviation-statistics-data-tables-avi

How we travel by air

Air travel accounts for 22% of the UK's total greenhouse gas emissions from transport, and 7% of the UK's total greenhouse gas emissions overall.[2] Emissions from flying have grown significantly in the last 30 years.[3]

Air travel's contribution to UK emissions comes from both:

- **Domestic travel** – travel within the borders of the UK; and
- **International travel** – travel that starts in the UK but ends in another country. 96% of the UK's air travel emissions are from international flights.[4]

Excluded from these figures are flights *from* other countries *to* the UK (for example, return flights from holidays), or travel that UK residents take within other countries or from one foreign country to another. Climate Assembly UK followed the same criteria when deciding what was, and was not, in scope for its discussions.

Air travel also includes both passenger or 'personal' transport, and freight. Personal transport is what people use to travel for pleasure, like going on holiday or visiting family and friends. It also covers travel for work. Freight is transport used to move goods. Climate Assembly UK considered personal transport only. It did not look at freight.[5] This followed guidance from Parliament that, if there was not time to consider both, its committees most wanted to hear assembly members' views on personal transport.

What did the assembly consider?

Thirty-six assembly members considered the topic of air travel in-depth. We selected these assembly members from the assembly as a whole using random stratified sampling. This ensured that they remained reflective of the wider UK population in terms of both demographics[6] and their level of concern about climate change.

2 BEIS (2019) Final UK greenhouse gas emissions national statistics 1990–2017. These figures do not include military aircraft and shipping.
3 Department for Transport (2019), Energy and environment: data tables, https://www.gov.uk/government/statistical-data-sets/energy-and-environment-data-tables-env, Table ENV0201.
4 Department for Transport (2019), Energy and environment: data tables, https://www.gov.uk/government/statistical-data-sets/energy-and-environment-data-tables-env
5 Climate Assembly UK speaker Dr Sally Cairns calculated that freight account for 12–14% of emissions from aircraft.
6 Age, gender, ethnicity, educational qualification, where in the UK they live and whether they live in an urban or rural area.

These assembly members heard a wide range of views both on what the future of air travel could look like for the UK, and how we might move towards that future. They had the opportunity to question each speaker[7] in detail. These evidence sessions took place at weekend two of the assembly.

Assembly members spent weekend three of the assembly discussing the evidence they had heard and their own views, before reaching recommendations on three separate areas:

A. **Considerations:** the overarching considerations that government and Parliament should bear in mind when making decisions about air travel and the path to net zero;

B. **Futures**: what the future of air travel in the UK should look like;

C. **Policy options:** how the UK should move toward this future.

Assembly members also had the opportunity to discuss and add **anything else they wanted to say** to government and Parliament about air travel and the path to net zero. Assembly members' views on the implications of Covid-19 for this topic are touched on in Chapter 10.

Contents of this chapter

7 The assembly heard from six speakers on air travel: Professor Jim Watson, University College London (informant); Owen Bellamy, Committee on Climate Change (informant); Professor Alice Larkin, University of Manchester (informant); Dr Sally Cairns, University of Leeds (informant); Leo Murray, Possible (advocate); Rachael Everard, Rolls Royce (advocate). All speakers' presentations are available as slides, videos and transcripts at climateassembly.uk/resources/. An 'informant' is a speaker who we asked to cover the range of views and available evidence on a topic. An 'advocate' is a speaker who we asked to give their own view, or the view of their organisation. Assembly members knew whether speakers were informants or advocates.

A. Considerations

Assembly members reached their first decisions on air travel by discussing their answers to the following question:

> *What considerations should government and Parliament bear in mind when making decisions about air travel and the path to net zero?*

Assembly members thought about their answers to this question individually. They then discussed their views in small groups at their tables, with each table agreeing their five top considerations. These top considerations had to, between them, represent the range of views at the table.

Facilitators took the top considerations from each table and grouped similar options together to create a list on which assembly members could vote. They checked this list back with assembly members to make sure they had accurately reflected their views. This included making any necessary adjustments. Each assembly member voted for the four options that they felt to be most important.

The results were as follows. The wording of the considerations in the table is either word for word what assembly members wrote on their option cards or, where facilitators combined similar options from several tables, how they described the options to assembly members prior to the vote.

Rank	Consideration	% assembly members who chose it as a priority
1	Taken together, the following two considerations had the most votes:	53
	▪ Escalate and speed up options to enable us to keep flying (e.g. technology, synthetic fuels, carbon offsetting)	25
	▪ Speed up technology (e.g. electric planes, synthetic fuels) but don't jump in before ready and don't compromise safety	28
=2	Influence the rest of the world (USA and China) – e.g. tax on aviation fuel needs to be worldwide	50
=2	Even out the costs of air travel compared to alternatives by making alternatives cheaper and better, including increasing capacity to cater for increased demand	50
4	Frequent fliers and those that fly more distance should pay more	44
=5	Stay competitive and protect the economy, including addressing the impact on business and the travel industry	31
=5	Engage the population in making the necessary changes (education, promotion, explanation)	31
7	Take account of different travel needs (e.g. people with family far away, the military, people who live on islands, medical needs)	25

=8	Promote and incentivise UK holidays	22
=8	Scrap incentives to make people fly more (e.g. air miles, 1st class)	22
10	Ban polluting private jets and helicopters, moving to electric technology as it becomes available	19
=11	Ensure choices are accessible and affordable to all sections of society	14
=11	Don't limit how much individuals travel	14
13	Even out the costs of air travel compared to alternatives by making air travel more expensive	8
14	Make those who take more expensive modes pay more (i.e. in carbon tax), including those who use private jets	3

Note: It is worth noting that, taken together, the options about **evening out the costs of air travel compared to alternatives** would have the most votes. These options came joint second and thirteenth in the vote, respectively. However it is possible that some assembly members voted for both these options, which is why they are not combined in the table above. This is not the case for the options that came first, where assembly members agreed prior to the vote that they could only vote for one of them.

B. Futures

After deciding their most important considerations, assembly members moved on to look at the future of air travel for the UK.

To aid them in this process, the Expert Leads presented assembly members with five scenarios for possible futures:

- Technological change;
- More emissions from flying;
- Flying less;
- Combined approach;
- Flying less until technology improves.

Together these scenarios cover a broad range of views about how air travel could change to help the UK reach net zero.

Each scenario presented to assembly included a different combination of assumptions about:

- How much to reduce the amount we fly, by for example:
  - Taking fewer holidays and business trips, including using video conferencing;
  - Shifting shorter flights to other forms of transport such as high speed rail or ferries;

- How quickly we are able to make planes more efficient and develop new engine technologies, for example electric aircraft;
- How quickly we are able to shift from fossil fuels to biofuels and synthetic fuels;
- The quantity of greenhouse gas emissions remaining from air travel in 2050 that will need removing from the atmosphere to meet the net zero target.[8,9]

Assembly members discussed each of the scenarios or 'possible futures', before voting on them by secret ballot.

We start by presenting the rationale for their views, taking each possible future in turn.

Jump to the vote results on page 135

B.1 Technological change

This future would see increased air travel, with technology used to reduce emissions. It would feature:

- A 50% growth in air passenger numbers between 2018 and 2050;[10]
- A higher rate of technology progress than in some other scenarios, leading to improved fuel efficiency;
- A high use of low carbon fuels (25% of fuel by 2050);
- Some hybrid electric aircraft by 2050;
- Emissions in 2050 that are lower than today, amounting to approximately 30m tonnes of CO_2 per year. These remaining 30m tonnes of CO_2 would need to be removed from the atmosphere.

Assembly members discussed this possible future in small groups. They identified the following pros and cons.

8 Even if technologies and policies to move towards net zero are successful, it is very likely that there will still be emissions from flying in 2050: emissions from flying have grown significantly in the last 30 years; new technologies and fuels that could substantially reduce emissions – such as synthetic fuels and electric aircraft – are at an early stage of development and their future impact on emissions is uncertain.

9 For the assembly's recommendations on how to remove greenhouse gases from the atmosphere, please see Chapter 9.

10 A 50% growth in passenger numbers between 2018 and 2050 is in line with the Department for Transport's central forecast, which assumes that airport capacity is not expanded. [source: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/878705/uk-aviation-forecasts-2017.pdf]

⊕ Pros

+ **Less restrictive on people's lives –** some assembly members suggested that this future provided "an acceptable balance with lifestyles and carbon emissions" or "maximum gain for least pain."
+ **Focus on technology** – some assembly members stated their support for "rapid technological improvements." Others suggested that a focus on technology is "good for the economy" or noted "we have the technology – use it...."
+ **"Significant shift away from fossil fuels"**

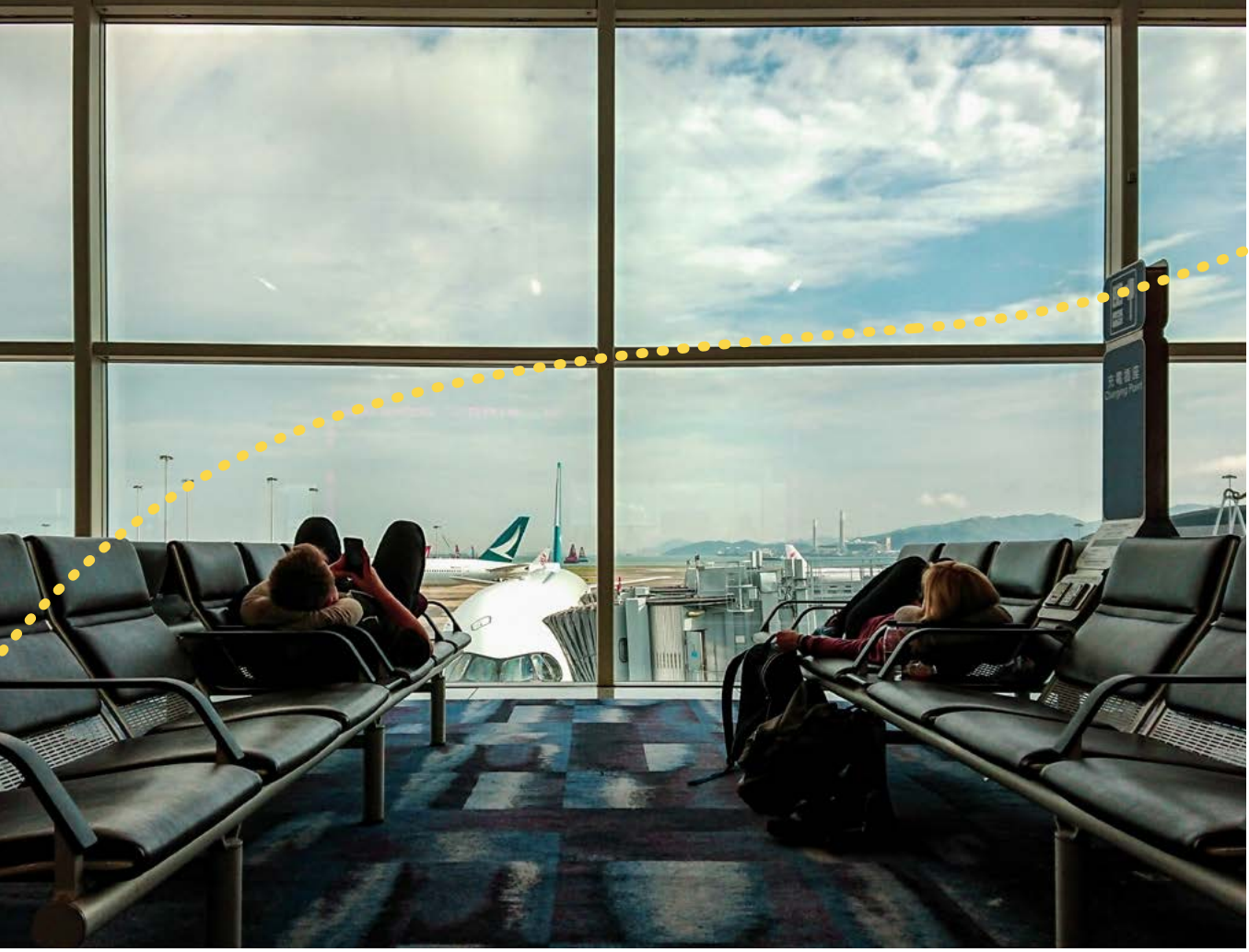
⊖ Cons

– **Concerns about rising passenger numbers** – some assembly members suggested that a 50% rise was "large" or "too high." Others said the "best way to reduce CO_2 is to reduce the amount we fly; this has a large increase."
– **Uncertainty about technology and fuel improvements** – some assembly members said technology and fuel improvements are "not quite ready" or that this future "contains assumptions" about when they will be ready, which might be "wishful thinking."
– **"Doesn't help improve CO_2 levels quick enough"**
– **"Relies on international agreement e.g. on fuel standards"**

Assembly members made the following additional comments in relation to this possible future:

> "We always have to put this in an international context."
>
> "Every option will be impactful on current behaviour. People will have to get on with that."
>
> "We have to set an example."

When we asked assembly members to rank the possible futures in their order of preference, this future received significant support from assembly members. Please see page 135 for the vote results.



B.2 More emissions from flying

This possible future would involve continued growth in air travel. It would feature:

- A 65% growth in air passenger numbers between 2018 and 2050;[11]
- Expansion of airport capacity to enable this growth;
- Some technology progress to improve fuel efficiency;
- Limited use of low carbon fuels and electric aircraft by 2050;
- Emissions in 2050 that are higher than today, amounting to approximately 50m tonnes of CO_2 per year. These remaining 50m tonnes of CO_2 would need to be removed from the atmosphere. Greenhouse gas removal measures would be needed more rapidly than in the other futures.

Assembly members discussed this possible future at their tables. A few individual assembly members noted positive points about this future. However, the majority of assembly members focused on its negatives.

11 A 65% growth in passenger numbers between 2018 and 2050 is similar to the assumption made in a recent decarbonisation roadmap published by an airline industry body called Sustainable Aviation in early 2020. [source: https://www.sustainableaviation.co.uk/news/uk-aviation-commits-to-net-zero-carbon-emissions-by-2050/]

⊕ Pros

+ **"Allows airway companies to make more money"**
+ **"Can concentrate on other aspects of net zero"**
+ **"Growth in economy / standard of life"**

⊖ Cons

- **Backwards step** – some assembly members commented that this future would be a "backwards approach", "counter intuitive", or "counterproductive." Others said there was "too great a rise in air passenger numbers."
- **Too great a reliance on removals** – some assembly members felt removals are "too expensive" or "rel[y] on ...methods that we don't currently have." Others said that it "makes sense to reduce emissions rather than have to remove them."
- **Knock of effect on other areas of CO_2 reduction** – some assembly members noted concerns that this future would mean a need to reduce emissions more, and/or more quickly, in other areas like the home and surface transport. They felt this could cause problems.
- **"Every sector has to play its part"**
- **"Undesirable consequences of increased airport capacity"**
- **"Limits development in technology"**

One assembly member said they would support this possible future if it included more technological change in order to reduce carbon emissions further.

When we asked assembly members to rank the possible futures in their order of preference, this scenario received almost no support from assembly members. The only assembly member who chose this option as their first preference commented:

> "To keep up with global growth and life expectations air travel will increase irrespective of UK policy. All options presented require carbon capture anyway…."

Please see below for the results of the vote.

B.3 Flying less

This possible future would involve reducing air travel. It would feature:

- A 15% reduction in air passenger numbers between 2018 and 2050;
- No expansion of airport capacity;
- Investment in high speed rail and alternatives to business travel;

- A higher rate of technology progress leading to improved fuel efficiency;
- Moderate use of low carbon fuels and hybrid electric aircraft;
- Emissions in 2050 that are lower than today, amounting to approximately 20m tonnes of CO_2 per year. These remaining 20m tonnes of CO_2 would need to be removed from the atmosphere

Assembly members discussed this possible future at their tables. They identified the following pros and cons.

⊕ Pros

+ **Reduced air travel and emissions** – some assembly members supported the "reduction in air passengers" or said this future was the "only option that reduces air travel and emissions."
+ **Cheap and easy** – some assembly members said that this was "the cheapest and easiest way to reduce emissions" or that they were "not convinced about feasibility / viability of carbon capture."
+ **Positive for alternatives** – some assembly members liked the idea of "investment in high speed rail" or "improved public transport."
+ **Helping UK tourism** – one assembly member noted that this future would be positive for "Holiday UK."
+ **"Achievable if people are educated about climate change"**
+ **"Immediate benefits of less flying"**
+ **"Reducing local flights is positive"**
+ **"Can be done fairly"**

⊖ Cons

– **Damage to business and the economy** – some assembly members labelled this future a "15% reduction in competitiveness of the UK economy" or said "flying less does not benefit businesses." Others said "no expansion of airports is two steps backwards for the UK."
– **Restricts people's freedom and limits their happiness** – some assembly members said that this future would "reduc[e] personal freedoms/rewards" or "may damage people's happiness."
– **Not realistic or practical** – some assembly members voiced concerns about the "need to improve alternatives very quickly" or "the very significant changes in lifestyle" required.
– **"Big Brother"** – some assembly members did not like the idea of lifestyle decisions being made for them, with one assembly member commenting "life change? Who decides? How?"
– **"If we have to take 20mt/pa[12] out of atmosphere, we might as well take 50mt/pa out"**

12 'Mt/pa' refers to million tonnes of CO_2 per year.

When we asked assembly members to rank the possible futures in their order of preference, this scenario received support from some assembly members. Assembly members who chose this as their first preference made a range of comments including:

> “Serious attempt to reduce emissions of greenhouse gases.”

> “Only future with reduction in air passengers over the period – most direct solution to reduce emissions instead of methods that increase emissions that then need to be captured – when technology does not seem reliable or all figured out yet.”

> “People staying in the UK and spending in UK.”

Please see below for the results of the vote.

B.4 Combined approach

This scenario would involve slower growth in air travel than has been the case in recent years, alongside the use of some new technologies and fuels. They noted that it would feature:

- A 25% growth in air passenger numbers between 2018 and 2050;
- Investment in high speed rail and alternatives to business travel;
- A higher rate of technology progress compared to some of the other futures, leading to improved fuel efficiency;
- Moderate use of low carbon fuels and hybrid electric aircraft;
- Emissions in 2050 that are lower than today, amounting to approximately 30m tonnes of CO_2 per year. These remaining 30m tonnes of CO_2 would need to be removed from the atmosphere.

Assembly members discussed this possible future at their tables. They identified the following pros and cons.

⊕ Pros

+ **“Allows an acceptable best of both worlds”** – some assembly members felt this future “target[s] all aspects of the problem but allow[s] growth”. Others noted that it would make “emissions lower,” whilst being “not a drastic change in lifestyle.”
+ **More achievable** – some assembly members commented that “growth in air passengers cannot suddenly stop.”
+ **Public appeal** – some assembly members felt that this future is “likely to appeal to most people” or “can enable a ground swell of support.”
+ **Investment in alternatives** – for example, some assembly members voiced their support for high speed rail.
+ **“Use of technology as part of the solution”**

⊖ Cons

- **Unachievable** – some assembly members commented that the "slower growth in air travel [is] not possible to achieve."
- **Doubts about technology** – some assembly members felt that "the technology is still uncertain and unproven."
- **Amount of CO_2 removal** – some assembly members were concerned about the "very high requirement for CO_2 removal."
- **Lacks ambition** – some assembly members felt this future was "just a slower version of 'fly less until technology improves'."
- **"Too pessimistic"**

One assembly member suggested that this scenario "requires a lot of education to make it work".

When we asked assembly members to rank the possible futures in their order of preference, this scenario received significant support from assembly members. Please see page 135 for the vote results.

B.5 Flying less until technology improves

This scenario would involve reducing air travel until new technologies become available.[13] It would feature:

- A 20% growth in air passenger numbers between 2018 and 2050;
- Investment in high speed rail and alternatives to business travel;
- Moderate technology progress, leading to improved fuel efficiency;
- Low carbon fuels commercially available in 2035. They supply a third of air travel by 2050;
- Emissions in 2050 that are lower than today, amounting to approximately 20m tonnes of CO_2 per year. These remaining 20m tonnes of CO_2 would need to be removed from the atmosphere.

Assembly members discussed this possible future at their tables. They identified the following pros and cons.

13 The Expert Leads developed this scenario as a direct response to comments made by assembly members at weekend two of the assembly.

⊕ Pros

+ **Reduction in emissions** – some assembly members commented that this future had the "lowest emissions of all options" or that "emissions [would be] significantly reduced."
+ **"Gives a chance for technology to catch-up"** – some assembly members suggested that this involved a "gradual introduction of alternatives – not rushed." Others felt it "would be good in the short-term, but not a long-term solution. Still need new technology as soon as possible."
+ **Investment in alternatives** – for example, some assembly members voiced their support for high speed rail.
+ **Best of all worlds** – one assembly member noted that this future "includes investment [in alternatives], development of technology and still continued growth [in air passenger numbers]."
+ **"Realistic"**

⊖ Cons

- **Restrictions on flying** – some assembly members said that "restricting flying in any way should not be encouraged" or that this future "reduces personal freedoms/rewards" or "impacts on lifestyles."
- **Not enough reliance on technology** – some assembly members felt that "progress should be quicker" particularly on low carbon fuels or that this future "removes incentives for on-going progression on technology."
- **Too much reliance on technology** – some assembly were concerned about the reliance on technology:

  "What if technology doesn't develop enough and we've waited too long to do anything?"

  "Is it realistic to improve technology significantly by 2035?"
- **Impact on businesses** – one assembly member noted that there would be a "change in lifestyle in [the] short to medium term with possible impacts on some businesses."
- **High speed rail** – one assembly member suggested that high speed rail "can be disruptive and environmentally damaging."
- **"Politicians will sit on it! Change won't happen"**

A number of assembly members made additional comments about this possible future. They suggested that:

- 15 years is too long to wait for low carbon fuels to be commercially available, and that there should be more emphasis on technology;
- The cost of carbon offsetting should be paid for from a levy or taxation on aviation;
- There should be a ban on private jets and helicopters, first and business class flights and non-essential air freight, as "an easy way to reduce emissions";
- "We can't be building new airports and runways while committed to reducing emissions."

One assembly member also asked whether electrical long–haul recharge platforms are a possibility.

When we asked assembly members to rank the possible futures in their order of preference, this scenario received support from some assembly members. Please see below for the results of the vote.

Vote results

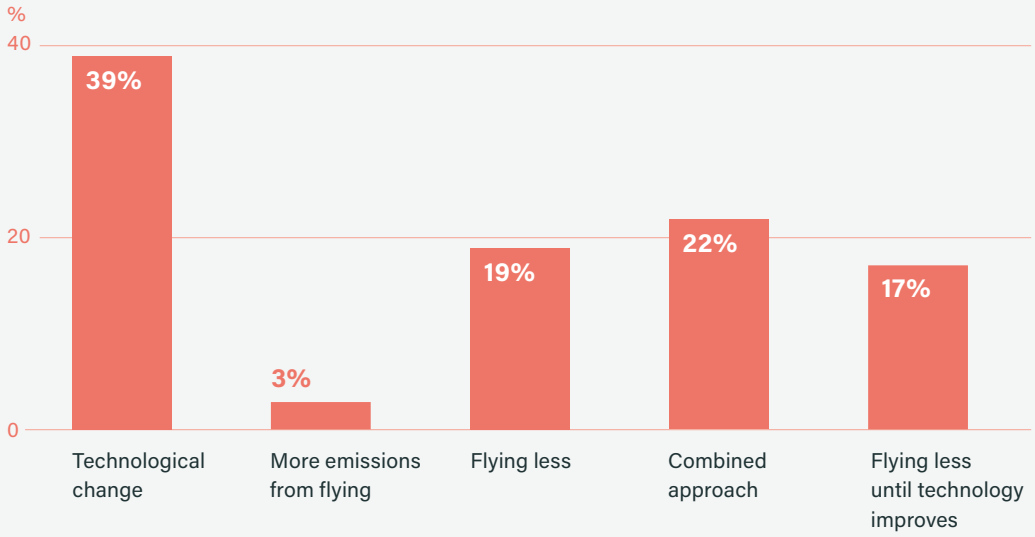
Assembly members voted on the possible futures by secret ballot. The ballot paper asked them to rank the futures in their order of preference.

The votes were counted in two ways:

- **Counting assembly members' first preference votes only.** This tells us what assembly members would and wouldn't choose if they could have their preferred future.
- **Using Borda count.** This involves allocating points for preferences – a first preference vote scored four points, a second preference vote 3 points and so on. A fifth preference vote scored no points. Counting the votes like this tells us which futures are most acceptable to the greatest number of assembly members.

Figure 1: Possible futures

Please rank the possible futures in order of preference
(% 1st preference votes)



'Technological change' received significantly more first preference votes than the other futures. 'More emissions from flying' received almost no votes. A majority of assembly members (58%) chose as their first preference a future that would see passenger numbers rise by just 15–25% by 2050 – a much lower figure than the 50% increase under 'technological change'.

Assembly members who chose **'technological change'** as their first preference wrote a range of reasons for their choice on their ballot papers, including:

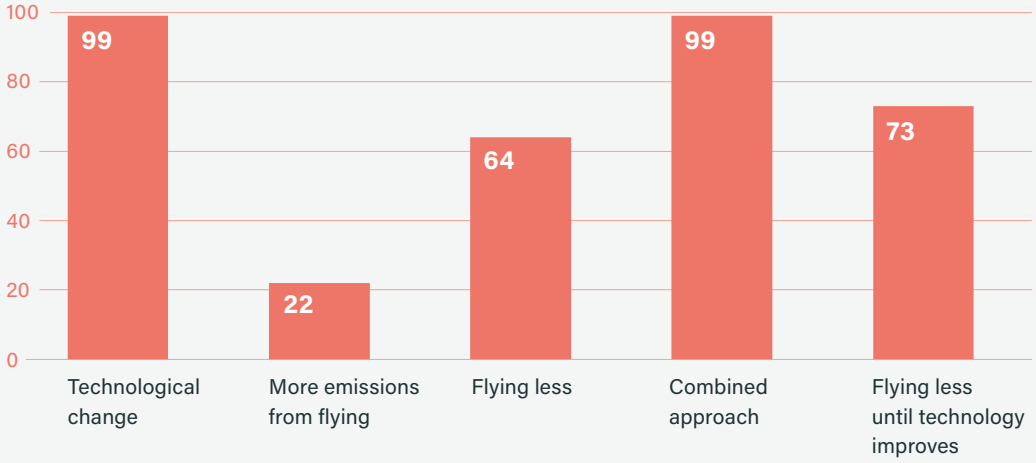
> "I think it is most sensible to push for an advance in technology because other ideas seem to just be putting off or avoiding the problems, instead of trying to solve them."

- “Has a reasonable level of CO_2 emissions … which may be achievable to remove from the atmosphere.”
- “Freedom of movement is important to me.”
- “It seems the most realistic and practical solution – as we are an island people need to fly.”
- “Most socially acceptable option.”
- “It also still allows a high growth level which is important to the economy and businesses.”
- “I believe the answer to all the problems in relation to emissions (within aviation) lies in technology.”

In the Borda count, ‘technological change’ and ‘combined approach’ received almost identical scores. ‘More emissions from flying’ again scored poorly.

Figure 2: Possible futures

Please rank the possible futures in order of preference
(Borda count)



Assembly member who chose **‘combined approach’** as their first preference gave a range of reasons for their choice. This included a feeling that this future is ‘balanced’, with some noting their support for investment in alternative forms of transport. Comments included:

- “Combines passenger growth with investment into surface transports. And a reasonable amount (30 m tonnes) of CO_2 to be removed.”
- “Emissions lower, alternatives to flying being invested in so not forcing people to completely stop travelling – not a very drastic change in lifestyle. Most realistic option as growth in air passengers cannot suddenly stop.”
- “Seems obvious to make best efforts on all fronts including some small behaviour change.”

> “Overall the investment in high speed rail. And higher rate of technology.”

> “Most achievable and likely to be acceptable to the majority.”

Futures – conclusions

Overall, assembly members’ preferred futures were ‘technological change’ and the ‘Combined approach’, with the former securing substantially more first preference votes (39% to 22%).

Comments in group discussions and on their ballot papers suggest that **assembly members’ reasons for supporting ‘Technological change’ centred on a wish for a solution to air travel emissions that allows people to continue to fly**. They cited rationale including freedom and happiness for this preference, as well as – to a slightly lesser extent – benefits to business and the economy. Some assembly members expressed scepticism about the feasibility of significant changes to passenger numbers.

Assembly members’ support for continued flying did, however, have limits:

- The scenario that included the greatest increase in air passenger numbers (**‘more emissions from flying’**) **secured just 3% of first preference votes** and received least support by a considerable margin in the Borda count. Assembly members suggested that it would be “counterproductive”, involved too great a reliance on greenhouse gas removals, and would have knock-on effects in terms of requiring greater change in other areas of people’s lives;
- While ‘technological change’ was clearly the most popular scenario in terms of first preference votes, **a majority of assembly members (58%) chose as their first preference a future that would see passenger numbers rise by just 15–25% by 2050** – a much lower figure than the 50% increase included under ‘technological change’. Some assembly members expressed uncertainty about when fuel and technological improvements would be ready. Others highlighted the benefits of flying less, for example for reducing emissions.

This split in first preference votes makes the Borda count results particularly instructive. They suggest that the **two scenarios that large numbers of assembly members could live with, even if they were not their first preference, are ‘technological change’ and the ‘Combined approach.’** For some assembly members the latter offered “an acceptable best of both worlds” that was likely to be more achievable and acceptable to the public, and which included investment in alternative forms of transport. Taken together, these two scenarios suggest a future in which:

- **Air passenger numbers increase by 25–50% between 2018 and 2050**, depending on how quickly technology progresses;
- **30m tonnes of CO_2 is still emitted by the aviation sector in 2050** and requires removing from the atmosphere.

C. Policy options

After considering what the future of air travel in the UK would be, assembly members moved on to consider how we might get there. Specifically they looked at policy options in two areas:

1. Managing the amount we fly;
2. Ensuring investment in greenhouse gas removals.

For each of these areas, the Expert Leads recapped and explained potential policy options. Assembly members discussed these ideas in their groups before voting by secret ballot. They were also able to make additional suggestions for steps that could be taken.

During their discussions, assembly members requested an opportunity to vote on:

3. Investment in the development and use of new technologies.

The results of this vote are also included below.

C.1 Managing the amount we fly

During the discussions, some assembly members asked for an additional option to be added to the ballot paper: *"Taxes that increase as people fly more often and as they fly further."* The Expert Leads accepted this request.

Assembly members looked at two options for managing the amount we fly:[14]

- A carbon tax on all flights;
- Taxes that increase as people fly more often.

During the discussions, some assembly members asked for an additional option to be added to the ballot paper:

- Taxes that increase as people fly more often and as they fly further.

We accepted this request.[15]

This section starts by presenting the rationale for assembly members' views, taking each policy option in turn.

Jump to the vote results on page 143

14 Other policies that could have been included here – for example no further airport expansion or investment in alternatives to flying – were embedded in some of the possible futures covered in Section B. Support for the development and use of new technology was also covered separately in a later vote (please see page 153). These options therefore focus on taxation.

15 Assembly members did not discuss this option in-depth because it was added so close in to the vote. We are therefore unable to include a full rationale for assembly members' views about it. However, their comments on the other two policy options, shed considerable light on why assembly members wanted it included.

A carbon tax on all flights

This would involve replacing the current tax on flights[16] with a carbon tax based on the amount of CO_2 emitted for each passenger. The carbon tax paid could be varied by cabin class, although it would not have to be. For example, business class passengers could be asked to pay a higher amount.

Assembly members identified a number of pros, cons and conditions about a carbon tax on all flights. Conditions are measures that some assembly members said would need to be in place for them to support this policy option.

⊕ Pros

+ **Direct relationship to carbon emissions** – some assembly members liked that it "reflects carbon emission on specific travel" or "directly relate[s] to CO_2 emissions."
+ **Fairer** – some assembly members suggested it is "a fairer way to tax users and airlines." Others liked that "you would be taxed at use."
+ **The right thing to do** – some assembly members commented that "it is right people should pay more" or said "we need to reduce emissions. We need to reduce flying."
+ **Simple** – some assembly members felt this option was "simple to administer" or would be the "easiest to implement and manage."
+ **Vary tax by cabin class** – some assembly members supported the idea of "vary[ing] tax by cabin class."
+ **Encouraging efficiency** – some assembly members said "it may encourage efficiency if they [flights] become more expensive."

⊖ Cons

– **Impact on people with lower incomes** – several assembly member expressed concerns that the "significant increase in flight cost" would have a "disproportionate effect on [people with] lower incomes." Similar comments included:

> *"Will low incomes be able to afford their one holiday a year?"*
>
> *"Price out lower incomes"*
>
> *"Cost of flying could increase to the point only the wealthy can fly."*

Others labelled it a "non progressive tax" or said it "discriminates more against poor people." Some assembly members felt the "rich will still be able to pay" or asked "what level of disincentive [is needed] before [the] richest stop flying?"

16 The current tax is called Air Passenger Duty. It does not reflect the impact of air travel on climate change because the rates of tax do not reflect the emissions produced.

- **Unfair and too blunt** – some assembly members disliked that it "will make everyone's flights more expensive" or "put the cost of flying up for everyone", with some suggesting this was "not fair." Others noted that "15% of people take 70% of flights." Others branded it "too blunt an instrument" with "disproportionate effects."
- **Increase in cost to passengers** – some assembly members suggested that "it significantly increases the cost of flying" or is a "high tax." Others predicted that the "cost [would be] passed on to [the] passenger" or said they were "afraid [we would] end up with air passenger tax plus carbon tax."
- **Restricting** – some assembly members said it would "restric[t] choice" or that there would be "less flights."
- **Lead to slower improvement in technology** – some assembly members suggested it would lead to "less in revenues and therefore investment in technologies" or said that a "tax on fuel will drive more efficiency."
- **Education** – some assembly members said reduced flying would mean "not learning about different cultures." Others said that "education will suffer."
- **Avoidance** – some assembly members felt it would be "difficult or impossible to prevent avoidance", with some suggesting overseas connections could be used in that way.
- **"Increasing taxes will discourage world trade for UK PLC"**
- **"It will affect me negatively"**
- **"Low cost airlines may make UK less efficient planes"**

Conditions

- **Where the money goes** – some assembly members said they would support a carbon tax if revenues were "ringfenced", "ringfenced for technology development" or "dependent on where money goes – i.e. investment in new technology fuels etc." Others asked "can we make government invest in technologies and not anything else (ringfence)?"
- **Transparency and trust** – some assembly members said it would be "okay if there is transparency" or that we would "need a trustworthy way of calculating carbon per flight."
- **Being more targeted** – some assembly members suggested that you "would need to consider exemptions for special cases", or that "there is a distinction to be made between family and business." Others asked "what are the tax implications for children flying?"

In the voting, a carbon tax on all flights received some support from assembly members. Please see below for the results of the vote.

Taxes that increase as people fly more often

This would involve replacing air passenger duty with a tax that increases as people fly more often. This could be done so that people who only fly once in a year pay no tax. The tax paid could also be varied by cabin class although it would not have to be. For example, business class passengers could be asked to pay a higher amount.

Assembly members identified a number of pros, cons and conditions about taxes that increase as people fly more often.

⊕ Pros

+ **Fairer** – several assembly members commented on "fairness". For example:

  "Penalise people who travel a lot – fairer to those who don't."

  "Targets the 15% who take 70% of the flights."

  "It is fairer. Those who pollute more, pay more of it. Doesn't disproportionately affect low income people."

  "I really like this option. I think it's fair."

  "Seems fair for people who have less."

  "Fairer to passengers."

  "Like the escalator aspect."

+ **"Could potentially persuade people not to take less needed flights or find alternatives (e.g. train)"**
+ **"Vary tax by cabin class"**
+ **"Likely to be more acceptable to more people"**

Cons

- **Doesn't reflect distance flown –** some assembly members disliked that it "doesn't take into account distance" or suggested that "this wouldn't be fair if one person's long-haul flight for the year is free – but if someone takes 3 short haul flights they have to pay." Others asked "what if your first flight of the year is short haul, and the second is long haul – is the charge reflective in any way?"
- **Too blunt** – some assembly members felt it would be "disproportionate to certain groups (families)" or would "penalise family relationships." Others asked **"**would there be exemptions for essential flyers – e.g. surgeons?" or suggested that it "needs safeguards and conditions built in."
- **"People travelling a lot will be from a higher income background, so will continue to fly regardless"**
- **"Variable rate of tax applied makes prices uncertain"**
- **"Increases cost of flying for some people"**
- **"Reduces incentive for airlines to decrease CO_2"**

Conditions

- **Where the money goes** – some assembly members said their support would be "dependent on where money goes – i.e. investment in new technology, fuels etc" or that they would support it "if [the income was] ringfenced."
- **Exemptions for certain groups** – picking up one of the points from the 'cons' list, some said policy-makers "would need to consider exemptions for special cases" or asked "what are the tax implications for children flying?"
- **"Companies will have to pay the levy for their workers' business flights"**
- **One assembly member said they would support this option if the number of miles someone flew was also taken into consideration**

In the voting, taxes that increase as people fly more often received significant support from assembly members. However they did not receive as much support as taxes that increase as people fly more often and as they fly further. Please see page 143 for the vote results.

Additional ideas

Assembly members raised a number of additional ideas for policy options in this area:

> “ We could have both (with a smaller fairer carbon tax and higher frequent flyer levy)”

> “ Escalating carbon tax depending on how often you fly”

> “ Tax on fuel will drive more efficiency”

One assembly member commented “we are having to vote on tax – are there other options?! Tax by back door.”[17]

Vote results

Assembly members voted by secret ballot on policy options for managing the amount we fly. There were two ballot papers. The first ballot paper asked assembly members how much they agreed or disagreed that each policy option should be part of how the UK gets to net zero. The second ballot paper asked them to rank the options in their order of preference. The votes from this second ballot paper were counted both in terms of first preference votes and via Borda count.

A majority of assembly members ‘agreed’ or ‘strongly agreed’ that all the policy options should be part of how the UK gets to net zero. However some policy options were clearly much more supported than others.

The most popular option was ‘taxes that increase as people fly more often and as they fly further.’ 81% of assembly members ‘agreed’ or ‘strongly agreed’ that this should be part of how the UK gets to net zero, with an outright majority of 65% strong agreeing. This was followed by “taxes that increase as people fly more often (70% ‘agreed’ or ‘strongly agreed’), with a carbon tax on all flights (59%) bringing up the rear.

A carbon tax on all flights also received much lower levels of strong support than the other options – 15%, compared to 35% and 65% respectively.

The results of the preference votes paint a similar picture. ‘Taxes that increase as people fly more often and as they fly further’ was by some distance the most popular option in terms of both first preference votes and the Borda count. A carbon tax on all flights remained the least popular option, again by some margin.

17 Please see footnote 14 on page 138.

Figure 3: Managing the amount we fly

How much do you agree or disagree that each of the following policy options should be part of how the UK gets to net zero? (%)

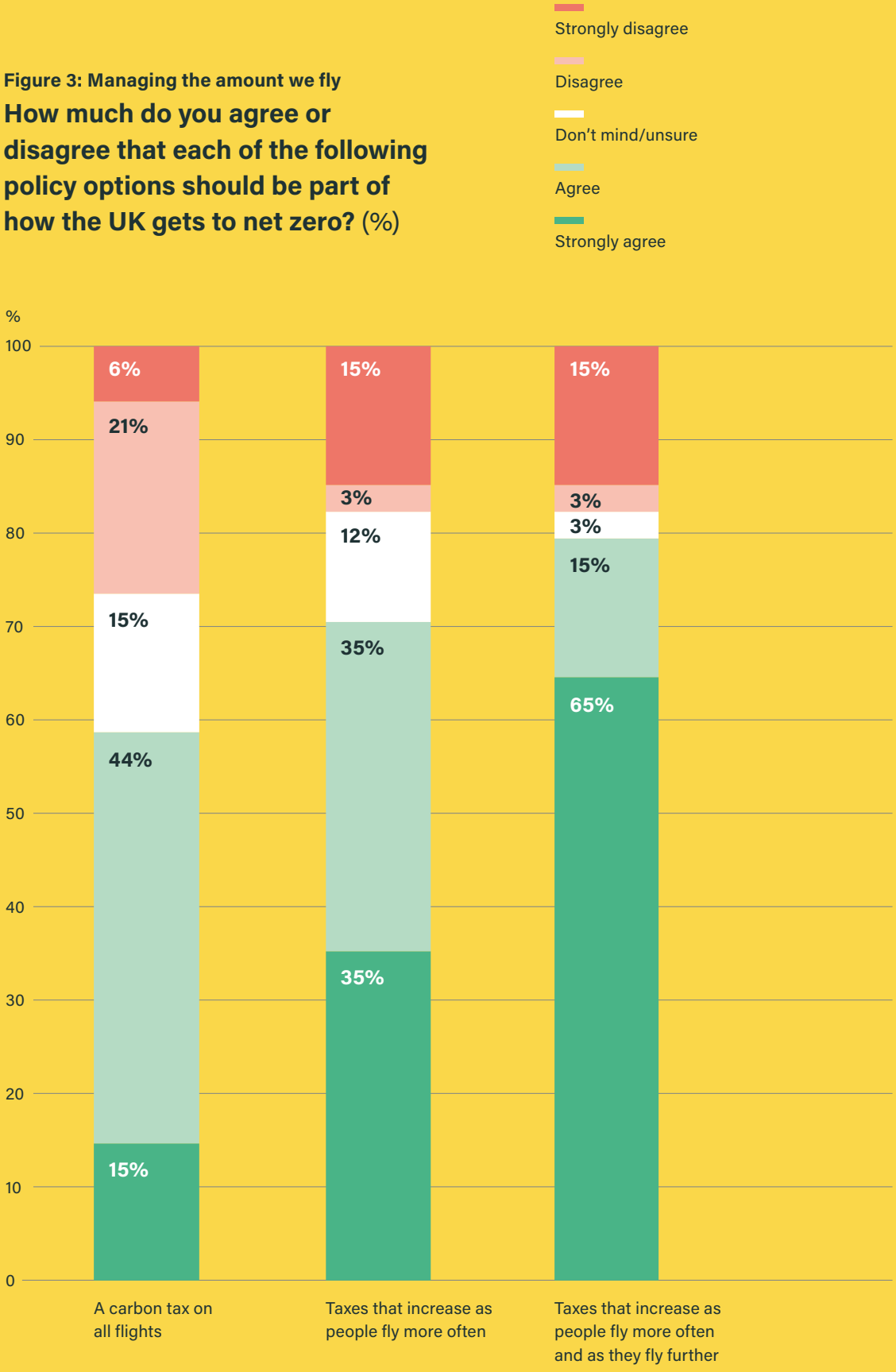


Figure 4: Managing the amount we fly

Please rank the following policy options in order of preference (% 1st preference votes)

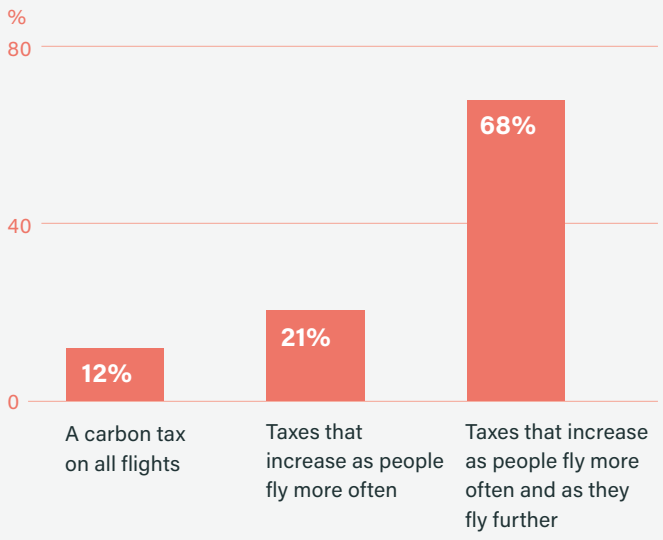
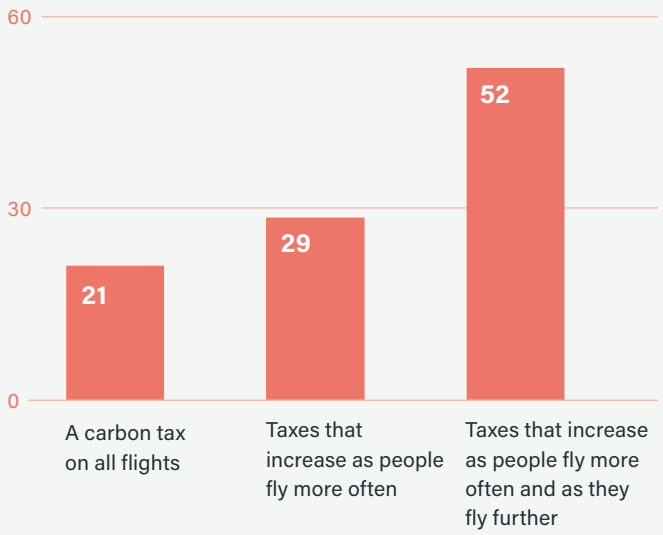


Figure 5: Managing the amount we fly

Please rank the following policy options in order of preference (Borda count)



C.2 Ensuring investment in greenhouse gas removals

Assembly members looked at three options for ensuring investment in greenhouse gas removals:

- Airline industry invests;
- Government invests;
- A wide range of organisations invest.

We start by presenting the rationale for their views, taking each policy option in turn.

Jump to the vote results on page 151

Airline industry invests

This policy option would give the airline industry responsibility for investing in greenhouse gas removal measures to balance out remaining emissions from air travel.

Assembly members identified a number of pros, cons and conditions relating to this policy option.

Pros

+ **The polluter pays** – some assembly members felt that the "industry that causes the problem should fix it". Comments included:

  "The people causing the problem are responsible for the solution."

  "Makes industry responsible for its own carbon."

  "Since they are the ones contributing, they should have the responsibility to consider the removals or at least consider putting [in] less in the first place."

  "Airline industry must take responsibility to capture their pollution and emissions. They must pay the true cost."

+ **Incentivising technological change** – some assembly members suggested it would provide an "incentive to make improvements quickly", would "incentivise the industry to change" or would "encourage innovation by the industry." Others felt it "would prompt airlines to invest in new technology and cleaner planes."

+ **Targeted** – some assembly members suggested it would have "no impact on people that don't fly" or that it would "not [be] costing [the] general taxpayer."

+ **"They will add to tickets which will change behaviour"**

+ **"Possible to do by passing legislation"**

+ **"Leave everything else to free market"** *(note: one assembly member countered this by suggesting "it isn't a free market; routes are set by government")*

Cons

- **Whether it would work** – a significant number of assembly members expressed scepticism about whether it would work. Some simply queried "not possible?" Others talked about:
  - **Trustworthiness and monitoring** – for example, some assembly members suggested there would be "high pressure on [the] airline industry to overstate/overestimate effectiveness of carbon capture – would result in untrustworthy figures." Others said "monitoring and enforcement would be needed" or asked: "How would this be implemented? How can we monitor what they do?" or "How will the money be spent or regulated to ensure they do?"
  - **Willingness** – some assembly members suggested that "airlines may refuse [to invest] and move business outside the UK." Others said that it "seem[s] ...an impossible task to persuade worldwide organisations – turkey voting for Christmas."
  - **Practicalities** – some assembly members felt that the "'airline industry' is too diverse to do connected up research."
- **Need for international agreement** – some assembly members noted that "it's an international industry" or said "there will have to be agreements with more places abroad because of international flights." Some asked "what will happen if we don't get agreement with other countries."
- **Not joined-up** – some assembly members disliked that it is a "non-integrated approach" that doesn't include "other sectors" beyond air travel. Similar others commented: "Doesn't take other carbon emissions into account (not other sectors)."

Conditions

- **"Investment in greenhouse gas removals"**
- **"Needs scrutiny by a third party to ensure removal is done right"**
- **"Matching investments need to be monitored – public money must not make private profit"**
- **"Must be only the funding generated by receipts from 1a [carbon tax on all flights] or 1b [taxes that increase as people fly more often]."**

In the voting, this option received significant support from assembly members. Please see below for the results of the vote.

Government invests

This policy option would involve the government investing in greenhouse gas removal measures to balance out remaining emissions and ensure the net zero target is met. This would include emissions not just from air travel but also from other sectors likely to have remaining emissions in 2050, such as farming.

Assembly members identified a number of pros, cons and conditions about this policy option.

⊕ Pros

+ **Effective** – some assembly members suggested it is a "good way to get it sorted" or that we are "hopefully more likely to reach net zero if [it's] under government investment."
+ **Positive about where the investment would go** – some assembly members said the "Government should fund: universities, research industries and manufacturers to do research" or "invest in training in GHG [greenhouse gas] technology."
+ **"Demonstrates commitment of government to reduce greenhouse emissions"**
+ **"You can see directly who you are holding responsible / accountable"**
+ **"Match funding for business investment (to x%)"**
+ **"Needs properly validated / audited carbon capture effectiveness measures. Think that only government has the credibility to produce accurate validated figures"**
+ **"Government can introduce measures across all sectors"**

⊖ Cons

– **Unfair on people who don't fly** – some assembly members said that "people who don't fly may object to government money being spent on the effects of the air industry." There were also several comments suggesting that "general taxation [is] not fair on those who don't fly."
– **Could / would government do it** – some assembly members suggested that it was "too expensive for the government to manage on its own" or that "changes in governments may affect decisions taken." Others felt that "big business [is] behind this. Biggest funders of [the] current government have [a] vested interest in this." Some felt it is "beyond the wit of government."
– **Lack of effort from business** – some assembly members disliked that there is "no onus on airline companies", or that we would be "subsiding an industry behaving badly."
– **"Non-entrepreneurial"**
– **"Not in favour of tax onus"**
– **"Unclear where funding comes from"**
– **"Knock on effect on other areas in need of investment"**

Conditions

- **"The government have a responsibility but the taxation must not hurt the least well off"**
- **"Government should support and invest in organisations' and researchers' contribution but responsibility should not fall completely on them because it would not teach the individuals of their effects"**
- **"Government / Parliament can find [a] combination of ways to fund – worldwide approach / unfound so far"**

In the voting, government investment received less support than the other policy options.

A wide range of organisations invest

This policy option would involve the government overseeing financial incentives to organisations that invest in greenhouse gas removal measures. This would include emissions not just from air travel but also from other sectors likely to have remaining emissions in 2050, such as farming. It could potentially involve a wide range of organisations receiving incentives.

Assembly members identified a number of pros, cons and conditions about this policy option.

Pros

+ **It would work** – some assembly members felt it "would be enforced as overseen by government. Confident it would happen." Others suggested there is a "history of financial incentives working" or that there would be "pressure from many directions [so it's more] more likely to succeed."
+ **Advantages of working together** – some assembly said the "economy as a whole will find ways if [we] work together" or that we "may have [a] better ability to meet the various challenges" if we take this approach. Others felt it would "maximis[e] investment and research into greenhouse gas removal across disciplines and ideologies" and that "encourage[ing] [this] investment could make [the] UK [a] world leader."
+ **"Shared responsibility amongst all who have an impact e.g. international businesses"**
+ **"Cost of greenhouse gas removal shared more widely via general tax"**
+ **"Frees up tax payer money for other services"**

Cons

– **Too generous to companies** – some assembly members felt there would be "no onus on airline companies" or that it "does not place responsibility on the industry or people that cause remaining emissions." Others commented that it "seems like the usual big businesses will profit but seen or sold as a 'green movement'." In a similar vein, some assembly members suggested that the "companies behind this have already spoken to government and felt it would be better for government to introduce it as it's a £26 billion industry that will be subsidised??"
– **Too many cooks** – some assembly members worried that it "doesn't enforce a clear direction i.e. too many cooks" or that "n[o] one organisation has responsibility."
– **"No rule/regulations to make change"**
– **"The use of general taxation in respect of air flight emissions is unfair to those who do not fly"**

Conditions

→ **"Financial incentives are good for organisations to capture carbon, but only if they are non-profits or class b corporations"**
→ **"Incentivised and driven by results e.g. Rolls Royce"**
→ **"Each industry and organisation should pay to capture any emissions they produce"**

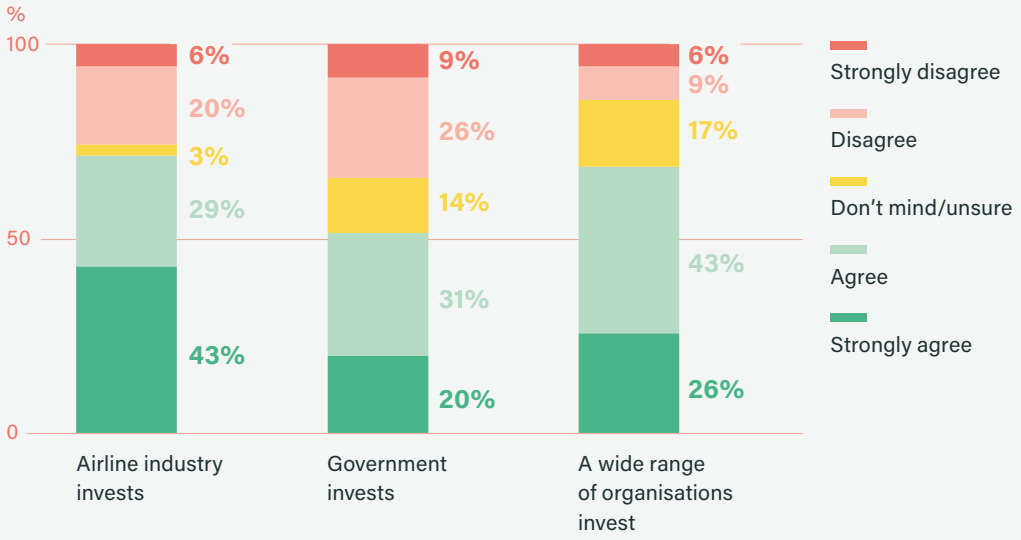
In the voting, this option received significant support from assembly members.

Vote results

Assembly members voted by secret ballot on policy options for ensuring investment in greenhouse gas removals. There were two ballot papers. The first ballot paper asked assembly members how much they agreed or disagreed that each policy option should be part of how the UK gets to net zero. The second ballot paper asked them to rank the options in their order of preference. The votes from this second ballot paper were counted both in terms of first preference votes and via Borda count.

Figure 6: Ensuring investment in greenhouse gas removals

How much do you agree or disagree that each of the following policy options should be part of how the UK gets to net zero? (%)



A majority of assembly members 'agreed' or 'strongly agreed' that all the policy options should be part of how the UK gets to net zero. However some policy options received significantly more support than others.

The two most popular options were airline industry investment and investment from a wide range of organisations:

- 72% of assembly members 'agreed' or 'strongly agreed' that airline industry investment should be part of how the UK gets to net zero, with 43% 'strongly agreeing';
- A similar figure of 69% of assembly members 'agreed' or 'strongly agreed' that investment from a wide range of organisations should be part of how the UK gets to net zero, but significantly fewer (26%) 'strongly agreed'.

Investment from the airline industry was, however, also more controversial. 26% of assembly members 'disagreed' or 'strongly disagreed' that it should be part of how the UK gets to net zero, with just 3% saying they were 'unsure' or 'didn't mind'. The equivalent figures for investment from a wide range of organisations were 15% and 17%.

Government investment was the least popular of the three options, although a small majority (51%) still supported it. It was also more controversial than the other options with 35% of assembly members 'disagreeing' or 'strongly disagreeing' that it should be part of how the UK gets to net zero. 14% said they 'didn't mind' or were 'unsure'.

The results of the preference votes shed additional light on assembly members' views. First preference votes showed a strong lean towards airline industry investment, with government investment coming second and investment from a wide range of organisations third. The Borda count showed a slight lead for airline industry investment with investment from a wide range of organisations coming a very close second, and government investment third.

Figure 7: Ensuring investment in greenhouse gas removals

Please rank the following policy options in order of preference (% 1st preference votes)

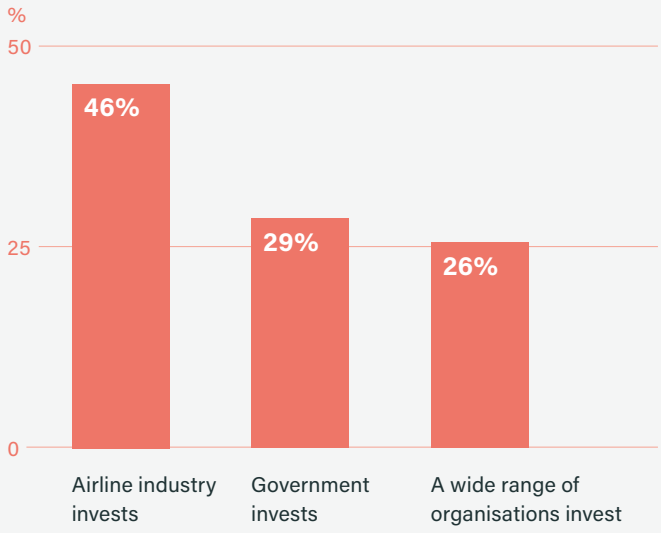
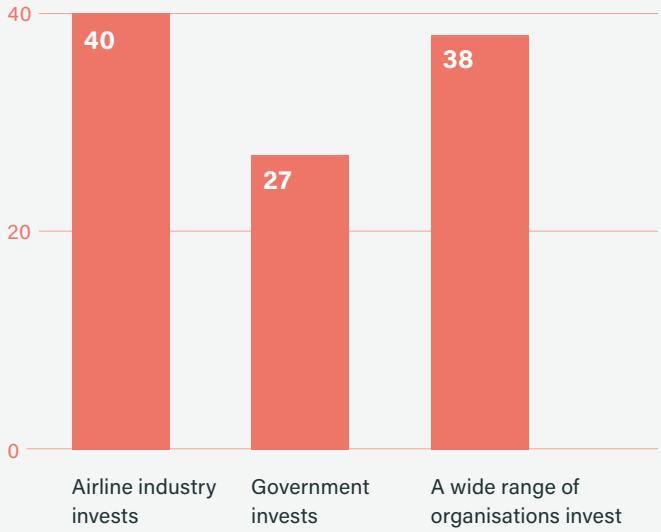


Figure 8: Ensuring investment in greenhouse gas removals

Please rank the following policy options in order of preference (Borda count)



C.3 Investing in the development and use of new technologies for air travel

The potential of new technologies was a strong theme in assembly members' discussions throughout weekend three. At the beginning of the weekend, ideas in this area topped assembly members' list of considerations for government and Parliament to bear in mind (see Section A). 'Technological change' was also assembly members' preferred future (see Section B).

Towards the end of the weekend, some assembly members asked if there could be a further vote looking at whether investment in the development and use of new technologies for air travel should be part of how the UK gets to net zero. Assembly members discussed the suggestion at their tables before the vote took place.

Assembly members identified a number of pros, cons and conditions about investment in the development and use of new technologies.

Jump to the vote results on page 155

Pros

+ **"Helps with advancing technology"** – several assembly members suggested that "investment speeds up its [technology's] availability", or that "research always throws out new insights and solutions." Others felt it would "encourage multinational companies to collaborate" or result in "healthy competition to improve efficient new fuels." Some said that it would be a "shot in the arm for [the] UK research industry" or that they wanted "Government to 'sell' and 'encourage' [the] scientific community to get going."
+ **Business potential** – some assembly members said that "technology can be sold to other countries" or that "Britain has strength in this area."
+ **Do it early** – some assembly members said it was "critical" to do it "early", with some advocating "money and funding and front load it." Others noted a "need to do [it] soon due to [the] long lead time...."
+ **Impact on emissions** – some assembly members felt it "will mean quicker CO_2 reduction" and "could make differences to meeting [the] target of net zero."
+ **Preference for technology as a solution** – some assembly members noted that it "could resolve the issue if a solution is found" or that "a solution means no guilt to travel." Others said technological solutions would involve "least waste", be "least disruptive" or have "less impact on people's lives." Some labelled it the "most progressive" or "most entrepreneurial" way forward.
+ **Support for synthetic fuels** – some assembly members noted support specifically for investment in the development and use of technologies relating to synthetic fuels. Comments included:

  "Carbon capture could be used for fuel rather than buried: as safety issues with burying have not been investigated."

"Storage is not entirely safe so might as well use it."

"Synthetic fuel could be used for land transport as well."

+ **"Prefer the developments towards more efficient air travel than methods of removing emissions after (e.g. carbon capture)"**
+ **"Aviation seems like one of the most problematic areas for net zero currently"**
+ **"If it doesn't affect your lifestyle maybe you will be inclined to help achieve it"**

⊖ Cons

- **Don't (just) do this** – some assembly members said we "shouldn't rely on it, need to do other things as well e.g. reduce travel." Others urged "don't drop everything – i.e. not all eggs in [the] synthetic fuel basket", or said "not at [the] expense of, or to replace, other options." Some assembly members expressed stronger views, suggesting that "chasing a magic unicorn is not a solution. We don't know if it will be possible by 2050."
- **Concern about where money comes from** – some assembly members asked "where is the funding coming from?" or noted "concern – will cost money to government?"
- **Not a good use of money** – some assembly members said that "synthetic fuels are very expensive – reducing flights is a much cheaper way to reduce emissions." Others noted that it "could be just extra expense if not successful" or that it "could end up a big waste of time and money." Some assembly members felt that "public funds must not be used to generate private profits."
- **"Limited funding pot and research resources"**
- **"Biofuels put more pressure on land use"**
- **"There may be safety / issues we are not aware of yet"**

⊖ Conditions

- **What type of technology is invested in –** some assembly members said they would support it "if it is fuel produced" or if "synthetic fuels are considered differently from biofuels – as they take less space."
- **Regulation or enforcement** – some assembly members said "as long as usage of new fuels / technologies is enforced this must be part of the path to net zero" or said they support "invest[ment] in [the] development and use of technology for air travel – electric, hybrid, biofuels, synthetic fuel. Including regulat[tion of] airlines or producers to incentivise investment."
- **"If this involves a significant increase in investment in this area"**
- **"Will it be better to capture carbon and use [it, rather] than store [it] underground?"**

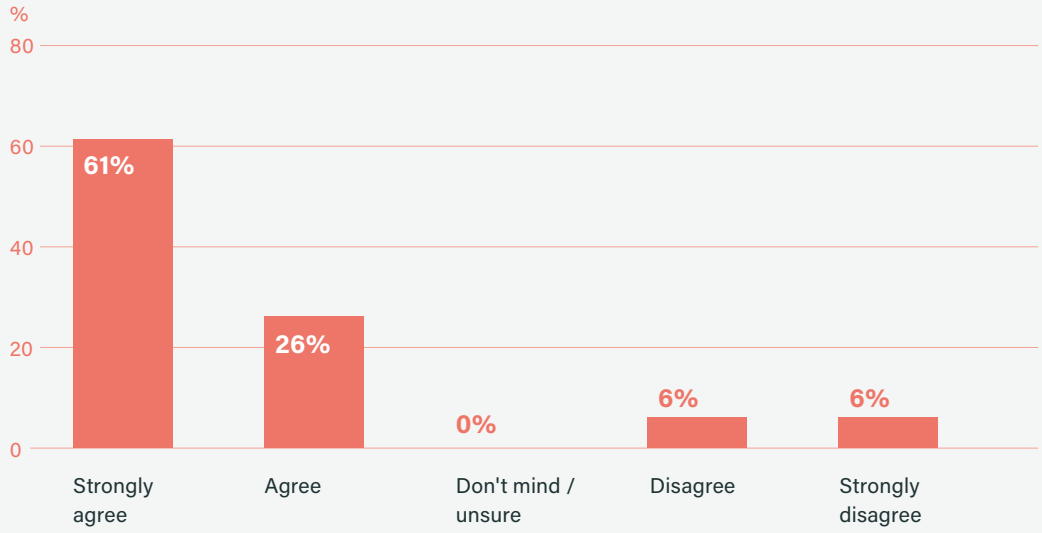
Vote results

The ballot paper asked assembly members how much they agreed or disagreed that investment in the development and use of new technologies should be part of how the UK gets to net zero.

Their results show overwhelming agreement. 87% of assembly members 'agreed' or 'strongly agreed' with the statement, with a large majority (61%) strongly agreeing.

Figure 9: Investment in the development and use of technologies

How much do you agree or disagree that investment in the development and use of new technologies for air travel should be part of how the UK gets to net zero? (%)



Policy options – conclusions

Assembly members were generally supportive of policies to manage the amount we fly, ensure investment in greenhouse gas removals and invest in the development and use of new technologies for air travel. At least 50% of assembly members supported all the policy options.

That said, assembly members had strong and clear preferences within the policy options they considered.

Overall **assembly members preferred managing the amount we fly through 'taxes that increase as we fly more often and as we fly further'**. 80% of assembly members 'strongly agreed' or 'agreed' that this should be part of how the UK gets to net zero. Assembly members' comments suggest that many saw this idea as fairer than the other proposals, which each took into account only one of how often people fly or how far they fly. They also felt it was less problematic in terms of its impact on people with lower incomes. Assembly members consistently highlighted two considerations as particularly important around implementation:

- Some emphasised that **exceptions may be needed for people with family abroad or for "essential flyers"** like "surgeons." They also raised questions about if and how the policies would apply to children;
- Some noted a wish for **any money raised from the policies to be ring-fenced to support new air travel technologies.**

In terms of investment in **greenhouse gas removals, assembly members tended to favour investment from the airline industry**. 75% of assembly members 'strongly agreed' or 'agreed' that this should be part of how the UK gets to net zero. There was also significant, albeit slightly lesser, support for the idea of investment from a wide range of organisations. Overall, assembly members were less keen on direct government investment.

Assembly members' comments suggest that behind these preferences lay a feeling that **'the polluter should pay.**' Some also felt airline industry investment would incentivise quicker process on new technologies. There was however uneasiness amongst some assembly members too, they suggested a need to **monitor, scrutinise and perhaps enforce airline industry investment to ensure it actually took place**.

Assembly members **strongly supported investment in the development and use of new technologies for air travel.** 87% of assembly members 'strongly agreed' or 'agreed' that it should be part of how the UK gets to net zero. Assembly members' rationale included a wish to see technology develop quickly, and support for a technology-based solution to air travel emissions in general. Some assembly members raised concerns or conditions, including a wish not to rely solely on hopes of technological progress.

D. Anything else to tell government or Parliament

At the end of weekend three, assembly members had the opportunity to add any further thoughts on air travel and the path to net zero. A small number of assembly members chose to add additional points. These centred around eight main areas:

- **Need for action** – some assembly members said we need to "make this a priority … it emits so much carbon!", "move away from 'business as usual'" or "think about future generations." Others suggested that we need to "stop making flying seem like a good thing / so attractive;"
- **Specific types of flights and air-miles schemes** – some assembly members made comments about specific categories of flights, suggesting that we "ban all non-essential air freight", "ban first class and business class seats" or "limit transit flights [as this] would help get to net zero more quickly." Some said that we "should get rid of air-miles schemes;"
- **Alternatives to domestic flights** – some assembly members emphasised that alternatives to local and domestic flights, such as rail travel, should be improved;
- **Carrots and sticks for airlines** – some assembly members said that "airlines should be taxed" or noted "airlines are being subsidised to create emissions; it is unfair;"
- **Freight** – some assembly members expressed disappointment that they had not been able to look at freight as well as personal transport use;
- **International co-operation** – some assembly members were keen to stress the international dimension to air travel and the path to net zero, commenting for example that "air travel is so international and global…. There needs to be international collaboration to bring about technological change;"
- **Questions and concerns around a carbon tax** – some assembly members commented:

  "Are you going to take into account aircraft engines and occupancy in relation to emissions, which will affect the amount of carbon tax for each journey?"

  "Carbon tax extreme example: You get on a plane, and find that you're the only passenger!"

- **Airport expansion** – one assembly member said the UK should "stop all airport and runway expansions. We can't expand while we aim to reduce emissions."

Conclusions

Assembly members expressed clear and consistent recommendations about air travel and the path to net zero.

There was strong support for **steps to ensure that new technologies for air travel progress as quickly as possible**. Assembly members chose "speeding up technology" as the top consideration they would like government and Parliament to bear in mind. They also expressed very strong support for investment in the development and use of new technologies for air travel. 87% of assembly members 'strongly agreed' or 'agreed' that this should be part of how the UK gets to net zero.

A key reason behind this preference is that many assembly members would like to see a **solution to air travel emissions that allows people to continue to fly**. Their rationale included a wish to protect people's freedom and happiness, as well as benefits for business and the economy. **Their support for continued flying did however have limits.** Assembly members resoundingly rejected a future in which air passenger numbers would rise by as much as 65% between 2018 and 2050, labelling it "counterproductive" – only 3% of assembly members chose such as future as their first preference.

Instead, assembly members sought to find an **acceptable balance between achieving the net zero target, impacts on lifestyles, reliance on new technologies and investment in alternative forms of transport**. Taken together, their preferences suggest a future in which:

- **Air passenger numbers increase by 25–50% between 2018 and 2050**, depending on how quickly technology progresses;
- **30m tonnes of CO_2 is still emitted by the aviation sector in 2050** and requires removing from the atmosphere.

Some assembly members noted their support for **investment in alternatives to air travel.**

In terms of how to achieve this future, assembly members' preferred policy option for managing the amount we fly were **taxes that increase as people fly more often and as they fly further**. 80% of assembly members 'strongly agreed' or 'agreed' that this should be part of how the UK gets to net zero. Assembly members tended see these taxes as **fairer** than alternatives that only took into account one of how often or how far people fly. They also felt they were **less problematic in terms of their impact on people with lower incomes.** Some assembly members suggested that exceptions would need to be made for people with family abroad or for "essential flyers." Others felt that any money raised from such taxes should be ring-fenced to support new air travel technologies.

In terms of investment in **greenhouse gas removals, assembly members tended to favour investment from the airline industry**. 75% of assembly members 'strongly agreed' or 'agreed' that this should be part of how the UK gets to net zero. There was also significant support for financial incentives for investment from a wide range of organisations. Overall, assembly members were less keen on direct government investment. Assembly members' comments suggest that behind these preferences lay a feeling amongst many that **'the polluter should pay.**' There was however uneasiness amongst some assembly members, who suggested a need to **monitor, scrutinise and perhaps enforce airline industry investment to ensure it actually takes place**.

Assembly members' comments and votes throughout the weekend **re-emphasised the points raised in their top considerations for air travel and the path to net zero** (see Section A). This list provides an important guide for policy-makers looking at the UK's net zero strategy.

In the home

Chapter 5

Summary of recommendations

1 Assembly members emphasised the need for a **long-term strategy** with a wide range of actors taking steps to move the sector towards net zero. Assembly members strongly supported roles for **government investment** (80%), **local solutions** (80%), **individual responsibility** (80%) and **market innovation** (80%).

2 **A majority of assembly members 'strongly agreed' or 'agreed' that 19 policy measures on heat and energy use in the home should be part of how the UK gets to net zero.** Policies supported by at least two-thirds of assembly members were:

- Support for smaller organisations to offer energy services (94%);
- Simpler consumer protection measures (92%);
- Changes to product standards to make products more energy efficient and 'smart' (91%);
- Local plans for zero carbon homes (89%);
- A ban on sales of new gas boilers from 2030 or 2035 (86%);
- Changes to energy market rules to allow more companies to compete (86%);
- Changes to VAT on energy efficiency and zero carbon heating products (83%);
- Information and support funded by government (83%), or information and support provided by government (72%);
- Government help for everyone (69%) or government help for poorer households (68%);
- Enforcing district heating networks (66%).

3 In their discussions, assembly members emphasised their support for **tailored solutions** for local areas and individual households; **increased choice**, including through steps to promote competition; and **reliable and clear information** for the public. They stressed that changes need to **work for all income groups and housing types**. Some noted **concerns about the influence and behaviour of big companies**, and around **use of personal data.**

4 On **home retrofits**, assembly members emphasised the need to **minimise disruption in the home**, **put in place support around costs**, and **offer flexibility and choice to homeowners**. They showed a slight preference for upgrading each home all in one go (56%), compared to upgrading each home gradually (44%) but attached conditions to the former around how it is financed. Some also stressed that this should be a choice for homeowners.

5 The best technology to use for **zero carbon heating** is a matter of significant policy debate. However at least 80% of assembly members 'strongly agreed' or 'agreed' that each of **hydrogen** (83%), **heat pumps** (80%), and **heat networks** (80%) should be part of how the UK gets to net zero. **94% of assembly members 'strongly agreed' or 'agreed' that 'people in different parts of the country should be offered different solutions to zero carbon heating.'**

6 The **23 considerations for government and Parliament** that assembly members identified at the start of their discussions

In the home

Climate Assembly UK's 'in the home' theme focussed on changes that are needed to the use of heating, hot water and electricity in the home to reach net zero greenhouse gas emissions.

At the moment, the main sources of greenhouse gas emissions in the home are:[1]

- **Using fossil fuels** (gas, oil and coal) for heating, hot water and cooking. Heating needs are greater if homes are not well-insulated. Many homes in the UK are currently poorly insulated;
- **Using electricity** to power lights and electrical appliances (e.g. fridges, freezers, dishwashers, tumble dryers, IT equipment, TVs etc). At the moment, some of this electricity is generated by burning gas and coal.

Around 15% of the UK's greenhouse gas emissions come from the residential sector.[2]

What did the assembly consider?

Thirty-five assembly members considered the topic of heat and energy use in the home. We selected these assembly members from the assembly as a whole using random stratified sampling. This ensured that they remained reflective of the wider UK population in terms of both demographics[3] and their level of concern about climate change.

These assembly members heard a wide range of views on the future of heat and energy use in UK homes, and how we might move towards that future. They had the opportunity to question each speaker[4] in detail. These evidence sessions took place at weekend two of the assembly.

1 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/862887/2018_Final_greenhouse_gas_emissions_statistical_release.pdf
2 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/862887/2018_Final_greenhouse_gas_emissions_statistical_release.pdf
3 Age, gender, ethnicity, educational qualification, where in the UK they live and whether they live in an urban or rural area.
4 The assembly heard from ten speakers on 'in the home': Jenny Hill, Committee on Climate Change (informant); Professor Nick Eyre, University of Oxford (informant); Richard Lowes, UK Energy Research Centre (advocate); Chris Clarke, Wales and West (advocate); Professor Rebecca Willis, Lancaster University (informant); Polly Billington, UK100 (advocate); Jonathon Atkinson, Carbon Co-op (advocate); Dan Alchin, EnergyUK (advocate); Matthew Lipson, Energy Systems Catapult (advocate); Dhara Vyas, Citizens' Advice (advocate). All speakers' presentations are available as slides, videos and transcripts at climateassembly.uk/resources/. An 'informant' is a speaker who we asked to cover the range of views and available evidence on a topic. An 'advocate' is a speaker who we asked to give their own view, or the view of their organisation. Assembly members knew whether speakers were informants or advocates.

Assembly members spent weekend three of the assembly discussing the evidence they had heard and their own views in-depth, before reaching conclusions on five separate areas:

A. **Considerations:** the overarching considerations that government and Parliament should bear in mind when making decisions about heat and energy use in the home;

What should happen:

B. **Retrofit:** whether upgrades to each home to reduce energy use (for example, to improve insulation) should happen gradually or all in one go;

C. **Zero carbon heating:** what technology or combination of technologies should be used to replace gas central heating, and whether or not different parts of the country should be offered different solutions.

How it should happen:

D. **Futures**: an overarching view of how to make change happen around heat and energy use in UK homes;

E. **Policy options:** which specific policies should be used as part of this future.

Assembly members also had the opportunity to discuss and add **anything else they wanted to say** to government and Parliament about heat and energy use in the home and the path to net zero. Assembly members' views on the implications of Covid-19 for this topic are touched on in Chapter 10.

Contents of this chapter

A. Considerations

Assembly members reached their first decisions on 'in the home' by discussing their answers to the following question:

> *What considerations should government and Parliament bear in mind when making decisions about heat and energy use in the home and the path to net zero?*

Assembly members thought about their answers to this question individually. They then discussed their views in small groups at their tables, with each table agreeing their eight top considerations. These top considerations had to, between them, represent the range of views at the table.

Facilitators took the top considerations from each table and grouped similar options together to create a list on which assembly members could vote. They checked this list back with assembly members to make sure they had accurately reflected their views. This included making any necessary adjustments. Each assembly member voted for the six options that they felt to be most important.

The results were as follows. The wording of the considerations in the table is either word for word what assembly members wrote on their option cards or, where facilitators combined similar options from several tables, how we described the options to assembly members prior to the vote.

Rank	Consideration	% assembly members who chose it as a priority
1	**Strategy needs to be enforceable by government, and binding for future governments.**[5] **A guaranteed long-term safety guard (including for industry)**	60
2	**Make this work for everyone. All housing types and geographies (urban and rural)** Some assembly members asked to avoid "mak[ing] the poor poorer by loading costs on to them", with others noting the need to pay attention to "people whose livelihoods will be affected (e.g. heating engineers and farmers)." Some said solutions need to work for both tenants and owners. Other assembly members talked about "infrastructure challenges" including "rural areas ...[not having] ready-made pipework in the ground", disruption caused by "dragging up streets" and the idea that "one size doesn't fit all."	54
3	**Education and good communication should build awareness to enable people to make informed decisions** Some assembly members suggested this was important to "overcome the challenge of lack of trust in government messages." Others advised "don't sell it as 'dealing with climate change' but as making a cleaner planet." Some assembly members suggested that part of the solution could be "more education in schools, colleges."	51
4	**Have imaginative solutions/incentives to make work financially viable** Some assembly members suggested the following: "loans that can be paid off through your bills", "lower stamp duty for efficient homes", "connect EPC rating with significant tax subsidy", "setting up a big charity with big philanthropy money." Others suggested "using milestones to force change (like TV switchover)" and "making the transition seamless for consumers."	46
5	**Learn from others and avoid making expensive mistakes** Some assembly members talked about a need to "plan things correctly, with everyone's voices/input to avoid expensive mistakes or revisions and with a phased approach and clear principles." Others said "government and Parliament need to consider learning from elsewhere to ensure planned, effective changes with clear deadlines (with urgency)."	43
6	**The onus should be on producers/manufacturers**, rather than consumers, to: ▪ "produce products that deliver as intended with guaranteed lifespan"; ▪ "ensure access to zero carbon products."	40
7	**Solutions should be affordable for all consumers in all circumstances** Some assembly members said this should include "helping 'everyday folk' (people who would not normally be considered vulnerable)." Others said it "needs to be fair and financially viable for all households."	37
8	**Minimum standard for all homes**	31

5 Some assembly members noted the difficultly in making changes that are binding on future governments, but said they agreed with the sentiment behind the statement. They called for cross-party commitment to changes, in order to create long-term certainty.

=9	**Make best use of the role of local authorities** Some assembly members suggested that this included local authorities "using their [area's] range of natural resources." Others said to "give local authorities power, but make them more accountable to local people, e.g. via citizens assemblies."	29
=9	**Solutions should be tailored to local and individual needs**	29
11	**Need to consider impact on jobs, including retraining and retention** Some assembly member noted the "impact on jobs, including local jobs," suggesting a need to "sustain skill-set[s] as technology progresses." Others said that "industry professionals will require retraining" and that this "should be affordable e.g. [retraining for] boiler/gas technicians on new boilers."	23
=12	Solutions should focus on reducing energy consumption and improving efficiency	17
=12	Ensure that changes made and any new technology are well-researched and sustainable in the long-term	17
=12	Consider the health benefits of change	17
=15	Cost of manufacturing and disposal (including carbon cost and price)	14
=15	Government and Parliament need to consider legislation that ensures transparency and fairness in lobbying and influencing	14
=17	We need cross-political party solutions	11
=17	Support vulnerable groups with advice and financially	11
=17	**Getting the right balance to ensure we build, recycle and upgrade products to deliver the best outcomes** Some assembly members asked "can we upgrade/update instead of [going for] full replacement."	11
=20	Consider adapting Section 106 to include a pot of cash for home insulation	9
=20	Government and Parliament need to consider disincentivising fossil fuels for homes	9
22	Businesses need to be transparent and reinvest profits/not make huge profits	6
=23	Practical, achievable and doable solutions implemented by government	3
=23	**Need to consider health and safety of interventions to ensure no negative effects on health e.g. from insulation or technologies** Some assembly members suggested "regulation of products and installation to ensure safety and no negative effects on health."	3

B. What should happen – Retrofit

The first topic assembly members looked at was retrofit. This means making improvements to homes to reduce energy use, such as insulating lofts and walls and reducing drafts from windows. Speakers at weekend two of the assembly told assembly members that significant energy efficiency improvements need to be made to most of our homes over the next few years.

Assembly members discussed whether it would work best to:

- **Upgrade each home all in one go** – meaning all improvements to a home (insulation, heating etc) would be done at the same time;
- **Upgrade each home gradually** – meaning improvements to a home would be done gradually over a longer period.

Assembly members discussed these options in small groups, before voting by secret ballot.

We start by presenting the rationale for their views, taking each scenario in turn.

Jump to the vote results on page 173

B.1 Upgrading each home all in one go

Assembly members felt that this option had both pros and cons, and expressed these in their discussions and on their ballot papers. Some assembly members also suggested 'conditions' that should be met if this option went ahead.

Pros

+ **Shorter period of disruption** – a significant number of assembly members liked that there would be "shorter disruption", "less disruption overall", "less disruption long-term", or that it would be "out of the way quicker." Some said there would "only [be] one period of disruption", that "all the upheaval [would be] in one go", or that when "it's done, disruption is finished." Some said you "don't have to remove walls/floors multiple times" or "redecorate at every stage." Others that the "disruption to [the] family lessens", that it would "reduce [the] duration of family stress and lifestyle disruption" or that it "makes more sense to me to disrupt my family life once." Some commented that it "wouldn't be as disruptive if suited to [the] householder's lifestyle."
+ **Reduced CO_2** – some assembly members suggested it was "the fastest way to drastically reduce CO_2 emissions", that "benefits to carbon [would be] seen quicker", or that there would be "quicker carbon savings." Some said or that there "would be more noticeable change to net zero if houses were insulated very quickly", "immediate benefits in terms of net zero" or that it would be "quicker for households and [the] whole country to move forward in terms of carbon."

- **Cheaper** – some assembly members thought this would be "cheaper", "cheaper overall" or that the "overall price would probably be cheaper." Some suggested that it "may be cheaper if funded by government/local government – can negotiate a good deal", or that "if government paid for social housing, [it] would drive energy efficiency and save taxpayer money in [the] short and long run."
- **Cost savings** – some assembly members felt people would be "saving on energy costs sooner", that there would be "bigger energy savings straight away" or that people would "save costs with lower bills." Others suggested that people would "start saving £ quicker and more."
- **Improved housing** – some assembly members said that "homes [would be] more efficient after [the retro]fit" or that it would result in "more comfortable homes."
- **"One central point for coordination, complaints etc"**
- **"Commitment from government – no risk they can go back on it later"**
- **"More jobs (from new home options)"**
- **"Improving house – would all be done e.g. if wanted to sell"**
- **"...at least I know what the total cost is"**
- **"Because of the need to act quickly and for all groups (government, individuals, firms) to be held to account"**

Cons

- **Cost** – some assembly members disliked that it would "cost a lot in one go", that you "have to pay it all at once" or that the "costs will come all at once – people may not be able to afford it." Some said it's "expensive", that it would be "too expensive for some people – would put people off", or that it's "better for people with large savings." Some disliked the "larger financial outlay" or the "cost of installations." Some assembly members said there would be a "loss of rental income" or asked "where is the money coming from" or "how will the money be found (i.e. expensive tower blocks)." One assembly member commented that "if homeowners are funding it, government can't mandate they get into debt, spend savings, disrupt their lives etc."
- **Disruption –** some assembly members felt that this option had "greater implications on lifestyle e.g. moving out", that it "could increase the need to move a family into temporary accommodation", or meant a "need for storage for contents." Others said it "would [be] too disruptive for say, older people and children", or worried about "disruption for people with children, [the] elderly [and the] vulnerable." Some disliked that there would be a "disruption to daily life (work, social)." One assembly said "for both landlords and the average home, the amount of disruption caused by such a large renovation project would be damaging."
- **Logistics** – some assembly members disliked that "more planning and logistics [would be] required to achieve [it] (individual and local government)" or the "logistics of so many tradespeople in concentrations."
- **Delays, problems and lower standards** – some assembly members said that "projects can take longer than expected" or suggested there would be a "greater likelihood of malfunctions and problems." Some said they "worry that mass projects may become rushed and not be done to the same standard."
- **Lack of skilled workforce** – some assembly members said there is a "lack of skilled workers for new tech/methods" or queried "are the workforce ready?"
- **Unnecessary work and replacements** – some assembly members disliked the idea of "replacing [a] working and reasonably new efficient gas boiler before its best before date", or said they were "concerned that equipment e.g. gas boilers may be discarded early and they're not cheap." Others said there would be "possible unnecessary work or [that you would be] shortening the life of existing installations."
- **"Scams will increase so will need tight regulation"**
- **"Technology might catch up/be better later"**
- **"People don't like change"**
- **"What would happen if people don't agree…to all changes"**
- **"…could distance [the] homeowner from the situation [if they need to temporarily move out] and [they could] feel [a] loss of control of their own home"**
- **"Some kinds of homes [are] more difficult [to retrofit]"**

Conditions

- **Spreading the costs** – some assembly members said they "prefer this only if it could be paid for in increments", or that they supported it "depending on costs and whether it can be spread over time." Some suggested a need to "spread the initial cost over a number of years", said that "costs [should be] spread with no interest" or that "payments should ... be spread over time for individuals so that there is a low monthly cost (a reasonable amount to add onto monthly bills)." One assembly noted "personally, I would prefer to have it all done in one go. However, because the cost would be higher I think there should be some cost spreading methods / initiatives or incentives in upgrading quickly."
- **Bringing down costs / affordability** – some assembly members said they would support this option "only if costs are brought down by using official tradesmen [and] multiple buying, also only with subsidies." Others said they'd prefer it "all done in one go (if affordable)."
- **Government funding** – some assembly members said that "this option ...is only preferable if [the] cost can be spread and/or government funding is supplied, full or partial depending on individual circumstances." Others said that they would support this option "only if costs can be covered using long term funding (and cheap funding) and cover all necessary costs including moving out / storage of furniture and refit and decorating." Others said they would support this option "if interest free loans from the council [are] available."
- **Support for those on lower incomes and fairness** – some assembly members said "there would be other factors to consider to achieve this, including government subsidies for low income households/social housing etc." Others said "there would need to be an element of cost sharing and means testing (those with fewer resources pay less / nothing) and fairness across types of homes/buildings."
- **Choice and consent** – some assembly members felt that "landlords and homeowners should be given a choice of what would be suitable for them" or that "private homeowners on higher incomes should be given the option to upgrade gradually in addition to all in one go." Some assembly members said that "different properties may need different solutions – e.g. old versus new houses" or that it "needs to be individualised – solutions need to suit different households."
- **Temporary accommodation** – some assembly members asked "where do people who have no means to go elsewhere [live]" that it's "great for people who can afford to live elsewhere", or that projects "can take longer than expected" meaning you need to "hous[e] people for longer."
- **"Incentivise landlords and homeowners"**
- **"Concerned about people who have difficulties learning, [with their] mental [health] etc, how will you help/support this group"**
- **"Need a synchronised supply chain"**
- **"More training [would be] required"**
- **"Easier to coordinate and roll out locally e.g. district heating"**
- **For something like district heating "everyone needs to be on board"**

B.2 Upgrading each home gradually

Assembly members felt upgrading each home gradually had both pros and cons, and expressed these in their discussions and on their ballot papers. Some assembly members also suggested 'conditions' that should be met if this option went ahead.

⊕ Pros

+ **Less disruptive** – a large number of assembly members felt that this option would entail "less disruption", "less disruption at any one time", or that the "disruption period [would be] shorter." Some said there would be "less disruption dealing with one tradesperson at a time", that it would be "logistically easier for [a] household as they can live [there] with most [of the] retrofit happening", or that "work can be done at a steady pace with minimal disruption." Others suggested that "some jobs might be quick and easy – won't disrupt as much" or that people would be "more in control of [their] lifestyle (e.g. moving out)."
+ **Flexibility and choice** – a significant number of assembly members felt this option "gives individuals more flexibility and choice", means you "can tailor [it] to your house", have "work done to suit each house…based on individual cost/need", or that "it can be tailored to specific individuals'/houses' needs." Some liked that it "enables people to prioritise what happens first" or to "cherry pick the most cost-effective options first." Some said that you "can change [things] as and when the upgrades are needed", or that you can get the "boiler heating system replaced when [the] old one needs replacing." Others said you can "tie in [the work] with other upgrades" or that it "can be done alongside other home modifications and upgrades." Some said it would allow people to "keep an eye on the work" or suggested there could be an "option to opt out…as you go through [the] process." Others said it "doesn't prevent people from doing it all in one go."
+ **Time** – some assembly members talked about there being "less new equipment at one time to adjust to/installation glitches", or it being "easier to adapt to change gradually." Others said people would be "more willing to change – easier to adapt/can see change" or that it would make it "less scary/easier to process." Some said there would be "time to fix snags", or that it would be a "more organic process – time to think about it." Some said it "allows you to install effective solutions and monitor effective impact."
+ **Affordability and costs** – some assembly members liked that the "cost [is] spread out", that it would be "easier to spread [the] costs", "easier to save towards it" or that it "enables people to build up the money to pay for it." Some suggested it would be "better for people on low incomes", "more financially viable for lower income individuals", or "more affordable." Others said that it "might allow people to wait for [the] price to come down" or that people "may see prices decrease and technology improve over the period of implementation." Some described it as "cost effective – does not amount [to] large quantities of debt."
+ **Better solutions and improved technology** – some assembly members suggested that people would be **"**more likely to install [the] most efficient / effective solutions." Others said that "technology might develop over time", that it would give "a chance for technology to improve" or that "the time lag may allow for new/upgraded technology to be available rather than an all-in-one approach where the next year much better technology becomes available."

+ **Skills and work quality** – some assembly members felt it "would be easier to get skilled workers in, as a phased approach", that the "quality of work could be higher – less rushed" or that the "workmanship [would be of] better standards (learning on the job)." Others said it would "mitigate the risk of poor installation ...[and there was] likely to be a better finished product."
+ **Industry** – some assembly members liked that "industry has time to prepare" or the "reduced strain on [the] construction sector and workers."
+ **"Better for listed homes"**
+ **"A home may already be energy efficient so doesn't need loads of work. When you sell you haven't done loads of work that you've paid for but don't benefit from"**
+ **"The possibility of increasing awareness of the need to change and competitiveness of who has done what"**

⊖ Cons

– **Disruption** – for some assembly members this option suggested "more long-term disruption", "longer term disruption", "continual disruption", "disruption (e.g. re-decoration) to housing to do it gradually", or "multiple periods of disruption."
– **Takes longer and slower change** – some assembly members labelled this option "slow", said it "takes longer", is "time-consuming" or that you "don't get [the] full benefit straight away." Some suggested that people "won't get improvements in bills quickly." Others said it would "take much longer to see the results we need" or that it "may not accelerate our impact on climate change."
– **Expense and pay back** – some assembly members felt it would be "more expensive" or "may [only] be cost effective in the long run." Some suggested that the "cost will be much more than if buying all [the] material in bulk...and [you have] to pay for the workers...over a long period." Some talked about the "challenge of not getting pay back on expensive investments in my home" or suggested you get "potentially less benefit from your investment."
– **Difficult to monitor and roll out** – some assembly members felt it would be "difficult to monitor if the changes are being made" or that it "might not get done." Some suggested that it would be "more difficult to roll out [and] coordinate across local areas (e.g. some want gradual, some don't / availability of workforce)." Others noted that there would be "different companies to monitor (quality of work)."
– **"People don't like change"**
– **"People may move or [be] in middle of moving when [it's] implemented"**
– **"Work for businesses could tail off"**
– **"Less time to pay off debt (i.e. lots of small loans)"**
– **"Might not notice the benefits of making the further improvements"**

Conditions

- **"No one can tell me what to do with my own home – unless government are willing to pay"**
- **"If loans can be offset against the value of the house / is tied to the house"**
- **"Lack of financial incentives as sanction for people not upgrading"**

A few assembly members who voted for 'upgrading each home gradually' used their ballot papers to expand on some of the points above. Comments included:

> "Everything needs a starting point. I think getting started with basic things i.e. loft, insulation, draft proofing, and expand from that."

> "From an environmental stand-point upgrading all in one go would be great, but I have chosen the option to upgrade each home gradually as I see this as being more realistic economically and technologically. Improvements over time may result in cost decreases."

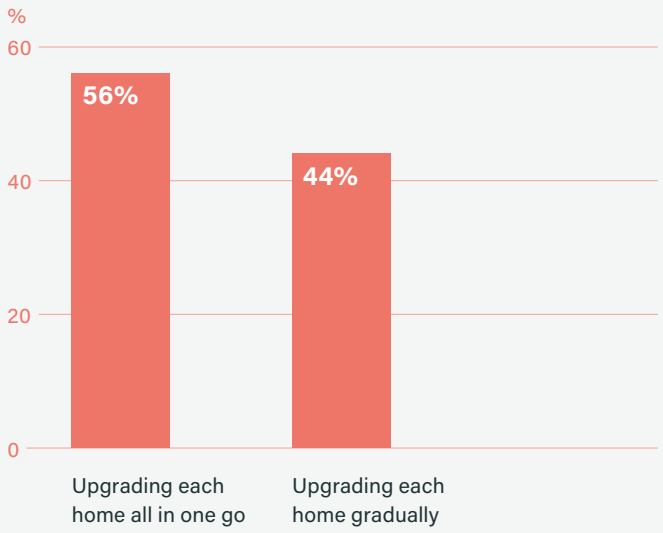
> "This has to be an affordable choice. Consideration must be given to the fact that the average UK resident is in huge debt to begin with so cost is a question. In my case I would not be able to afford to do this at once, so a gradual programme would be satisfactory."

Vote results

Assembly members voted on the two retrofit options by secret ballot, ranking them in order of preference.

Figure 1: Retrofits

Please rank the following policy options in order of preference (% 1st preference votes)



Assembly members showed a slight preference for 'upgrading each home all in one go' (56%), over 'upgrading each home gradually' (44%). For a number of assembly members, their backing for all-in-one retrofits was however conditional on what financial support and arrangements

would be available. Conversely, only one assembly member said their support for 'upgrading each home gradually' was conditional on a particular measure.

Some assembly members emphasised on their ballot paper that both options should be available or that each is good for different purposes:

> "As a homeowner, I would need to do things gradually, due to cost, so that would be my preference. If the government or housing association were responsible I would go for option 1 as they have the ability to do several houses at once."

> "Gradually [for a] homeowner (cost and inconvenience, normal on-going renovations). All in one [for]…social housing should be the best approach."

> "I do think though that it shouldn't be a 'one size fits all' situation and both methods should be considered."

> "[I support Option 2 because] it would not prevent households upgrading in one go whereas 'all in one go' prevents [people upgrading] gradually."

> "I do not believe we should force people into a decision one way or the other. Different people have different circumstances. What is better for one is not better for the other."

The assembly member who made the last comment above abstained from the vote.

Retrofit – conclusions

Taken together, assembly members' votes and comments paint a nuanced picture of their views on retrofits. They suggest that assembly members saw three areas as particularly important:

- **Disruption** – many assembly members were keen to minimise disruption in people's homes. They had different views on whether it would be better to have less disruption more often, or one much more major disruption. However it was clear that anything that could be done to minimise disruption and stress for people during retrofits would be welcome;
- **Cost, who's paying and how** – assembly members talked about costs in relation to both 'upgrading homes all in one go' and 'upgrading homes gradually', but felt they were particularly important in relation to the all-in-one retrofits. Assembly members had a range of suggestions for steps that might help, including spreading out payments, ways of bringing down the initial cost, and government funding. Some assembly members noted concerns around how to make retrofits affordable for all income groups and housing types;
- **Flexibility and choice** – the idea that householders should be able to choose the solutions best suited to them featured prominently in assembly members' discussions and comments, although slightly less so than the two areas mentioned above.

Assembly members also raised points around impacts on CO_2 emissions, work quality, and the availability of improved technology, among other issues.

When it came to the vote, assembly members had mixed views about whether gradual or all-in-one retrofits would be best. In pure percentage terms, their votes showed a slight preference for 'upgrading each home all in one go' (56%), over 'upgrading each home gradually' (44%). However, some assembly members attached conditions to their backing for the all-in-one-go option around what financial support and arrangements would be available. Others were clear that they felt both gradual and all-in-one retrofits should be possible: for some this was about the ability of households to choose what is right for them; for others, the best option depended on the type of housing in question.

C. What should happen – Zero carbon heating

Assembly members discussed two different areas in relation to zero carbon heating:

- Different technologies that could be used to replace gas central heating (heat pumps, hydrogen and heat networks);
- Whether or not different parts of the country should be offered different solutions.

At present most homes in the UK are heated with natural gas, which is a fossil fuel.

This section takes each of the above areas in turn, firstly presenting assembly members' rationale and then the results of the relevant votes.

Jump to the vote results on technologies on page 181

Jump to the vote results on variation by area on page 185

C.1 Heat pumps

Assembly members discussed electric heat pumps in small groups. They identified the following pros and cons.

Pros

+ **Use renewable energy and create no emissions** – some assembly members liked that they "would be run on renewable energy", "can be powered with cleaner energy", or that you "can power [them] with solar panels." Others liked that they produce "no carbon emissions – can be run on solar for each individual property", that there are "zero emissions at point of use", or that it "doesn't rely on carbon capture." One assembly member suggested that "heat pumps could be provided with solar panels and a wind turbine to provide free energy so people could rent the equipment for a similar price to current heating bills, or better still cheaper."

+ **Works everywhere, anytime** – some assembly members said that they are "available everywhere" or "can be used everywhere [and are] ...easy to implement everywhere." Some commented that they "can be used all year round."
+ **Ready to go** – some assembly members noted that we "already have the technology – ready to go?", that they are "proven to work", are "available now" or "are in use now." Others said they are a "short-term technology" or "can be done sooner and everywhere."
+ **Efficient** – some assembly members suggested they are "really efficient" or "more efficient than other options."
+ **Rural areas** – some assembly member felt they are "better for rural areas" or the "only option in rural areas – no pipework for h[ydrogen]."
+ **Individual** – some assembly members said a heat pump has the "same cost and doesn't require being part of network" or that they "can be one to a house."
+ **"Less financial investment required"**
+ **"2 different options – air and ground"**
+ **"Safe – no flammable gas – no hydrogen – no hot surfaces indoors"**
+ **"It's really cosy, comfortable and good for the environment"**
+ **"Once installed the heat pump will not be emitting any CO_2 gas and will encourage and hopefully ensure good/efficient insulation so no heat will be wasted"**

⊖ Cons

– **Disruption** – some assembly members felt heat pumps would need "disruptive installation work", or be "more disruptive to install." Some suggested that they "could possibly require full refurbs of properties", that "all houses need new internal pipework (disruption)", or that you "might need to update pipes/plumbing." Others noted that heat pumps "requir[e] large changes to houses (could also be a pro)."
– **Need for insulation** – some assembly members disliked that the "house needs to be properly insulated beforehand", or that "homes need to be well-insulated." Others suggested that "old houses...[would be a] challenge to bring up to [a] good insulation standard."
– **Initially expensive to install** – some assembly said that heat pumps "can be very expensive", are "expensive to install", or are "more expensive to fit initially". Others echoed that the "initial outlay [is] expensive" or said they disliked the "installation and product costs."
– **Noise and look** – some assembly members talked about an "ugly box in your garden", said they are "unattractive to look at" or that they create "noise pollution." Some felt that the "air con unit in [your] garden [would have a] visual and possible noise impact."
– **Space needed for pump** – some assembly members disliked the "space [needed] for installation", the "space required outside", or that it "needs outside space."
– **Not as hot** – some assembly members said that the "hot water temperature is lower than current levels", or that there "can be a slow heating process."

- **"Manufacturing is 'dirty'"**
- **"Can't store excess energy"**
- **"Susceptible to power cuts"**
- **"Concept hard to understand"**
- **"Air source [is] not effective at really low temps"**

Some assembly members suggested conditions they would want to be in place for heat pumps to be used. Some said that "solar panels need to be part of the mix and windmills at home." Others talked about the "role of surveyors – need to be proactive."

Assembly members' votes showed considerable support for heat pumps. Please see below for the vote results.

C.2 Hydrogen

The second technology that assembly members discussed was hydrogen. Assembly members identified the following pros and cons.

⊕ Pros

+ **Works with current infrastructure** – a significant number of assembly members commented that hydrogen "fits with current pipework in the house and nationwide." Some said it "doesn't require home upgrade first", that it "can more easily be used in natural gas central heated houses," or that it's "easy to retrofit and boilers [are] not too much more expensive." Others said it "can be piped in like natural gas with no extra visible infrastructure", that it "fits with current infrastructure", that "it uses the existing heat network – less disruption", or that the "delivery infrastructure for homes is there."
+ **Easy to transition** – some assembly members suggested that it would be an "easier transition", "easy for gas companies to transition", that it "will seem familiar in how it works" or that there are "no big lifestyle changes required."
+ **Cost** – some assembly members suggested that "widespread use could drive cost down" or that it would "driv[e] competition in the market to get [the] price down."
+ **Emissions reductions** – some assembly members said that it would result in a "really dramatic reduction in CO_2" or that it is "zero carbon when it's burnt."
+ **"If it is like natural gas it will be good at keeping your house warm"**
+ **"More innovation friendly"**
+ **"Could be self-sufficient"**

+ **"Could combine with natural gas – if supply problem"**
+ **"I have gas already and I know it works. Green hydrogen would be the ideal solution in an ideal world"**

Cons

- **Technology not ready, including for scale** – some assembly members suggested the "technology is still nowhere near", the "technology is not made yet" or the "technology [has] not yet been used on a large scale." Others said "hydrogen is not available yet / not proven", that "it can't be done now", or it "is not currently available – there's no easy or clean way of producing it." Some said "implementation is difficult – wouldn't be able to be done at scale until [the] 2030s", "we don't have it" or that it "requires more investment into production."
- **Expensive** – some assembly members said it is an "expensive process", "too expensive", "very expensive to produce", "expensive if it works", or "will always be expensive...." Others were more optimistic saying "the big concern is the cost of hydrogen production, but that may come down."
- **Green vs blue hydrogen** – some assembly members highlighted that "hydrogen needs to be produced which has its own problems", that there is a "risk that fossil fuels are still used to power them" or a "worry that hydrogen still uses (or could use) fossil fuels." Some assembly members disliked the fact blue hydrogen "relies on carbon capture", with some concerned specifically about the "risk of carbon leaks from underground storage." Others suggested that "hydrogen can only be considered from 'green sources'", that it "needs lots of electricity to produce – only green hydrogen [should be used]", or that "carbon capture is not a long-term solution."
- **Safety risk** – some assembly members disliked the "safety" implications, or suggested there is a "safety risk – explosive."
- **Not available to all** – some assembly members said that it's "not available in all areas" or that "not all homes [are] connected to [the] gas grid."
- **"Does not work with existing boilers"**
- **"Requires hot water cylinder"**
- **"Gas network needs [to be] maintained"**
- **"Hydrogen is not as energy intensive as natural gas. The process of obtaining hydrogen from natural gas seems to be counterintuitive since natural gas is already a clean, energy dense fuel source, and it will require a lot more hydrogen to achieve the same energy output. In addition it will require a lot of energy to extract the hydrogen and further energy and resources to deal with the CO_2 (blue hydrogen)"**

Some assembly members suggested conditions they would want to be in place for hydrogen to be used. Some wondered whether "smaller networks [could] be created to make it more available." Others suggested that it "might be viable in [the] long term [only] – due to [the] costs of electrolysis."

Assembly members' votes showed considerable support for hydrogen, although this support was slightly less strong than for heat pumps and heat networks. Please see below for the vote results.

C.3 Heat networks

Assembly members discussed heat networks in small groups. They identified the following pros and cons.

⊕ Pros

+ **Cheap and income generating** – some assembly members suggested that heat networks are "cheaper", "cheaper for households", the "cheapest of all options" or "cheap to run once set up." Others suggested that they "could generate income for families" or that they would make it "easier to help those in need – lower cost."
+ **Efficient and effective** – some assembly members described heat networks as "efficient", "extremely efficient", "efficient for urban areas or "most effective for cities."
+ **Mass change** – some assembly members talked about the potential for "mass change at once – quicker solution and easy to implement for lots of houses." Some suggested it was "easy to roll out locally and convert large areas."
+ **Good for some areas and owners** – some assembly members suggested it is "good for towns / built up areas", "great for cities and some smaller towns", or "good for large scale house owners e.g. housing associations." Some suggested it "can be used for streets i.e. mews, homes close together." Some assembly members sounded a slightly more cautious note saying it is "great for the areas affected – but limited to some areas."

+ **Waste heat used** – some assembly members liked that it "uses existing waste heat", "can soak up extra heat", or "can use existing heat which would otherwise be wasted."
+ **Sense of community** – some assembly members felt it "encourages co-operation in communities" or "creates a spirit of community."
+ **Boiler / maintenance not in the home** – some assembly members liked the idea that "maintenance [is] done centrally – not in your house" or that the "boiler etc [is] not in your home or garden."
+ **"Technology already exists and [is] already in use"**
+ **"Can be mixed with other solutions"**
+ **"Easy for new builds"**
+ **"Can use different sources based on areas e.g. geo[thermal]"**

⊖ Cons

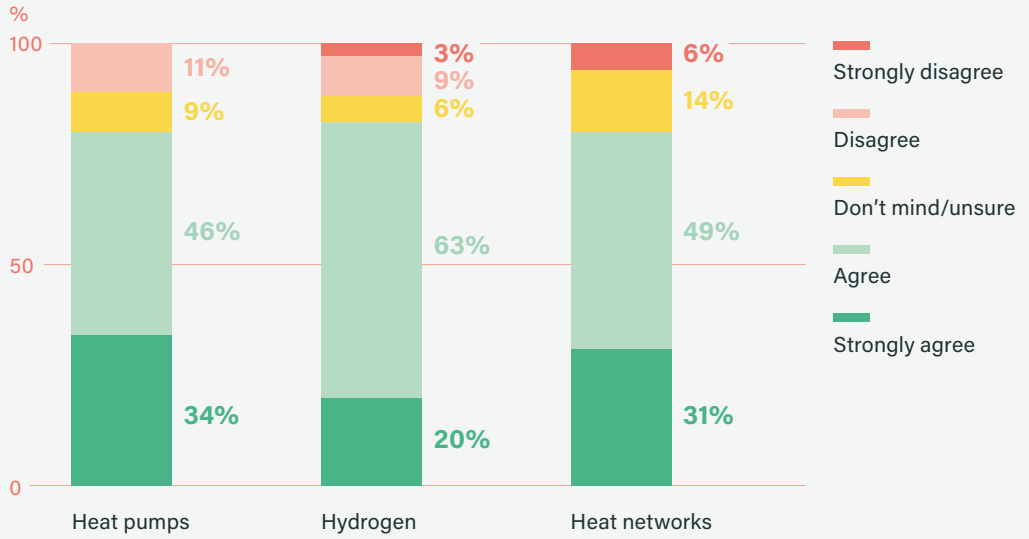
– **Not suitable everywhere** – a large number of assembly members suggested that it "needs [a] certain density of buildings", is "only for cities", "only good in urban areas / geographically restricted", or is "only really effective in cities / towns." Some said it is "good for large housing infrastructure", is "only suitable for certain areas – a small percentage of homes" or "would not be available for all." Others noted that it is "not as good for rural areas" or "not available in low intensity housing." Some said "a lot of places [are] not set up for it – a lot of work."
– **Disruption** – some assembly members said there would be "disruption for installation", "disruption when fitting pipes etc initially" or "disruptions in refitting network." Some suggested it "may be cheaper in flats – high-rise / tower – but in individual houses [it] would be disruptive."
– **Difficult to retrofit** – some assembly members felt it would be "hard to retrofit" or "more difficult for existing buildings."
– **Loss of individual control** – some assembly members expressed "concern about individual control", or noted that "everybody in their network has to be in it (no choice)" or "everyone has to be on board."
– **Bigger problems if breakdown** – some assembly members suggested it was "not fault tolerant", or that "if it breaks down [it] would affect more people."
– **"Need a separate immersion heater"**
– **"Sophisticated engineering at individual level required"**
– **"Expensive to implement"**
– **"Requires forward planning"**

Vote results

Assembly members voted on heat pumps, hydrogen and heat networks by secret ballot.

Figure 2: Zero carbon heating

How much do you agree or disagree that each of the following options should be part of how the UK gets to net zero? (%)



At least 80% of assembly members 'strongly agreed' or 'agreed' that each technology should be part of how the UK gets to net zero. Variations between the results for the different technologies were minimal: slightly more assembly members supported the use of hydrogen (83%, compared to 80% for the two other technologies), but fewer 'strongly agreed' with its use (20%, as opposed to 31% and 34%).

C.4 Different solutions for different local areas

After considering the three types of technology, assembly members moved on to look at whether people in different parts of the country should be offered different solutions to zero carbon heating. They identified the following pros and cons.

⊕ Pros

+ **Areas are different, so solutions should be different too** – a large number of assembly members said that it would result in a "suitable solution for [the] area you're living in", or that "each area may need choices that are more suitable [to it]." Others noted that "different parts of the country have different resources and restrictions", that "rural and urban areas will have different requirements" or that "every area is geographically different and what will work well in one area will not work in others." Others agreed, saying that "one heating

solution does not cater to each location, financial or maximum efficiency consideration we have discussed", that "[viable] options depend on location, infrastructure on [the] ground, cost per unit of home", or that "different kinds of heating will work in different areas depending on the area (rural/urban) and the kind of housing (rented / homeowners)." Some assembly members said specifically that "local energy resources should be allowed to be used if more efficient – e.g. hydro, wind, tidal, solar, industrial waste heat", or that we need "'local solutions to national problems' – local government is better suited to finding efficient energy generation based on [their area's] natural resources and infrastructure." Others said that "heat networks are not suitable for rural areas", that "some people aren't on [the] gas network so can't just switch to hydrogen", that "rural communities [are] not on the gas network [so] are only left with heat pumps", or that "air source [based methods are] inefficient in colder weather and areas."

+ **Choice** – some assembly members liked that "people have a choice." Others said that "people should always be allowed to choose what is better for their individual circumstances" that "giving people a choice is always important when trying to get them to buy-in to change" or that "if [the] technology is available, why restrict freedom of choice?" One said: "I like all of these options. If you can afford heat pumps etc it should be the homeowner's or housing association's choice, with [the] agreement of tenants."
+ **Democracy** – some assembly members commented that "more choice = more democracy" or that "everyone should have a say in the changes required."
+ **Competition and cost** – some assembly members suggested it would be "more competitive", that it "encourages competition with lower prices for people" or that "multiple providers / options should hopefully lead to competitive pricing." Some said competition would provide an "opportunity for technical improvements." Others said that "some solutions might be cheaper in different areas."
+ **Economy, jobs, industry** – some assembly members felt that "being able to sell [a] diversity of tech ...[is] better for [the] economy." Others said it would create "more job opportunities" or that you "could have specialists in that local area to do the maintenance." Some suggested there would be "less strain on individual industries due to diversity" or "less demand / strain on each type."
+ **All three technologies are needed** – some assembly members said that "we need as many options as possible" or that "the best solution could involve using a mix of these [three] options in different areas." One assembly member said that "to achieve net zero emissions I believe a hybrid solution of the 3 proposals – heat pumps, hydrogen and heat networks is required."
+ **"More power to local government for decision-making"**
+ **"Individual solutions can be rolled out quicker"**
+ **"Less infrastructure"**
+ **"House prices might dramatically rise in areas with strong heat networks, creating more rural-urban migration"**

⊖ Cons

- **Regional inequality** – some assembly members disliked the idea of "regional inequality", saying that "success in certain places" could result in a "change in house prices" or, more broadly, that "different rates of progress could disadvantage some people / areas." Some assembly members also noted that "costs might vary from area to area – needs to be done fairly so that people don't pay more – consider subsidies."
- **Efficiency and maintenance** – some assembly suggested it might be "slow to roll out as not centrally planned", or that there would be "multiple networks needing maintenance." Some suggested that "too many options may lead to less efficient combinations being used so it may be appropriate not to offer a choice."
- **Risk of no choice and lack of support** – some assembly members felt there is a "risk of being dictated to e.g. in cities have to be in a heat network", while others noted that "people may not get onboard."
- **"Worry that hydrogen still uses (or could use) fossil fuels"**
- **"People should have the right to choose but [no choice] is understandable if there's no other option e.g. rural areas"**
- **"I think we need more expert advice and a structure. ... each case is different depending on the type of property and individual household, also it's important to learn more about all the risks before committing and spending money on a boiler that will not be effective in the long term"**
- **"Limits the economy of mass production"**

Some assembly members suggested measures they would want to see in place if different areas are offered different solutions:

> "I believe that central government funding to local authorities should be based on the options they have at their disposal to avoid any unfair disadvantages to areas that are not rich in natural resources, so [that] each LHA [can] have a consistent fair approach and all energy consumers pay the same price."

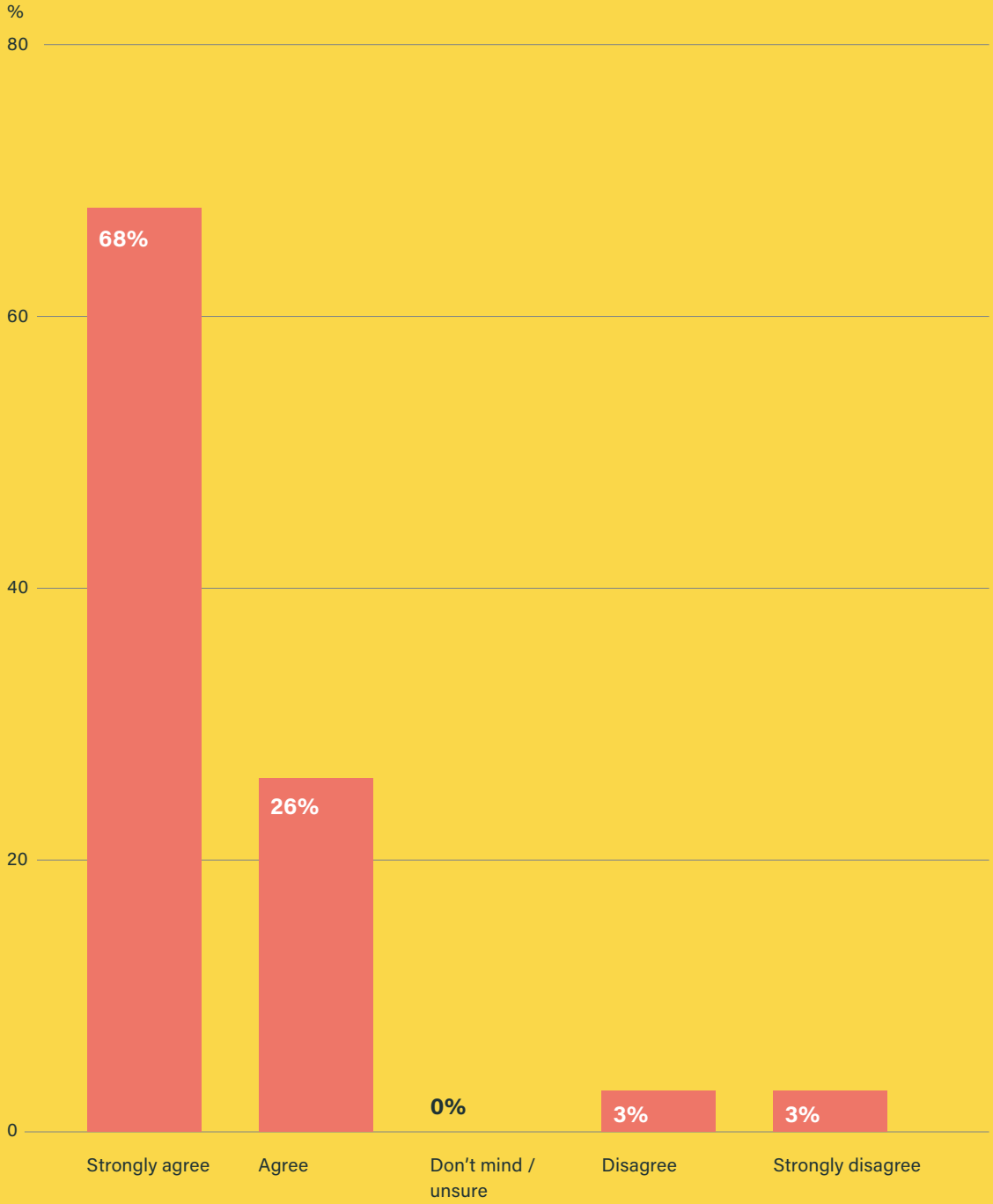
> "Needs good joined up / partnership working"

> "Transparency should be used to explain why different options are available to different people."

Assembly members voted overwhelmingly in favour of offering people in different parts of the country different solutions. Please see below for the voting results.

Figure 3: Zero carbon heating

"People in different parts of the country should be offered different solutions to zero carbon heating" (%)



Vote results

Assembly members voted by secret ballot on how much they agreed or disagreed with the statement: "People in different parts of the country should be offered different solutions to zero carbon heating".

94% of assembly members 'strongly agreed' or 'agreed' with the statement. A large majority (68%) 'strongly agreed'.

Zero carbon heating – conclusions

The best technology to use for zero carbon heating is a matter of significant policy debate. However assembly members were clear that, in general, they would be comfortable for any of the technologies to be used. **At least 80% of assembly members 'strongly agreed' or 'agreed' that each technology of heat pumps, hydrogen and heat networks should be part of how the UK gets to net zero.**

Assembly members also had clear views about whether **people in different parts of the country should be offered different solutions to zero carbon heating**. 94% of assembly members 'agreed' or 'strongly agreed' with this statement, with 68% strongly agreeing. For many assembly members, local areas have different geographies, resources, infrastructures, restrictions and costs; they felt that areas should be able to choose the technologies best suited to their needs.

D. Futures

Having considered what the future should look like in terms of home retrofits and zero carbon heating, assembly members moved on to look at how change should happen.

To aid them in this process, the Expert Leads presented assembly members with four scenarios:

1. Individuals take responsibility;
2. Market innovation;
3. Government investment;
4. Local solutions.

Together the scenarios cover a broad range of views about how change might work. They were not mutually exclusive.

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D.1 Individuals take responsibility

In this possible future, individual householders or landlords would have responsibility to upgrade their properties. This would include installing energy efficiency measures and zero carbon heating. It would involve:

- The government setting minimum standards for carbon emissions from heating and powering homes;
- Householders / landlords arranging for energy companies, and installers of heating and insulation, to make changes in the home;
- Existing energy companies, like British Gas, possibly having a significant role;
- A need for special arrangements for people who cannot afford to contribute.

Assembly members discussed this possible future at their tables. They identified the following pros and cons.

⊕ Pros

+ **Choice, freedom, and tailored solutions** – a large number of assembly members commented that "people [would] have the freedom to choose what they want, when they want and who they want" or that "people need to have the freedom to chose what is best for them." Others commented that "individuals know their own circumstances and needs."
+ **Promotes interest and support** – some assembly members suggested that "empowering individuals to make their own choices will promote support for the scheme" or that it "promotes individuals' interest in seeking alternative solutions (gets the ball rolling)." Others suggested that "choice of individuals can be incentivised." One assembly member felt it would create a virtuous circle: "individuals make choice to go 'green' – market reacts offering more options and better products, and government acts on people's opinion to win votes [and] set policies to help houses go 'green' and this influences local government."
+ **Control and responsibility** – some assembly members said that it's "good to have control over who work[s] in your own home i.e. recommendations, tradespeople known to you" or suggested that "if individuals take responsibility they are safe in the knowledge that any improvement[s] made are safeguarded – no scams from unregulated firms." Others said that they liked the idea of "individuals taking ownership of the solution and acting on it", that "individuals have their own choice to choose therefore [it's] giving them responsibility", or that "the more responsible the house owner the better their benefit."
+ **Competition and prices** – some assembly members felt it "drives competition", that "competition amongst firms 'may' keep costs lower", or that the "creation of new companies should regulate prices with the bigger suppliers."
+ **Government set standards** – some assembly members said there are "advantages [to]... government standards", or that they liked that "government sets standards – for landlords / private sector" or that the "government sets minimum standards for carbon emissions and powering homes."

+ **Sharing solutions and results** – some assembly members suggested that "actions completed can help inform and influenc[e] others by sharing results" or that "recommendations of work people can be shared."
+ **"Set price to be introduced"**
+ **"Takes the pressure off government to front cost"**
+ **"Familiar with making choices about energy supply"**

⊖ Cons

– **Cost** – some assembly members disliked the "financial costs on the individual", or that "regulations may impose large costs on home owner[s]." Others worried that "individuals may not have the funds", or commented that it's "expensive – low income families, people living in insufficient homes won't take responsibility due to costs." Some suggested it "may be more expensive without bulk buying or savings from doing a whole area at the same time."

– **Barriers to change and not forcing people** – some assembly members suggested that "some people won't do anything / will object" or that you "can't 'force' people to do things." Others said it would be "difficult to convince people to spend money", that "financial consideration[s] might outweigh decisions", or that "individuals may not have the resources to take responsibility." Some felt that "it won't result in enough/fast enough change because individuals won't take responsib[ilty] or have enough money" or that "the choice may cause individuals to delay decisions."

– **Lack of knowledge, scams and poor quality work –** some assembly members suggested that "individuals don't know the right tradespeople to call – lack of technical knowledge" or that "you may not get the skilled person to do the right job." Others felt that "companies could take advantage of lack of knowledge", or that "vulnerable people could be 'ripped off' by rogue traders." Some noted the need to "really trust the supplier!", or said that they "don't want to have to rely on energy companies as they have a poor track record."

- **Need for information** – some assembly members said this "needs a lot of information which is honest, unbiased" or that "some individuals may not know how/what to do (outside help needed)." Some suggested that "lack of information = bad decisions" or that this future "punishes those with less time to do adequate research (those with kids or demanding jobs)...."
- **Issues with landlords** – some assembly members suggested that "private landlords would meet minimum standards only (if that!)" or that "landlords may not act and skip corners as [the changes] will not increase [their] income". Some suggested that "landlords [would] nee[d] incentives i.e. rogue landlords."
- **Cutting corners and the wrong solution** – some assembly members felt that "people might go with a cheaper solution that may not be ideal if they are not going to live in the house for long" or that "individual[s] may cut corners to save on cost/time."
- **Lack of government funding** – some assembly members disliked the fact it was "self-financed" or that there was "no government funding."
- **Doesn't work with district heating** – some assembly members said that you "can't co-ordinate individual solutions to work with wider local initiatives e.g. district heating" or there's a "lack of coordination with choices so [it] would work against district heating."
- **"The best technology may not be available"**
- **"Not great/takes choice away from tenants"**

Some assembly members made additional points about this future. They suggested that consideration should be given to:

- **Insurance** – "an insurance for company failures";
- **Ease and affordability** – some suggested "government subsidies for the individuals concerned" or said it "works if made easy and affordable";
- **Reliable and clear information** – some felt that "information provided to individuals should be recommended by a regulatory body e.g. Checkatrade" or noted a need for "Plain English! Clear";
- **Rented properties** – some asked "what about rented properties – can tenants choose which system since they are paying [the] bills";
- **Enforcement** – some queried "who will regulate and check these 'minimum standards'?"

Assembly members showed considerable support for this future in their votes, although slightly less than for some of the other futures. Please below for the vote results.

D.2 Market innovation

In this possible future, it would be easier for any company, not just energy companies, to sell 'energy services' (like 'heat as a service')[6]. It would involve:

- The government setting minimum standards for carbon emissions from heating and powering homes;
- Companies being allowed to sell 'energy services' – packages including insulation, energy efficiency, zero carbon heating, renewable electricity (e.g. solar panels) and storage (e.g. batteries);
- A need for special arrangements for people who can't afford to contribute.

Assembly members discussed this possible future at their tables. They identified the following pros and cons.

⊕ Pros

+ **Competition, prices and quality** – some assembly members suggested that a "competitive market will drive down prices and drive up quality/choice", that there would be "more ideas about making services better and cheaper" or that "companies competing should result in lower prices and better products." Others agreed saying that a "wider range of choice [is] likely to drive down prices", that "more competition ... may bring prices down", that "innovation drives revolution – market competition drives lower prices" or that "companies can offer more competitive choices." Some suggested that "co-ops/non-profits may keep costs lower for consumers." Others said that it would be "good for competitive services – Ofcom and trust pilot involvement."
+ **More options and choice** – some assembly members welcomed the idea that "more or different options will be available e.g. heat as a service", that there would be "lots of options from companies", or that "you can choose where you go for your services / individual needs." Others liked that it is "open to wide range of companies, including co-ops, non-profits, smaller local tradespeople."
+ **Tailored solutions for households** – some assembly members suggested that "households will be offered a solution that is tailored to them – less stress, best decision made" or that "consumers may benefit as it can be tailored to their needs e.g. buying heat per hour." Others said they liked "tailored solutions" or "tailored solutions for homes."
+ **Company skills** – some assembly members commented that "companies can provide information that individuals don't already have" or that "companies have the resources / skills to find solutions and implement."

6 This is where you pay a company to manage your home heating – for example, by hour and by room – and provide you with heat when you need it, rather than just paying a gas bill.

+ **Less responsibility, easier to understand (heat as a service)** – some assembly members liked that it's "less responsibility for individuals to learn / make decisions", that there's "less responsibility on the home-owners to know what needs doing and how much it will cost" or that there's "less worry [because]...everything is included." Others said that "some people prefer decisions solved for them – given full product" or that it's "easier to understand – don't need to decide which is right for you." Some liked that "everyone knows their target and [the] improvement required."
+ **One-stop-shop** – some assembly members highlighted the "possibility of one bill pays all" or suggested there "could be a one stop shop (finance loan)."
+ **Less reliance on government** – some assembly members suggested it was "likely to be longer lasting due to not having a direct dependency on government" or that it "eases the financial responsibility on the government."
+ **Economy** – some assembly members said it would lead to the "creation of new jobs as companies innovate in new areas" or that "there's great potential here for a new industrial revolution."
+ **"Recommended by government – minimum standards must be met. Possible subsidies for these types of companies"**
+ **"De-risks a technology mistake – someone else takes this hit"**

⊖ Cons

– **Concerns about companies** – a large number of assembly members expressed concerns about companies:

  – They suggested that "companies may not have your best interest as a priority (profits first)" or that they could "potentially offer **more profitable choices, instead of lower carbon choices**." Some assembly members felt that "companies may implement options which they can get away with but [which] are not the best for consumers." Others envisaged a situation where the "technology is available but companies will go for [the] cheaper option" or said that the "best options can be held back e.g. iPhones."

  – Some assembly members worried that companies may "**cherry pick houses and areas** that are more profitable", with some suggesting "houses [would be] refused services due to income." Some asked, "if companies can deny services to a property – what will they do?" Others worried that "companies [would be] unable to deliver produce in some local areas" or that the "market/companies may not cater to certain areas – regions."

  – Some assembly members felt that "companies may allow **price fixing** to occur."

  – Some assembly members worried about the "**standard of goods being sold (under par).**" Some felt it "could lead to companies making less longer lasting products / not reparable to keep profit margins high" or companies "rush[ing] products to market which aren't suitable and do not meet standards i.e. VW diesel."

  - Some assembly members worried about the potential to "**mislead customers"** or said that "vulnerable people could get sold expensive solutions." Other assembly members expressed concern about **"cowboys."**
- Some assembly members commented that there are "lots of negatives – possibility of low standards, poor information, mis-selling – needs [to be] handled right as there's lots of risks."
- **Hard to understand** – some assembly members worried that it would be "hard to communicate different services/products – complicated!" Others said it "might be confusing and difficult to understand deals", that "too many options offered by companies can cause confusion" or that "individuals will have too many choices – get confused [about] what is best for them." Some said it is an "unfamiliar way of getting our energy."
- **Affordability and expense** – some assembly members suggested it "might be difficult for poorer households, local areas and jobs contracts etc" or that "if government doesn't provide incentives / subsidies for these innovations, it won't be feasible for poorer households." Some disliked the potential for "expensive products."
- **Lack of strategy and co-ordination** – some assemblies members disliked that it is "not a nationwide strategy", while others suggested that it would be "more difficult to co-ordinate solutions across a local area because individuals can choose what they want."
- **"Job security for smaller companies – higher risk of companies folding"**
- **"May become 'one size fits all' for many and rest unsuitable"**
- **"No incentives for individuals to implement change"**
- **"'Minimum standards' again – landlords difficult to enforce"**

Some assembly members made additional points about this future. They suggested that consideration should be given to:

- **Regulation** – some assembly members talked about the need for a "regulator to ensure prices and work [quality]" or said it "needs proper regulation." Others said "company standards [would need to be] regulated and reviewed regularly (penalties)", that there would need to be "regulations to prevent …mis-selling" or that it "needs regulation – no dodgy tradespeople." Some felt that there would need to be "protection for individuals less able to understand" or that it "should be regulated so [that it] can't be driven by profit. No dodgy tradesmen or upselling";
- **Clear offers and information** – some said it needs "clear understandable offers" or information that is in "plain English – clear and concise";
- **Moving house** – some said "consideration [should be given to]… what happens with [a] package system if [you] move house?"

Assembly members showed considerable support for this future in their votes, although less than for some of the other futures. Please below for the vote results.

D.3 Government investment

In this possible future, central government would invest public money in a nationwide retrofit scheme. It would involve:

- Each home owner being offered help to get their home up to high standards, including replacing gas boilers;
- Government making a national plan for different technologies in different areas;
- Private companies still having a role in providing energy services (primarily selling electricity).

Assembly members discussed this possible future at their tables. They identified the following pros and cons.

⊕ Pros

+ **Co-ordination and planning** – some assembly members liked the idea of "government plans for each area", suggested that the "government could have a co-ordinated policy and be responsible" or welcomed the "large-scale" nature of a "strategic national plan." Others said it could "fund the provision of [a] knowledge and expertise base for steering the way forward."[7] Some suggested that "government needs to invest and work with local authorities. LAs need to advise on local issues, housing."
+ **Quicker and more effective change** – some assembly members felt that it would be "quicker and more effective" or "would lead to greater reduction in CO_2 in shorter time." Others commented that "government investment [would] motivat[e] decisive action to stop loss", that "it will happen if government organise it" or that "rules and regulations will force the change to happen."
+ **Standards and government control** – some assembly members felt that "all changes [would be] made to the same standard" or that the "standardised nature of services [would be] more efficient and cheaper in [the] long-run." Others suggested that "as [it's] associated with government [it's] more likely to set a minimum quality standard" or for "good standards of work to be set." Some said that "government control [would] ... ensure higher standards." Others liked the idea of "government control over the technology."
+ **Costs and financial help** – some assembly members liked that it would be "government funded", that there would be a "financial incentive for homeowners", that government would "offe[r] financial help to homeowners" or that "homeowners will be offered help to achieve green homes." Some said it "takes pressure off [the] individual – financial and logistical" or would result in "less cost to [the] individual." Others suggested that "government could keep the costs down by preventing it being profit led."

7 One comment on a ballot paper expanded on this point. It said a "government fund is needed to establish a body of expertise to give professional guidance and advice to individuals and local government to help / ensure only viable solutions are attempted whilst allowing as much freedom of choice as possible."

+ **Less responsibility for individuals** – some assembly welcomed that this "takes away 'our' responsibilities", or meant "less pressure for individual[s] to make a decision." Some noted that "if it fails it is 'their fault!'.

+ **Efficient use of existing resources** – some assembly members felt that this future would "make use of [the] best local resources – efficiency, creates less waste", while others welcomed "using existing resources to make the changes."

+ **"Individuals could extend the changes if government produces a minimum level of adaptations"**

+ **"Contributes to national economy / independently run (not reliant on foreign firms i.e. google)"**

+ **"Elect[ed] people choose policies"**

⊖ Cons

– **Lack of individual / homeowner choice** – some assembly members disliked "taking choice away from home-owners", that "householders [have] no choice", or "removing choice from individuals." Some labelled it "dictatorial homeowners don't want to be told what to do." Others said it "creates a 'nanny state'."

– **Lack of flexibility** – some assembly members suggested that there would be a "lack of flexibility because of [the] 'one size fits all' approach" or noted a need to "identify the technologies for the areas as certain environments may prove impossible." Some felt it would be "harder to cater to individual properties", or disliked that it "look[s] for a one size fits all solution to keep costs down."

– **Bureaucracy and red tape –** some assembly members disliked a "reliance on government red tape" or the "possibility of bureaucracy and inter-department disagreement." Some suggested that it would take a "long time to implement – red tape!" Some said "Government bureaucracy £££."

– **Cost, overspend and inaccuracy** – some assembly members felt that the "tax payer could be ripped off", that there would be "overspending", or that government "cannot be trusted to use [the] most economical business." Others suggested that the "tender for projects [would] not [be] accurate just like HS2."

– **Not enough investment** – some assembly members suggested that "government may be less inclined to invest as much money as needed" or that "government may not fund as much as initially promised." Some felt there was a "risk of low-quality upgrades due to cost restrictions" or worried about whether the "help offered will…be enough… changing tech, new ideas, and new tech."

- **Restricting innovation** – some assembly members said that "blinkered government could restrict new innovations", that there "may be less scope for innovation as government led" or that "new technology can be slow to get government support / bureaucratic process can be slow so we may end up being behind technologically." Others suggested government is "unwilling to invest in long-term solutions."
- **Risk of change in political party in power** – some assembly members noted that "if political parties in government change this may affect / cause uncertainty to any national plan", or that it "could be subject to political changes (who is in power) legislation reversal?" Some suggested that it "could be hard to separate [from] politics." Others felt it "needs to remain across party governments."
- **Lobbying** – some assembly members expressed concerns about the "risk of large companies being able to lobby central government to change policy (large energy firms)" or suggested that "government could be sway[ed] by large companies…policy-makers then benefit them." Others wondered if it was "open to lobbying, possible corruption?" or felt there would be "less of a role for smaller companies or co-operatives and community groups in decision-making and implementation."
- **Private companies might unfairly profiteer** – some assembly members worried about "private companies making prices, extortionate" or suggested that it "needs strict monitoring of incompetent or greedy private companies."
- **"If it fails it is government fault – and then no progress made"**
- **"Problems with service delivery"**
- **"Who decides who gets help – who pays for those who are exempt"**

Some assembly members made additional points about this future. They suggested that:

- "Costing has to be reported and broken down";
- There should be "regulations only for all landlords but not individual owners";
- "You will need higher taxes or charges";
- "Government should provide fairly priced solutions but not strict enforcement."

Assembly members showed considerable support for this future in their votes. Please see below for the vote results.

D.4 Local solutions

In this possible future, local government (e.g. a city or a county) would have overall responsibility for getting homes to zero carbon. It would involve:

- Local government co-ordinating a local plan for getting homes to zero carbon;
- Local government working with private companies and community groups to offer energy efficiency improvements, zero carbon heating and other services to householders;
- Central Government backing up this work with resources;
- A need for special arrangements for people who can't afford to contribute.

Assembly members discussed this possible future at their tables. They identified the following pros and cons.

⊕ Pros

+ **Tailor to local areas** – some assembly members felt that this future would result in the "best solution for local areas as [it would involve a] better understanding of localised needs." Some talked about solutions "localised and personalised to [the] local area", "tailored solutions based on geographical and local resources" or "localised tailor made solutions." Others liked that "everyone can enjoy a solution that suits their locality", that solutions will "suit [the] local area better – targeted" or suggested that "different strategies in different areas could be positive."
+ **Knowledge and interests of local government and local organisations** – relatedly, some assembly members said that "local government / organisations have better knowledge of [the] local area", that "local government will have best knowledge of local resources", that "local government should have a better idea of local needs" or that "local government will ensure that what works best for their area will be chosen for them." Some said that "local councils should benefit rural communities more than central government." Others talked about "pride in local government."

+ **Local economy, trades and companies** – some assembly members suggested this future would result in "bringing jobs into [the] local area, boosting [the] economy and local trusted firms." Some felt there was a "higher chance of supporting local trades/businesses", or an opportunity to "focus on and encourage local business development appropriately" or "grow local industries." Some suggested that "it may keep work local to do installations etc", would be "good for local businesses" or would mean "more work for local companies." Others said that the "use of local companies / contractors for each local area will bring economic benefit to the area instead of using larger companies!"
+ **Engaging local community** – some assembly members said it would be "easier to work with different groups in [the] community (e.g. local firms) compared to [a] centralised system" or that the "local community would be more involved/interested." Others noted an opportunity to "involve [the] community with decision-making", or suggested that it would be "more democratic and may challenge and improve recommendations."
+ **Accountable** – some assembly members suggested that it would be "easier to identify accountable officers", that "local government [can be] held to account" or that it would be "accountable to local residents, more local and votes."
+ **Cost-effective** – some assembly members felt it would be a "cost-effective option for areas done all at once", or "most cost-effective to work locally."
+ **Central government involvement and funding** – some assembly members liked that this option "still has central government involvement" or that the "funding [is] backed by central government."
+ **"MORE FUNDING to carry out projects."**
+ **"Easier to manage/implement"**
+ **"Local people with less funds may be considered more if part of local community"**
+ **"All solutions are available – whether district heating or private (heat pumps)"**
+ **"Council advocates for or encourages legitimate / reliable products and services so more likely to install better quality products"**

⊖ Cons

– **Lack of local government money and resources** – some assembly members said that "local government is always short of money", "may not be able to allocate adequate funding", or "may not have the budget." Others said that there is "insufficient funding – local governments have all had [their] funding cut", that "local government does not have [the] existing infrastructure/resources to do this" or that "local government needs extra support and money – agree funding on a range of matters – resources, equipment, services etc." Some said it "may be too slow £££ – not enough money and might cost more."

– **Less choice for the individual** – some assembly members said there would be "less choice for private owners", "less choice for individuals" or that "residents and homeowners don't have as much choice." Others suggested that the "local solutions offered may not suit everyone" or asked "will they listen to what people want."

- **No strategic or central approach** – some assembly members said this was "not a strategic approach and [involves] missing out on lost savings and not doing [what's] best." Others disliked that there was "no central co-ordination" or worried that "different strategies in different areas may lead to regional inequalities" or "uneven costs". Some said that those responsible would be "unwilling to invest in long-term solutions."
- **Tax increases** – some assembly members felt there would be an "increase [in] local taxes to pay", that "council tax will just increase to cover costs" or that an "increased cost [to] local government = increase for taxpayers."
- **Quality of implementation and solutions** – some assembly members worried that "local lack of expertise could be a problem for implementation", or that there was a "risk of poor choice of contractors", "cowboys" or "choos[ing] [the] cheapest solutions, not the best."
- **Politics and vested interests** – some assembly members suggested there could be "possible party political bias", that it "could be too political" or that there was a risk of "conflict of vested interest by councillors." Some said that local councils "may disagree with [the] main government then fail."
- **"Low income families may still not be able to contribute/benefit"**
- **"Red tape"**
- **"May not use government funding in total"**

Some assembly members made additional points about this future:

> "Need for informal forward looking, efficient, innovative local councils"

> "How would local authorities prioritise where gets changes first?"

> "Local citizen assemblies deciding which tech is best for local environment"

> "Must be options for choice [for] individuals"

> "Central government will need to work with local authorities to meet local needs"

> "Individuals should be trusted to chose what is best for them but they should be supported by government"

Assembly members showed considerable support for this future in their votes.

Vote results

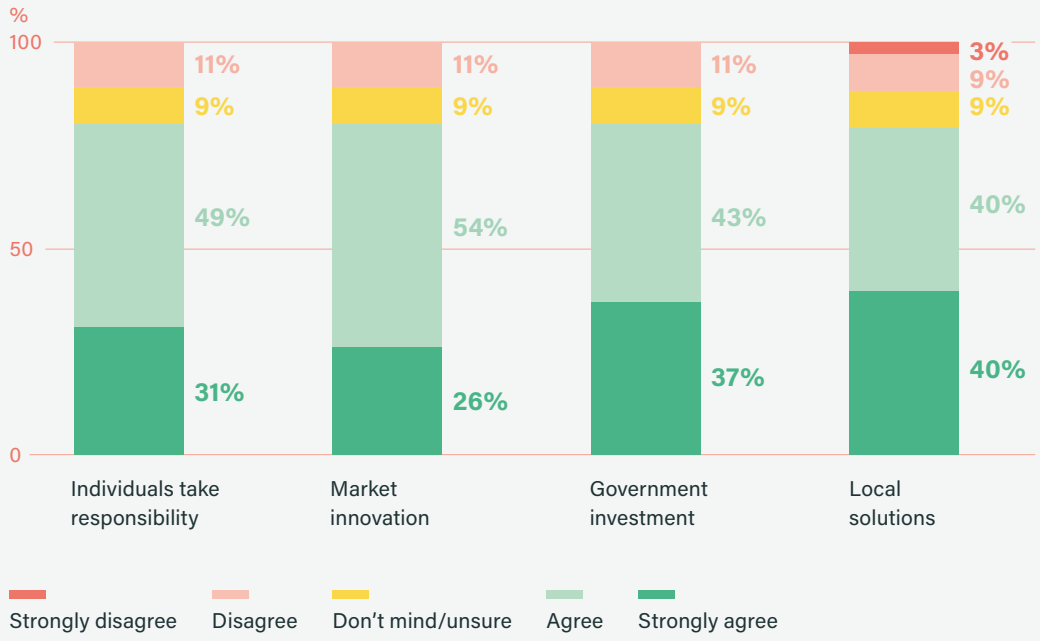
Assembly members voted on the futures by secret ballot. There were two different ballot papers. The first ballot paper asked assembly members how much they agreed or disagreed that each future should be part of how the UK gets to net zero. The second ballot paper asked them to rank the futures in their order of preference.

The votes from this second ballot paper were counted in two ways:

- **Counting assembly members' first preference votes only.** This tells us what assembly members would and wouldn't choose if they could have their most preferred future.
- **Using Borda count.** This involves allocating points for preferences – a first preference vote scored three points, a second preference vote two points and a third preference one points, and a fourth preference no points. Counting the votes like this tells us which futures are most acceptable to the greatest number of assembly members.

Figure 4: Possible futures

How much do you agree or disagree that each of the possible futures should be part of how the UK gets to net zero? (%)



The results of the first vote suggest that assembly members would be happy for all four of these ways of making change happen to play a role in helping the UK get to net zero. **80% of assembly members 'agreed' or 'strongly agreed' that each of the futures should play a part.** There were slightly higher levels of strong support ("strongly agree") for 'local solutions' and 'government investment', with 'market innovation' receiving the lowest levels of strong support.

Figure 5: Possible futures

Please rank the possible futures in order of preference

(% 1st preference votes)

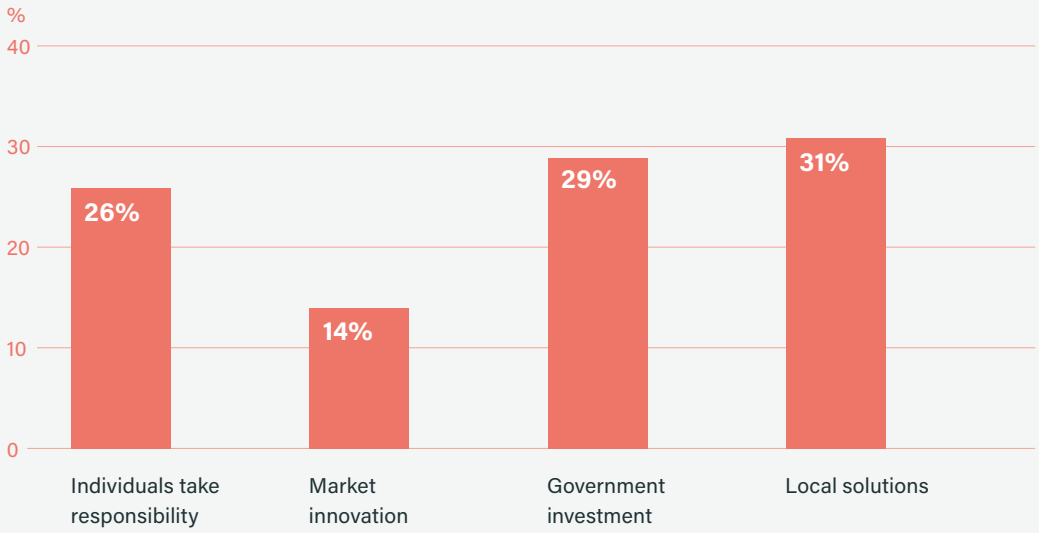
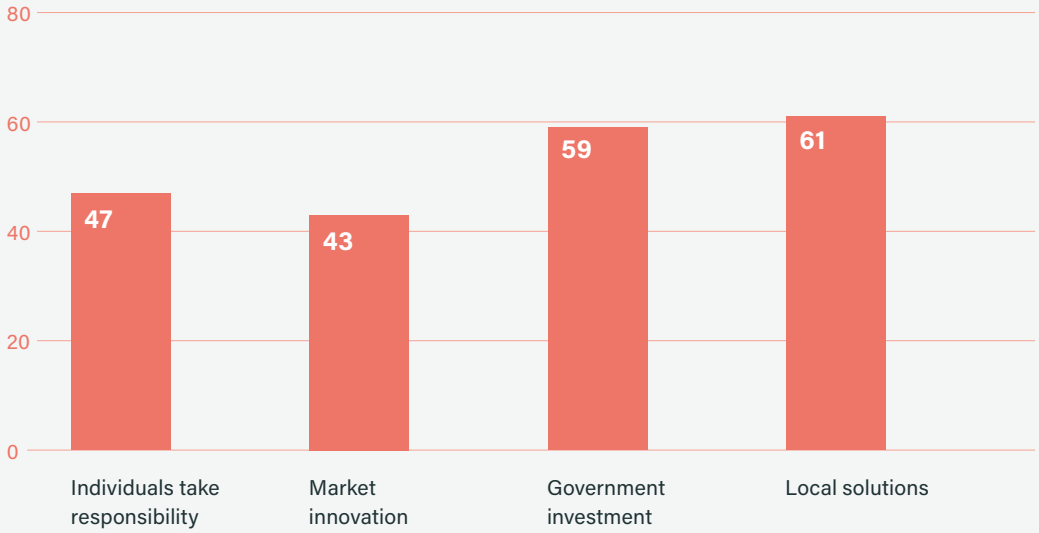


Figure 6: Possible futures

Please rank the possible futures in order of preference

(Borda count)



The second vote confirmed these preferences. 'Local solutions' and 'government investment' received the most first preference votes and highest Borda count scores, followed by 'individuals take responsibility'. 'Market innovation' was a little way behind the other options, particularly in terms of first preference votes.

One assembly member commented:

> “I think that the best solution is actually a combination of them all. We need government investment and regulations to force the change and make it available. The solutions need to be considered on a local level to incorporate the different needs/resources there. Then the individual can make a decision on what is available to them. Market innovation alongside this could allow for a wider range of options and collaboration.”

Futures – conclusions

Assembly members backed a combination of ways to create change in heat and energy use in the home. **80% of assembly members ‘strongly agreed’ or ‘agreed’** that each of **individual responsibility**, **market innovation**, **government investment** and **local solutions** should be part of how the UK gets to net zero. Assembly members were particularly positive about ‘government investment’ and ‘local solutions’. They suggested that government investment would mean a co-ordinated plan, with quicker change and clear standards, among other benefits. They felt that local solutions would result in plans tailored to local needs, and that they would benefit the local economy and facilitate better engagement with local communities.

‘Market innovation’ tended to receive slightly less support across the votes, with assembly members expressing concerns about potential company behaviour.

E. Policy options

After considering how to make change happen in general terms, assembly members moved on to consider what specific policies that might involve. They looked at policy options in five areas:

- Information;
- Fairness and consumer protection;
- Standard setting;
- Incentives;
- Roles and powers.

For each of these areas, the Expert Leads recapped and explained potential policy ideas. Assembly members discussed these options in their groups before voting by secret ballot. They were also able to note suggestions for additional measures.

We start by presenting the rationale for their views, taking each policy option in turn.

E.1 Information

Assembly members looked at four options around information:

- Carbon MOTs for houses;
- Information and support provided by government;
- Information and support funded by government;
- Information and support funded by private companies.

Jump to the vote results on page 207

Carbon MOTs for houses

This would involve each home having a test every few years to see what improvements could be made to reduce its energy use (e.g. draught proofing, better insulation, heating upgrade). It would be carried out by independent assessors.

Assembly members identified the following pros and cons about carbon MOTs for houses.

Pros

+ **Useful for selling/renting property** – some assembly members suggested Carbon MOTs could be "useful if selling [a] house" or "useful for prospective tenants and rental property." Others noted that they "could be adapted as a scale to add value to [a] home in selling."
+ **Awareness of issues and improvements** – some assembly members said it "can make people aware [of] defects / improvements" or that a "compulsory MOT will help identify [the] minimum improvements required to achieve net zero."
+ **Tailored advice** – some assembly members felt it "could provide more specific / tailored solutions and pricing", a "specific, personalised assessment and advice for [your] home", or "personal advice suitable to your house rather than general [information] that you have to relate to your situation." Some suggested it "provides a clear cost estimate ... helping homeowners budget accordingly (advisory)."
+ **Helps with funding** – some assembly members said it "simplifies [the] process of applying for funding" or "acts as an evidence base for financial support."
+ **Quick to implement** – some assembly members suggested that it "could be implemented straight away" or that we "already have trained energy assessors to take up the role."
+ **Jobs** – some assembly members felt it would "provide jobs!" or be an "opportunity for jobs."
+ **"Landlords will face more pressure to ensure properly-insulated homes"**
+ **"Identify trends/patterns in existing houses to be rectified"**
+ **"Would be good to get independent advice (voluntarily)"**

⊖ Cons

- **Ineffective and stressful** – some assembly members questioned "would 'failing' the MOT mean you must fix it or [is it] advisory? If ...[it's only advisory], what's the point?" Others asked "what happens if you fail?" or "will there be follow up checks – will there be consequences if work not done / haven't met standards?" Some said it "could cause stress knowing that your house is not suitable." Others asked "would it affect [people's] ability to sell [their] house?"
- **Compulsory and punitive** – some assembly disliked that it was "compulsory not voluntary" or said it amounted to "big brother government interference." Others described it as "punitive – could result in more regulations, costs and fines", or said "MOT is the wrong word to use – conjures up 'regulation' not advice." Some said it "could end up penalising homeowners... need to focus on using incentives (carrot not stick) such as lower council tax."
- **Difficult to enforce and implement** – some assembly members said it would be "difficult to police and enforce", or "difficult to implement." Others asked "what happens if homeowners refuse to have [the] MOT done?"
- **Invasion of privacy** – some suggested it was an "invasion of privacy" or that "some people may find it invasive?" Others said there could be "resistance to strangers entering homes, especially [from the] elderly."
- **Potential costs to individuals and households** – some assembly members worried about the "cost of MOTs." Others said "some people will face huge costs – not everyone can afford it" or queried "who pays – low income families cannot afford." Some people said that "people may not be happy to pay."
- **"Waste of money"**
- **"If funded through taxation not everyone would contribute"**
- **"Resistance to a new scheme people do not know about"**
- **"Very labour-intensive (28 million homes to inspect!)"**
- **"A house is not a car"**
- **"Cat flaps, pets?"**

Some assembly members said they would only support this policy if it was a "single MOT once [and] only advisory!" Others said it would need to "tailor results to personal situations. Not everyone should be forced to take the fastest option to reach net zero." Similarly others said there would need to be an "allowance for special situations" or queried "are required improvements compulsory, especially in rented accommodation." Some assembly members said it would need to combined with "government funding." Others said work would need to go into ensuring that MOT assessments are "genuine and honest."

Information and support provided by government

This would involve the government running an information campaign to tell householders and landlords how they could make their homes zero-carbon and who can help them.

Assembly members identified the following pros and cons about this policy option.

⊕ Pros

+ **Trustworthy** – some assembly members suggested government is "unbiased as they are not making profits from the solutions" or that "information from government shouldn't be profit led." Others felt it would be a "trusted source of information – i.e. [it would] direct [you] to reputable sites and companies." Some noted that "Government has access to advice."
+ **Carries more weight** – some assembly members said that "people [are] likely to take note of information given by the government" or that it "carries more weight."
+ **Cheap and no direct costs to consumers** – some assembly members felt it would be "cheap" or "relatively cheap to run." Some noted it would be "paid for out of [the] public purse – no direct cost to consumers."

+ **Clear, uniform and accountable** – some assembly members liked the idea of a "uniform message for country." Some said it would be "clearer from government" or that "if [it] comes from government, it comes from one voice (accountability)."
+ **Access to information** – some assembly members said there would be a "constant reminder", "more varied information" or that information would be "easily available."
+ **Effective and fair** – some assembly members said it "could be extremely effective if it's a good campaign (multiple services)" or that "if controlled by government they can provide subsidies and best solutions" and they "can't go bankrupt like private companies." Some said "government can offer fair incentives to all."

⊖ Cons

– **Information is too general** – some assembly members disliked that the "information given is more general and less specific for individual homes" or worried that the "information provided could be too generalised." Some suggested that the "government could provide [a] one-solution-fits-all approach which doesn't meet the needs of everyone" or that people "might not be able to relate [the information] to [their] actual personal situation."
– **Lack of trust in information** – some assembly members suggested that government "can be accused of scaremongering", that there is a "lack of trust in government" or a "fear of misleading information." Others said it could feel like "'Big brother' i.e. public perception of being told what to do."
– **Ineffective** – some assembly members said that "people will not listen to advice", "a lot of people just wouldn't listen or care" or that there is "no incentive for people." Some said it would be "ineffective if it's a bad campaign" or "might not reach everyone."
– **Vested or party interests** – some assembly members worried about "party influence on [the] information provided" or the "possibility of information being influenced by vested interests."
– **"Paid for by taxes"**

Some assembly members said that they would want to see a "consistent campaign" or that they would want the information provided to include details of agencies that could provide advice on the work to be done.

Information and support funded by government

This would involve information and support funded by government, but run by an independent organisation such as Citizens' Advice. The government would pay this organisation to run an information campaign that tells householders and landlords how they could make their homes zero carbon and who can help them.

Assembly members identified the following pros and cons about information and support funded by government.

⊕ Pros

+ **Independent advice** – some assembly members felt that "people might listen to an independent organisation more", or liked that it would be "independent advice" or "independent info – should be able to trust impartiality." Others suggested it would be "clear of party politics" or "unbiased because not working for the profits." Some said that "people trust C.A.B. [Citizens' Advice Bureau] + charity organisations" or trust "C.A.B. and energy saving trust [because they have] no vested interest."
+ **Access to up-to-date and constant information for everyone** – some assembly members liked that you "can be made aware of incentives and offers/options" or that it would be a "constant presence (across governments etc)." Others said it would be "good for everyone to have access to information."
+ **Effective** – some assembly members felt it "could be effective if people use it and they're encouraged to seek the help" or "could be very effective if it's a good campaign."
+ **Locally provided** – some assembly members suggested it "can be provided locally" or could be "widespread...in local areas."
+ **"Still individual choice"**
+ **"Place to complain about issues and get information – give consumers a voice"**

⊖ Cons

– **Funding** – some assembly members worried that it "may have insufficient funding" or that "funding by government may be cut (not consistent across governments)." Some said that "priorities must change over time – due to cuts."
– **Costs more** – some assembly members suggested it would be "more expensive / ineffective to outsource [the] campaign rather than [run it] through government" or that it would "cost slightly more."
– **Lack of trust if not coming from government** – some assembly members felt it "would be difficult to get a trustworthy organisation" or said "some may feel they can trust the government more than a company." Others worried about "lobbying to get [the] contract", or that the organisation running the campaign "might fund research which is biased or ideological" or "may provide selective information not all (unless asked directly)."
– **Individuals may ignore it or not be aware** – some assembly members said that "people might not be inclined to listen and take action" or that "as not from the government, people may ignore the information." Some said that "people may be unaware of [the] organisation", that there's a "lack of awareness of this type of organisation" or that it's "hard to encourage people to seek the advice – especially if it's [the organisation or campaign] unknown."
– **"Could be overburdened with information"**

Some assembly members said they would want it to be an "equal service for everyone", with "information provided regularly." Some said that "all information needs to direct to support – funds / loans may not be clear." Others said their support was conditional on "funding [for] Citizens' Advice", or a "mix of funding (companies and government)." Some commented that "legislation for private housing is generally efficient…."

Information and support funded by private companies

This would involve information and support funded by private companies through energy bills and run by an independent organisation such as Citizens' Advice.

Assembly members identified the following pros and cons about this policy option.

⊕ Pros

+ **Independent, non-profit, credible and knowledgeable** – some assembly members suggested that it "may provide [an] opportunity for independent personal advice." Others said they liked the "independence of [the] organisation [doing] delivery" or that these "organisations are non-profit – no incentive to do anything else / rip consumers off." Some felt there would be "confidence from [the] public in credible sources providing data" or that "they have knowledge and expertise to offer this service." Others said "it is essential that any information and advice given by any organisation is independent and free and correct."
+ **Saving money** – some assembly members suggested that people "could save money – good advice" or that there would be "more incentives and offers."
+ **Scale (constant and widespread)** – some assembly members felt there would be a "constant presence (across different governments etc)" or that it could be "widespread in local areas."
+ **Funding** – some assembly members liked that "everyone contributes to the funding of it" or said that "they [private companies] have the funding to run the initiative."
+ **"Place to complain about issues and get info – gives consumers a voice"**

⊖ Cons

– **Potential bias** – some assembly members said there is a "chance private companies could influence the organisation", that "private company vested interest [is a] concern" or that "the private companies are run for profit and won't have the best interest of their consumers at heart." Some said that "private companies develop their own technology, rather than a fair view of other options", that they are "biased towards their own services" or that there would be "bias towards commercial interests / products." Similarly others said that they "may be biased recommendations favouring certain products, ways and companies", that they would be "perceived to be biased" or that they would use "their expertise to present the info in a way that will encourage you to spend money unnecessarily."

- **Poor delivery and lack of resources** – some assembly members suggested that "methods of delivery might not be good" or that there might be a "lack of expertise to provide subject matter information." Others worried there would "not [be] enough advisors to cover demand" or that "accessibility and organisation may be impaired due to lack of funding."
- **Increase in energy bills** – some assembly members disliked the "increase in energy bills" or said that it's "not good for energy bills to go up before anything is done – bills are already too expensive." Some said "if run by private companies – could potentially lead to price fixes and higher bills."
- **Ineffective** – some assembly members said it's "hard to encourage people to seek advice", that there is a "lack of awareness of this type of organisation" and that this policy involved "no compulsion."

Some assembly members asked "can the higher energy bills be paid for by companies (profits) rather than the consumer."

Vote results

Assembly members voted by secret ballot on policy options around information. There were two ballot papers. The first ballot paper asked assembly members how much they agreed or disagreed that each policy option should be part of how the UK gets to net zero. The second ballot paper asked them to rank the options in their order of preference. The votes from this second ballot paper were counted both in terms of first preference votes and via Borda count.

A clear majority of assembly of assembly members 'strongly agreed' or 'agreed' that three of the policies should be part of how the UK gets to net zero. In order of overall levels of agreement, these were:

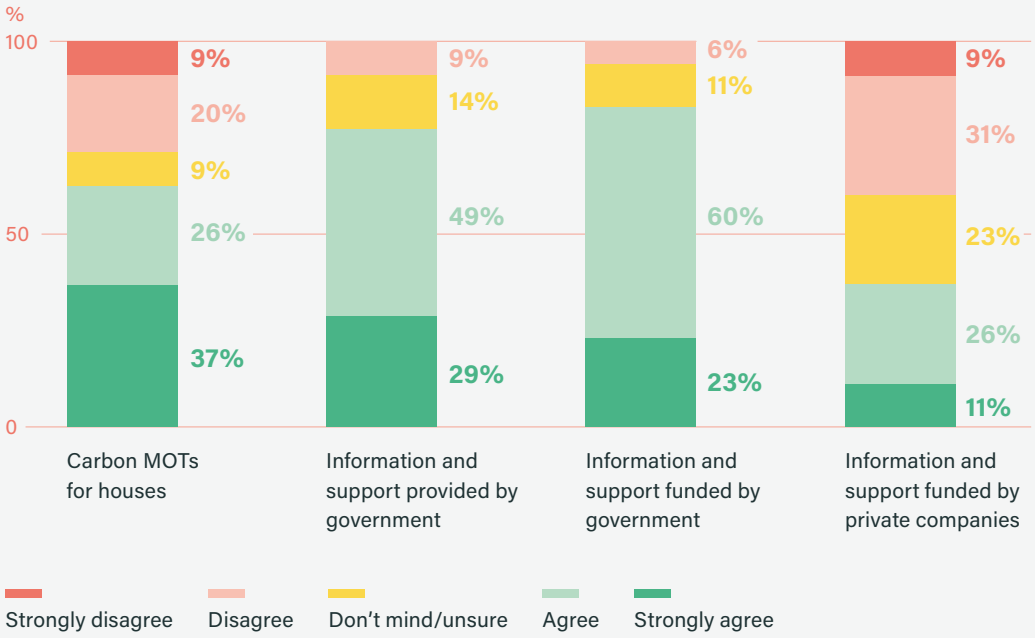
- Information and support funded by government (83%);
- Information and support provided by government (72%);
- Carbon MOTs for houses (63%).

More assembly members 'strongly agreed' with carbon MOTs for houses (37%) than with the other two options they viewed favourably (29% and 23% respectively).

Only 37% of assembly members supported the idea of 'information and support funded by private companies.' A greater percentage (40%) 'strongly disagreed' or 'disagreed' that it should be introduced.

Figure 7: Information

How much do you agree or disagree that each of the following policy options should be part of how the UK gets to net zero? (%)



The ranking votes largely reinforced the results of the first vote. Carbon MOTs for houses was the most popular policy in terms of first preference votes, possibly reflecting the higher levels of 'strong support' for it in vote one. In the Borda count all three options supported by a majority of assembly members in the first vote scored well. 'Information and support funded by private companies' remained the least popular option by some distance.

Figure 8: Information

Please rank the following policy options in order of preference

(% 1st preference votes)

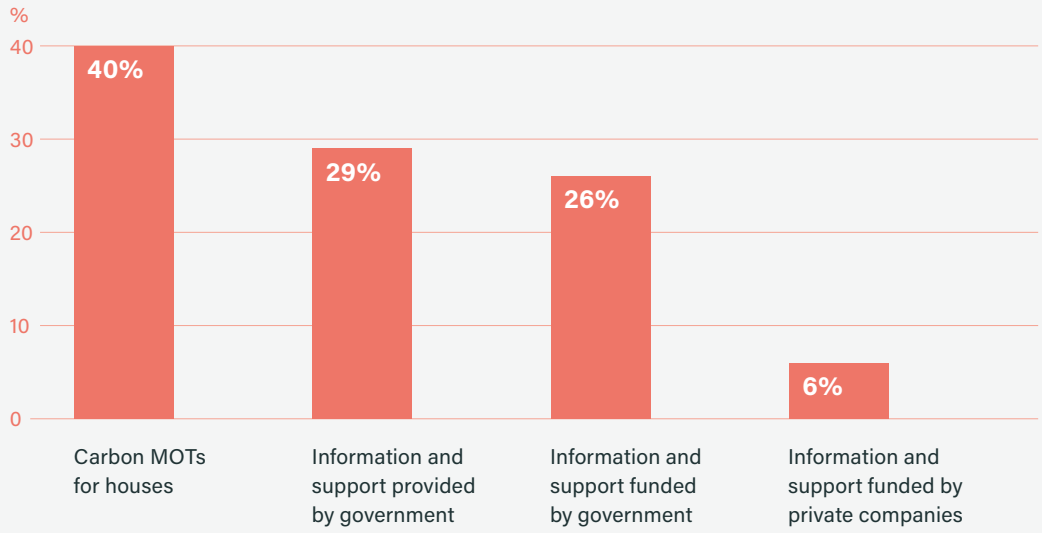
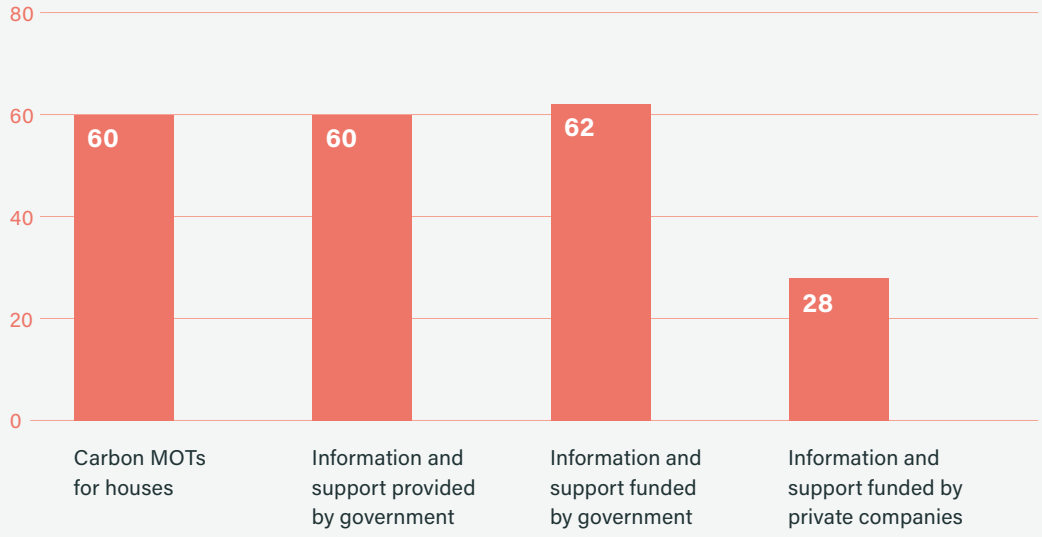


Figure 9: Information

Please rank the following policy options in order of preference

(Borda count)



E.2 Fairness and consumer protection

Assembly members looked at two pairs of policy options and one standalone policy idea around 'fairness and consumer protection.'

Assembly members started by considering whether they preferred to 'raise money through adding to all householders' energy bills' or to 'raise money through taxation and government borrowing.' They then looked at whether there should be 'government help for everyone' or only 'government help for poorer households.' Finally they examined whether or not there should be 'simpler consumer protection measures.'

Jump to the vote results on page 217

Raise money through adding to all householders' energy bills

This would involve raising some funding for energy efficiency improvements through adding an additional charge to gas and electricity bills.

Assembly members identified the following pros and cons about this policy option.

Pros

+ **Everyone pays** – some assembly members liked that "everyone pays" or "every household pays."
+ **Fair** – some assembly members felt it is "fairer because everybody pays for the energy that they use" or "fair because it is like paying for improvements."
+ **Money can be ring-fenced** – some assembly members liked that the "funds are more specific", that you "can raise funds specifically targeted at [the] project" or that it "keeps the money in a separate pot – ring-fenced."
+ **"Will drive efficiency as you're paying for your energy"**
+ **"Easier to monitor (tax evasion) can't falsify energy bills"**
+ **"Some willingness to pay"**
+ **"Simple way of raising money for improvements"**
+ **"Save money when using less energy in summer months"**

Cons

– **Impact on certain groups, including those with low incomes** – some assembly members disliked that there would be a "larger impact on poorer people" or that "people on low incomes will pay more" compared to other options. Others said it "could be unfair towards those of lower income" or that "low income families cannot afford any increases." Some suggested that "people who need most heating (e.g. the vulnerable) will pay the most", or that the "wealthiest / those with multiple homes who holiday frequently may end up paying less."

– **Tenants paying for improvements to landlords' properties** – some assembly members suggested this policy would mean "tenants paying energy bills to add efficiency improvements to landlords' homes" or that "renters pay extra but landlords may get [the] benefits if [the] house qualifies for support."

– **Penalising certain homeowners** – some assembly members said "people with energy efficient homes will pay … no benefit to them" or that "people with fully electric homes will be penalised."

– **Money goes through energy companies** – some assembly members queried "how [to] guarantee money goes towards improvement funding and not profits for energy companies", said there would be "no transparency on where money is spent" or that there "would need [to be] clear criteria for how the money is used." Others disliked that the "money goes directly to energy suppliers, not the government" or commented that "energy companies already have too much money and they should be reinvesting profits instead of consumers paying increased bills."

– **Cost** – some assembly members said that "bills are high enough already", that it "may be too expensive" or that "it's like another tax."

– **"A lot of people would find it hard to understand how higher energy bill = more effective"**

Raise money through taxation and government borrowing

This would involve the government using public money, raised through taxation, to fund some energy efficiency improvements. The government could also borrow money.

Assembly members identified the following pros and cons about this policy option.

⊕ Pros

+ **More proportional** – some assembly members said "it's more proportional to income so fairer", that "proportional pay[ing] will help lower earners" or that people with "bigger houses using more energy are often more affluent and [would] pay more tax to fund the energy efficiency." Some said "there is an underlying principle of fairness in that employed people must pay for those that won't want to pay."
+ **"Everyone pays in"**
+ **"People who don't pay tax still get the same benefit as others"**
+ **"Will help landlords and tenants"**
+ **"Already know how to collect tax (who to increase)"**
+ **"Tax [is a] good method to raise the money [and a] good use of the government"**
+ **"Paid for over a long time"**
+ **"Easier for government to disguise as increase in tax"**

⊖ Cons

– **Doubts over how money is spent** – some assembly members said there is "no guarantee [that the] money raised will be used for [this] specific purpose" or that "no government taxes are ring-fenced." Others queried "will all funds be used for cutting carbon or used on other projects", "will taxes raised directly fund the solutions" or "who decides how the money is distributed."
– **Unfair** – some assembly suggested it was "unfair because tax is avoided by higher earners! (employ accountants!)" or noted that "not all earners pay – tax avoidance loopholes used." Others felt it is "unfair for people who work to have to subsidise those who do not." Some said "high earners with energy efficient homes lose out as they pay more and get nothing back" or that there would be "no benefit, but extra cost for households that have already decarbonised privately so they are paying twice."
– **Tax is unpopular** – some assembly members disliked that it's an "increase in tax." Others felt it would be an "unpopular method", that "any tax increase is unpopular – and a 'vote loser'" or that "some people won't be happy."
– **Cost** – some assembly members said "it's going to be a massive amount of money" or that it "may be costly for both public and government."
– **"More bureaucracy"**
– **"Each house could receive only a small amount, too little to carry out any work"**

Some assembly members noted 'conditions' that they would want to see in place for this policy to be implemented:

- **Everyone benefits** – some said we "wouldn't mind paying more taxes if we're all getting the free improvements or the same percentage";
- **Tax loopholes closed** – some asked for "work to close all tax loopholes (business and individuals)";
- **Ring-fence the money** – some said "we would want the money to be ring fenced" or that the money should go into a "pot…[with] clear criteria for use";
- **Time-limited** – some asked for "a time limit on the taxation – till the problem gets solved";
- **Use money saved by EU exit** – some assembly members said the government should use the "money saving from [the UK's] European Union exit" instead.

Government help for everyone

This would mean that everyone could get help to fund improvements to their home, regardless of income.

Assembly members identified the following pros and cons about this policy option.

⊕ Pros

+ **Simple and quick** – some assembly members suggested it is "simple and easy to allocate", "would be much simpler [as] no means testing" or that it "might speed up the process because the government can just get it done."
+ **Universal help** – some assembly members liked that it is "universal", or that "ALL who need will be helped." Others noted more specifically that it "doesn't discriminate against location / inherited homes" or that the "the middle classes would benefit – they wouldn't miss out."
+ **People more likely to make the changes needed** – some assembly members felt people would be "more willing to make change because it's offered by government", that it "will ensure changes are done – people need encouragement not based on income/finances" or that "people have a huge incentive to make the changes." Others said "this prevents folk from opting out – they wouldn't want to opt out – 100% compliance."
+ **"Could work well with other reforms"**

⊖ Cons

- **Everyone gets the same even if they don't need it** – some assembly members disliked that it's "not means-tested so individuals who can afford to do repairs still claim funding", or that it's "subsidising house owners that can afford the changes." Others said that "some people can afford to do the work themselves", or that "people feel higher earners can pay [their] own way – may seem unfair." Some labelled it "regressive (could help rich people more)" or commented that "money [is already] wasted on free bus travel and fuel payments to people who don't need it."
- **Borrowing is a bad idea** – some assembly members said that "borrowing ties up government funds" or that "borrowing to finance changes is high risk and bad for [the] economy." Others suggested there are issues around "intergenerational fairness – government borrowing paid off by future generations."
- **Costs and their implications** – some assembly members said it would involve "high costs" or that it is "costly to provide services to everyone." Some commented that it's a "huge cost to cover everyone so [would need] more taxes to fund [it]." Some suggested that "funding may be cut in other areas to allow the outlay...."
- **Unfair on those who have already made the changes without help** – some assembly members felt it would be "unfair to those who have already made home improvements." Others noted that "some people may have done [the] work needed and end up losing out" or that there is "no benefit to those who have already decarbonised, but [they will] still [be] expected to fund others' decarbonisation."
- **Not all houses are the same** – some assembly members commented that "not everyone's houses are the same size" or that "not everyone's house needs [the] same level of work." Some felt this option would be "taking away personal preferences – not all homes are the same."
- **"Might overwhelm providers of services/upgrades"**

Some assembly members noted 'conditions' that they would want to see in place for this policy to be implemented:

- **Funding cap** – some assembly members suggested that we "cap the amount of help so that it costs less for government" or that it "could have a ceiling cap – to minimise the burden on government money";
- **Vary the help** – some assembly member suggested that "some people could get more help than others if it is determined by income" or that we need to "set standards/ guidelines [that] can be applied to ensure equity in [the] help provided."

Government help for poorer households

This would mean households on a lower income and/or who have high energy costs ('fuel poor') getting help to fund improvements to their home.

Assembly members identified the following pros and cons about this policy option.

⊕ Pros

+ **Targeted help for the most vulnerable** – some assembly members liked that it would "help the vulnerable", is "helping the most vulnerable" or is "targeted assistance for poorer households." Others approved of the "focus on supporting low income households" or on "providing a better service for 1 group of people (poorest)." Some said it would "hel[p] health and those who couldn't otherwise do it" or conversely that "households that can definitely afford [to do it] don't get government money."
+ **Less cost to government** – some assembly members liked that there is "less cost to government overall" or "less cost to government as helping less households."
+ **Lower costs to individuals/households** – some assembly members said it would mean "less tax" or "will decrease bills."
+ **"Create jobs in low income areas"**
+ **"Could work well with other reforms"**
+ **"Right way to do things"**

⊖ Cons

– **Misses people who need help** – some assembly members asked "what about the middle income (class) earners who currently struggle to pay bills" or said "middle folk – mid income folk will miss out." Others said it's "not taking into account other factors e.g. disability could disadvantage some" or "people with the lowest income may not be the neediest."
– **Public feeling** – some assembly members suggested that the "public may feel it's not fair" or that it "could cause resentment in people who can't afford to make similar improvements."
– **Limits change –** some assembly members wondered if people would be "discouraged to move forward if they cannot get assistance?" or said there would be "no incentive for people who don't receive funding to make improvements." Some commented "this is a national priority so why restrict the support."
– **Issues around landlords/tenants** – some assembly members suggested that "landlords may not spend the money fairly" or that it "could allow landlords to get support if their tenant is poor."
– **Stigmatising for the poorest** – some assembly members worried that it "could stigmatise" or that it would "stigmatise poorer homes."

- **"Not realistic"**
- **"Funding could be via taxation again high earners/ tax payers lose more"**

Some assembly members noted 'conditions' that they would want to see in place for this policy to be implemented:

- **Think through implications for landlords and tenants** – some assembly members said we "need to figure out who pays if [it's a] landlord/renter situation, and [the] impact of this." Others said it "should be for house owners not households – rented should be via [the] landlord as [it's about the] owners' not renters' income." Some felt that "with new rules and legislation putting the onus on landlords it may increase rents."
- **Criteria** – some assembly members talked about the need to define clear criteria for support or made suggestions for what these should look like:

> "How is 'poor' defined? Is there a means test? How to regulate this?"

> "Who sets the criteria for assistance"

> "Scales of help so that people with middle income can be included too but less"

Simpler consumer protection measures

This would involve the government reviewing current rules on consumer protection to make them simpler and more effective. There are currently lots of separate sets of rules, covering different aspects of energy (such as supplying gas and electricity, or fitting boilers), as well as products and services linked to energy (like building regulations). This can make it difficult for people to know who to turn to if something goes wrong.

Assembly members identified the following pros and cons about simpler consumer protection measures.

⊕ Pros

+ **Makes things easier** – some assembly members suggested simplification would make the rules "easier to understand and apply", would "reduc[e] confusion re: rules / standards" or would "mak[e] life easier."
+ **Proactive problem-solving** – some assembly members suggested that "more understanding leads to proactive action" or that it "would enable problems to be fixed quickly."
+ **Consumer protection** – some assembly members felt it would ensure "those in vulnerable positions are protected" or boost "consumer confidence and protection."
+ **Centralised responsibility** – some assembly members suggested it "gives government responsibility", that it "would be good to have centralised protections for consumers" or that there would be "less onus on consumers to take action."

+ **"Could work well with other reforms"**
+ **"Can develop as things change to improve rules"**
+ **"Imperative, as this is a national priority"**

⊖ Cons

- **Less effective** – some assembly members suggested that "making measures simpler could make them less effective" or that we "don't want to oversimplify (regulations are often necessary)." Others felt there would be "more opportunity for abuse" or that "loopholes could be exploited due to oversimplification." Some highlighted a "need to maintain protection against digital companies misusing consumer information."
- **Impractical** – some assembly members said it would be "difficult to set-up", "could be difficult to set up?" or "might take time to implement." Others asked "who enforces [the] new rules?"
- **Would people use it?** – some assembly members queried "are consumers aware of the recourse they have to support if things go wrong." Others said it would mean "more changes to learn about" or that it "may not seem necessary enough to act [in a] timely [way]."

Some assembly members suggested that consumer protection measures "nee[d] clarification rather than simplification for consumers." Others noted a need to think about any "funding implication."

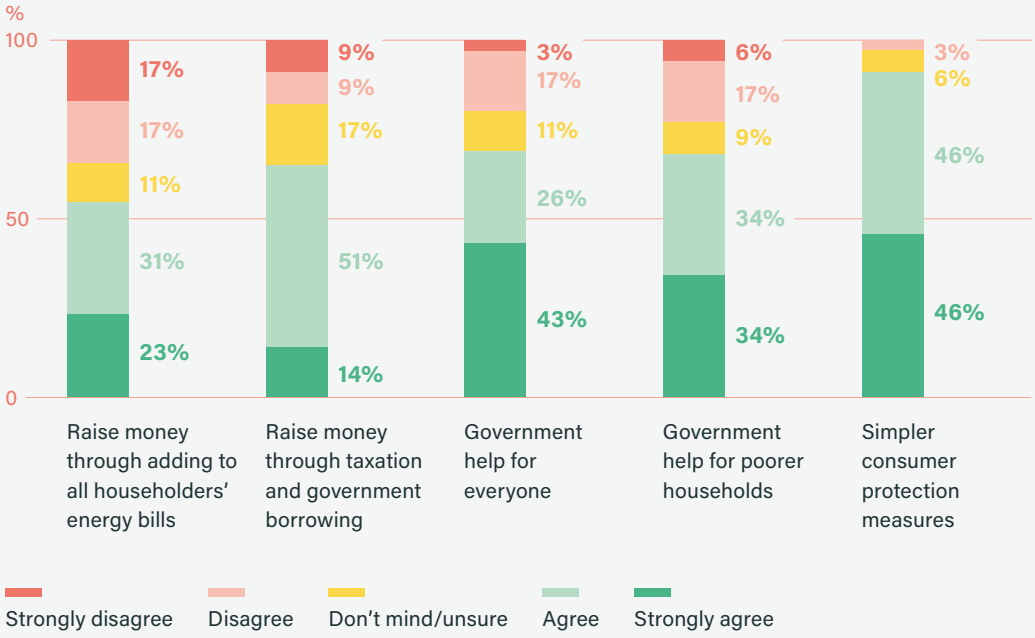
Vote results

Assembly members voted by secret ballot on policy options around fairness and consumer protection. There were two ballot papers. The first ballot paper asked assembly members how much they agreed or disagreed that each policy option should be part of how the UK gets to net zero. The second ballot paper asked them to rank two pairs of options:

- 'Raise money through adding to all householders' energy bills' versus 'raise money through taxation and government borrowing';
- 'Government help for everyone' versus 'government help for poorer households.'

Figure 10: Fairness and consumer protection

How much do you agree or disagree that each of the following policy options should be part of how the UK gets to net zero? (%)



A majority of assembly members supported all five policy options. However the extent of their support varied:

- 92% of assembly members 'strongly agreed' or 'agreed' that 'simpler consumer protection measures' should be part of how the UK gets to net zero, with nearly half (46%) strongly agreeing;
- Very similar numbers of assembly members supported 'government help for everyone' (69%) and 'government help for poorer households' (68%). However of the two, more *strongly* supported 'government help for everyone' (43% compared to 34%);
- Overall more assembly members supported 'raising money through taxation and government borrowing' (65%) than 'raising money through adding to all householders' energy bills' (54%). However 'adding to all householders' energy bills' received more strong support (23% compared to 14%). It was also more controversial: 34% of assembly member 'disagreed' or 'strongly disagreed' that it should be part of how the UK gets to net zero, compared to 18% for 'raising money through taxation and government borrowing'.

The preference voting shed additional light on assembly members' views:

- It reinforced assembly members' slight preference for 'government help for everyone' over 'government help for poorer households';

- It suggested that when faced with a straight choice between the two, slightly more assembly members preferred 'raising money through adding to all householders' energy bills' than 'raising money through taxation and government borrowing.'

Figure 11: Fairness and consumer protection

Please rank the following policy options in order of preference (% 1st preference votes)

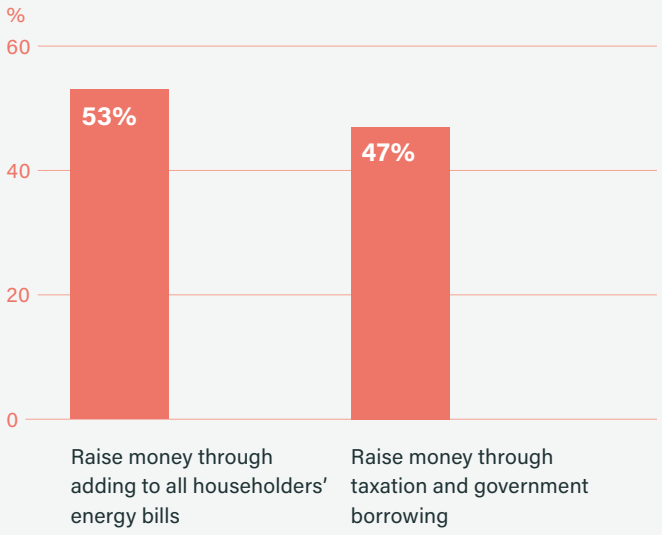
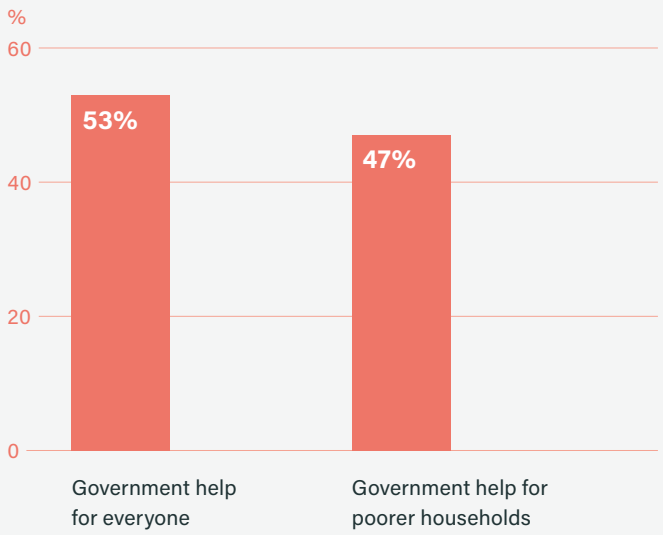


Figure 12: Fairness and consumer protection

Please rank the following policy options in order of preference (% 1st preference votes)



E.3 Standard setting

Assembly members looked at three options around standard setting:

- Ban sales of new gas boilers;
- Changes to product standards;
- Requirements for selling and renting.

We start by presenting the rationale for their views, taking each policy option in turn.

Jump to the vote results on page 227

Ban sales of new gas boilers

This would involve the government announcing a ban on the sale of new fossil fuel gas boilers. The ban would come into effect in 10 or 15 years time (2030 or 2035).

Assembly members identified the following pros and cons about this policy option.

Pros

+ **Encourages innovation and better technology –** some assembly members said it "influences industry to innovate", that it will "encourage [the] market to develop and research new products" or that "it is a deadline that is going to speed [up] innovation." Others said it "will encourage innovation as companies know demand will go up" or that "the more time will produce better technology."

+ **Time to plan** – some assembly members liked that it "allow[s] for a transition period", or that "long timescale policies [give] time to plan." Others said that "time ahead to plan timings sounds practical" or that "boilers will need replacing anyway so they can slowly switch over."
+ **Better for consumers** – some assembly members felt it would "increase awareness with consumers" or create "less responsibility for consumers to make big changes."
+ **Commitment, confidence and leadership** – some assembly members suggested "it shows commitment to the target" or "gives confidence it is being taken seriously." Others liked that it showed "government leadership enforcing action."
+ **Simple and clear** – some assembly members said it "sets out a clear picture, a clear signal" or labelled it a "simple effective solution."
+ **Will make change happen** – some assembly members liked that "it forces the change", "will make sure change happens – drives compliance", or that the change "will happen as [it's] in law."
+ **It works** – some assembly members said "it works", that the "approach has worked in the past", or that it's a "proven approach."
+ **Economy and skills** – some assembly members suggested there would be "increased business for plumbers/heating engineers" or that there could be "up-skilling of workers to be able to fit new types of boilers – long-run benefits."
+ **Cost** – some assembly members suggested it would lead to "competitive pricing as purchase guaranteed" or that it would be "cost effective."
+ **"Cleaner"**

⊖ Cons

– **Cost** – some assembly members expressed concerns about "affordability", the "financial impact" or that it "could be expensive." Some noted that "hydrogen is more expensive than natural gas so it will be difficult to convince people to change" or said "houses will need to be energy efficient or bills will be extremely high." Some talked about "cost – new things are more expensive" or suggested it "harms the incentive for competitive pricing." Some asked "who is going to pay?" or said it "will require government lending to householders."
– **Won't work in all areas** – some assembly members said it's "still not tackling the issue in areas without gas connections" or that their support was impacted by "not knowing which areas will have hydrogen networks."
– **Technology isn't ready** – some assembly members suggested it "might not work", that the "technology [is] not ready" or that the "timescale is not realistic." Some noted it "hasn't been trailed on a large scale (early shortages)" or queried "is it definitely the right option? Research needed."
– **Lack of understanding** – some assembly members said that "people may not understand what to do" or that we "need education because people might not understand about the alternatives." Others noted that "hydrogen is a scary word – don't know how it works. People are afraid of it going bang!"

- **Unpopular** – some assembly members felt it "might be unpopular" or "may alienate some people."
- **Gas boilers obsolete** – some assembly members disliked that the "gas boiler will be obsolete if gas supply is switched off" or said it "will lead to old boilers even though functional – add to waste problem."
- **"Disruption to people as houses need to be made more efficient at the same time"**

Some assembly members noted 'conditions' that they would want to see in place for this policy to be implemented:

- **Coordination** – some assembly members said we "need to coordinate when gas [is] turned off" or that we "need to make sure there is a clear plan in place for switching over." Others said we "will need coordination between hydrogen supply/heat pumps and boilers";
- **Education and information** – some assembly members said we need to "educate and inform people clearly, advertising", or that there will need to be "education in smart technology." Some said they would support the policy "as long as there is good information and plenty of warning";
- **Readiness of alternatives** – some assembly members said they would support it if "the technology is there", or if there is "an attractive alternative." Some said that "eco-friendly alternatives need to be available and affordable in time for legislation";
- **Time to implement** – some assembly members asked for "a longer transition period";
- **Enforcement** – some assembly members asked "how do we make sure that after 2030 existing boilers are quickly take out of service"? Others suggested "why not turn off all gas suppliers?" Some queried "what is the need for gas after carbon zero?";
- **Carbon capture and storage** – some assembly members said that "if [it's] blue hydrogen then [we will] need more carbon capture and storage."

Changes to product standards

There are legal standards applied to energy-using products. This policy option would involve the government strengthening these standards to make sure products are more efficient and also 'smart'. 'Smart' products are connected to the internet and the electricity grid, so that they can respond to demand on the grid. For example, a fridge might turn off if there is a short period of high demand for electricity.

Assembly members identified the following pros and cons about changes to product standards.

⊕ Pros

+ **Money-saving** – some assembly members suggested it "will save people money", will "save money in the long run", "will save energy and money" or "saves money [by] using electricity efficiently." Others said it would result in "cheaper electricity." Some talked about "purchase power over a longer period" or suggested it "should bring the price of higher rated (more efficient) appliances down."
+ **More efficient** – some assembly members liked that "products become more energy efficient", suggesting that this policy option would "encourage [the] market" to make this change. Others liked that it "increase[s] efficiency", or that it "reduces energy consumption by more efficient devices." Some said that "it is a good idea to improve standards and make products more energy efficient" or that it's "good to improve efficiency and safety standards."
+ **Will (help) create change** – some assembly members suggested it would "empower tenants to demand higher quality" or "makes [sure] landlords and house owners reach a certain standard." Some said it "tightens rules on home efficiency across the board."
+ **User control** – some assembly members liked that "owners can track usage in comparison to [the] national/local average using smart enabled devices" or said it "allows for flexible user control."
+ **No behaviour change** – some assembly members said "making smart devices removes the need of retraining people's habits" or liked "the ability for a 'chip' to make the decision for you to use cheaper electricity."
+ **Onus on manufacturers not consumers** – some assembly members liked that it "puts [the] emphasis on manufacturers to meet high standards" or that the "onus is on manufacturers not consumers to make better choices – it's easy." Some said it would have "minimal impact on consumers.
+ **Innovation and the economy** – some assembly members said it would lead to "increased innovation through demand for smart tech" or that it "encourages companies to invest in R&D to improve products." Others suggested that "if UK companies have to innovate it makes the economy more competitive."
+ **"Building on an existing system"**
+ **"Obviously good to do"**
+ **"Ease of use (using smart tech)"**
+ **"Gets rid of cowboy/counterfeit products"**

⊖ Cons

- **Data protection and security risks** – some assembly members labelled it "intrusive" or said "[I] don't want to share my data." Others said "data protection regulation currently needs strengthening", that there should be "clear regulations on data protection – big brother" or that they had "data protection concerns and [concerns about] security." Some assembly members highlighted "security issues regarding smart connections", the "risk of [a] data breach" or the "risk of hacking or IT failure compromising homes." Some assembly members suggested that "smart technology may lead to unwanted adverts."
- **Cost** – some assembly members worried about the "affordability of new products", or said the "purchase price is higher." Others said it is "expensive to repair more complex products – [you] can't do [it] yourself." Some assembly members reported that "smart tech hasn't saved …[us] money", asked "if green energy costs more how will I save money?" or expressed "concern that cost savings may not happen."
- **Not everyone is tech savvy** – some assembly members felt it "might marginalise less tech savvy groups" or noted that "'smart' products are not universally popular, especially amongst the elderly." Others said that it's "harder to understand smart technology" or talked about the "knowledge cost of using IT."
- **Safety** – some assembly member said that "making things 'smart' is a concern – if things run when you are asleep or out (e.g. tumble dryer fires)." Others queried "any hygiene/safety implementations if a fridge is too warm and can't power-up for several hours?"
- **"Punishes recent installations/those who invested in other sustainable heating"**
- **"Restricting times that smart products can be used would be unpopular"**
- **"Increased electricity demand to power all the smart tech"**
- **"Nothing forcing people to replace their efficient old products"**
- **"Like VW emissions scandal – could they claim to be energy efficient when not?"**

Some assembly members noted 'conditions' that they would want to see in place for this policy to be implemented:

- **What the standard is** – some noted that it "needs to be [a] responsible long term standard";
- **Cost** – some said they would support it "if it leads to cost savings";
- **Separate 'efficiency' from 'smart'** – some said "energy efficiency and 'smart' should be considered differently";
- **Privacy** – some said the "consumer needs to be prioritised (privacy)";
- **Education** – some noted a "need for education to use smart technology";
- **Timing** – some said "if cheaper electricity is earlier in the day, it would be safe to have 'smart' controls", or that they would support the policy "if [the] variable rate happens at different times, depending on supply and demand."

Requirements for selling and renting

This would involve a requirement for each home to reach a certain level of energy efficiency. You couldn't sell or rent a home that did not reach this level.

Assembly members identified the following pros and cons about this policy option.

⊕ Pros

+ **More efficient homes** – some assembly members liked that "houses will be more energy efficient", that "better/more efficient homes will be available" or that "homes will be more efficient if they meet the standard." Some said it "brings up [the] base level."
+ **Speed of change** – some assembly members suggested it "will speed up the overall upgrade programme", "forces homes to get more efficient" or "will force people's hand to adhere to [the] standard, making efficiency a priority." Some felt it would "phase out bad building practices" or that "it would help to reach net zero."
+ **Better for tenants** – some assembly members liked that it "forces landlords to invest in [a] house (but issue of money)", "creates a guarantee for tenants of maintenance" or "exposes/[puts] pressure on rogue landlords/builders." Some said it would make the "EPC more important for rental standards" or that it's "good for tenants... comfier house."
+ **Peace of mind for buyers and tenants** – related to the above, some assembly members felt it would "give confidence and peace of mind to tenants and buyers that properties will meet a minimum standard" or provide "re-assurance for potential buyers/tenants to see actual proof of energy efficiency." Others talked about "peace of mind for house purchasers" or said it would mean "buyers can be confident of the home." Some said it "sets [a] minimum standard – everyone can understand."
+ **Reduced bills** – some assembly members liked that it "reduc[es] bills for new owners/tenants as homes more efficient" or that "tenants save money."
+ **Health benefits** – some noted that there would be "improved living standards and health, including mental health – less stress" or "health benefits from warmer and drier homes."
+ **"New homes already meet these standards so there is a group of houses that don't require changes"**
+ **"Dynamically includes the energy efficiency of a house to its value – improvements are an investment"**
+ **"Relatively easy to add onto existing survey"**
+ **"Directly includes both renters and home owners"**

⊖ Cons

- **Those who cannot afford to make changes will be stuck** – some assembly members suggested that "people who *have* to sell, for hardship reasons, may not be able to afford to do the work to reach the standard" or that it would be "problematic for people who might need to sell due to [a] change in circumstances (can't afford to make [the] upgrade)." Some asked "what happens with social care – selling house to pay if low rating?", "what if you cannot afford to meet the requirements – may lead to [a] housing trap", or "what do you do with houses that require renovation – how do we sell." Others suggested that "poorer families may struggle to sell homes", that it requires a "financial outlay which may not be available when trying to sell", or expressed concerns about "affordability."
- **Stress and delays** – some assembly members said it "could seriously delay essential house moves" or "could cause stress to [the] household."
- **Cost to landlords / homeowners and tenants** – some assembly members said it "will put a stop to landlord income temporarily" or be an "added cost on [the] homeowner." Others said "it will put up rents", that "landlords may pass on costs to tenants" or that it will be "more expensive…as landlords try to recoup costs." Some asked "where there is a mix of rented/owner occupied housing, how could that be managed?"
- **Older properties are disadvantaged** – some assembly members suggested that "people in older properties are disadvantaged" or that the "biggest challenge [is] for older properties – may actively reduce value." Others said it "would be illegal to buy/sell old properties to renovate."
- **Shoddy upgrades or assessments** – some assembly members worried that it "could encourage 'shoddy' upgrades." Others noted a "risk of subjective home assessments" or asked "who funds the system and assessors? Where does the money come from?"
- **"People don't like investing to be able to sell"**
- **"Could have a HUGE impact on the housing market – the housing market is a big part of the UK economy"**
- **"Invasive every man's/woman's home is his/her castle"**

Some assembly members noted 'conditions' that they would want to see in place for this policy to be implemented:

- **May need different rules for different types of homes** – some assembly members asked do "listed buildings [have] different rules?" or "are listed buildings exempt?" Others queried "what about houses for redevelopment?" or "empty, derelict, or run-down homes which property developers might want to buy and do up: what happens to this part of the market?" Some said "what constitutes a 'house' (e.g. an old barn or similar)?", "what about house sales when the buyer wishes to extend?" or noted "every home is different";
- **Different types of landlord** – some assembly members suggested a "happy balance [is] needed between professional landlords and accidental landlords";

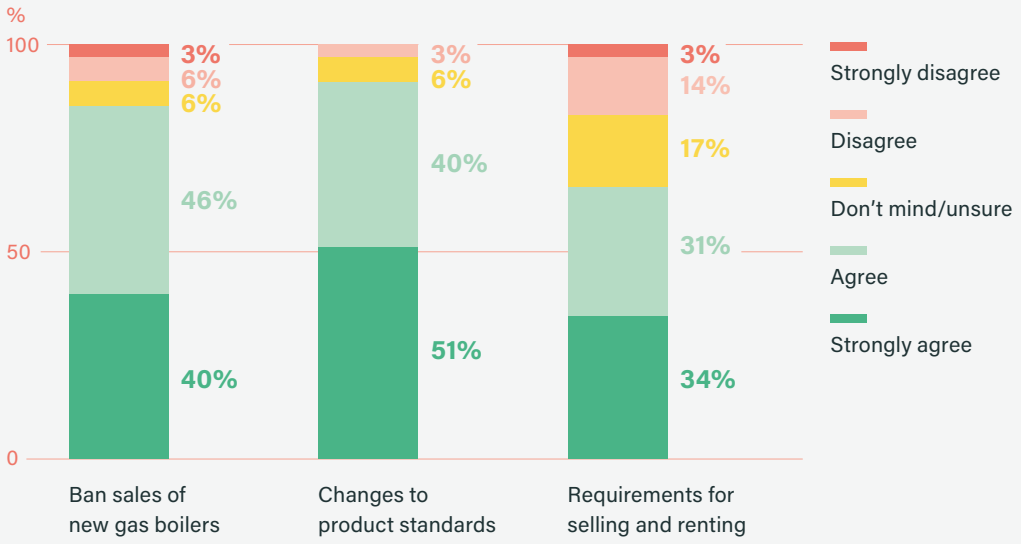
- **Quality assurance** – some assembly members asked "can it work [with the afore] mentioned 'MOT for houses'?" or said it needs "reliable assessors, like Corgi with relevant expertise." Others said we "must have guarantees that the work has been done well, linked to [a] regulatory body";
- **Who pays** – some assembly members asked "who is going to pay – will change attitudes to the question";
- **Culture shift** – some assembly members said "having a more efficient home should increase the value of a home – does this need a culture shift?";
- **Date certainty** – some assembly members said those responsible should "set a date for this to be implemented."

Vote results

Assembly members voted by secret ballot on policy options around standard setting. There were two ballot papers. The first ballot paper asked assembly members how much they agreed or disagreed that each policy option should be part of how the UK gets to net zero. The second ballot paper asked them to rank the options in their order of preference. The votes from this second ballot paper were counted both in terms of first preference votes and via Borda count.

Figure 13: Standard setting

How much do you agree or disagree that each of the following policy options should be part of how the UK gets to net zero? (%)

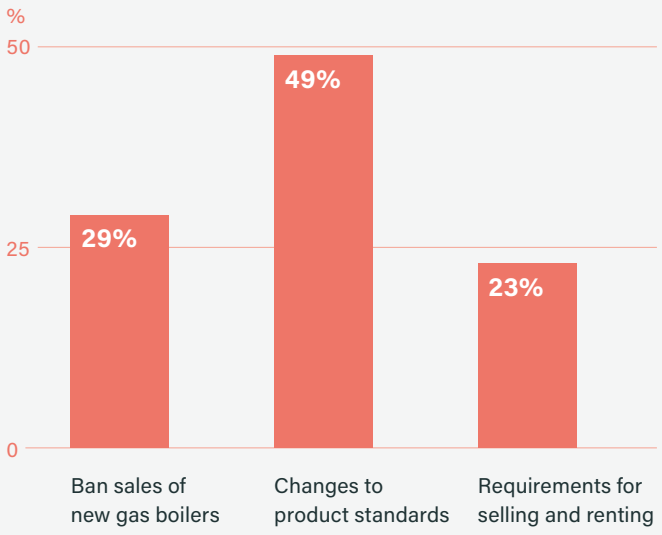


A clear majority of assembly members supported all three policy measures, with two options securing over 80% support. The percentage who 'strongly agreed' or 'agreed' that each option should be part of how the UK gets to net zero was:

- 91% for 'changes to product standards';
- 86% for 'ban sales of new gas boilers';
- 65% for 'requirements for selling and renting."

Figure 14: Standard setting

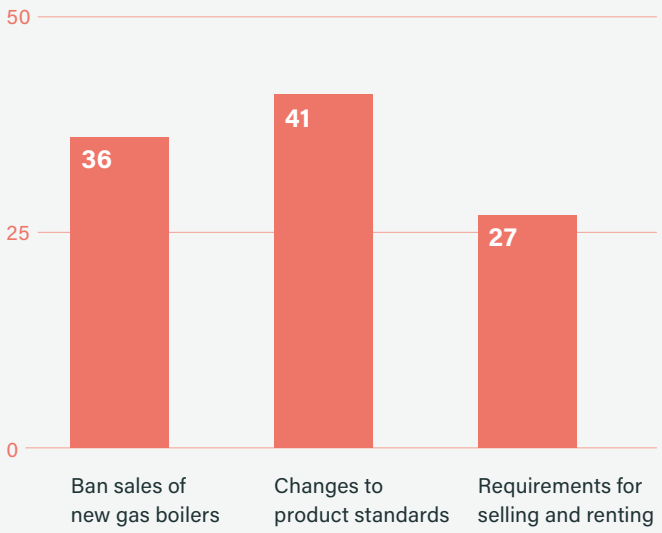
Please rank the following policy options in order of preference (% 1st preference votes)



Levels of 'strong disagreement' or 'disagreement' with 'ban sales of new gas boilers' and 'changes to product standards' were low – just 3% and 9% respectively. 17% of assembly members opposed 'requirements for selling and renting"; another 17% were unsure.

Figure 15: Standard setting

Please rank the following policy options in order of preference (Borda count)



The ranking vote confirmed the results of the first vote. 'Changes to product standards' remained assembly members' preferred option, followed by 'ban sales of new gas boilers'. 'Requirements for selling and renting' brought up the rear.

E.4 Incentives

Assembly members looked at four options around incentives:

- Changing council tax or stamp duty;
- Green mortgages;
- Government-backed loans;
- Changes to VAT.

We start by presenting the rationale for their views, taking each policy option in turn.

Jump to the vote results on page 237

Changing council tax or stamp duty

Council tax is a regular payment, while stamp duty is paid when you buy a house. The levels of either could be adjusted so that you pay less tax for a home that has lower emissions.

Assembly members identified the following pros and cons about changing council tax or stamp duty.

⊕ Pros

+ **Incentivises change** – some assembly members said it's "another measure towards pushing homebuyers or people that rent to 'greener' options", that "it will encourage people to make changes, will be an incentive", or that it "encourages home owners to improve homes to cut tax." Others said it's "good to have incentives for homeowners who have new builds" or that it "incentivises estate agents to advertise efficient homes – raises awareness of ways of improving homes." Some commented that "people can start straight away with investing and not wait (when this is in place)."
+ **Good for housing market and certain types of houses** – some assembly members said it "may reinvigorate the housing market." Others suggested that "cuts in stamp duty may stimulate sales of smaller houses" or that the "stamp duty incentive [is] good for new builds."
+ **Less tax and stamp duty is good, including for tenants** – some assembly members said it's a "good reason for reducing stamp duty!" or that "council tax benefits would be a continuous benefit." Others said that "changing council tax can help landlords and tenants" or that it's "good for tenants if [the] landlord has had to increase rent to cover home improvements – get a bit back on council tax." Some said "if you take action and have a 'green' home you are rewarded as you pay less tax."
+ **"Possible good short-term win"**
+ **"Fair for people already invested to making their house more efficient without using any future government funding"**
+ **"Could control your situation by choice of home"**
+ **"Everyone is affected not just owners"**

⊖ Cons

– **Disadvantages the less well-off** – some assembly members said it would "disadvantage homeowners who can't afford the improvements (i.e. get a loan or re-mortgage)", "would penalise the poor more than the rich" or "may marginalise [the] lower middle class from selling homes."
– **Unfair on older properties and those needing more work** – some suggested that "some homes may not be able to get to a higher level of energy efficiency so wouldn't get a tax reduction." Others said specifically that it's "taxing older properties unfairly", that "older properties [would be] disadvantaged" or that it "doesn't seem to be a viable incentive for older buildings."

- **Penalising tenants** – some assembly members worried that "tenants [would] pay higher council tax because landlords won't allow changes to [their] property" or that "low income householders / renters might have to pay more, when it's not in their control to make their home more efficient."
- **Expensive** – some assembly members noted that the "homeowner has to get [the] home to [be] energy efficient first – money for that?" or that "some homes need way more done for it to reach energy efficient...expensive... people won't do it." Some said it "it will take a long time to see the financial benefits."
- **Councils will end up with less funding** – some assembly members noted that "if it's council tax the Local Authority will have less money to spend and they are strapped for cash already" or expressed "concern that it will mean councils have less money to fund services." Others asked "would council tax tariffs change drastically" or suggested we "may end up being taxed elsewhere to make up for [the] shortfall made by council tax."
- **Complex and confusing** – some assembly members said it "won't work – much too complex", that it "could be complex to change" or that "stamp duty incentives seem complicated." Others suggested that "constantly changing parameters for efficiency may confuse home owners."
- **Negative impact on housing market** – some assembly members highlighted that "stamp duty changes might have a negative impact on [the] housing market, if prices go up" or that "house prices could go up."
- **"The buyer is penalised for the seller's inefficient home"**
- **"Would be full of loopholes and anomalies"**
- **"Would breed discontent"**
- **"Tax rises can be seen as a penalty / negative – rather than a positive for improving the planet"**
- **"Can we trust government to not use this as a money making scheme."**

Some assembly members noted 'conditions' that they would want to see in place for this policy to be implemented:

- **Protect council income** – some assembly members said they would support the policy "if the overall amount councils get in stays the same or goes up" or asked "re council tax – is there another way of using it to compensate homeowners which doesn't reduce [the] income of the Local Authority? Others said "if [the] right banding was put in place it may work."
- **Provide support** – some assembly members said they would support the policy "if all councils set aside an amount to fund climate change work, to help people who can't afford [to make their properties] energy efficient."

Green mortgages

This would involve government encouraging or requiring mortgage providers to offer 'green mortgages' at cheaper rates to people in lower carbon homes.

Assembly members identified the following pros and cons about this policy option.

⊕ Pros

+ **Works as an incentive** – some assembly members suggested it would "mak[e] more people interested in going carbon neutral", "encourages buying low carbon homes", "encourages house sellers to make homes more energy efficient" or "encourages retrofit etc so homeowners can switch [their] mortgage to a cheaper green one." Others said it is "appealing to go for a green mortgage as it is cheaper", that it's "only low level but is a positive incentive" or that "providing [a] mortgage rather than [a] loan strengthens the significance of the efficiency improvements."
+ **Stimulates green building** – some assembly members felt it "will drive a market for green homes to exist", that it "incentivises low carbon homes sale / production" or will "stimulate more 'green' building." Some commented that "all new homes should be able to qualify for a green mortgage."
+ **Helps some, including first time buyers** – some assembly members said it "could particularly help first time buyers", "could assist first time buyers" or would be "good for first time buyers." Others suggested it "could improve prospects for renters" or "would help people who want to buy their Local Authority or Housing Association rented home as [their] house [is] more likely to be a low carbon home."
+ **"Green mortgages are already being sold"**
+ **"Cheaper mortgage payments"**
+ **"Home owners prepared to bring their homes to a level 'A' should be able to claim a green mortgage"**
+ **"People may feel better not dealing with a 'government organisation'"**
+ **"Green mortgages will create jobs and employment to improve and update"**
+ **"Could apply to landlords and may reduce rent"**
+ **"They have a place and would like to see them available as a part of a wider scheme"**

⊖ Cons

- **Only helps some, and excludes tenants** – some assembly members said that "landlords may not pass on savings to tenants", or that it "excludes renters." Others said it "only supports those that buy", "only benefits the better off homebuyers" or that it is "not applicable to those who are not buying a house – covers only a fraction of houses." Some agreed saying it "doesn't help everyone – only applies to those who own their own homes", or is "only for people who own property, [a] lot of people would not benefit." Some suggested that a "lot of people's credit ratings would not qualify."
- **Timescale to see benefits** – some assembly members disliked the "timescale to see any benefits for a lot of effort" or said that "landlords would not see [a] return on [their] extra investment for many years, so [there's] little incentive for the rental market."
- **Won't work** – some assembly members asked "what incentives are there for banks [to offer]... lower rates", "how would they incentivise banks?" or said "with interest rates already so low, how will this work in practice." Others commented "only low impact – most of [the] benefit [is] likely to be absorbed by fees." Some assembly members felt it "isn't an incentive for everyone – some people want to keep [an] old style" or "other factors [are] far more important for buyers e.g. location."
- **Unfair** – some assembly members suggested that there would be a "perceived unfairness – funded indirectly by people who don't own property through [their] taxes." Others talked about "home improvements / extensions", saying "may affect eligibility for green mortgages. Therefore once [a] mortgage has been awarded, if home improvements reduce efficiency (conservatory?) you still reap benefits."
- **"Impact on sellers – if you haven't done the work to make it efficient, you can't sell to move into a greener home"**
- **"Could distort the housing market"**
- **"The cost of checking for 'lower carbon'"**
- **"It's a short-term thing because soon all homes will be efficient"**

Some assembly members noted 'conditions' that they would want to see in place for this policy to be implemented:

- Some assembly members made points about **ensuring the policy works for different groups of people**. Some said it "needs to work for existing homeowners who might be renovating their home", and others that "people's circumstances change and [those responsible should] consider [a] way to have a break paying loans back short term." Some asked "are they available to everyone (e.g. first time buyers)?" Others said they had a "question / potential concern: would 'normal' mortgages be more expensive as a result?";
- Some assembly members wanted to see a **bigger incentive**. Some suggested that those responsible should "make the value of [a] home higher if [it's] more energy efficient: would be more [of an] incentive to make improvements." Others said "if interest rates go up [it] could be more beneficial."

Others assembly members asked “who decides on qualifying homes” or suggested “a lump sum one-off payment off the mortgage because of concern about government involvement: poor experience of dealing with government.”

Government-backed loans

This would involve government working with banks or other lenders to offer loans with low or no interest. This would spread the cost of home improvements, including for energy efficiency measures and zero carbon heating.

Assembly members identified the following pros and cons about government-backed loans.

⊕ Pros

+ **Works as incentive** – some assembly members felt it “would act as an incentive”, that “low interest / zero interest will encourage take up”, that “no interest loans [are] a good incentive” or that it “could incentivise homeowners to make [the] full suite of improvements.” Some noted that you “don’t have to pay all at once if [you] don’t have all the money for improvements so more people will upgrade [their] home.” Others said it “will encourage people to take it up if [a] law [is] passed to improve standards.”
+ **Trust / confidence in a government loan** – some assembly members said that “as it would be a government scheme it would provide confidence to homeowners” or that “government backing is nice: people trust government loans.” Others suggested that it “could make taking the loan ‘safer’ (better regulated, safer provider, more focussed purposes).”

+ **"May take financial pressure off to raise funds to upgrade your home"**
+ **"You no longer have financial liability when you sell your home (a loan would stay with you)"**
+ **"Government may be able to borrow at a cheaper rate than individuals"**
+ **"Available to everyone – fair"**
+ **"Reduces the amount of research people have to do into alternative loan providers"**
+ **"May encourage increase in co-operatives / non-profits to help households become more efficient"**

⊖ Cons

– **Taxation and government borrowing** – some assembly members said they "don't agree with taxpayers' money being used", that it "could be costly to taxpayers" or will "caus[e] higher taxes to pay for it." Some suggested it "may require taxation / government borrowing."

– **Liability is against the person, not property** – some assembly members asked "what would the loan be secured against" or said there is "uncertainty [about] if [the] loan is tied to property or person." Others disliked that the "liability remains with you even after [the] sale of [the] house" or asked "what about if you sell the house but still have a loan to pay off?"

– **People could default** – some assembly members noted that "people's circumstances may change a lot over the time of the loan" or asked "what certainty is there over the period of [the] loan: can it be 'recalled' at any time?" Others said that "householders may default on loans if [they are] not structured properly."

– **Time taken to pay it off, if it's paid off at all** – some assembly members said it "may take a long time to pay off" or "may end up like student loans, poorer people can never pay." Others said it "not clear how it's going to be paid" or expressed "concern about [the] experience of student loans."

– **Not everyone can benefit** – some assembly members suggested it "only benefits the well-off", that "not everyone would be eligible" or that "not everyone will have the extra money to pay back a loan."

– **Increases debt** – some assembly members disliked that it "increases debt", or "encourages more debt."

– **Won't work** – some assembly members suggested that "there might not be demand for them if there is no obligation to make changes", that "landlords may not upgrade" or that "if solely imposed [they] will not attract people who rent their house – no benefit for them through reduced bills."

– **"Lack of trust in the government – prefer a one-off lump sum"**

– **"Governments could abuse loans to raise capital (like 6.5% interest on student loans)"**

– **"High recovery administration costs for government"**

Some assembly members noted 'conditions' that they would want to see in place for this policy to be implemented:

- **Who is liable** – some assembly members said that "if the loan is on the house, not the homeowner, and the repayments become the responsibility of the buyer not the older owner (because the person gets the benefit) would need to be transparent to buyer?";
- **Cross–party agreement and long-term certainty** – some assembly members said it "would need cross-party agreement for the long-term certainty of the policy / loan";
- **Offer low interest to all** – some suggested that it "could be of benefit to homeowners provided the loans are offered to all at a low interest rate";
- **Who gets loans** – some said that "some people may struggle to ever pay [it] back so [thought should be given to] who gets loans."

Changes to VAT

VAT is currently paid on some energy efficiency and zero carbon heating products, including efficient window glazing, some boilers, and DIY insulation measures. Rates are between 5% and 20% and are added to the cost of the products. Removing or reducing this VAT would make these products cheaper.

Assembly members identified the following pros and cons about changes to VAT.

⊕ Pros

+ **Encourages and promotes retrofitting** – some assembly members said it would "encourage us to think about carbon emissions – 0% VAT for carbon zero", "offers some incentive", or that it "encourages people to make changes – 20% is a big saving." Some said that "any measures to help people to make their homes more energy efficient cheaper must be welcome" or liked that it "targets energy efficiency e.g. retrofitting." Others commented that "in contrast with applying higher taxes, cutting VAT ensures that these efficient products are more attractive."
+ **Quick and easy to implement** – some assembly members suggested it "can be put forward quickly and easily", is "easy to make into law / implement" or is "easy to implement."
+ **Increases employment** – some assembly members felt it would "increase employment in this sector" or "creates demand for green products and new jobs."
+ **Popular, beneficial and easy to understand** – some assembly members suggested it would be "good publicity to reduce VAT", that it was "easy to understand" and would be "popular with voters." Others said there was a "benefit (but small benefit)" or that "everyone will make a saving."
+ **Reduction in energy use/bills** – some assembly members suggested that, by encouraging people to make their homes more efficient, it would result in a "reduction in total energy use" or "may reduce your energy bills."
+ **Market innovation** – some assembly members felt it "encourages market innovation" or provides a "financial incentive for energy efficient products and services."

⊖ Cons

- **Loss of government revenue stream and its implications** – some assembly members disliked that it involves a "loss of revenue for government", a "slight loss of government revenue" or that it "reduce[s] government revenue." Some suggested it could "cause conflict re government spending" or asked if "other taxes [would] go up to compensate?"
- **Minor incentive** – some assembly members felt it is "only a minor incentive", that it "might not make enough difference to the price", or "will only be equal to a small saving." Others said we would be "directing central funds into the situation but less efficiently than a focussed grant."
- **Might not lead to cheaper prices** – some assembly members queried "if VAT was removed would companies increase prices" or wondered "would people actually end up saving money, and see that they have?"
- **"Might not reduce CO_2 dramatically enough"**
- **"High administration cost and complexity"**
- **"Unfair to people who have already become energy efficient"**
- **"For SME contractors, will this make an impact on their VAT registration?"**

Some assembly members noted 'conditions' that they would want to see in place for this policy to be implemented:

- **Not enough by itself** – some assembly members said it "definitely needs to be done alongside something else because not enough. What if still not affordable for some people – those people just won't be able to bring in new products";
- **Clarity on savings** – some assembly members said they would support it "if bills are very clear, and you know what real saving you've made (e.g. might contractors put their prices up to compensate?)";
- **Advertise it well** – some assembly members said it "would need to be well advertised";
- **Use reclaims** – some suggested that the VAT "could be reclaimed."

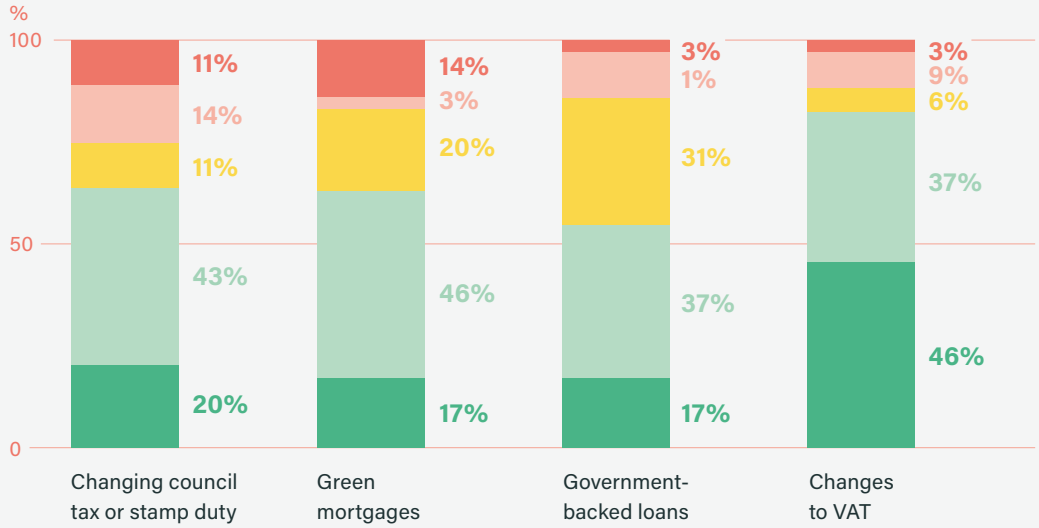
Some assembly members suggested that "the devil will be in the detail with all of these options."

Vote results

Assembly members voted by secret ballot on policy options around incentives. There were two ballot papers. The first ballot paper asked assembly members how much they agreed or disagreed that each policy option should be part of how the UK gets to net zero. The second ballot paper asked them to rank the options in their order of preference. The votes from this second ballot paper were counted both in terms of first preference votes and via Borda count.

Figure 16: Incentives

How much do you agree or disagree that each of the following policy options should be part of how the UK gets to net zero? (%)



A majority of assembly members 'strongly agreed' or 'agreed' that all four policy measures should be part of how the UK gets to net zero:

- 83% backed 'changes to VAT';
- 63% backed 'green mortgages';
- 63% backed 'changing council tax or stamp duty';
- 54% supported 'government-backed loans'.

Levels of disagreement were highest for 'changing council tax or stamp duty' (25%) and 'green mortgages' (17%).

Figure 17: Incentives

Please rank the following policy options in order of preference

(% 1st preference votes)

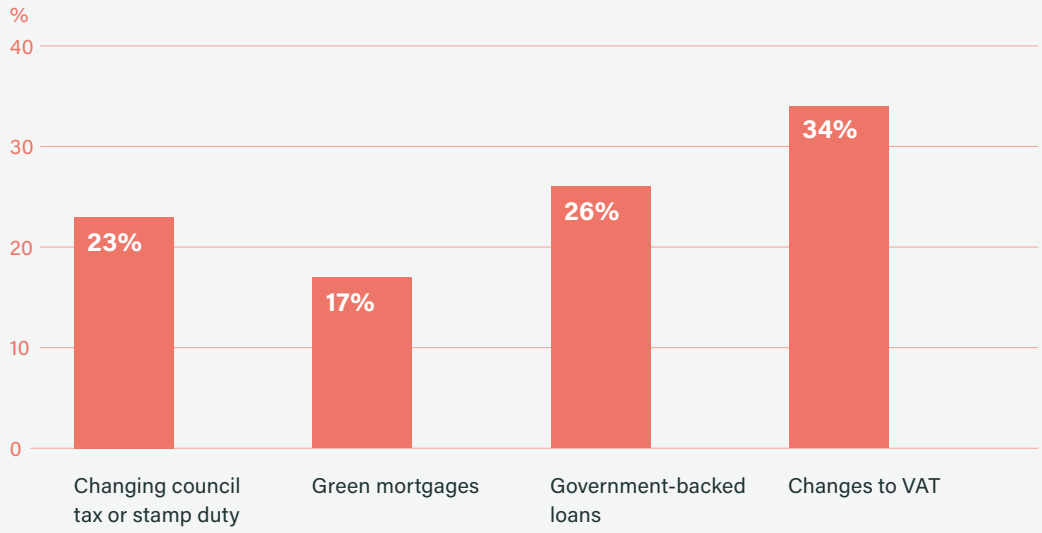
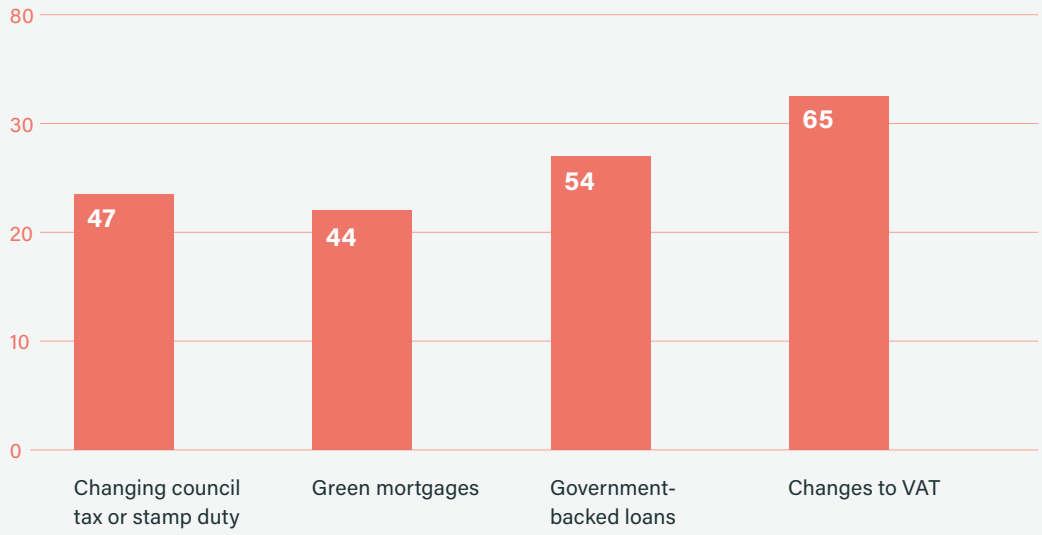


Figure 18: Incentives

Please rank the following policy options in order of preference

(Borda count)



The ranking vote confirmed 'changes to VAT' as the most popular option amongst assembly members. It also suggested that 'government-backed loans' were more supported – and more strongly supported – by more assembly members than might have been assumed from the first vote. 26% of assembly members said these loans were their preferred option and it came second in the Borda count.

E.5 Roles and powers

Assembly members looked at four options around roles and powers:

- Changing energy market rules;
- Support for smaller organisations;
- Local plans for zero carbon homes;
- Enforcing district heating networks.

We start by presenting the rationale for their views, taking each policy option in turn.

Jump to the vote results on page 248

Changing energy market rules

This would involve changing the rules governing energy markets to allow more companies to compete. This could, for example, enable companies to sell energy services like 'heat as a service'.

Assembly members identified the following pros and cons about changing energy market rules.

Pros

+ **Increases competition and is better for consumers** – some assembly members said it would "create competition", or that "increased competition is a good thing for consumers." Some suggested that it "could result in cheaper tariffs for consumers", "opens up [the] market/increases [the] potential for competitive pricing" or would lead to "more competition in the energy sector – could lead to price reductions." Others said that "increased competition [would promote] fairness for consumers", that it "opens up more options" or that they "would be open to more options as an individual." Some said it would give "increased control to consumers and possibl[y] reduced costs" or that it gives "greater flexibility to [the] consumer."
+ **Increased innovation** – some assembly members said that "increased competition [would mean] better options – more innovation" or that changing the rules would "stimulat[e] [the] need for innovation." Some suggested that "small companies might work with bigger companies where they have new green initiatives to offer which big companies had not thought of."
+ **Could reduce fuel poverty** – some assembly members felt that "once rules are finalised (including what happens to poorer households etc) [there could be] many positives." Others said it "may reduce fuel poverty e.g. GPs prescribe heat to [the] elderly."
+ **Easier and simpler** – some assembly members suggested that providing 'heat as a service' would be "simpler for consumers to understand", "clearer for some people to see what they are paying for" or that it "could be an opportunity to simply some things."
+ **"If people are more aware of their energy use there is an incentive to reduce consumption"**

⊖ Cons

- **Complicated and confusing** – some assembly members expressed "concerns that packages might be complicated", that it "could be more complicated" or that it "could be more complicated for householders to decide?" Others said that "anything which makes things more complex is problematic" or that "too much competition may be confusing – you may not know what is best – too many options." Some said "too much choice."
- **Could lead to price increases** – some assembly members suggested that the "consumer could pay more" or that "changing [the] rules is not guaranteed to provide better value." Some asked "could surge pricing happen?" or commented that "opening up electricity to more companies was not wholly successful, eventually will raise prices."
- **Concerns about online** – some assembly members expressed concerns that it "will it mean more online communication which some people find hard" or that it "could be heavily reliant on technology – may alienate some groups." Others highlighted that it could be "vulnerable to cyber-crime e.g. people's data."
- **Rules, regulation and monitoring** – some assembly members disliked that you "need more regulation" or that "more competition means more rules." Some suggested that "changing rules causes more short-term disruption" or commented "unknown consequences, loopholes, could be harder to monitor."
- **"Would co-ops/small companies reduce employment (marketing, advocacy etc)"**

Some assembly members noted 'conditions' that they would want to see in place for this policy to be implemented:

- **Oversight and regulation** – some assembly members said there needed to be "oversight of the market" or that the "role of regulators may need to change." Others called for "simple regulation [and] close regulation";
- **Consumer focused** – some assembly members talked about the need for "consumer focused regulation" or "consumer focused support and advice." Others asked for information to be provided in "plain English!";
- **Rewarding loyalty** – some assembly members said that "loyalty (of customers) should be rewarded – it is tiring to keep switching – bad experiences of switching";
- **Support to switch** – some said "keep the schemes which help you switch providers easily, and Ofgem/Ombudsman are still in place";
- **Take account of vulnerable people** – some assembly members said "any changes should take account the most vulnerable people."

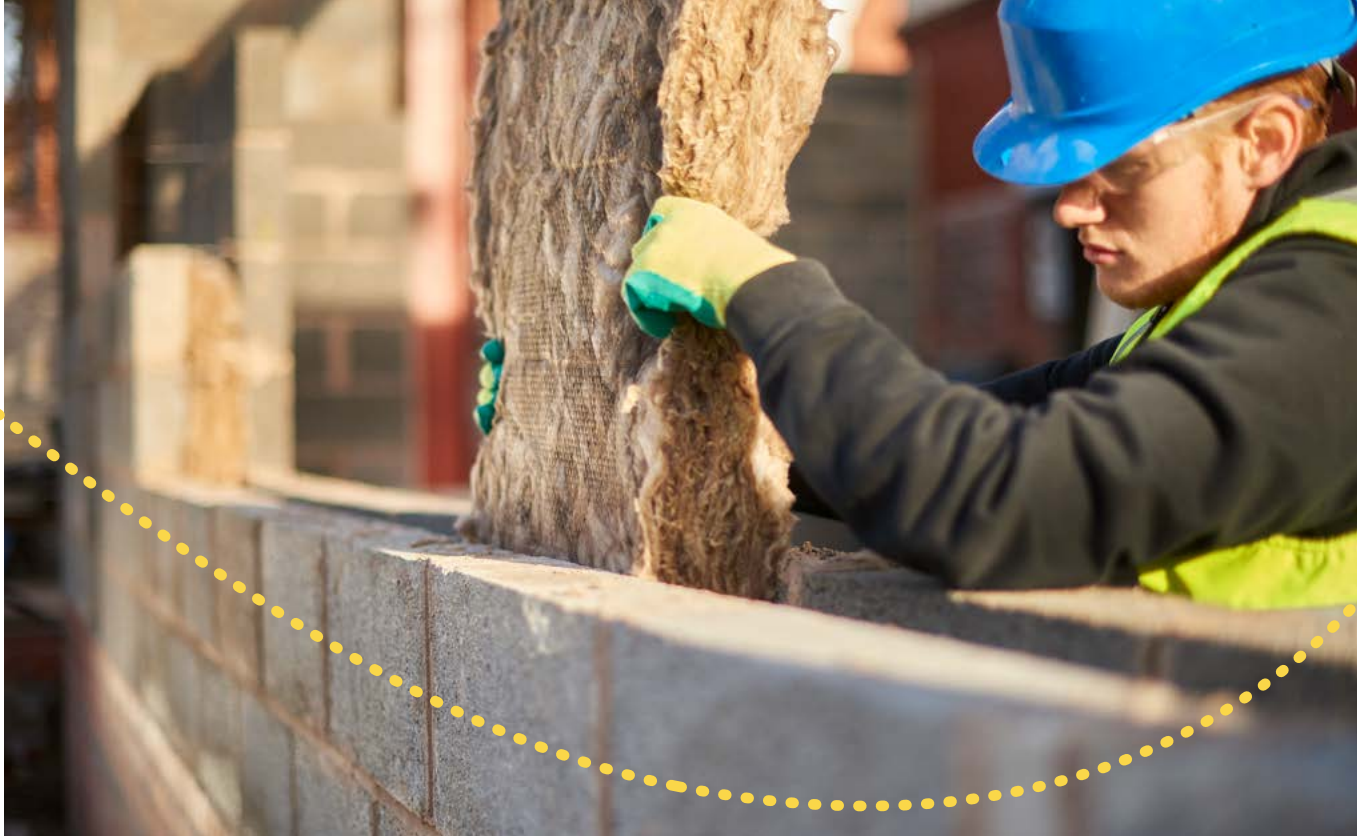
Support for smaller organisations

This would involve providing support for smaller organisations to offer energy services. Organisations impacted would include small companies, co-operatives and non-profit organisations. Examples of the support they might receive include reduced tax rates, less regulation, or obligations for big companies to work with co-operatives and community organisations.

Assembly members identified the following pros and cons about support for smaller organisations.

⊕ Pros

+ **Better and more tailored support for local needs** – some assembly suggested that "smaller local based organisations can address better the different needs in different areas", that it "utilises organisations with local knowledge" or that it "may mean services are better tailored to local situations e.g. coastal holiday seasonal locations." Others said it "will open up more choice, local and community level might give a better personal service", that organisations would be "easier to communicate with" or that "smaller organisations give better customer service." Some suggested these organisations were "more likely to offer support to local communities and [the] less well off" or that there would be "better local engagement."
+ **Trustworthy** – some assembly said "householders can use smaller companies known to them and who they can trust" or that it would be "more trustworthy as local." Others commented: "More social and community and trust and engagement so more people asking and understanding things."
+ **Support for co-ops** – some assembly members said that they are "very pro co-ops getting involved" or that "co-ops [are] not for profit – good for communities."
+ **Creates greater choice and lower prices** – some assembly members commented that it would mean "more choice for consumers" or that "more competition may lead to lower prices."
+ **Greater Innovation** – some assembly members said it would "help with start-ups and innovations", would bring in "new ideas!!" or that "smaller companies may be more innovative."
+ **"Easy to implement"**
+ **"Small is good"**
+ **"Like the idea of doing retrofit this way"**



Cons

- **How to define and make fair the difference between small and big organisations** – some assembly members asked "how do we determine who is a small company?" or "where does the support end?" Others said that it's "unfair to have different rules for different companies" or that it "may affect investment in bigger companies."
- **Complex market and increased regulation** – some assembly members said it "could make the market very complicated", that "more complicated = more costly" or that they "don't want too much government regulation."
- **Costs** – some assembly members disliked the "cost of investigation [to ensure quality provision by small companies]" or the "extra cost in subsidies for government (who pays?)."
- **Quality of service might be lower** – some assembly members suggested that "small companies need to be investigated for quality control", that there could be "bad service/lack of incentive" or that "if you are on the 'border' between organisations' areas, you may not be able to access the better service."
- **"Take away jobs (especially starter)"**
- **"What is to stop larger companies taking advantage – set up small companies (loop holes)"**
- **"Unnecessary. If the bigger companies can benefit from smaller companies they will and people already use small local people"**
- **"Smaller companies might not have financial backing of bigger firms e.g. for investment, economies of scale of business failure. Will they be able to offer ...deals and be less harsh with late payment"**
- **"Smaller = less well known"**
- **"More different offers may be confusing"**

Some assembly members noted 'conditions' that they would want to see in place for this policy to be implemented:

- **Information for consumers** – some assembly members highlighted that "people need to know where they can go for support e.g. Ofgem", that there should be "clear education on options for people" or that there needs to be a "climate advice bureau!";
- **Regulation and supervision** – some assembly members suggested that there may need to be "an Ofgem for smaller companies?", that there "would need [to be] regulation/ supervision", or that there is a "need [for]…accountability." Some said there should be "overall rules for all large companies to share expertise with non-profit etc organisations";
- **Support vulnerable people and smaller businesses** – some assembly members said that "any changes should take account [of] the most vulnerable people and have support systems, and backing for the smaller businesses."

Local plans for zero carbon homes

This would involve central government giving local authorities the powers and resources to develop an area-wide plan for moving to zero carbon homes.

Assembly members identified the following pros and cons about this policy option.

⊕ Pros

+ **Local knowledge and control** – some assembly members said that "local knowledge and control should deliver better outcomes for local areas", that it "will make better use of local knowledge" or that it is "good to take account of [the] different needs of local areas." Others suggested it would be "more well-suited and not 'one size fits all'" or that "they can organise and fund local projects e.g. district heating."
+ **Local council involvement** – relatedly, some assembly members said that "local councils should have a better idea of the circumstances and requirements of their own local area" or that "local authorities will have better understanding and experience of their resources and options for zero carbon homes." Others suggested that "local authorities need to be involved" or that "local authorities want their area to improve and they understand it." Some stated "it is essential that central government provide the financial resources for local authorities to implement a local plan for moving to zero carbon houses."
+ **More accountable** – some assembly members liked the idea of "local accountability" or said it "should be more accountable." Some commented "local power held to account – no one else to blame."
+ **"Should be a speedier process"**
+ **"Possibly more chance for input"**
+ **"Could be more local enthusiasm"**
+ **"May end up providing more funding to local authorities"**

⊖ Cons

- **Local variation** – some assembly members said it "could result in too much variation throughout UK", that there is "no central UK co-ordination e.g. different areas at different paces etc" or that "local plans may end in some areas staying behind in improvements – central co-ordination may be preferable." Others talked about "how to ensure it is fair to everyone no matter where you live."
- **Issues around funding** – some assembly members asked "where will funding come from" or "if additional funds are required where do they come from?" Others commented that it "might be hard to fund it – depends on how rich the local authority is", or that "some areas are more well-off so some people may not get as much help." Some suggested that a "lack of funding could lead to missed targets and increased costs."
- **Lack of trust in local authorities** – some assembly members asked "do you trust your local authority?" or said "some people don't trust their local authorities so might not want what is being put into place." Others questioned "what stops local areas for making pricey mistakes and who pays?"
- **"Could be difficult to access expertise"**
- **"Might stop people from taking initiative to price compare"**
- **"Local vested interests could distort sensible action"**
- **"A lot of diversity within even a small community = may be very broad advice"**
- **"Might local authority boundaries get in the way of the best solutions"**
- **"Will big business have influence [over] the plans and [make those responsible] do something different?"**

Some assembly members noted 'conditions' that they would want to see in place for this policy to be implemented:

- **Local councils need adequate funding and powers** – some assembly members said that "central government needs to invest in and trust local authorities", that those responsible "need to ensure they [local authorities] get the correct funding" or that "some local authorities will face bigger challenges due to lack of resources so there needs to be a formulated plan of fair funding from central government." Some assembly members asked "will local authorities have the power to insist on their plans and not be overruled by central government." Others stated that "local authorities need to be able to invest";
- **Fairness and transparency** – some assembly members commented that it "needs a lot of transparency in developing and implementing the plan" or that "once resources are provided there should be a recognised/agreed criteria by which it is allocated." Some said that "local authorities need to give support fairly within their area." Others asked "who decides [the] criteria for 'home'?";
- **Delivery models** – some assembly members said their support "depends on [the] delivery model." Others said "local authorities need to have special climate change departments (some already do) for the wellbeing of the local people";

- **Enforcement** – some assembly members said that "if central government gives the powers to local authorities then they should enforce penalties/sanctions if targets aren't met."

Enforcing district heating networks

This would involve local authorities requiring developers – and possibly individual buildings and homes – to connect to heat networks.

Assembly members identified the following pros and cons about this policy option.

⊕ Pros

+ **Cheaper** – some assembly members suggested it has a "very cheap operating cost" or that "overall [it] should be cheaper to use." Others said it "could save money in long-term" or "should reduce people's bills."
+ **Not reliant on choice** – some assembly members liked that it is an "enforced change – not reliant on people making choices", that it is "not reliant on individuals changing" or that it "gets it done, makes it happen."
+ **Local** – some assembly members liked that it is "more controlled by local authorities" or that "local authorities can take account of local opinions within national guidelines." Others suggested it would be "good for local communication."
+ **Works for new developments** – some assembly members said it is "good for new development i.e. it will work for new developments" or that "builders / developers will know in advance that this is required."
+ **Impact and speed** – some assembly members said it "has large impact quickly for an area" or that it is "ready to implement quickly."
+ **Uses waste heat** – some assembly members liked that it "can use waste heat" or said it's "crazy to let heat go to waste."
+ **"Use the heat directly, without a storage problem"**
+ **"Will fit with current planning rules and procedures"**
+ **"A plan within a plan"**
+ **"Might generate income for e.g. hospital"**
+ **"Will be done as it is the law"**
+ **"Cleaner in providing than hydrogen/heat pump"**
+ **"Spread carbon cost (more value for carbon spent)"**
+ **"Gets disruption to people/households over and done with in one go (before they move in?)"**

⊖ Cons

- **Geographically restricted** – some assembly members said it is "geographically restricted", "doesn't work everywhere", or is "not suitable for all areas." Others said it is "not beneficial for rural [areas]" or is "only accessible to a few."
- **Only viable for new builds** – some assembly members said it will be "difficult to retrofit" or "will be a big challenge to incorporate into existing towns/cities – easier for new housing estates." Others commented that "this is for new homes and builds – what about existing ones that could potentially be part of [the] network?" or said that "older houses will not be connected to it – it is for new builds." Some said it "only applies to new houses so by 2050 75% of housing stock will be unaffected" or queried "how effective will it be, if it only applies to new builds or only dense areas."
- **Lack of choice** – some assembly members disliked that "households have no choice" or that there's "less individual choice." Some felt it "could be too aggressive and put people off" or that you would need to "to enforce ideas ...[over] resistance."
- **Failures affect many people** – some assembly members noted that "failure could mean many people affected at [the] same time", that "if it breaks a lot of people would be affected all at once (similar to a big power cut)" or that "if sources break down lots of people can be without services, heat etc." Others disliked the "risk of [the] heat source closing down."
- **Impact on developers** – some assembly members suggested there would be "increased construction costs for housing companies." Others worried it "might discourage builders from developing in those places" or "stop developments happening where they are needed."
- **Monopolies** – some assembly members disliked the "potential monopoly" or "monopolies."
- **Future needs** – some assembly members said "there is a risk included in this choice as the future heating needs of an area may change" or that it "requires forward planning."
- **"Disruptive"**
- **"Builders could pass on costs to potential buyers"**

Some assembly members noted 'conditions' that they would want to see in place for this policy to be implemented:

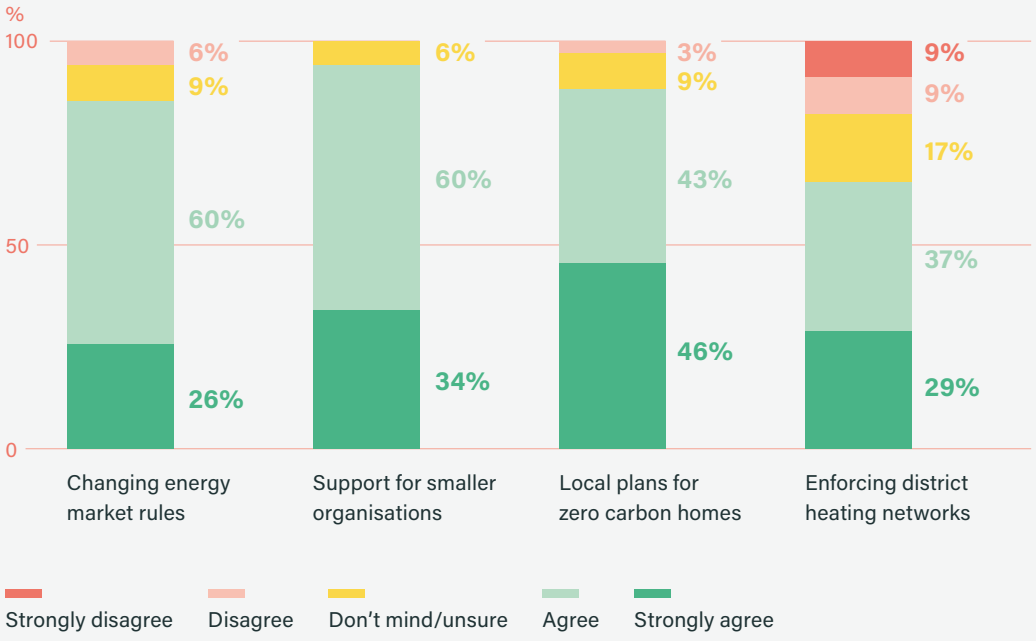
- **Where it is used** – some assembly members said it "would work better in cities/populated areas rather than [in] rural [locations]";
- **Encourage developers** – some assembly members said that "developers of new builds should be encouraged to provide [connection to a] district heating network";
- **New designs** – some assembly members said we "will need estates to be designed in new ways or [that it] will change how estates are designed."

Vote results

Assembly members voted by secret ballot on policy options around roles and powers. There were two ballot papers. The first ballot paper asked assembly members how much they agreed or disagreed that each policy option should be part of how the UK gets to net zero. The second ballot paper asked them to rank the options in their order of preference. The votes from this second ballot paper were counted both in terms of first preference votes and via Borda count.

Figure 19: Roles and powers

How much do you agree or disagree that each of the following policy options should be part of how the UK gets to net zero? (%)



A clear majority of assembly members 'strongly agreed' or 'agreed' that all four options should be part of how the UK gets to net zero, with three options securing over 80% support:

- 94% backed 'support for smaller organisations';
- 89% supported 'local plans for zero carbon homes';
- 86% approved the idea of 'changing energy market rules';
- 66% voted for 'enforcing district heating networks'.

Levels of disagreement were very low. No assembly members disagreed with 'support for smaller organisations'. Only 'enforcing district heating networks' saw disagreement levels reach higher than 6% (18% of assembly members 'strongly disagreed' or 'disagreed' with this option).

Figure 20: Roles and powers

Please rank the following policy options in order of preference
(% 1st preference votes)

Figure 21: Roles and powers

Please rank the following policy options in order of preference
(Borda count)

The ranking vote suggested that the option assembly members most want to see implemented is 'local plans for zero carbon homes.'

Policy options – conclusions

Assembly members examined policy options in five areas:

- Information;
- Fairness and consumer protection;
- Standard setting;
- Incentives;
- Roles and powers.

Under 'information', a majority of assembly members backed proposals for **carbon MOTs for houses** and **information and support either provided or funded by government**. Assembly members did not back the idea of information and support provided and funded by private companies, citing concerns including potential bias.

In terms of 'fairness and consumer protection', assembly members strongly supported the idea of **simpler consumer protection measures**, suggesting for example that they would make rules easier to understand, help ensure problems are fixed quickly and protect the vulnerable. A majority of assembly members also supported both **government help for everyone** and **government help for poorer households**, with a small majority preferring help for everyone. Their rationale for this preference included that help for everyone would incentivise more people to make changes.

Again under the 'fairness' theme, assembly members were divided about whether it was better to raise money through **adding to all householders' energy bills** or through **taxation and government borrowing**. A small majority of assembly members preferred 'adding to all householders' energy bills' when faced with a straight choice between the two options. However this idea was also more controversial with more assembly members overall saying that they agreed with taxation and government borrowing.

Under 'standard setting', large majorities of assembly members backed a **ban on sales of new gas boilers** (from 2030 or 2035) and **changes to product standards** to make products more energy efficient and 'smart'**.** Their rationale for supporting the ban on new gas boilers included that it would encourage innovation and better technology, and allow people time to plan. They felt that changes to product standards would make products more energy efficient and save people money in the long-run, among other benefits. A majority of assembly members, albeit a smaller one, also supported **requirements for selling and renting**.

In terms of 'incentives', a large majority of assembly members backed **changes to VAT on energy efficiency and zero carbon heating products**, commenting for example that it would encourage and promote retrofitting by making prices lower. A majority of assembly members also supported **changing council tax or stamp duty** so that people pay less for homes that have lower emissions and **green mortgages.** A small majority backed **government-backed loans** for energy efficiency measures and zero carbon heating.

Under roles and powers, large majorities of assembly members backed **supporting smaller organisations** to offer energy services, **local plans for zero carbon homes** and **changing energy market rules** to allow more companies to compete. A smaller majority also backed **enforcing district heating networks**.

The following table shows all 19 policy measures backed by a majority of assembly members.

Policy	Policy area	% assembly members who 'agreed' or 'strongly agreed' that it should be part of how the UK gets to net zero
Supporting smaller organisations to offer energy services	Roles and powers	94%
Simpler consumer protection measures	Fairness and consumer protection	92%
Changes to product standards to make products more energy efficient and 'smart'	Standard setting	91%
Local plans for zero carbon homes	Roles and powers	89%
Ban sales of new gas boilers	Standard setting	86%
Changing energy market rules to allow more companies to compete	Roles and powers	86%
Changes to VAT on energy efficiency and zero carbon heating products	Incentives	83%
Information and support funded by government	Information	83%
Information and support provided by government	Information	72%
Government help for everyone	Fairness and consumer protection	69%
Government help for poorer households	Fairness and consumer protection	68%
Enforcing district heating networks	Roles and powers	66%
Requirements for selling and renting	Standard setting	65%
Raise money through taxation and government borrowing	Fairness and consumer protection	65%
Changing council tax or stamp duty so that people pay less for homes that have lower emissions	Incentives	63%
Carbon MOTs for houses	Information	63%
Green mortgages	Incentives	63%
Raise money through adding to all householders' energy bills	Fairness and consumer protection	54%
Government-backed loans for energy efficiency measures and zero carbon heating	Incentives	54%

Assembly members' consideration of the pros and cons of all the policies above – and the conditions they suggested for their use – provide detailed insights for policy-makers.

F. Anything else to tell government and Parliament

At the end of weekend three, assembly members had the opportunity to add any further thoughts on heat and energy use in the home and the path to net zero. We have divided comments into nine themes to make them easier to navigate.

UK-wide leadership

- Some assembly members said "we want commitment and clarity."
- Some noted a wish for "cross party support for net zero", asking "MPs to convince colleagues to support net zero," and emphasising the "importance of continuity from one government to the next."
- Some said we need to "ensure all government departments address climate change." Others suggested there "may be [a] need for a dedicated government department and Cabinet minister", commenting that the "issue needs to be more prominent at Cabinet."
- Some assembly members suggested those responsible should "set up a big national charity to tackle climate change – with tax incentives to give." Others asked for a "climate bureau", stating that this is a "crisis."
- Some assembly members said they wanted to "know that they will do what we say and, if not, tell us why not."

The role of local authorities

- Some assembly members asked "central government to work with Local Authorities and N[ational] A[ssemblies] across [the] country to make it happen (starting with policy)."
- Some said they "like the idea of local authorities getting involved across all of the actions, to make it suitable for the local area, and take advantage of word-of-mouth."
- Some asked national government to "give more power to local councils and a fair funding plan to tackle heat and energy use in the home – some Local Authorities will have bigger challenges than others."

Transparency, information and education

- Some assembly members asked "could we have a live net zero national meter e.g. on TV/online."
- Some said "citizens are interested in what big businesses can and are doing – tell us!" Some asked for "more transparency around corporate lobbying of government and Parliament."
- Some said "carbon footprint – make it simpler and more relatable – concrete examples e.g. like calorie labelling."
- One assembly said "the complexity of the topics has dawned on me. Can we get everyone this level of education – the level of education that assembly members now have? If we could, we'd be laughing. The complexity of the sacrifices and trade offs. Wider understanding would be the best thing to come out from this assembly."

Public mood

- Some assembly members noted that "there is much more awareness and attention on climate change now", that "there is momentum" and that "people are getting involved." Some assembly members said they were "encouraged by humanity… conversations!"
- Some suggested that "all the votes (and the reasons people gave) are based around a lack of trust – therefore it's important that there is more legislation and regulation."

Planned transition

- Some assembly members said "we like (reasonable) target dates and deadlines, with planned transition periods because people take it seriously. [You can] [w]ork towards it and it's a commitment – gives people a chance to plan. Everybody knows it's going to happen. Progress can be measured, and people can be held accountable."

Cost and tax

- Some assembly members asked those responsible to "try not to tax the living daylights out of everyone." One said "if tax increase [is] linked to tackling climate change [it] might lose public support."
- Some assembly members suggested that "people will be reluctant to fork out money if they're not getting value for it (e.g. investing in retrofitting their home but this not being reflected in the market value)."

Urgency and getting started

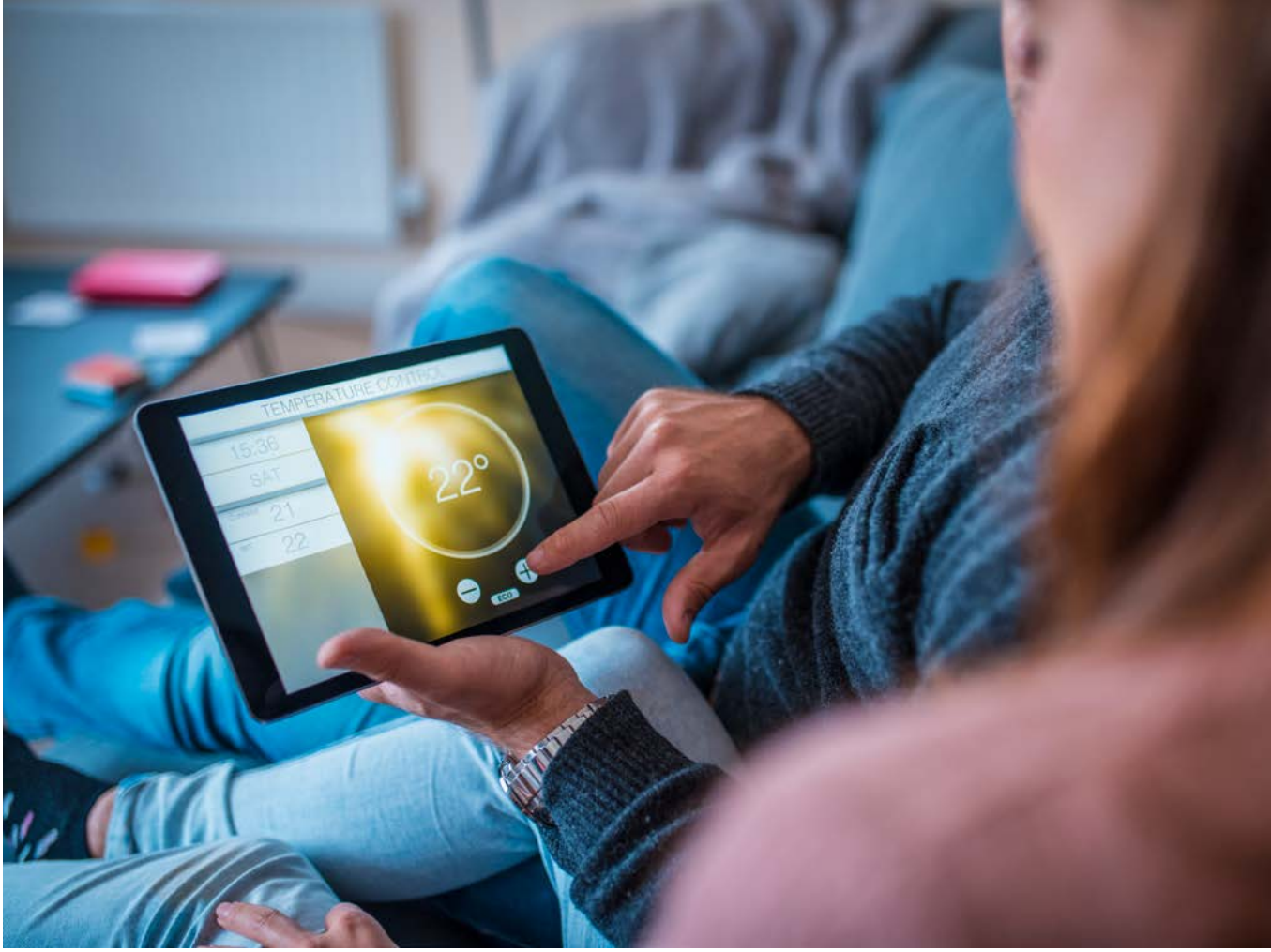
- Some assembly members said "urgent action [is] required on heat and energy in the home – biggest carbon emission after transport" or that "it's a national emergency – beyond the pockets of individuals – needs to be a national effort." Some said "we can get started [now]!"

Global

- Some assembly members asked "government to remember [the] global impact of climate change." Others said we "need global solutions and global support from the UK and other major economies."

Other

- "Be careful not to demonise or move away from large industry / companies too much – because they contribute a lot to the social and economic elements of our society."
- "The solutions aren't isolated, they are connected so you need to do a combination of everything."
- "Getting the right balance of incentives and penalties" is important.
- "Are we going to get enough hydrogen? [especially if we need it at same time]"



Conclusions

Assembly members' recommendations on heat and energy use in the home show a strong push for action.

Assembly members emphasised the need for a **long-term strategy** with a wide range of actors taking steps to move the sector towards net zero; assembly members strongly supported roles for **government investment** (80%), **local solutions** (80%), **individual responsibility** (80%) and **market innovation** (80%).

They also gave strong backing to a wide range of specific measures to create change. **A majority of assembly members 'strongly agreed' or 'agreed' that 19 policy measures on heat and energy use in the home should be part of how the UK gets to net zero.** Policies supported by at least two-thirds of assembly members were:

1. Support for smaller organisations to offer energy services (94%);
2. Simpler consumer protection measures (92%);
3. Changes to product standards to make products more energy efficient and 'smart' (91%);
4. Local plans for zero carbon homes (89%);
5. A ban on sales of new gas boilers from 2030 or 2035 (86%);
6. Changes to energy market rules to allow more companies to compete (86%);

7. Changes to VAT on energy efficiency and zero carbon heating products (83%);
8. Information and support funded by government (83%);
9. Information and support provided by government (72%);
10. Government help for everyone (69%);
11. Government help for poorer households (68%);
12. Enforcing district heating networks (66%).

Assembly members' discussions on the above measures and on the 'in the home' theme more broadly showed a number of **consistent themes**:

- Assembly members emphasised their support for **tailored solutions** – enabling local authorities and other local organisations to chose solutions suited to their local areas, and householders to pick the options best for them. They saw local solutions as having additional benefits in helping the local economy and enabling better public engagement;
- They also consistently backed measures to **increase the choice** available to individuals, including through steps to increase competition – measures that some assembly members felt would also lower prices and speed-up innovation. They stressed the need to provide the public with **reliable and clear information**;
- Assembly members were also clear throughout that they want measures to **work for all income groups and housing types,** not least in terms of financial support to make changes affordable. They stressed the need to remember tenants as well as homeowners.
- Some assembly members noted **concerns about the influence and behaviour of big companies**, and around **use of personal data.**

Assembly members' discussions on home retrofits and zero carbon heating picked up on many of these themes:

- On **home retrofits,** assembly members emphasised the need to **minimise disruption in the home**, **put in place support around costs**, and **offer flexibility and choice to homeowners**. They showed a slight preference for upgrading each home all in one go (56%), compared to upgrading each home gradually (44%) but attached conditions to the former around how it is financed. Some assembly members also stressed that this should be a choice for homeowners;

- The best technology to use for **zero carbon heating** is a matter of significant policy debate. However at least 80% of assembly members 'strongly agreed' or 'agreed' that each of **hydrogen** (**83%**), **heat pumps** (**80%**), and **heat networks** (**80%**) should be part of how the UK gets to net zero. **94% of assembly members 'strongly agreed' or 'agreed' that "people in different parts of the country should be offered different solutions to zero carbon heating."** They argued that areas should be able to choose the technologies best suited to their needs.

The **23 considerations for government and Parliament** that assembly members identified at the start of their discussions – along with the rationale and conditions assembly members noted throughout – provide a valuable guide for policy-makers working on heat and energy use in the home and the path to net zero.

What we eat and how we use the land

Chapter 6

Summary of recommendations

1. Assembly members put forward **eight considerations for government and Parliament to bear in mind when making decisions about food, farming, land use and the path to net zero.** These focussed on:
    1. Providing support to farmers;
    2. Information and education;
    3. Using land efficiently;
    4. Rules for large retailers and supermarkets;
    5. More local and seasonal food;
    6. Making low carbon food more affordable;
    7. Some, just less, meat;
    8. Considering net zero as part of planning policy and new developments, including support for allotments.

2. Assembly members' **preferred future for food, farming and land use in the UK** centred around:
    - **Local produce and local food production** – for a wide range of reasons including community benefits, fairer prices for farmers, a 'feel good factor' and reduced environmental impacts;
    - **A change in diet to reduce meat and dairy consumption by between 20% and 40%** – the assembly stressed the significance of education, saying these changes should be voluntary rather than compulsory;
    - **A "managed diversity" of land use**, including steps such as restoring woodlands, peatlands and gorselands.

3. Assembly members highlighted the need for the above to be combined with **support for farmers to make the transition**, and policies to ensure changes do **not disproportionality affect the less well off.** Assembly members said changes should **not compromise animal welfare,** and expressed **strong concerns about GM and lab grown food**. They asked for policy-makers to take into account the implications for smaller farms, the suitability of different land for different uses, and differences in impact between UK regions.

4. Assembly members showed **strong support for policies to change both farming, food production and land use,** and **retail and individuals' behaviour**. At least two-thirds 'agreed' or 'strongly agreed' that nine policies should be part of how the UK gets to net zero. These included:
    - **Emissions labelling** for food and drink products;
    - **Information and skills training** for those who manage the land;
    - **Low carbon farming regulations;**
    - **Paying farmers and other landowners to use their land to absorb and store carbon;**
    - **Amending the procedure for awarding government contracts** to give preference to low carbon food producers and carbon storing products;
    - **Changing planning rules** so that food can be produced sustainably in a wider range of areas.

What we eat and how we use the land

Assembly members looked at food, farming and land use together because of the impact they have on one another. In total, about a tenth of the UK's greenhouse gas emissions come from farming and others ways we use the land.

Land in the UK is mainly used for farming.[1] This means it is used for purposes such as growing crops and grazing animals. Only a small amount of land is left natural or used to plant trees. To get to net zero emissions this needs to change. The UK will need to reduce the amount of land used for food production, while still producing enough food. It will need to use more land to help remove carbon dioxide from the air (see chapter nine) or grow crops to burn for energy (this is called bioenergy – please see chapter eight). This will affect what we can eat.

What we eat also affects greenhouse gas emissions in other ways. How much we eat and waste, how food is produced, and how far it is transported, can all have an impact on emissions.

What did the assembly consider?

Thirty-five assembly members considered the topic of what we eat and how we use the land. We selected these assembly members from the assembly as a whole using random stratified sampling. This ensured that they remained reflective of the wider UK population in terms of both demographics[2] and their level of concern about climate change.

1 74% of land in the UK is used for agriculture (26% for cropland, 31% for grassland, 17% for rough grazing) – Committee on Climate Change (2018), Land use: Reducing emissions and preparing for climate change.

2 Age, gender, ethnicity, educational qualification, where in the UK they live and whether they live in an urban or rural area.

These assembly members heard a wide range of views on the future of food, farming and land use for the UK, and how we might move towards that future. They had the opportunity to question each speaker[3] in detail. These evidence sessions took place at weekend two of the assembly.

Assembly members spent weekend three of the assembly discussing the evidence they had heard and their own views in-depth, before reaching conclusions on three separate areas:

A. **Considerations:** the overarching considerations that government and Parliament should bear in mind when making decisions about food, farming and land use and the path to net zero;

B. **Futures**: what the future of food, farming and land use should look like;

C. **Policy options:** how the UK should move toward this future.

Assembly members also had the opportunity to discuss and add **anything else they wanted to say** to government and Parliament about food, farming, land use and the path to net zero. Assembly members' views on the implications of Covid-19 for this topic are touched on in Chapter 10.

Contents of this chapter

3 The assembly heard from six speakers on what we eat and how we use the land: Indra Thillainathan, Committee on Climate Change (informant), Ceris Jones, National Farmers' Union (advocate), Sue Pritchard, RSA (advocate), Dr Jo House, University of Bristol (informant), Dr Rosie Green, London School of Hygiene and Tropical Medicine (informant), Professor Tim Lang, City University (informant). All speakers' presentations are available as slides, videos and transcripts at climateassembly.uk/resources/. An 'informant' is a speaker who we asked to cover the range of views and available evidence on a topic. An 'advocate' is a speaker who we asked to give their own view, or the view of their organisation. Assembly members knew whether speakers were informants or advocates.

A. Considerations

Assembly members reached their first decisions on food, farming and land use by discussing their answers to the following question:

> *What considerations should government and Parliament bear in mind when making decisions about food, farming and land use and the path to net zero?*

Assembly members thought about their answers to this question individually. They then discussed their views in small groups at their tables, with each table agreeing their five top considerations. These top considerations had to, between them, represent the range of views at the table.

Facilitators took the top considerations from each table and grouped similar options together to create a list on which assembly members could vote. They checked this list back with assembly members to make sure they had accurately reflected their views. This included making any necessary adjustments. Each assembly member could vote for the four options that they felt to be most important.

The results were as follows. The wording of the considerations in the table is either word for word what assembly members wrote on their option cards or, where facilitators combined similar options from several tables, how they described the options to assembly members prior to the vote.

Rank	Consideration	% assembly members who chose it as a priority
1	**Provide support to farmers** – including financial and professional/skills focussed support. Some assembly members noted that any schemes needed to "consider the respective impacts of arable and livestock farming."	89
2	**Information and education** – from an early age about "greener and healthier eating habits". This category also included suggestions for "carbon footprint labelling".	86
3	**Use land efficiently** – including: ▪ "Use the land differently to absorb more carbon" (e.g. "planting forests not trees", restoring peatlands); ▪ "Increased support for and collaboration between farming, forestry, land management and land owners to balance the need for sustainable food production with biodiversity and reduction of harmful emissions", and other considerations such as flood prevention.	66
4	**Rules for large retailers / supermarkets** – including: ▪ Addressing pricing structures and the low prices imposed on farmers; ▪ Reducing food waste and packaging.	46

5	**More local and seasonal food** – including: ▪ Active promotion, encouragement and support of local, seasonal and home-grown food options, including allotments; ▪ Support for people on low incomes to be able to access and cook/use healthy local foods; ▪ The UK becoming more self-sufficient; ▪ Cheaper, local food.	40
6	**Make low carbon food affordable** – including: ▪ "Mak[ing] low carbon, healthy and home cooked food affordable (and vice versa)". Some assembly members suggested "meat and dairy subsidies [should be put] towards making vegetarian and vegan alternatives more affordable"	34
7	**Some, just less, meat**	29
8	**Part of planning policy and new developments, including allotments**	14

B. Futures

After deciding their most important considerations, assembly members moved on to look at the future of food, farming and land use for the UK.

To aid them in this process, the Expert Leads presented assembly members with three scenarios for possible futures:

- Smarter farming;
- Eating differently;
- Local food and rewilding.

Together these scenarios cover a broad range of views about what could happen to food, farming and land use to help the UK meet its 2050 net zero target.

Assembly members discussed each of the scenarios or 'possible futures' in turn, before voting on them by secret ballot.

We start by presenting the rationale for their views, taking each possible future in turn.

Jump to the vote results on page 274

B.1 Smarter farming

This scenario would involve making farming more efficient and using more land to store carbon. It would feature changes for businesses but not individuals.

What business would do:

- **Farms would emit less greenhouse gases** – e.g. by using more renewables and different animal feeds;
- **Farming would be more efficient** – e.g. by using precision farming, 'gene editing' or breeding to select stronger livestock/crops;
- **Farmers would use more land to store carbon** – e.g. planting trees and/or planting energy crops with carbon capture and storage to soak up and store carbon;
- **Farmers could also use 'speculative' measures to store carbon** – e.g. using minerals on land to absorb carbon.

What individuals would do:

- **No change.**

Assembly members discussed this possible future at their tables. They identified the following pros and cons.

⊕ Pros

+ **Least amount of change, so easier for people to adapt, implement and accept** – some assembly members described it as the "soft option", saying there is "no need for people to change so should be popular." Others commented that it "will go down best with farmers and the public, because there won't be any impact on individuals", that "doesn't change as much so it is easier for people to accept" or that it would be "easy for people to adapt and easy to implement."
+ **Moves towards renewables** – some assembly members felt it would "encourage farmers to use more renewables" or that it is "positive to move towards renewables."
+ **Reduces flood risk and provides other benefits –** some assembly members noted that it "can reduce flood risk" or that "woodland, hedgerows and peatlands provide other benefits e.g. flood risks."
+ **More efficient and less waste** – some assembly members said that "smarter, more efficient farming practices are beneficial" or that "increased efficiency is really important as it saves money in the long-term, making it more likely to be accepted." Some liked that it "leads to less waste e.g. less young male cows being slaughtered."
+ **Protecting farmers, in particular livestock farming** – some assembly members suggested that there would be "no job losses (livestock farming)" or that it "ensures [the] farming industry is protected." Others commented "livestock farming is not at risk" or "livestock farming – no risk to farmers to change the way they work."

+ **Restoring biodiversity and land** – some assembly members said that "returning to traditional methods of farming restores (in time) biodiversity and healthy land" or said they liked the idea of "restoring hedgerows – many have been ploughed up so the land can be used (large arable farms)."
+ **'Natural' carbon capture and tree planting** – some assembly members felt that "using land to store carbon naturally is a great idea as it restores biodiversity naturally whilst also creating other benefits e.g. food production." Others liked that "land that is not in use can be used for trees to help capture carbon" or that we could "plan[t] more trees for timber farming."
+ **"Additives to food to reduce methane"**
+ **"20% less land for livestock, more home-grown fruit and veg – small change to diet"**
+ **"GM is a great idea, if it's done properly e.g. government controlled not a big corporation"**

⊖ Cons

– **Doesn't have enough impact on target** – some assembly members said they "don't think it'll have enough impact on the target" or that it "falls short, doesn't do enough." Others said more specifically that "it doesn't tackle red meat and dairy consumption therefore will carbon emissions be reduced enough?" or "I feel it's unrealistic to reach net zero if there is no consumer change…." Others agreed suggesting that it "doesn't change people's attitudes – some might even decide to increase their intake because they can justify it with smarter farming" or that "it won't help much if people don't change their behaviour."
– **Unfair on farmers** – some assembly members felt that "it seems unfair" or that "all the pressure to change is on the farmers."
– **No health improvements** – some assembly members commented that there would be "no health improvements" or "no health improvements from dietary change."
– **Negative effects on biodiversity and animal welfare –** some assembly members suggested that "some forms of farming intensification could risk biodiversity and animal welfare" or that "increasing efficiency is [a] good idea however we need to be aware of [the] negative effects of some processes, e.g. breeding decreases biodiversity." Others worried about impacts on "animal welfare" or "reducing welfare standards – selective breeding could have unforeseen [affects], e.g. mad cow disease." Some said "farming intensification won't be considered because of biodiversity, animal welfare and carbon capture and storage."
– **GM and gene editing issues** – some assembly members expressed "gene editing concerns – is it safe?" or asked "do we know the effects of gene editing? If we do and it is fine, then how do we know this?" Others commented "GM – there are already problems with getting rid of 'weeds' etc" or "GM crops need to be bought for a fair price as they can't reproduce, so new seeds need to be bought each year. Also, they reduce biodiversity so will need to be controlled."

- **Impact on (some) farmers** – some assembly members said "farmers' health and wellbeing is a priority." Others noted concerns about specific types of farmer:

  "It could have a big impact on the smallest livestock farmers."

  "Would land quality be good enough for many 'hill farmers' to plant trees and grow arable crops."

  "Restoring hedgerows and woodland – some arable farmers won't like it as they have removed them for more 'efficient' land use."

- **"Maintaining 'look' of countryside when not in original state"**
- **"Crops from South Africa being shipped in ... = carbon footprint"**
- **"Pesticides/chemicals may be used more if there is increased demand"**
- **"Farmland will disappear in order to build homes for an increasing population"**

Some assembly noted conditions to their support for this scenario or points they would want taken into account around its implementation. These included suggestions around:

- Grants and incentives:
  - "Government will have to give grants (e.g. to farmers) to help the transition";
  - "There have to be incentives in place for farmers to convince them and retrain";
  - "Can the government support more innovation rather than introduce more regulation?"
- Standards, regulations and labelling:
  - "Would have to have standards for farming practice to ensure all farming follows these measures";
  - The "retail industry [would need] to be regulated to ensure fair prices for farmers";
  - "Any genetically modified crop/livestock need to be labelled to give consumers the opportunity to make an informed choice";
  - "Should individual farmers be given a quota of livestock to produce but not based entirely on the size of the farm";
  - As noted above, some assembly members said that GM should be "government controlled."

Some assembly members also suggested that the "**transition can only happen on land that is suitable** (e.g. Yorkshire sheep farming won't be able to convert)" or wondered whether "we [can] **look outside of the UK for solutions** to land restriction challenges."

When we asked assembly members to rank the possible futures in their order of preference, this scenario received limited support from assembly members. Please see below for the results of the vote.

B.2 Eating differently

This possible future would involve farmers, retailers and individuals taking steps to reduce food waste and choose lower-carbon foods. It would feature changes for businesses and individuals.

What business would do:

- **Farming would be more efficient** – e.g. by using precision farming; 'gene editing' or breeding to select stronger livestock/crops;
- **Farmers would use 20% less land for livestock** (beef, lamb and dairy) and more for less carbon-intensive crops that grow well in the UK (e.g. some vegetables, fruit);
- **Farmers/landowners would use more land to store carbon** – e.g. planting trees, planting energy crops, restoring peatlands;
- **Retailers and restaurants would reduce food waste** – e.g. reducing portion sizes;
- **There could also be more 'speculative' measures to produce food** – e.g. making synthetic (lab-grown) meat or using genetically modified (GM) foods to improve crop yields.

What individuals would do:

- **Eat lower-carbon foods**, including 20% less red meat and dairy
- **Waste less food** – e.g. choosing smaller portions

Assembly members discussed this possible future at their tables. They identified the following pros and cons.

⊕ Pros

+ **Changes to land use** – some assembly members supported the idea of "reduc[ing] land used for livestock", saying it could be "reused for other things" or would be "free to grow more fruit and veg domestically instead of importing." Some noted that changing land use would "reduc[e] carbon emissions (through 20% less land for livestock)." Others suggested that "restoring woodland etc will reduce flood risk and increase biodiversity – restoring peatlands and planting trees is beneficial for the environment." One assembly member commented that the "landscape is already changing" and that "people complain about [the] look of 'prairie' farmland, loss of habitat for wildlife."
+ **Positive changes to farming** – some assembly members noted their support for certain types of farming, suggesting that:
  + **"Seasonal farming (horticulture) would be in better balance with wildlife";**
  + **"High intensity farming such as multi-story agriculture (hydroponics)" would be positive;**
  + **"Breeding to select stronger livestock crops" is "natural, farmers already do this";**
  + **"Cattle can be run on forests not just fields. It's a win-win."**

+ **Health benefits** – some assembly members liked the "health benefits from eating less red meat and dairy" or that it "does require people to change their eating habits…[which] in turn improves their health." Some assembly members pointed out that health benefits are possible without stopping eating red meat completely:

  "Red meat is getting [a] bad press, but our 'experts' have stated that no more than 100grams a day is perfectly safe."

  Others suggested that "farming output will change i.e. different products will replace existing produce leading to… healthier eating habits."

+ **Realistic, including dietary change already happening**– some assembly members felt this future was "more realistic than other options to be able to reach net zero." Relatedly, others noted that "dietary changes … in meat consumption are already happening e.g. 'meat free Mondays'" or said this this future would be "quick [to achieve] because people are already reducing the amount of meat and dairy they eat. Young people are more and more inclined to become vegetarian." One assembly member wondered whether "school children [should] have no meat products in their school meals."

+ **Less food waste, saves money** – some assembly members suggested that "wasting less food" would be positive. Others agreed saying "less food waste is important and an easy thing to do as people will be saving money – only problem will be …reduc[ing] supply." Some noted it "saves money from reducing food waste – farmers could save money long-term." One assembly member noted a scheme in a Chinese restaurant in Camberley, which seeks to charge people for waste when they take too much food from the buffet.

+ **"Moves in the right direction, doing more"**

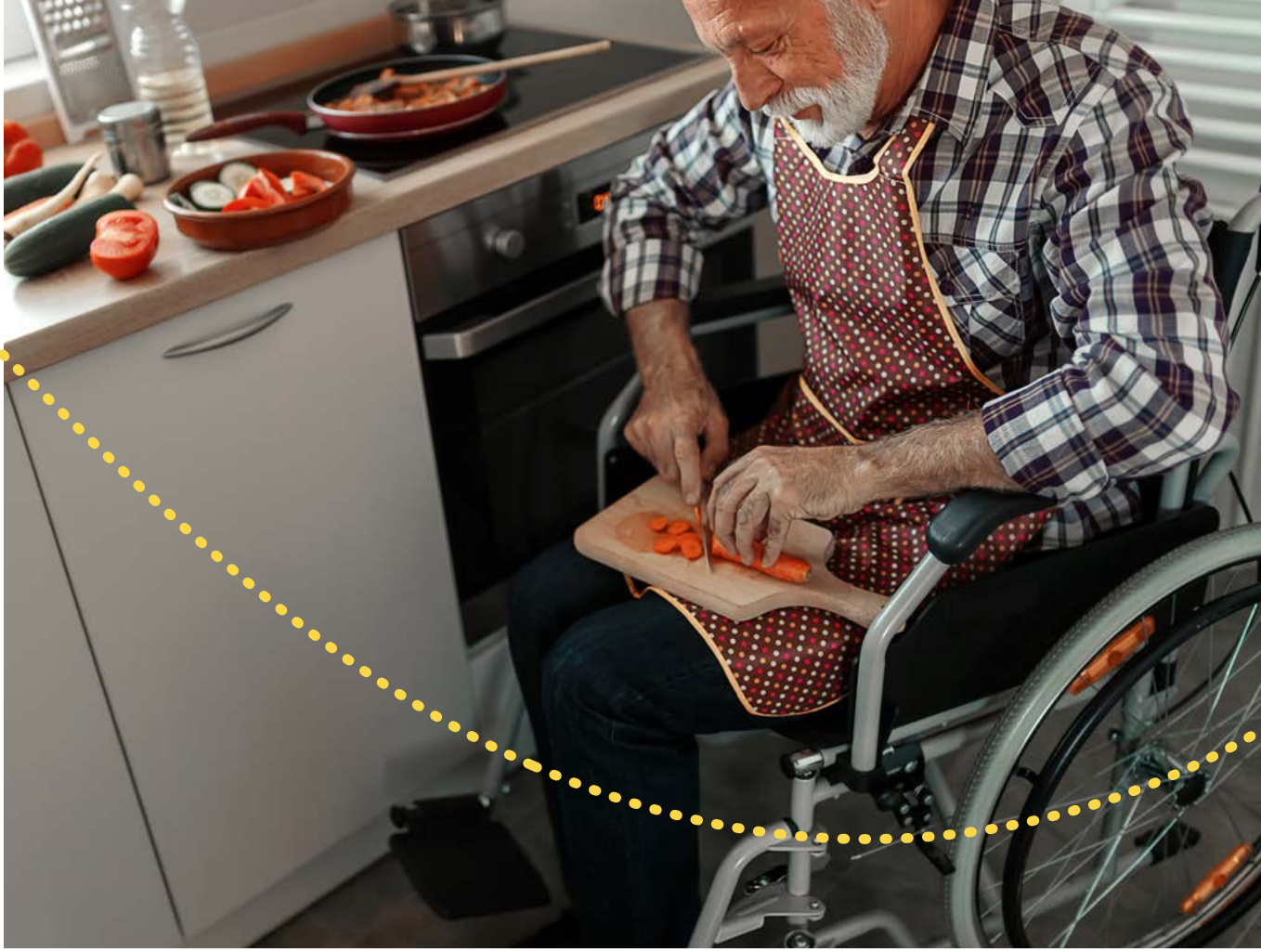
+ **"Might not be to everyone's taste, but where's the harm in testing the demand for synthetic meat in the market?"**

+ **"Farmers must make money long-term in order to maintain [their] lifestyle… [and] provide us with food."**

⊖ Cons

– **Lab meat and GM foods** – some assembly members said they were "not sure of the health implications of lab meat and GM foods" or that there is "not enough information about the impact and risk of measures such as GM food to make informed decisions." Some said "GM foods and lab grown meat – prefer natural food, not necessarily organic but don't want modified food" or "synthetic lab meat is not something we can support. Either you eat proper meat, or you don't." Some assembly members suggested that "gene editing open[s] the door for science and big businesses to take over."

– **Not (sufficiently) effective** – some assembly members questioned "does it go far enough? 20% less red meat and dairy may not reduce enough carbon emissions" or that "using 20% less land (for livestock) won't affect demand for meat."



- **Impact on farmers and regional implications** – some assembly members disliked that there would be "more impact on farmers", **"**potential job losses for farmers", "risk to livestock farming (job loss)" or "farmers having to retrain." Some also expressed concerns that it "may have regional implications i.e. farmers in some areas more adversely affected than others."
- **Impact on nature** – some assembly members suggested that "farming intensification risks biodiversity and animal foods" or that "farmers already do this [breeding to select stronger livestock/crops]; they can't do this faster (naturally) than they are."
- **Societal habits and attitudes not changing fast enough** – some assembly members felt that "social changes targeting habits will take a long time to implement, possibly generations through fundamental education" or noted that the "social barrier could be a big issue – attitudes are already changing, but will it be fast enough?"
- **Controlling** – relatedly, some assembly members worried that "people might feel forced if they're not educated about the goals of meat reduction." Others said it "might be rather restrictive and controlling."
- **Restaurant implications** – some assembly members disliked the "restaurant restrictions" saying it's "hard enough to make a living and restaurants already try to reduce food waste."
- **Concerns about cost** – some assembly members suggested that "the less meat there is available the more expensive it'll be…[which] will specifically affect poorer people and families." Others questioned "who will be footing the bill?", asking "will the government subsidise, or will it be down to us?"

- **"Not realistic"**
- **"Risk to animal welfare is not okay!"**
- **"Will reduce the amount of our fresh milk supply, which is our most bought dairy milk item"**

Some assembly members noted conditions to their support for this possible future, or points they would want taken into account if it is implemented:

- "Government will need to provide farmers with subsidies" or that they supported this possible future "as long as farmers are supported in the transition to move away from livestock."
- More public information and education is needed "on less meat and non-meat diets" and "about GM foods for [the] public to make informed decisions";
- "The change in consumer mindsets will only occur if incentivised and not forced";
- Retailers and fast food restaurants need to change too – "don't just push waste onto the consumer, no wasteful production."

One assembly member commented that they would want to see more technological change added to this possible future to reduce carbon emissions further.

When we asked assembly members to rank the possible futures in their order of preference, this scenario received considerable support from assembly members.

B.3 Local food and rewilding

This possible future would involve fundamental change in food systems and landscapes, towards local production and more space for biodiversity. It would feature changes for businesses and individuals.

What business would do:

- **Food would be produced locally in towns, as well as the countryside,** including growing food indoors, in gardens, in allotments, as well as on farms;
- **More wholefoods and less processed foods would be available and more food would be bought directly from producers** – e.g. farmers markets, veg boxes, food co-operatives – than from supermarkets;
- **Farming would be more efficient** – e.g. by using precision farming; 'gene editing' or breeding to select stronger livestock/crops;
- **Farmers would use at least 40% less land for livestock** (beef, lamb and dairy) and more for less carbon-intensive crops that grow well in the UK (e.g. some vegetables, fruit);
- **Farmers/landowners would use more land to store carbon** – e.g. planting trees, planting 'energy crops', restoring peatlands;

- **Retailers and restaurants would reduce food waste** – e.g. reducing portion sizes;
- **There could also be more 'speculative' measures to produce food** – e.g. making synthetic (lab-grown) meat or using genetically modified (GM) foods (to improve crop yields).

What individuals would do:

- **Eat lower-carbon foods**, including 40%+ less red meat and dairy, and less processed foods;
- **Waste less food,** e.g. choosing smaller portions.

Assembly members discussed this possible future at their tables. Assembly members tended to be consistent in what they saw as the main pros of this option, with strong support for the idea of local produce and food production. Assembly members were more divided about the cons, with smaller numbers of assembly members picking up a number of different points.

⊕ Pros

+ **Support for local produce** – some assembly members said they "love the idea of local (food) and less use of supermarkets", "great idea for local produce" or that they liked that this future "encourages people to buy local and locally produced products." Others suggested that this future was "overall [a] good option, just [with] a few extreme aspects – having more food locally is good." Some were specific about why they like the idea of local produce, suggesting that "having more local foods will reduce costs and the food will be fresh" or that there is a "feel good factor with 'grow your own' or getting food locally produced e.g. eggs." Others said "wastage – need more local markets to sell local produce", "could be cheaper for people and less packaging" or suggested local food is a "money saving incentive for local and personal food waste reduction – make it visible."
+ **Benefits of local produce for farmers** – some assembly members suggested that "farmers [would] get a better price for food", with others commenting that people "don't mind paying a bit more, if you know where it's from and if it's going to a local vegetable grower."
+ **Community benefits from local food production** – some assembly members suggested that there would be "community benefits from local food production and co-operative food schemes" or "community and wellbeing benefits from community/individual growing." Some liked that "communities' access to local food is increased."
+ **Getting people more involved and aware** – some assembly members felt it "educates and involves people in the process of meat reduction and growing local production" or that "improved self-sustainability makes individuals aware of the plant to plate process, reduces waste and improves awareness." Some commented "communal gardening – inner cities? Grow veg, free to pick – makes people more aware and engaged with source of food nutrition and benefits." Others suggested that it "encourages everyone, not just farmers to grow using different methods."
+ **Restoring woodlands, hedgerows, peatlands and gorselands** – some assembly members said this would provide benefits including reducing flood risk, acting as a carbon store, supporting biodiversity and encouraging more wildlife.

+ **Health benefits** – some assembly members highlighted the "health benefits from eating less red meat, dairy and processed foods" or said it "encourages people to cook their own meals – better for health and diet."
+ **Impact on carbon reduction** – some assembly members liked that this future included a "more dramatic reduction in high carbon food", with others suggesting it would have the "largest impact on reducing carbon emissions." Relatedly, some noted that it "make[s] more land available for less carbon intensive crops (more is better)", or that "less import is great as the production within our country will be more green and transport costs will be lower as well."
+ **"Promotes change for everyone in the food chain – good because everyone needs to change."**
+ **"Hydroponics method releases some land for other use and can only be grown in small amounts – less transport needed."**

⊖ Cons

– **Jobs and regional impact** – some assembly members expressed concern about "job losses – farming." Others commented:

> *"impact on the regions where beef and lamb are bred, could have long-term consequences ... [for the] local economy. Small farmers will be forced out of farming. Rich will get richer; the big will get bigger."*

– **Impact on low income households** – some assembly members suggested that "large numbers of families rely on cheaper food prices in supermarkets etc, due to their low income/financial situations." Others commented "cost – less meat and dairy will mean poorer people/families will be hardest hit" or said it was a "risk to equality and less fair for those on low incomes."

– **GM food/farming** – some assembly members said "again, includes modified 'farming'" or "GM – again do not like modified food." Others said we "need to know more about gene editing then [be] given a choice."

– **Nutritional and safety issues** – some assembly members said they were "not sure about the nutritional level on vertical wall farming foods" or highlighted "possible food safety risk[s] with more informal schemes."

– **Scale of behaviour change and controlling people** – some assembly members felt that a 40% reduction in meat and dairy is "too much." Others suggested that "convincing individuals to make the change may be a problem" or that "for that kind of fundamental change, 30 years is not long enough – behaviours cannot change so radically/quickly." One assembly member noted that they didn't "like the idea of controlling people to change food choices." Some said "role of supermarkets: so big, it will be hard to go back to local shops. Big part of people's life. Will be hard to persuade people to change."

- **Need for education** – some assembly members suggested that "many young people don't know how to cook healthy nutritional foods from scratch, would have to work with education" or said "food choices – if we need to change, more options [need] to be available. *Education*"
- **Animal welfare** – some assembly members said that the "risk to animal welfare is not okay!"
- **"Potential risk to rare breeds"**
- **"This idea is to move food production back to towns and cities, but we already produce too much food, and will this actually reduce food production"**
- **"Difficult for people in dense, urban areas to get access to 'grow your own' options (highest population)"**

Some assembly members noted conditions to their support for this possible future, or points they would want taken into account if it is implemented:

- It "could be a positive change, as long as training subsidies are provided to ex-meat/dairy farmers";
- "Imported food [needs to be]… regulated somehow. We don't just want to increase our importing of Brazilian beef with a higher carbon footprint";
- "Mindsets need to change";
- Attention needs to be paid to ensuring we "don't price people out completely";
- "Retailers/restaurants need to buy fresh not frozen food, this would reduce food waste. Use by dates differ. Local purchase if possible."
- "Local food: local councils need to look at that. Communities and local producers in green belts need to produce local food."
- A number of assembly members emphasised the importance of allotments, with some recommending that allotments should added "into housing developments". One assembly member said:

> "I live next to the second biggest [allotment] in the country. The local authority can't use it as a shop to sell surplus [food grown]. It has to be used by local authorities – needs to be looked at; it is a massive missed opportunity."

When we asked assembly members to rank the possible futures in their order of preference, this scenario received considerable support from assembly members.

Cross-cutting comments

A small number of assembly members made cross-cutting comments about the possible futures. Some highlighted the "differences in farming in rural areas vs urban areas – very different problems and solutions required." Others noted again the need to consider the impact and suitability of different land uses, such as forestry, for different parts of the country and types of land.

Some assembly members suggested that all three possible futures "need to be combined when developing policy" or that the "scenarios include lots of proposals but only some of them are agreed with." These two points are picked up in more detail in the next two sections.

Some assembly member re-emphasised their concern about GM and lab grown food, noting the "risks" of these types of food and the fact they had "triggered lots of concerns" at the assembly. Some also highlighted that these foods "could be received with lots of opposition" by the wider public. Conversely a smaller number of assembly members felt that the assembly did not hear enough information about genetically modified food and expressed concerns that "our response was therefore based on preconceptions not evidence."

Vote results

Assembly members voted on the possible futures by secret ballot. The ballot paper asked them to rank the possible futures in their order of preference.

The votes were counted in two ways:

- **Counting assembly members' first preference votes only.** This tells us what assembly members would and wouldn't choose if they could have their most preferred future.
- **Using Borda count.** This involves allocating points for preferences – a first preference vote scored two points, a second preference vote one point and a third preference no points. Counting the votes like this tells us which futures are most acceptable to the greatest number of assembly members.

Figure 1: Possible futures

Please rank the possible futures in order of preference (% 1st preference votes)

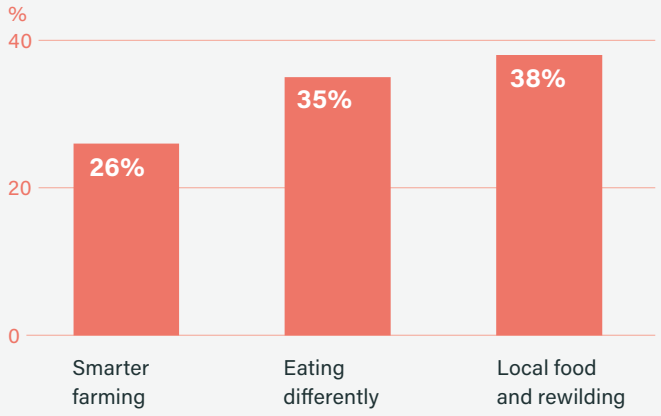
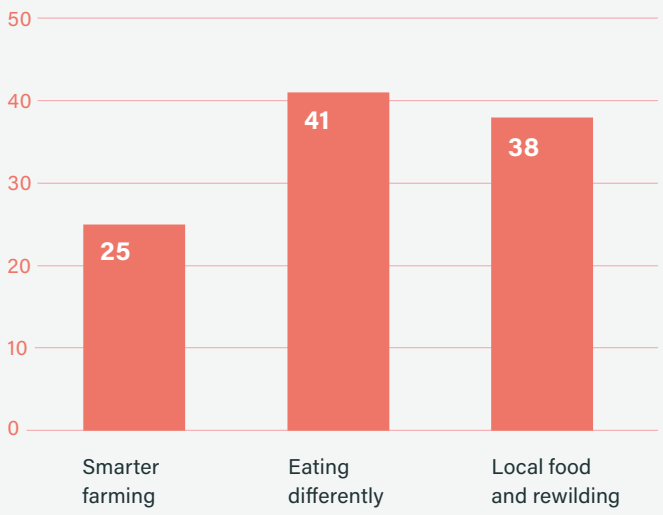


Figure 2: Possible futures

Please rank the possible futures in order of preference
(Borda count)



The results of the votes consistently show greatest support amongst assembly members for 'eating differently' and 'local food and rewilding'. 'Local food and rewilding' received slightly more first preference votes. 'Eating differently' scored slightly better in the Borda count. In both votes the difference is minimal.

Assembly members who chose **'local food and rewilding'** as their first preference wrote positive reasons for their choices on their ballot papers, focussing on why they liked this future. Their explanations always mentioned a range of reasons, not just one. Points that came up frequently included those around:

- **Health benefits;**
- **Community and wellbeing benefits** from local food and local food production;
- **Advantages for farmers** including fairer prices and reducing supermarkets' "stranglehold". One assembly member suggested that "more localised food production would enable farmers to plan and adapt better to local market conditions/requirements." Another suggested it would benefit local businesses as well as farmers;
- **Support for a "managed diversity" of land use**, including steps such as restoring woodlands, peatlands and gorselands.
- **Other potential environmental or emissions benefits**, such as reductions in packaging and the transporting of foods, or a decrease in food waste;
- **A general feeling that the future "promote[s] a positive change"** for everyone in the food chain, building on some social trends already underway.

Smaller numbers of assembly members suggested that this future would result in **better pricing and food quality for consumers**, or that it would reduce the likelihood of intensified farming for livestock, thus **promoting animal welfare**.

Some assembly members who supported this future noted **caveats to their support**. These touched on concerns around GM and lab grown foods, animal welfare and the need for changes in land use to take account of regional differences:

> "The decrease and reuse of land for livestock is a good thing as long as that is practical for that region (some areas are no good for anything but sheep)."

One assembly member said that they would want the change in meat and diary to be 20% not 40%.

Assembly members who chose '**eating differently**' as their first preference gave a range of reasons for their choice on their ballot papers. Two themes that recurred several times amongst their answers were the ideas of:

- **Shared responsibility between different actors** – for example, some stated "we [would] all take responsibility: individuals, farmers, retailers" or that "we can't expect one group to take on all the responsibility for everybody";
- **Lesser change and smaller negative impacts** – for example, some commented that there would be "small changes for farmers, other producers, and for the general public" or "less impact on farmers with regard to possible job losses."

Several of the rationales talked about this future in relation to the other two. For example:

> "I think all of the options are good but smarter farming wouldn't be enough on its own and I can see issues with the 3rd option that would need to be addressed first, e.g. teaching people how to change their diets and cook healthy, nutritional meals from scratch. Also 40% less livestock land may be too big a jump. [….] So option 2 was my favourite on balance but I do still support the other options and believe we will need to use a combination of all of them over a number of years to eventually work towards the best option (somewhere between 2 and 3)."

> "I don't like any of the scenarios, this is the best of a bad lot. I don't encourage GM crops in any way, or lab grown meat. However, I do acknowledge the need to change. I worry though that a drop in meat production and dairy will always affect the poorer and families more than the rich…."

These last two quotes raise themes noted by a number of assembly members. They are addressed more fully directly below.

Futures – conclusions

Assembly members' discussions on the possible futures presented a nuanced but clear picture of their views on food, farming and land use.

A number of assembly members made comments in group discussions and on their ballot papers about either: (1) liking all of the futures and feeling that they needed to be combined; or (2) not liking any of the futures because they disagreed with some elements of each of them. Some assembly members said they "wanted the good bits" of all of them.

These comments fit with some clear themes emerging from assembly members' discussions. In general, assembly members tended to express support for:

- **Local produce and local food production** – for a wide range of reasons including community benefits, fairer prices for farmers, a 'feel good factor' and reduced environmental impacts (packaging, transport etc);
- **A change in diet to reduce meat and dairy consumption by between 20% and 40%** – overall the assembly tended to stress that significant education was needed to promote voluntary, rather than compulsory, changes in diet. 'Choice' was important. They did however tend to support the need for these changes in diet to happen, including noting the health benefits these would bring;
- **A "managed diversity" of land use**, including steps such as restoring woodlands, peatlands and gorselands.

Assembly members noted strongly on several occasions the need for the above to be combined with **support for farmers to make the transition**. This was also their top consideration (please see Section A above).

Areas where some assembly members expressed strong concerns were:

- **GM and lab grown food** – some assembly members voiced strong opposition to including this in any potential future;
- **Animal welfare** – some assembly members expressed strongly that this needed to be protected;

- **Impact on lower income families/households** – some assembly members advocated strongly for measures to ensure that changes to food, farming and land use (including local food production and the price of meat/dairy) did not disproportionately affect the less well off.

Some assembly members also spoke at various points about the need to ensure that any changes and related measures took account of **smaller farms**, the **suitability of different land for different uses**, and **differences in impact between UK regions**.

C. Policy options

After considering the future of food, farming and land use in the UK, assembly members moved on to consider how we might get there. Specifically they looked at policy options in two areas:

- Changing farming, food production and land use;
- Changing retail and individuals' behaviour.

For each of these areas, the Expert Leads recapped and explained potential policy options. Assembly members discussed these ideas in their groups before voting by secret ballot. They were also able to note additional suggestions.

C.1 Changing farming, food production and land use

Assembly members looked at six options for changing farming, food production and land use:

- Low carbon farming regulations;
- Payments for carbon storage;
- Grants for research and development;
- Government contracts for bioenergy and forestry products;
- Changing planning rules;
- Information and skills training.

We start by presenting the rationale for their views, taking each policy option in turn.

Jump to the vote results on page 288

Low carbon farming regulations

This would involve:

- Requirements for farmers to retain a proportion of their land for non-food uses, such as woodland or peatland; or
- Making farm payments conditional on low carbon practices (such as using different feeds or fertilisers) and other public benefits (such as protecting biodiversity).

This could involve extending existing rules that make it illegal for farmers to use artificial fertiliser where it is likely to run-off into water sources.

Assembly members identified a number of pros and cons about low carbon farming regulations.

⊕ Pros

+ **Effective** – some assembly members felt it "will be more effective" than the other options, will be "effective in reducing emissions" or is "the only one guaranteed to do something." Others commented that "regulations = change" or that "farmers need constant reminding and auditing to ensure change happens."
+ **Co-benefits, particularly from woodland and peatland** – some assembly members commented that "increasing woodland and peatland helps with flooding, wildlife and biodiversity" or that the "increase [in] woodland/peatland ...will greatly help flood protection."
+ **Reduces use of fertilisers** – some assembly members liked the existing rule that "prohibits farmers from using artificial fertilisers [where it causes pollution]" or the potential "reduction of artificial fertilisers" through more low carbon farming practices.
+ **"Rewards farmer for changing"**
+ **"Extending existing rules"**
+ **"Promotes [the] restoring of peatland and woodland"**

⊖ Cons

– **Dislike regulation** – some assembly members said "regulation is a big and unpopular step", that they "don't like regulation – nanny state", or that the policy amounted to "heavy hand[ed] regulation." Others commented:

  "No regulations! – low-carbon practices to be encouraged not enforced."

– **Cost to farmers and the need for support** – some assembly members suggested it would be "more expensive for farmers" or that there would be a "cost for farmers." Others asked "would there be sufficient support for farmers?" or stated that farmers would "need financial support." Some said they disliked that the "government would have to subsidise." Some queried "incurs cost to farmers – what about [the] long-term?"

- **Who pays?** – some assembly members asked "what is the impact of these financial incentives on everyone's tax?" or suggested that any "price rise could affect low income families." Some commented that "funding support [would be needed] to reduce [the] impact on public consumption of farmers' increased costs."
- **"Not fair to farmers, not sure there would be a result"**
- **"Obstacle to passing farms down to the next generation"**
- **"Not all farmland can be used for low-carbon practices e.g. sheep farmland"**

Some assembly members noted conditions to their support for this policy option, or points they would want taken into account if it was implemented. They suggested a need for:

- **Nuance, for example to take account of local conditions:** some assembly members said what was suitable "would depend on land and geography and [measures would] have to be localised." Others noted a need to "think of farmers who can't change land use."
- **Financial incentives and support, including careful thought about how they work:** some assembly members said they would support the policy if it went "along with financial incentives and support." Others focussed on how subsidies might work:

  "Subsidies need to be means tested. At the moment, large rich landowners get as much in subsidies as small farmers who don't earn or own a lot. It's not a fair system, single farm payment. Based on Common Agricultural Policy, not a fair system."

- **A combined approach:** some assembly members said that "all options [for policies to change farming, food production and land use] need to be combined" or specifically that options a, b, d and f[4] should be combined, "including steps around information and skills, regulations and payments for carbon storage and government contracts for bioenergy and forestry products."

Others said their support for the policy would depend on the detail of how it worked, for example: "What percentage of land would farmers be required to keep as that? Which farmers would receive payments?" Others commented that "regulations [would] have to be fair for farmers" or that "although it is more expensive at first, in the long run it is cheaper as it has higher efficiency for farmers."

Payments for carbon storage

This would involve farmers and other landowners earning money for using their land to absorb and store carbon, for example by restoring peatland or planting trees. Payments or incentives could also be provided for food producers who increase productivity or efficiency – in other words, who produce as much or more food using less land.

Assembly members identified a number of pros and cons about payments for carbon storage.

4 Options a, b, d and f are: low carbon farming regulations, payments for carbon storage, government contracts for bioenergy and forestry products, and information and skills training.

⊕ Pros

+ **Good for the natural world** – some assembly members suggested it would provide "support for [the] natural world" or lead to the "improved health of rivers." Others said they liked the idea of "free distribution of tree saplings – connected to nature."[5]
+ **Incentivises low carbon practices and is flexible** – some assembly members said they "think this will incentivise good practice by farmers and will catch on as other farmers see [the] pay system working." Others liked that it provides an "incentive for farmers and encourages low-carbon practices in a flexible way."
+ **Effective at storing carbon** – some assembly members noted that "even at low uptake rates or slow change, [the] impact on reducing carbon is positive" or labelled it "quite a good approach, good for storing carbon." Others said we "need to do it."

⊖ Cons

– **Who pays what?** – some assembly members asked "what is the impact of these financial incentives on everyone's tax?" or "how much do we pay farmers and landowners?" Others queried "how long do payments go on for?" or "who would pay for this?"
– **Can all farmers do this?** – some assembly members noted "cost to farmers – which farmers can afford [it]?" or expressed concerns that it "may just make the richer owners richer and not [be] possible for small landowners." Others suggested that "some farmers can't change their practices because the land is only suitable for e.g. sheep."
– **Won't create (enough) change** – some assembly members felt it would lead to "slower change (farmers not required to change)" or suggested that "farmers must be forced to change attitude towards [the] carbon storage goal for it to become the norm." Others commented it "happens anyway, but is not a priority [for farmers]" or that "farmers need to change but need guaranteed financial support."
– **"Allow and encourage the farming community to provide the solutions and lead! Based on low-carbon specifications"**

Some assembly members noted conditions to their support for this policy option, or points they would want taken into account if it was implemented:

- Some suggested it "**needs to be combined with other things** to be effective e.g. low carbon farming regulations and changing planning rules", or that "all options need to be combined." Others said "if [the payments are] not carried out in combination [with other options], they probably will have limited impact in terms of changing behaviour and making a difference in reduction of emissions."

5 We think this is a reference to this scheme – http://www.onetreeperchild.com – which was brought up by an assembly member.

- Others focused on the **finances** suggesting that "if government doesn't pay it [would] pa[y] for itself" or recommending that policy-makers "shift money from bad practice subsidies rather than use extra money." Some commented "if farmers are receiving payments e.g. subsidies, why aren't they obliged to use land in diversified ways… e.g. maintaining peatland." Some suggested that "carbon storage [should]… be encouraged and monitored before payments [are made]" and that there should be "payment scales" linked to the volume of carbon stored. Others queried "what timescale? – for forever?"
- Some assembly members commented on **the need to consider all types of farmers**, saying "think of farmers who can't change land use" or querying "tenant farmers?" Others said "payments for carbon storage should be proportionate to [the] size of land owned e.g. to make it fair."
- Others expressed support for **carbon capture and storage**, saying it "seems like a great idea, quick fix but also effective"[6] or that "natural carbon storage has other benefits as well e.g. increased biodiversity." Some assembly members advocated **methane capture and storage** suggesting it "pays for itself in the long-term, burning it for energy" or commenting that it "should be implemented especially as methane has a larger effect than CO_2."

Some assembly members suggested **"use the land that can't be used for arable."**

Grants for research and development

This would involve grants for food producers to support research and technology development. The research and development could focus on making agricultural practices more sustainable, and/or on reducing the costs of meat and dairy made in labs.

There could also be a dedicated fund providing loans to help food and farming businesses shift to lower-carbon practices.

Assembly members identified a number of pros and cons about grants for research and development

⊕ Pros

+ **Encourages innovation** – some assembly members said it "encourages innovation" or "encourages farmers/producers to come up with new ideas for reducing emissions." Others said it would allow us to "innovate [our way] out of [the] problem (not enforce)."
+ **Benefits of R&D, including globally** – some assembly members suggested that "research and development have multiple benefits: increased efficiency which is better for the environment; selling this tech worldwide as leaders has further environmental and economic benefits." Other agreed saying they felt that by innovating the UK could create an opportunity for "global leadership."

6 The assembly went on to consider carbon capture and storage in detail. Please see chapter nine.

+ **It will/could help** – some assembly members said they were "confident that it will help" or that it would be beneficial because "there are still problems e.g. flooding, that we ... don't know how to solve yet." Others were more cautious suggesting it "could be good, but would need to be overs[een] and evaluated."
+ **"Good for farmers to be the leaders"**
+ **"Farmers must engage with changes required – education on benefits and profits over time"**

⊖ Cons

– **Not guaranteed to be effective** – some assembly members said it was "not guaranteed to be effective" or "might not be as effective as other options." Others commented that "we must have guarantees that change will happen with funding, otherwise it's money wasted."
– **Will this be funded by taxes?** – some assembly members asked "what is the impact of these financial incentives on everyone's tax?" or noted that there is "lots of talk around grants across topics, but – will this come from taxes? Who will fund it?" Others queried "how much do we pay farmers and landowners?"
– **Lab food** – some assembly members suggested that "lab grown meat diverts attention away from lower carbon options e.g. veganism" or commented "lab food – don't need it." Another assembly member commented that "I don't like the idea of meat and dairy being made in labs – don't know the impact. Taking jobs from farmers."
– **"Risk of bias from funders/sponsors"**

A small number of assembly members noted conditions to their support for this policy option, or points they would want taken into account if it was implemented. Some suggested that "**impact evaluation** [would be] needed to ensure that pilot schemes are actually making a real difference." Others said that "**all** [**policy**] **options need to be combined**" or suggested linking grants for research and development with low carbon farming regulations.

Government contracts for bioenergy and forestry products

This would involve amending the procedure for awarding government contracts to give preference to carbon-storing products. It would mean government contracts around energy or construction giving preference to bioenergy crops and forestry products (like wood for buildings or furniture). It could also include setting minimum purchase levels – guaranteeing that government will buy a certain amount of these products per year.

Providing a long-term customer base for bioenergy crops and timber would give farmers certainty that they can make money from them.

Assembly members identified a number of pros and cons about government contracts for bioenergy and forestry products.

Pros

+ **"Allows farmers to use land they weren't otherwise using to plant bioenergy crops"**
+ **"Government sets precedent, gives carbon-friendly industry a foot up"**
+ **"Supports campaigns who have interest[s] besides profit"**
+ **"Really easy option, makes sense"**
+ **"Government contracts good for competition, competition is healthy and produces better goods"**

Cons

– **Unsure about bioenergy crops** – some assembly members said they "don't want to include bioenergy" or that "bioenergy is not the way to go as it requires a lot of land and releases CO_2." Others queried "are bioenergy crops any more carbon efficient if we are still burning them?"[7]

– **Puts burden on farmers** – some assembly members disliked that that "farmers must change to achieve lower emissions." Others suggested that this policy "puts indirect pressure on farmers" or asked "will some farmers need retraining?" Some assembly members countered this final point saying *"we always need to learn new things – so it [farmers needing to be retrained] is not a problem."*

– **"How long will it take?"**

7 The assembly went on to look at bioenergy in detail (please see chapter eight).

Some assembly members noted conditions to their support for this policy option, or points they would want taken into account if it was implemented. Some suggested the policy should be expanded in scope:

> “These shouldn’t be limited to the farming industry – how about building industry using low carbon materials.”

> “A lot of contracts with farmers are from the private sector (e.g. supermarkets, restaurants). Need to think more widely with procurement contracts, not just government.”

Others queried “will new governments honour previous contracts for bioenergy etc?”

As with previous policy options, some assembly members noted their preference for “all options need to be combined” or for those responsible to “think of farmers who can’t change land use.”

Changing planning rules

This would involve changing planning rules so that healthy food can be produced sustainably in a wider range of areas, including in urban areas and buildings. This could include requiring new developments to set aside space for residents or communities to grow their own food. The changes could also make it easier to locate renewables, such as wind turbines or solar panels, on farmland or elsewhere.

Assembly members identified a number of pros and cons about changing planning rules.

⊕ Pros

+ **Space, scope, feasibility** – some assembly members commented “rooftop developments and vertical green walls – lots of scope for this” or noted that there are “lots of empty buildings already.” Others suggested “turning existing green spaces/squares into allotments e.g. plot in the middle of high rise [buildings]” or said “smaller allotments are needed e.g. long waiting lists in some cities, urban areas particularly.”
+ **Less packaging and transportation** – some assembly members liked that it involved a “reduction of food miles” or that it involved “less packaging and [less] nee[d] [for] low carbon transport from rural to urban.”
+ **Fewer imports and local** – some assembly members commented “less import[s] and more self-sustainable.” Others liked that it’s a “local way of doing [things] – not shipping food” or said that “growing locally means you know what has gone into it.”
+ **General support** – some assembly members said that they “can’t see a negative with this option” or “like this option very much.”
+ **“Planning guidelines must be monitored to ensure compliance. Leads to better choice of product”**
+ **“Buying direct from farmers so profit made, and consumers pay fair price”**
+ **“Not too restrictive”**

⊖ Cons

- **Need to ensure standards are met** – some assembly members expressed concern about "safety issues and loose standards" or "food standards not being maintained – open to abuse and people not checking." Some commented that "food standards must be adhered to – ensure health and safety is paramount...."
- **"Will planners recognise what needs are?"**
- **"No guarantee that people will use them"**
- **"Changes are too big"**

Some assembly members noted conditions to their support for this policy option, or points they would want taken into account if it was implemented. They suggested:

- We "need to make sure food is the same price or cheaper";
- We should "make [the] most of existing brownfield [sites] in urban areas."
- "Food standards are only a problem if you're going to sell the produce, but okay if you're going to consume it."
- "All [policy] options need to be combined."

Information and skills training

This would involve providing information and skills training to those who manage the land in order to encourage low-carbon farming practices and other ways of reducing emissions (e.g. restoring peatlands, planting trees, growing different crops).

Assembly members identified a number of pros and cons about information and skills training.

⊕ Pros

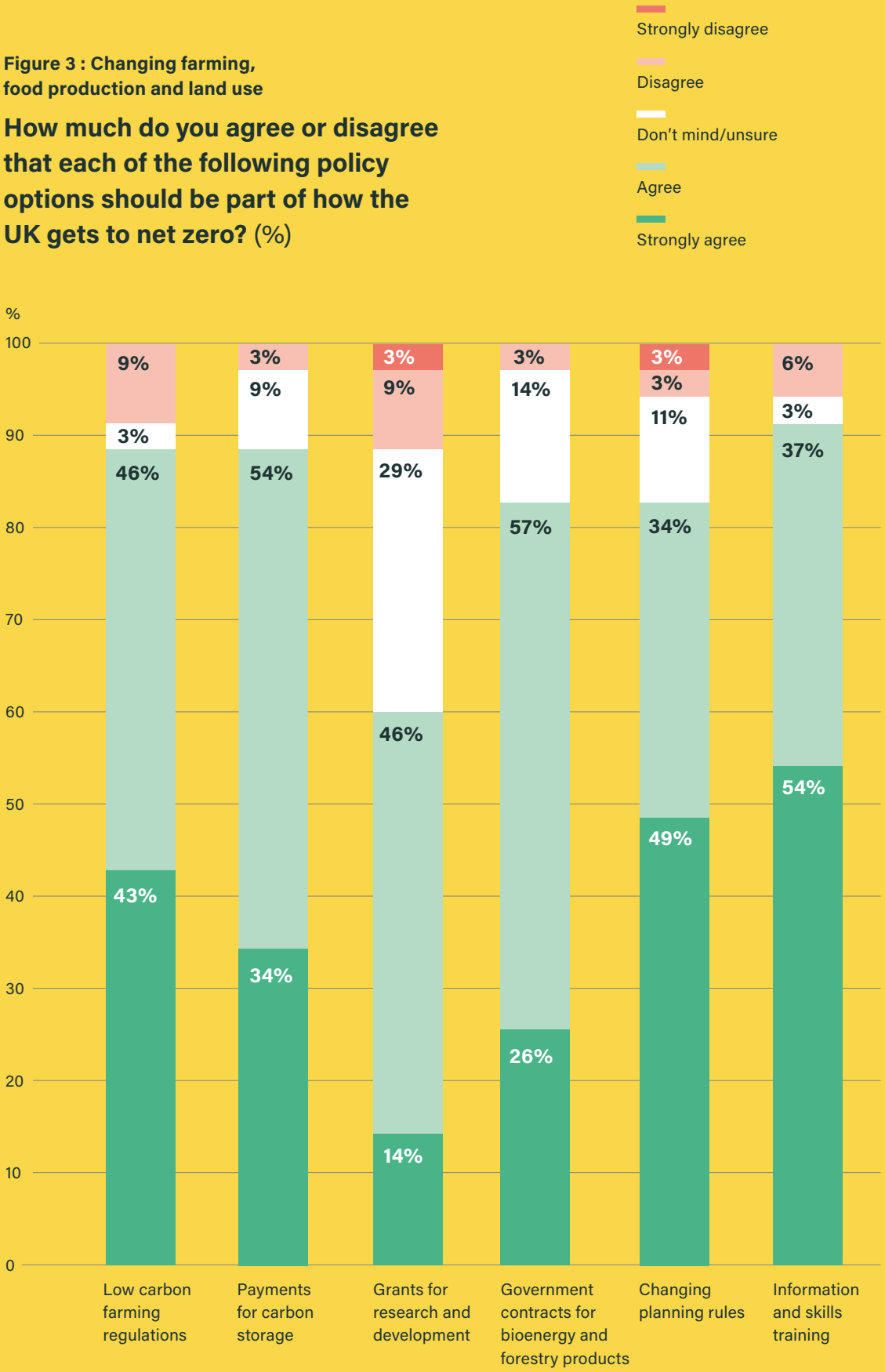
+ **Understanding why change is needed** – some assembly members said "farmers need to understand why they're being asked/told to change." Other commented:

  "education is the basis for everything, especially if the government is going to make changes. With farming practices, [it] will need a lot of education and training."

+ **Common sense** – some assembly members said it was a "no brainer" that should be "available no matter what." Others said "most [people] want changes."
+ **"Train and benefit farmers including across generations"**
+ **"Primary schools planting food – good for education and attention from media, fast solution?"**
+ **"Low cost"**

Figure 3 : Changing farming, food production and land use

How much do you agree or disagree that each of the following policy options should be part of how the UK gets to net zero? (%)



⊖ Cons

- **Wouldn't create fast enough change** – some assembly members queried "would world change be quick enough?", "not radical enough?" or noted that it doesn't "force action from people?"
- **"Risk of glut of seasonal veg grown – too much of one crop"**

Some assembly members said their support for this option would depend on how it is implemented, asking "who gets trained – farmer, labourer, staff?" Others noted the need to "think of farmers who can't change land use." Some said this policy "needs to be in tandem with retailer change " or again stressed that "all [policy] options need to be combined."

Vote results

Assembly members voted by secret ballot on policy options for changing farming, food production and land use. There were two ballot papers. The first ballot paper asked assembly members how much they agreed or disagreed that each policy option should be part of how the UK gets to net zero. The second ballot paper asked them to rank the options in their order of preference. The votes from this second ballot paper were counted both in terms of first preference votes and via Borda count.

Assembly members were in general very supportive of the policy options: **a clear majority of assembly members 'agreed' or 'strongly agreed' that all six policies should be part of how the UK gets to net zero**. For five of the six policy options, the percentage of assembly members backing their implementation was over 80%. A comparatively smaller 60% of assembly members supported the remaining option of 'grants for research and development.'

There was also a difference in how much 'strong' support policies received. Assembly members were most likely to 'strongly agree' with 'information and skills training', 'changing planning rules' and 'low carbon farming regulations', followed by 'payments for carbon storage'.

In the ranking vote **'grants for research and development'** remained assembly members' least preferred option by some distance. The main difference was that **information and skills training** received less support in terms of first preference votes in particular than might have been expected given the earlier result. This difference may be explained by the fact that, while assembly members generally felt it should happen, they were uncertain about how much change it would create by itself.

Figure 4: Changing farming, food production and land use

Please rank the following policy options in order of preference

(% 1st preference votes)

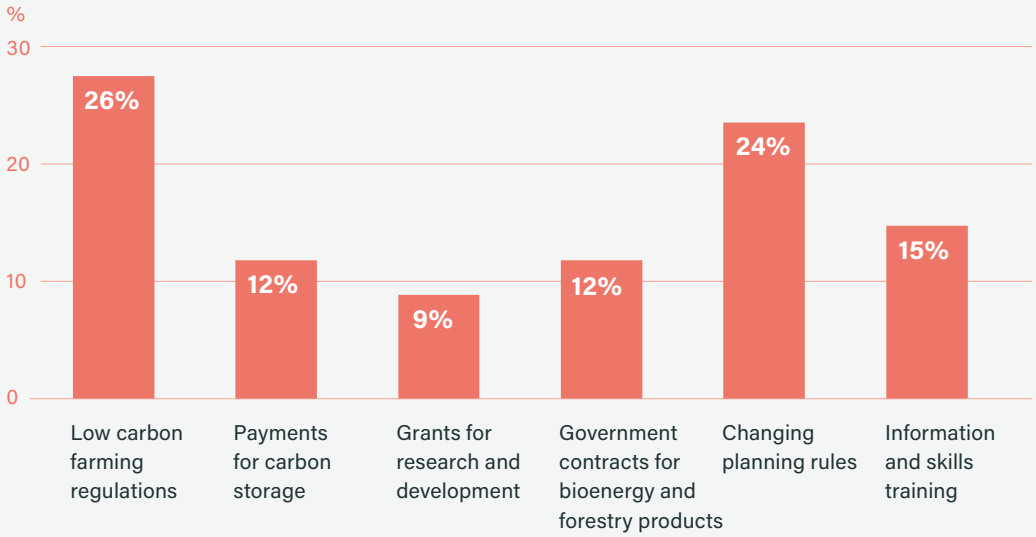
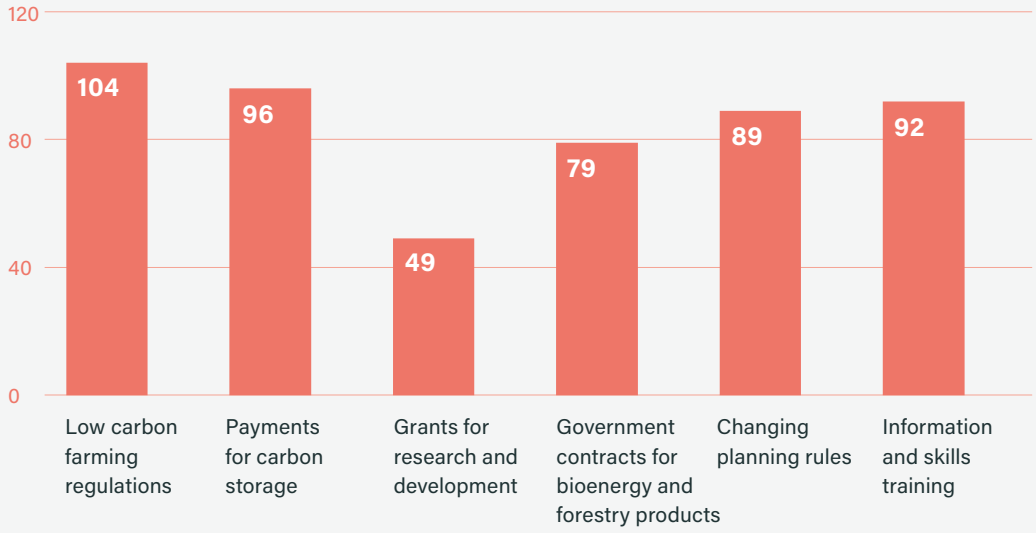


Figure 5: Changing farming, food production and land use

Please rank the following policy options in order of preference

(Borda count)



C.2 Changing retail and individuals' behaviour

Assembly members looked at five options for changing retail and individuals' behaviour:

- Bans and restrictions;
- Taxes and incentives for low carbon foods;
- Taxes and incentives for reducing food waste;
- Government contracts for low carbon food;
- Labelling and information.

We start by presenting the rationale for their views, taking each policy option in turn.

Jump to the vote results on page 298

Bans and restrictions

This would involve applying bans or restrictions to the most carbon-emitting food-types (e.g. red meat, processed foods, foods transported by aeroplanes). The rules could start by reducing the use of these foods in the public sector, for example in schools and hospitals.

Adverts for high-carbon foods could also be regulated. This could mean forcing adverts to include information about the relevant food's emissions, or banning the adverts altogether.

Other regulations could focus on food retail (restaurants, cafes, takeaways, shops/supermarkets, caterers), perhaps limiting high-carbon foods on menus, or reducing portion sizes.

Assembly members identified a number of pros and cons about bans and restrictions.

Pros

+ **Changes in schools and hospitals** – one assembly member said "I like the idea of public sector establishments only offering healthy/low carbon food." Others agreed saying you "don't need [high carbon food] in schools or hospitals." Some commented that "restricting red meat in hospitals also benefits health – hypocritical to serve" or that "if you're going to eat meat eat better meat e.g. especially in schools such as primary schools."
+ **Lack of impact on individuals** – some assembly members said it "forces producers to change their ways – trickles down to us. We don't have to do anything" or it "doesn't hit individuals hard financially."
+ **"Restrictions would be okay"**
+ **"Health benefits for children and they are more receptive to changes than older people"**
+ **"Smaller portion sizes and reducing the amount of high carbon foods in our diets"**
+ **"Advertising high carbon foods to be banned, healthy advertising to be encouraged"**

⊖ Cons

- **Bans are too harsh** – some assembly members said that "restrictions [are] okay, but not a ban – likely to damage business (butchers, shops, not just farmers)." Others agreed saying "there should be restrictions not bans" or that they disliked "forcing change through ban." Some commented that "forcing the public to eat/not eat certain foods is bound to be unpopular (impacts on freedom)" or that they "prefer to give people choices rather than banning – some people rely on particular foods, or won't change and [it] could lead to hoarding and increased black market use."
- **"Hard to regulate adverts online"**
- **"School meal the only decent meal a child might get"**
- **"Use of carbon emitting foods is already being reduced in many hospitals and schools"**
- **"Livestock farming to be reduced with alternatives put in place"**

Some assembly members noted conditions to their support for this policy option, or points they would want taken into account if it was implemented. Many were about advertising, with most, but not all, favouring restrictions over bans:

> "Allow advert[s] but [they] must have [a] message about carbon footprint"
>
> "Ads with information about food emissions is a great way to educate people."
>
> "Restricting high carbon advertising is great as it'll be very effective"
>
> "[I would like to see] no adverts for high carbon foods."

Some assembly members suggested that "schools and hospitals [will] need to ensure [people are] … still getting enough nutrients." Others called for "greater scrutiny and regulation of unhealthy ingredients, mainly highly processed ingredients such as sweeteners." Some said in general that we should "not ban just restrict."

Taxes and incentives for low carbon foods

Additional taxes could be brought in for:

- The types of food with the largest emissions (e.g. red meat);
- Emissions coming from how food is produced, packaged, stored and transported;
- Advertising high-carbon food.

These charges could be targeted at producers, retailers, or consumers.

Incentives could help make low carbon food cheaper. They could include subsidies for local food suppliers (e.g. food cooperatives) if they are lower carbon. Additional discounts could be given to people on low incomes.

Assembly members identified a number of pros and cons about taxes and incentives for low carbon foods.

⊕ Pros

+ **Taxes and restrictions** – some assembly members felt that "taxes on meat could help shift behaviours." Others liked "taxes/charges for food producers to encourage emission reductions."
+ **Making low carbon food (comparatively) more affordable** – some assembly members liked that it would "make healthy low carbon food much cheaper than unhealthy high carbon food" or suggested it "makes low carbon food more affordable." Others said that "vegan/ vegetarian diets can be more expensive so decreasing the price and increasing [that of] high-carbon foods will be effective."
+ **Not everyone has to be able to afford everything** – some assembly members said "it's okay if not everyone can afford red meat" or it's the "same as [the] current system, where people can afford different foods."
+ **Less restrictive** – some assembly members said it "doesn't restrict personal choice as much so more likely to be accepted" or that it's "more free market: gives options; less controlling; carrot and stick."
+ **Important / meeting a need** – some assembly members felt this policy is "really important" or commented that "we do need more low-carbon food."
+ **"More beetroot bonds"**[8]
+ **"Charges for red meat locally is better than Brazil etc"**

8 One of the speakers, Sue Pritchard from the RSA, mentioned 'beetroot bonds.' They are the idea that: "Every person in the UK would receive a monthly dividend to spend on fresh, healthy produce purchased directly from local farmers and traders. For more information, please see https://www.thersa.org/globalassets/reports/rsa-ffcc-our-future-in-the-land.pdf

⊖ Cons

- **Impact on consumers, including those on low incomes** – some assembly members expressed concerns that "retailers will just pass the cost onto the consumer" or that "costs [will]... be passed on to consumers – only a problem if it extends so the poor can't afford any food." Others said it "may just mean poorer people can't eat it [red meat]."
- **Behaviour of the wealthy** – some assembly members disliked that the "wealthy could continue to buy a lot of high carbon foods." Others were more circumspect, saying "we can't tell for sure if wealthy people will continue buying high-carbon foods" or that the "wealthy will continue to buy meat, but that's okay."
- **"Concern supermarkets always win, whatever system is in place"**

Some assembly members noted conditions to their support for this policy option, or points they would want taken into account if it was implemented:

- **Education and information:** some assembly members said it has "no major downsides, if you communicate about the carbon footprint of products (e.g. share graph from presentation)." Others advocated a combination of "stop[ing] producing high carbon foods and education and awareness of healthier options."
- **Supporting people on low incomes** – some assembly members stressed the need to provide "support for those on low incomes or nearly low incomes – so it's fair and doesn't increase inequality" or to "ensure access for low income individuals."
- Some said they **"prefer incentives to taxes."**

One assembly commented that "I like the idea that adverts for high carbon foods could be targeted for regulation/banning altogether."

Taxes and incentives for reducing food waste

Taxes or incentives could:

- Encourage shops to reduce waste (e.g. make 'wonky veg' cheaper to buy);
- Penalise food waste by businesses and individuals (e.g. food waste charges/taxes);
- Encourage supermarkets, restaurants and shops to serve smaller portion sizes.

Assembly members identified a number of pros and cons about taxes and incentives for reducing food waste.

⊕ Pros

+ **Reducing food waste** – some assembly members said "we produce too much [food] at the moment" or that it would result in "less waste for farmers e.g. wonky veg." Others liked the idea of "educat[ing] people to only buy what they need – reduces waste."
+ **Changes for supermarkets and restaurants** – some assembly members particularly liked the idea of "supermarkets ... sell[ing] smaller packaging/portions" or said it "makes more sense for supermarkets and restaurants – hard to monitor at individual level (e.g. private households)."
+ **Already starting to happen and it works** – some assembly members said it's "already happening, does work" or that "Fareshare[9] cafés [are] growing in popularity (social enterprise)."
+ **"Recycle/compost food waste through doorstep collection"**
+ **"Not difficult"**
+ **"New homes built or developed should have built in waste reduction technology"**
+ **"Eco-tax – could use tax revenue for other projects to get to net zero"**

⊖ Cons

– **Food going to landfill** – some assembly members worried that "charges for food waste could mean people put it in black bins for landfill, causing more greenhouse gas emissions." Others agreed saying "if you tax food waste, they will chuck it away [in the general waste]" or "concerns about landfill – food needs to be composted nationally as well as wasting less."
– **Scepticism** – some assembly members queried "do we really need to encourage shops to sell wonky food cheaper?" or "isn't this a business idea that has been explored already?" Others said "smaller portions – will this have the effect of reducing consumption, or will people just buy more?" or "the wealthy would continue wasting food."
– **Penalising people** – some assembly members suggested it "penalises businesses and individuals – it's unfair and unrealistic" or said "don't penalise people e.g. no council facilities."
– **Practical issues** – some assembly members noted that it's "currently very restrictive to share 'waste' food so it doesn't go to waste" or said there would be "some difficult things to manage e.g. if you don't eat all your food in a restaurant who pays?"
– **"Let market work"**
– **"Like BOGOF[10] deals e.g. freeze/store food"**

9 For more information about FareShare please see https://fareshare.org.uk
10 Buy One Get One Free

Some assembly members noted conditions to their support for this policy option, or points they would want taken into account if it was implemented. These tended to fall into two themes.

Some assembly members highlighted that **"provision would have to be there for food waste"** or commented "what other alternative is there for disposal of black bin bags of waste food." Others suggested there "needs to be national solutions, e.g. composting that already exists locally."

Approaching the issue from a different angle, some assembly members identified a "need to review best before policies, currently causing waste – use same policy as France, if waste food is left at the end of the day, give it to the homeless." Others suggested a need to get firms to "reduce 2 for 1 deals."

Slightly overlapping with the above, another set of comments looked at **who should and shouldn't take responsibility and pay for any changes**:

> "Consider impact of penalising small business e.g. café owners"
>
> "Supermarkets need to take responsibility"
>
> "Incentives only, not taxes as it comes back to the individual"
>
> "Mostly focus on firms as this will reduce their waste and reduce 2 for 1 deals which will lead to decreased consumer waste as well."

Government contracts for low carbon food

This would involve amending the procedure for awarding government contracts to give preference to food producers that are low carbon. Food producers are people or companies that make, process and supply food (e.g. farmers, food factories, caterers). It could also involve all public sector catering (e.g. hospital cafes, school canteens) offering plant-based alternatives at every meal.

Assembly members identified a number of pros and cons about government contracts for low carbon food.

⊕ Pros

+ **Government can lead the way** – some assembly members liked "government/public sector contracts for low carbon foods – lead the change", with others agreeing that they liked the idea of government "leading by example."
+ **Practical to implement** – some assembly members suggested it is a "quick fix, very easy for government to implement" or noted that they are "already regimenting what's happening e.g. plant-based option in school and in hospital." Others suggested that it could later be "extend[ed]."
+ **Maintains choice** – some assembly members liked that it "maintains choice" or the idea of "offering plant-based alternatives at meals in public establishments." Others commented that they supported a "Government preference to food produce in low carbon products, but don't take people's freedom of choice away on i.e. red meat eaters."

+ **Good for business** – some assembly members suggested it "would give [a] huge initial boost to [the] plant-based industry" or that it would "hel[p] companies work out how they might change – test beds."
+ **"Makes sure child in school gets good school meal"**
+ **"Health benefits (more plant-based)"**
+ **"Can't see major downside – needs to be enforced at local government and central government levels and related services (e.g. NHS)"**

⊖ Cons

– **Leave it to the experts** – some assembly members said that "experts, not civil servants in isolation [should]... develop solutions and track progress/outcomes." Others said "leave experts to decide not politicians or civil servants."
– **"Already happening, so superfluous"**
– **"Doesn't incentivise producers ... regulation would be more effective"**

Some assembly members commented that "contracts should include reducing food waste as well."

Labelling and information

This would involve labelling on food and drink products showing the amount of emissions that come from different foods. This could help individuals choose what they wanted to buy.

Education could also raise awareness of issues around food and food waste. This could include teaching skills like cooking and meal planning in schools.

Assembly members identified a number of pros and cons about labelling and information.

⊕ Pros

+ **Educate people and let them choose** – some assembly members said it "doesn't restrict choices but educates people", that it's "not controlling, allowing choice" or that it "helps consumer choice." Others commented that "showing carbon footprint on food helps individuals to choose (reduces confusion on low carbon food)" or that "many people don't understand climate change – need informing to make the right choice."
+ **Impactful** – some assembly members said you "see [labelling] instantly" and "it would have a big effect." Others said that "labelling and marketing are very important to change people's behaviour and what they eat." Some commented "start young, drives behaviour change."

⊖ Cons

- **"Might not work in isolation"**
- **"Name[s] and shame[s] decent producers where a high carbon product has no alternative"**

A significant number of assembly members noted conditions to their support for this policy option, or points they would want taken into account if it was implemented.

Some talked about **how to make labelling effective**. Assembly members consistently emphasised that it "must be clear" and "has to be easy to understand." Some said a "traffic light system [is] needed and [should be] highly visible – simple fuel gauge traffic light labelling." Others recommended a similar idea, suggesting "labelling on food and drink to show emissions i.e. green sticker for green products. It's a way of educating people and being transparent."

Others noted that labelling "has to be available when doing online shopping as well." Others suggested a need for "independent oversight to make sure information is true and properly represents carbon footprint." Some commented "what about imports? – if you have a choice with one carbon scoring labelled, and the other without, you will probably get the product with the carbon scoring."

Another group of comments focussed on the **power of peer influence.** Some assembly members said "information and peer pressure on choice of food is as effective as wealth. Need more notice taken of peer pressure to change behaviour." Others said they "believe in the power of peer influence" or that we "need key influencers for all sorts of audiences, not just young people influencers."

Some assembly members said that "**teaching** could also cover [the] big picture – life skills, cooking."

Additional ideas

Some assembly members suggested additional policy ideas that could help to change retail and individuals' behaviour:

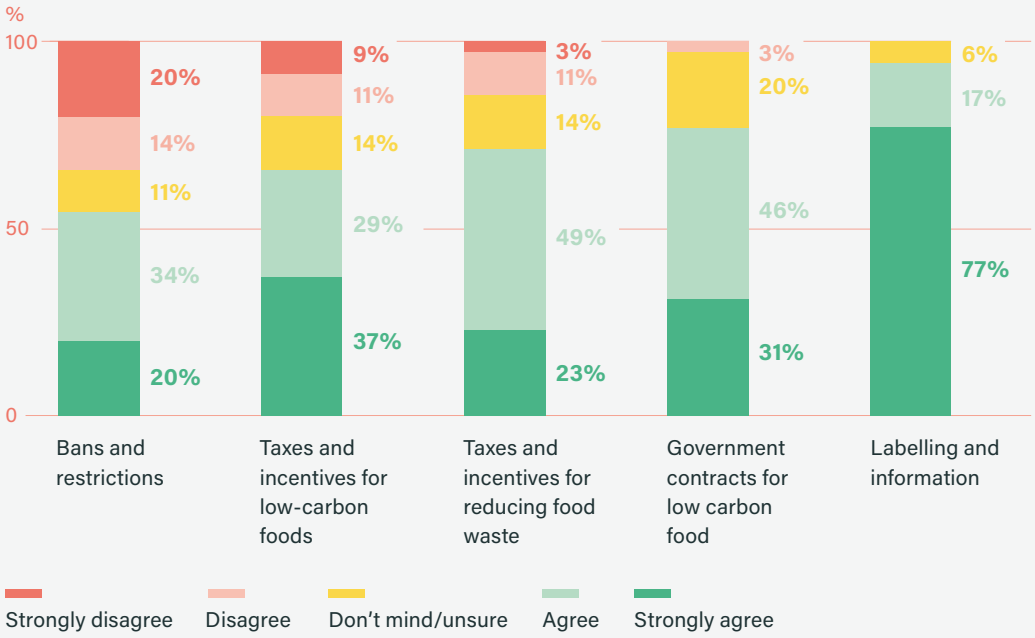
- "New policy idea: a carbon card to reward low-carbon lifestyles"
- "Include rules about where products can be placed in supermarkets to encourage low carbon choices"
- "Can someone invent/distribute recyclable carrier bags"
- "High carbon/low carbon menu"
- "High/low carbon information on menu"
- "Have a small, medium and large portion size serving at restaurants"

Vote results

Assembly members voted by secret ballot on policy options for changing retail and individuals' behaviours. There were two ballot papers. The first ballot paper asked assembly members how much they agreed or disagreed that each policy option should be part of how the UK gets to net zero. The second ballot paper asked them to rank the options in their order of preference. The votes from this second ballot paper were counted both in terms of first preference votes and via Borda count.

Figure 6: Changing retail and individuals' behaviour

How much do you agree or disagree that each of the following policy options should be part of how the UK gets to net zero? (%)



Assembly members were in general supportive of the policy options: **a majority of assembly members 'strongly agreed' or 'agreed' that all of the policies should be part of how the UK gets to net zero**. The size of the majorities was however lower in general than for policies to change farming, food production and land use.

The exception was 'labelling and information' which was more popular than all the policies for changing farming, food production and land use. 77% of assembly members 'strongly agreed' that it should be introduced, with a total of 94% 'strongly agreeing' or 'agreeing'.

The most controversial policy was 'bans and restrictions'. A small majority (54%) of assembly members supported this option, while 34% 'strongly disagreed' or 'disagreed' that it should be introduced.

For the other options, 77% of assembly members 'strongly agreed' or 'agreed' with 'government contracts for low carbon food', 72% with 'taxes and incentives for reducing food waste' and 66% with 'taxes and incentives for low carbon foods.'

Figure 7: Changing retail and individuals' behaviour

How much do you agree or disagree that each of the following policy options should be part of how the UK gets to net zero? (%)

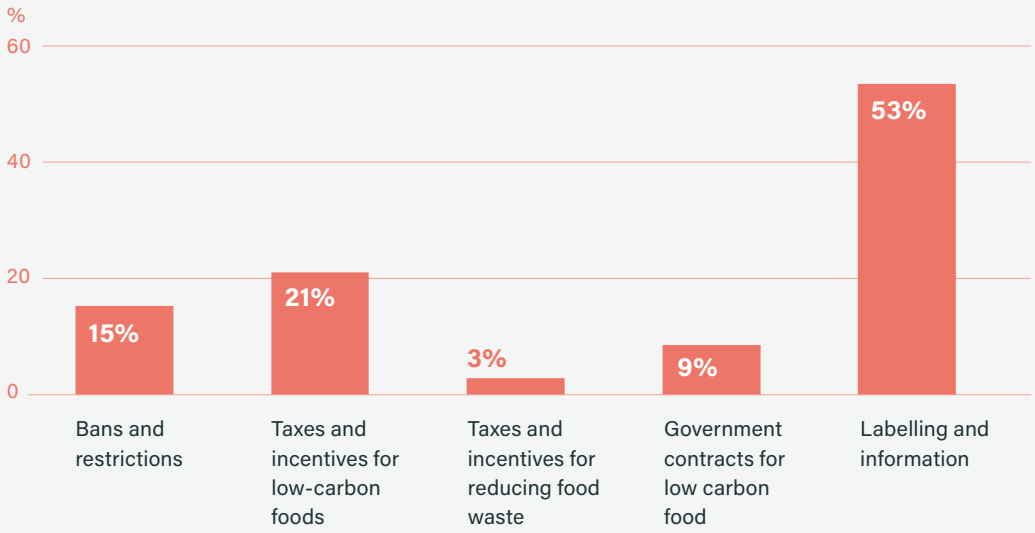
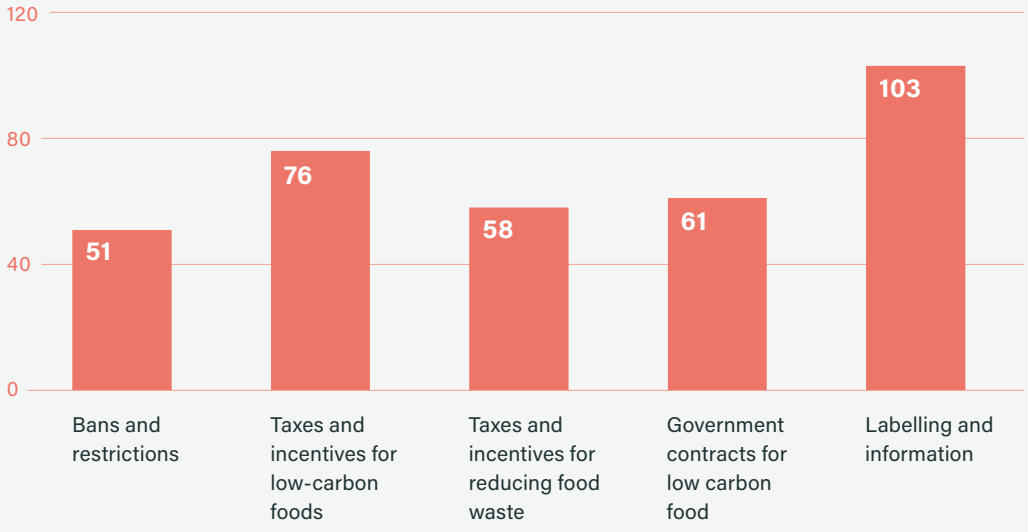


Figure 8: Changing retail and individuals' behaviour

Please rank the following policy options in order of preference (Borda count)



The results of the ranking vote re-emphasised assembly members' strong support for **'labelling and information.'** The second most popular policy in terms of both first preference votes and the Borda count was **'taxes and incentives for low carbon foods.'** Whilst it received slightly lower support than some of the other options in the first vote, these results suggest that those who did support it felt comparatively strongly about it.

Bans and restrictions secured a reasonable number of first preference votes, but was again the least popular option in the Borda count.

Policy options – conclusions

Assembly members showed **strong support for a wide range of policies.**

Their support was particularly pronounced for policies to change **farming, food production and land use**:

- A clear majority of assembly members 'agreed' or 'strongly agreed' that all six policies in this category should be part of how the UK gets to net zero;
- For five of the six policy options, the percentage of assembly members backing their implementation was over 80%. Assembly members' preferred options were 'information and skills training' (91% supported implementation), 'changing planning rules' (83%), 'low carbon farming regulations' (89%), and 'payments for carbon storage' (87%).

Assembly members noted positives about the policies including effectiveness, feasibility, and co-benefits such as helping nature. They suggested 'information and skills training' was a "no brainer" and should be "available no matter what." They showed comparatively less support for 'grants for research and development' (60%). There was also strong support, albeit slightly more measured, for policies to **change retail and individuals' behaviour:**

- A majority of assembly members 'strongly agreed' or 'agreed' that all of the policies should be part of how the UK gets to net zero;
- The size of the majorities whilst lower in general was still substantial tending to lie between 60% and 80%.

Assembly members' preferred policy option in this category was **'labelling and information' (94% supported implementation).** Assembly members suggested that steps in this area would allow individuals to make an informed choice, with some clearly feeling that this would have a "big effect." Assembly members put forward a range of ideas about how to implement this policy effectively.

Beyond 'labelling and information', assembly members also showed substantial levels of support for **'government contracts for low carbon food' (77%), 'taxes and incentives for reducing food waste' (72%)** and **'taxes and incentives for low carbon foods' (66%).** They showed comparatively less support for **'bans and restrictions' (54%).** 34% of assembly members 'strongly disagreed' or 'disagreed' that these should be implemented.

Assembly members also put forward a number of additional ideas for policies that could help to change retail and individuals' behaviour.

D. Anything else to tell government and Parliament

At the end of weekend three, assembly members had the opportunity to add any final thoughts on food, farming, land use and the path to net zero. A large number of assembly members chose to add additional points. All of the comments came from small group discussions – and were well-supported by the assembly members in those discussions – unless otherwise stated.

About farming and farmers

- "Protecting farmers is essential (particularly small to medium scale)– not big ones." This group continued:

  "Protecting farmers/farming community is key. They need to get a fair deal for their crops. Need to involve major companies in the process (e.g. supermarkets)."

Another group also commented that they wanted an "emphasis on supporting farming."

- "Farmers in particular should be leading change in their industry and should be supported financially by the government in the process."
- "Solutions and actions must include and allow farmers diversifying into the leisure industry e.g. holiday homes, recreation, petting farms."
- "Should be regional and fixed solutions that work in different contexts – **not** 'one size fits all'". Two assembly members in another group made a similar point: "It isn't a case of one size fits all – must fit local environment."
- "Prioritise capturing or reducing methane in farming and in tackling food waste (not just focus on carbon)."

About the UK's relationship with the rest of the world

- "Look at what other countries are doing – they may already have solutions that we could use too."
- "Existing climate change laws in UK are restrictive as it's limited to the UK – more global approach is needed (and R&D), partnership and investment with other countries."
- "Use what we produce or could produce in the UK **before** we import from abroad."

About land use and biodiversity

- "Preserve environment and wildlife in whatever changes are made don't adversely impact it."
- "We shouldn't build on flood plains – recreate peatland or natural habitat." *(This point was made by three assembly members)*
- "Rewilding is a popular idea – could help with a lot of problems produced by climate change." *(This point was made by two assembly members)*
- "Livestock can co-exist with woodland they don't have to be purely on grassland win-win." *(This point was made by one assembly member)*

About education, communication and wider involvement

- "Education/information is key."
- "Suggest greater profile given to farmers and farming to educate public on 'where their food comes from' etc."
- "Evidence needs to be presented by credible people."
- "All need to be involved, we need media involved. Needs to go beyond the assembly." Assembly members in this group commented that "as citizens involved in the assembly, we have learned a lot." One said I "was not bothered so much before the assembly about the evidence", another that "I heard the evidence and it made me aware of the risks."

About a fair and managed transition

- "Make sure you focus on nearly low income i.e. working poor, just about managing (as well as lowest incomes)."
- "Ensure a transition period, no sharp transition."

About business and waste

- "Restaurants should have carbon footprint rating on display (like hygiene rating)."
- "League table for brands – competition (for CO_2 emissions)."
- "Composting food waste nationwide to stop landfill." *(This point was made by four assembly members)*

Conclusions

Assembly members put forward **eight considerations** for government and Parliament to bear in mind when making decisions about food, farming, land use and the path to net zero. These focussed on:

- Providing support to farmers;
- Information and education;
- Using land efficiently;
- Rules for large retailers and supermarkets;
- More local and seasonal food;
- Making low carbon food more affordable;
- Some, just less, meat;
- Considering net zero as part of planning policy and new developments, including support for allotments.

Assembly members' preferred future for food, farming and land use in the UK centred around:

- **Local produce and local food production** – for a wide range of reasons including community benefits, fairer prices for farmers, a 'feel good factor' and reduced environmental impacts (packaging, transport etc);
- **A change in diet to reduce meat and dairy consumption by between 20% and 40%** – the assembly stressed the significance of education, saying these changes should be voluntary rather than compulsory. They noted the health benefits such changes would bring;
- **A "managed diversity" of land use**, including steps such as restoring woodlands, peatlands and gorselands.

Assembly members noted strongly the need for the above to be combined with **support for farmers to make the transition**, also saying that changes should take account of smaller farms, the suitability of different land for different uses, and variations in impact between UK regions. They backed measures to make sure changes do **not disproportionality affect the less well off,** said that **animal welfare should not be compromised,** and expressed strong concerns about **GM and lab grown food**.

Assembly members showed **strong support for policies to change both farming, food production and land use,** and **retail and individuals' behaviour**. While the former received slightly more support on average, a majority of assembly members 'agreed' or 'strongly agreed' that all eleven policies they considered should be part of how the UK gets to net zero. In assembly members' order of preference, these policies were:

Policy option	Policy objective	% strongly agree or agree
Labelling and information about emissions from food and drink products	Changing retail and individuals' behaviour	94%
Information and skills training	Changing farming, food production and land use	91%
Low carbon farming regulations	Changing farming, food production and land use	89%
Payments for carbon storage	Changing farming, food production and land use	87%
Government contracts for bioenergy and forestry products	Changing farming, food production and land use	84%
Changing planning rules	Changing farming, food production and land use	83%
Government contracts for low carbon food	Changing retail and individuals' behaviour	77%
Taxes and incentives for reducing food waste	Changing retail and individuals' behaviour	72%
Taxes and incentives for low carbon foods	Changing retail and individuals' behaviour	66%
Grants for research and development	Changing farming, food production and land use	60%
Bans and restrictions	Changing retail and individuals' behaviour	54%

Assembly members put forward a number of ideas about how to best implement 'labelling and information' about emissions from food and drink products. They also suggested a number of additional ideas for policies that could help to change retail and individuals' behaviour.

What we buy

Chapter 7

Summary of recommendations

1 Assembly members envisaged a future for 'what we buy' with five key elements:

- Assembly members strongly supported **businesses making products using less – and lower carbon – energy and materials.** They backed a range of specific policies to further this aim, including 'resource efficiency targets and standards' (91%), an 'amended procedure for awarding government contracts that gives preference to low carbon companies and products' (83%), taxes on producers, products and services (83%), and 'extended producer responsibility' (79%).
- Assembly members supported the idea of **individuals repairing and sharing more**, with less purchasing of new products. They backed '**measures to enable product sharing'** (77%) including technical and financial support to businesses who offer sharing or renting services.
- Assembly members' felt strongly about the need for **better information to promote informed choice and changes in individual behaviour**. They supported 'labelling and information about the carbon emissions caused by different products and services' (92%) and 'product labelling and information campaigns about what can be recycled and why it's important' (92%). They also backed 'advertising bans and restrictions' on high emissions products or sectors (74%).
- Assembly members supported a range of **measures aimed at increasing recycling,** including 'deposit return schemes' (86%), 'increased doorstep recycling' (85%), and 'grants and incentives for businesses' to improve recycling, develop new materials and make goods from recycled materials (77%). Their preferred future included businesses doing more to turn old products into new ones.
- Assembly members called for **long-term commitment from government and Parliament**. They emphasised the importance of cross-party support to prevent policies changing when governments change, as well as the need to look at both quick wins and long-term solutions.

2 Some assembly members raised additional points for government and Parliament to consider around a need to **take account of imports**, **ring-fence any tax revenue generated by the above policies**, and **protect consumers from increased costs**. Some also highlighted **trust and compliance issues relating to business**, asking for transparency, honesty, strong enforcement, and reliable and independent information and schemes. Assembly members welcomed measures that would create additional job opportunities and stressed the need for a Just Transition.

3 **Assembly members were also clear about what they did not support. They did not back voluntary agreements, changes to income tax or working hours, personal carbon allowances, recycling requirements** or **pay-as-you-throw schemes.** Their concerns included that measures would be ineffective or impractical, that they would penalise the less well-off, or that they would have unwanted side-effects such as an increase in fly-tipping.

What we buy

The things we buy are linked to climate change because they use energy, and some of that energy comes from fossil fuels like oil, coal and gas.

They use energy:

- **While they are being made** – for example, to extract raw materials or in factories;
- **Through services we use when we buy them** – for example, we may buy products on the internet. The internet uses energy for tasks like powering the servers that store our data;
- **Because of how they reach us** – making packaging for products and transporting them to us uses energy;
- **Some products need energy to run** – for example, mobile phones, kitchen appliances and cars.

Throwing away products has implications for climate change too. The UK has traditionally sent most of its waste to landfill sites. Some of this waste generates potent greenhouse gases as it rots.

Most of the emissions linked to the goods and services we purchase are produced in the UK. Some, however, are produced in other countries. For example, a lot of the electronic products we buy, such as televisions and computers, are made abroad,[1] meaning that the factories that make these products release their greenhouse gas emissions overseas. This still causes climate change: the greenhouse gases end up in the atmosphere whichever country they come from. However these overseas emissions are not included in the UK's net zero target.[2]

What did the assembly consider?

Thirty-five assembly members considered the topic of 'what we buy' in-depth. We selected these assembly members from the assembly as a whole using random stratified sampling. This ensured that they remained reflective of the wider UK population in terms of both demographics[3] and their level of concern about climate change.

1 Allwood, J., Azevedo, J., Clare, A., Cleaver, C., et al. (2019). Absolute Zero. https://doi.org/10.17863/CAM.46075
2 We explained this fact to assembly members and provided them with brief information about UK and overseas emissions.
3 Age, gender, ethnicity, educational qualification, where in the UK they live and whether they live in an urban or rural area.

These assembly members heard a wide range of views on the future of 'what we buy' for the UK, and how we might move towards that future. They had the opportunity to question each speaker[4] in detail. These evidence sessions took place at weekend two of the assembly.

Assembly members spent weekend three of the assembly discussing the evidence they had heard and their own views in-depth, before reaching conclusions on three separate areas:

A. **Considerations:** the overarching considerations that government and Parliament should bear in mind when making decisions about 'what we buy' and the path to net zero;

B. **Futures**: what the future of 'what we buy' in the UK should look like;

C. **Policy options:** how the UK should move toward this future.

Assembly members also had the opportunity to discuss and add **anything else they wanted to say** to government and Parliament about 'what we buy' and the path to net zero. Assembly members' views on the implications of Covid-19 for this topic are touched on in Chapter 10.

Contents of this chapter

4 The assembly heard from six speakers on what we buy: Professor Lorraine Whitmarsh, University of Bath (informant); Professor Mike Berners-Lee, Lancaster University; Professor John Barratt, University of Leeds (informant); Dr Nicole Koenig-Lewis, Cardiff Business School (informant); Julie Hill, WRAP (informant); Libby Peake, Green Alliance (informant). All speakers' presentations are available as slides, videos and transcripts at climateassembly.uk/resources/. An 'informant' is a speaker who we asked to cover the range of views and available evidence on a topic.

A. Considerations

Assembly members reached their first decisions on 'what we buy' by discussing their answers to the following question:

> *What considerations should government and Parliament bear in mind when making decisions about what we buy and the path to net zero?*

Assembly members thought about their answers to this question individually. They then discussed their views in small groups at their tables, with each table agreeing their five top considerations. These top considerations had to, between them, represent the range of views at the table.

Facilitators took these top considerations from each table and grouped similar options together to create a list on which assembly members could vote. They checked this list back with assembly members to make sure they had accurately reflected their views. This included making any necessary adjustments. Each assembly member could then vote for the four options that they felt to be most important.

The results were as follows. The wording of the considerations in the table is either word for word what assembly members wrote on their option cards or, where facilitators combined similar options from several tables, how we described the options to assembly members prior to the vote.

Rank	Consideration	% assembly members who chose it as a priority
1	**Education and information for consumers** – including: ▪ Good, clear, accessible and understandable information, so people understand what's going on and the impact of their choices; ▪ Education and awareness to help consumers understand their choices; ▪ Labelling of products (e.g. carbon scoring system – red/amber/green)	74
2	**Long-term commitment from government and Parliament** – including: ▪ Long-term cross-party commitment from Parliament; ▪ Long-term commitment from government, with no backsliding; ▪ A permanent citizens' assembly to oversee the work of Government.	69
3	**Regulate and incentivise companies to produce things that last longer** – including: ▪ Incentivise companies to produce things that last longer; ▪ Make the cost of producing high emissions products high/prohibitive; ▪ Clear labelling of products to provide information (and choice) to consumers; ▪ Make items more efficient and easier to repair and incentivise individuals and companies to do so.	60
4	**Benefit research, manufacturing and development in UK**	46
5	**Place controls and restrictions on advertising of environmentally damaging products, and label them clearly as such**	34

6	**Include quick-wins and long-term solutions** – including: ▪ Scaling up things that are already working (e.g. charity shops); ▪ Doing things that can be done immediately that will have the biggest impact for carbon reduction; ▪ Planning and piloting longer term initiatives.	31
7	**Create a culture through education to encourage minimising waste and to help establish community repair, re-use and recycle initiatives** (e.g. better use of/access to dormant high street shops etc)	23
8	**Take a nationwide, standard approach that makes it easy and possible for people to make changes**	14
9	**The polluter should pay (e.g. carbon allowance)**	14
10	**Be financially and geographically fair** – including: ▪ Not penalising the poor; ▪ Measures working for urban and rural areas.	11
11	**Legislation for firms to reduce packaging**	0
12	**Create an overall differentiated strategy to ensure those who pollute and are super rich pay more than those who are less responsible and/or are less able to pay**	0
13	**Maintain and promote a healthy standard of living for everyone**	0
14	**Incentivise consumers to make the right choices through cost/tax** (i.e. higher carbon = higher cost)	0

B. Futures

After deciding their most important considerations, assembly members moved on to look at the future of 'what we buy' for the UK. To aid them in this process, the Expert Leads presented assembly members with three scenarios for possible futures:

- Efficiency and old-into-new;
- Repairing and sharing;
- Less stuff, more equality.

Together these scenarios or 'possible futures' cover a broad range of views about what could happen to help the UK meet its 2050 net zero target in terms of what we buy.

Assembly members discussed each 'possible future' in turn, before voting on them by secret ballot.

We start by presenting the rationale for their views, taking each possible future in turn.

Jump to the vote results on page 321

B.1 Efficiency and old-into-new

This possible future would involve businesses making products using less energy and materials, and turning old products into new ones. Individuals wouldn't necessarily buy fewer things, but the things they buy would be less polluting. This scenario would feature changes for businesses and individuals.

What business would do:

- **Use less energy and/or materials to make things;**
- **Avoid using high-emission materials** – e.g. buildings could use more timber than cement;
- **Use renewable energy** (**and electricity or hydrogen**) instead of fossil fuels, and carbon capture and storage to stop remaining emissions getting into the atmosphere;
- **Recycle more.**

What individuals would do:

- **Keep products in a good enough state** so they can be returned to producers to be turned into new products;
- **Recycle more.**

Assembly members discussed this possible future at their tables. They identified the following pros and cons.

⊕ Pros

+ **Employment opportunities** – some assembly members felt that this future would provide "additional employment opportunities" or "additional employment opportunities in remanufacturing." Others noted that it "protects jobs by transitioning into renewable industries."
+ **Recycling more and reducing waste** – some assembly members felt it would lead us to "recycle more", or "recycle more (less waste to landfill)." Some noted that "sending less waste to landfill saves money and reduces pollution."
+ **Avoiding high emission materials** – some assembly members liked that businesses would "avoid high emission materials" or "avoid using higher emissions materials", with some saying this meant there would be "no / little impact on individuals."
+ **Individuals don't need to change much** – some assembly members liked that it requires "little change by individuals" or suggested it would have "minimal impact on people's lives but still [lead to] positive changes." Some suggested that it is "more efficient to change manufacturers rather than many individuals." Others liked that it "doesn't restrict consumer choice."

+ **Shared responsibility** – some assembly members liked that this future "has a large effect on both firms and consumers i.e. not just focussed on consumers." Others said that "recycling is [for]...business and individuals: like consistency; like shared goal; like standardised."
+ **Saves money** – some assembly members suggested that it "enables money saving", or meant "saving money – most people are money orientated (motivation)." Others felt that "some producers may save money in [the] long-run by being more efficient."
+ **Using timber** – some assembly members liked the "change to timber frame buildings" or "using timber: innovation; new architecture; restore eco-systems."
+ **Using renewable energy** – some assembly members liked the "use of renewable energy", the "increased use of renewable energy", or "renewable energy [and] carbon capture and storage."
+ **"Easy to implement"**

⊖ Cons

– **Very business led** – some assembly members disliked that it "deferred responsibility from the individual to the manufacturer" or that there is "less that individuals can do to change things – very business led." Others noted that it "need[s] industry to change practices – may need incentives / training" or that "there could be difficulty enforcing regulations for businesses."
– **Cost** – some assembly members commented that it would result in "increased costs." Others suggested that it would be "expensive in the short term" or that there "may be upfront cost[s] for some measures."
– **Job losses and impact on building trade** – some assembly members said it would put "jobs at risk." Others expressed concerns about "job losses – steel", "cement and steel manufacturing – what will replace these materials / jobs?" or "timber / raw material imported from overseas – building trades lost [in UK}."
– **Does it go far enough?** – some assembly members noted that "efficiency has increased – will the gains in efficiency be enough? Concern it won't." Others queried "less public engagement – does this go far enough to meet net zero?" or commented "efficiency has increased but consumption has increased more, so [it] won't work if incentives aren't provided [to individuals] for green technology."
– **Will products last?** – some assembly members asked "will those new materials be strong enough in 20 years, with a changing climate." Others felt that "consumers may not follow manufacturers' instructions (e.g. maintenance and cleaning). Therefore products may not last as long."
– **Doubts about repairs** – some assembly members queried "is repairing broken products on a large scale practical?" Others suggested that "transport may be required for larger items to be sent or returned post repair."

- **"Increase[d] use of timber"**
- **"No benefits for individuals – motivate"**
- **"Carbon storage"**[5]

Some assembly members noted conditions to their support for this possible future, or points that they felt would help its implementation:

- **Just Transition**[6] – some said that "industries and jobs need to adjust – need to manage a Just Transition";
- **Training** – some talked about the need for "suitable training courses for repair/ renew employees";
- **Carbon capture** – some said they would want "carbon capture – but need more information."[7] Others suggested we should "use natural carbon capture rather than carbon capture and storage";
- **Need other measures too** – some said it "would have to be alongside other actions."

5 The assembly went on to discuss carbon capture and storage in detail. Their thoughts and recommendations on it are presented in chapter nine.

6 There is no one agreed definition of what a Just Transition entails, but broadly it relates to who bears the cost of taking action on climate change. The Scottish Government's Just Transition Commission, which published its interim report in February 2020, suggested that, "The imperative of a just transition is that Governments design policies in a way that ensures the benefits of climate change action are shared widely, while the costs do not unfairly burden those least able to pay, or whose livelihoods are directly or indirectly at risk as the economy shifts and changes." https://www.gov.scot/publications/transition-commission-interim-report/, page 2.

7 The assembly went on to look at ways to remove greenhouses gases from the atmosphere in detail. Their recommendations on this topic are presented in chapter nine.

When we asked assembly members to vote on the three possible futures, this future received strong support from assembly members. Please see below for the results of the vote.

B.2 Repairing and sharing

This possible future would involve making products that last longer, and people renting/sharing more and owning less. It would feature changes for businesses and individuals.

What business would do:

- **Use less energy and/or materials to make things;**
- **Make products that last longer;**
- **Bring in systems for sharing, offer repair services etc.**
- **Recycle more.**

What individuals would do:

- **Replace products less frequently** – e.g. half as often;
- **Use fewer disposable things and reuse more things** – e.g. using fewer disposable cups and more reusable ones;
- **Own less and share or rent more** – e.g. renting toys or tools;
- **Get things repaired** instead of throwing them away;
- **Buy more second-hand rather than new things;**
- **Sell or gift products after use, or return them to the retailer/manufacturer**, rather than throwing them away;
- **Recycle more.**

Assembly members discussed this possible future at their tables. They identified the following pros and cons.

⊕ Pros

+ **Sharing goods instead of owning** – some assembly members felt that "renting for specific goods can be great, e.g. children's shoes renting costs less and [is] better for the environment." Others suggested that "sharing (cars) makes more sense", that "certain things are fine to rent: roof rack for your car (for your weekend) other things would be difficult" or that "sharing is great as it helps recycle instead of landfill (Freecycle[8], social media etc)." Some liked the idea of "prioritising monthly subscriptions, leases and renting."

8 This is a reference to The Freecycle Network www.freecycle.org

+ **Community and wellbeing benefits** – some assembly members said it "could offer wellbeing and community benefits" or noted "well-being – social activities – repair cafes etc." Others said that "repair shops [mean] ... well-being and community benefits – social interaction and fill empty high streets."
+ **Engagement and empowerment** – some assembly members said that "people will feel more empowered to make the right decisions" or that there was potential for "engaging local communities."
+ **Repairs** – several assembly members liked the idea of "promoting repairing", or "sending products back to manufacturers".
+ **Less waste** – some assembly members supported "the idea of everyone recycling all waste household products (including food / garden waste)" or people "using less disposable things." Others said that "sending less waste to landfill saves money and reduces pollution."
+ **Skills and employment** – some assembly members felt there would be "additional job opportunities", "increased employment opportunities", or "additional employment opportunities in product repair and servicing." Some liked the idea of "sharing skills and bringing back lost trades."
+ **Saving and making money** – some assembly members suggested that "individuals can save money if products last longer and can be repaired." Others noted "opportunities for individuals to make money by selling used items" or an opportunity to "save / make money."
+ **Products that last longer** – some assembly members commented that "quality products last longer and require less maintenance." Others liked that this future means we "use less energy / things last longer (repairable)."
+ **"Change in individuals' behaviour – a less consumerist society/more money"**
+ **"Builds on the current service economy therefore easier to implement"**
+ **"Buy more second-hand clothes. Baby clothes?"**

⊖ Cons

– **Will industry change?** – some assembly members asked "how can we convince companies to make products that last longer – they will lose money", or queried "industries to change – will they?" Others commented that this future "needs industry to change practices – may need incentives and training" or "industries to change – profits / incentives."
– **Attitudes, including to sharing and buying second-hand** – some assembly members felt "it would require a change in attitude towards using products" or said the "stigma about second hand items needs to change." Others questioned "how to change mindsets on sharing and buying second hand" or commented "there is a perception that people do not want to repair, share or rent: although it is a good thing that needs exploring."
– **Cost of products** – some assembly members said that "products may cost more if they are made to last longer."

- **Cost of renting and repairing** – some assembly members were concerned about the "cost of renting" or said that the "cost of repairs can be as much as buying new." Others felt that "rental [costs] would have to be substantially lower than [the] cost to buy."
- **Inconvenience of renting and repairing** – some assembly members said that "repairing and renting things may be more inconvenient than buying new" or commented "repairing / renting inconvenience – time." Some said they "like [the] idea of repairing and sharing but just don't see it working because it is so easy now to order a new product off the internet."
- **Trust in quality of products** – some assembly members said there was "no guarantee that the product will be up to standard and last" or that they would need "confidence in [the] longevity of recycled products."
- **Job losses** – some assembly members highlighted the "potential loss of jobs" or the "financial impact on businesses / jobs."
- **"Unless sharing is organised and incentivised, very unrealistic"**
- **"Especially sharing or renting tools has unintended side effects (e.g. driving to shop and instead buy new as you don't have tools at hand)"**
- **"Need knowledge to do repair. Need time"**
- **"A health risk? Cross contamination infections"**
- **"It is difficult: would require training"**

Some assembly members noted conditions to their support for this possible future, or points that they felt would help its implementation:

- **Information** – some said that "items that are rented or shared should have appropriate information regarding care and use."
- **Changes to product design** – some suggested that "products will need to be redesigned with easy to repair features and diagnostic parts (e.g. to fridge etc)."
- **Ease of recycling** – some said we need to "make the recycling process easy – e.g. label how to recycle the item."

When we asked assembly members to vote on the three possible futures, this future received some support from assembly members.

B.3 Less stuff, more equality

This possible future would involve people earning less and buying less, with them spending more time fixing and making things. It would feature changes for businesses and individuals:

What business would do:

- **Make products that last longer;**
- **Employ people in more flexible ways and/or for fewer hours;**
- **Bring in systems for sharing, offering repair services, etc.**
- **Recycle more.**

What individuals would do:

- **Be taxed more if they are on higher incomes, or everyone could be given a 'carbon allowance'.** This could result in less inequality;
- **Work fewer hours or in more flexible ways** – e.g. working from home. This could mean that people had more time to repair things or make things themselves, and this could be rewarded with 'community currencies'.
- **Buy less stuff**, including replacing products less frequently – e.g. half as often;
- **Use fewer disposable things and reuse more things** – e.g. using fewer disposable cups and more reusable ones;
- **Buy more second-hand rather than new things;**
- **Recycle more.**

Assembly members discussed this possible future at their tables. They identified the following pros and cons.

⊕ Pros

+ **Wellbeing and quality of life** – some assembly members said that "flexible working leads to more quality family time", or that it would result in "more leisure and family time." Some liked the idea of "less working hours – flexible working to suit lifestyle." Others suggested it would "improve people's wellbeing and community" or "could improve wellbeing by working less and increasing time for leisure, family etc."
+ **Recycling and less waste** – some assembly members liked that we would "recycle more", "recycling!" or that "everything [would be] produced so it can be recycled." Others said that it "uses fewer disposables" or that "less disposable means less waste." Some welcomed that we would "send less to landfill – local councils to consider options."
+ **Repairing, sharing and renting** – some assembly members liked the idea of "sharing / repair services", "swap shops / centres", "recycle shops / centres" or "renting appliances / rental plans." Others talked about the "social and financial benefits of collective sharing and leasing."

+ **Benefits to the environment and biodiversity** – some assembly members felt it would be "better for [the] environment" or suggested that "using less raw materials benefits biodiversity and [creates] less landfill."
+ **Equality** – some assembly members liked the idea of "taxing higher earners" or "less difference in income between richest and poorest."
+ **Longer lasting products and saving money** – some assembly members talked about "longer lasting products" or said "individuals could save money in [the] long-run if products last longer [or are] better quality."
+ **"Less stuff"**
+ **"If demand decrease is targeted at high carbon goods and services [it will have] great effects (e.g. decreased imports). This will also help balance of payments deficits."**
+ **"Local currencies have been around forever (e.g. bartering/LETS,9 Bristol pound)"**
+ **"Carbon allowance"**

⊖ Cons

– **Working less is unappealing and counterproductive** – some assembly members stated that "less working [is] not good" or that there would be "more social unrest if people have more time available." Others disliked that "they want us to work longer age wise, but less days/ hours when you are fit and able." Some identified a "risk that having more spare time will lead to more consumption" or that "working less means more time to buy more stuff with less money."
– **Job loss and economic damage** – some assembly members suggested that "jobs will be at risk (industries)", that GDP [will be] down [and] unemployment up" or that "some industries [and] jobs will be at risk (e.g. manufacturing)." Others said it would make the UK "less internationally competitive, therefore less exports, therefore GDP down, therefore lower incomes may become a spiral if not controlled."
– **Hard work not incentivised** – some assembly members felt there would be "less incentive for people to work harder." Others were concerned about an "impact on social class movement – why work harder to get taxed more?" Some said that if you "limit earnings... [there is] less incentive to become industry leaders."
– **Reduced income for high earners** – some assembly members disliked "higher income [being] taxed more" or "reduce[d] income for [the] highest earners."
– **Behaviour change unrealistic** – some assembly members noted that this future would need a "change in individuals' values and lifestyle towards buying less (social barriers and fashion)" or said that "people might be reluctant to change behaviour in big ways." Some felt that "people working less will not use [their] spare time to repair things."

9 LETS (Local Exchange Trading Systems) are community-based networks in which people exchange goods and services with one another, instead of using money (https://www.letslinkuk.net/).

- **Forced social change** – some assembly members were concerned that this option would require "forced social change (using free time)" or would "chang[e] people's lives (e.g. less money, buying less)." Some said "people should have a choice. People like to have stuff. [...] They love buying stuff. People like to buy new. That's human nature."
- **Preferable to buy new** – some assembly members noted that it's "sometimes cheaper to buy new" or that "repairing things [is] more inconvenient than buying new."
- **Affordability and product costs** – some assembly members suggested that "low income earner[s] may not be able to afford necessities" or that there may be an "increase in product costs." Others asked "if working less how would we ensure people could afford to live? Companies can't afford to pay more for less hours."
- **"Lead[s] to a culture whereby people believe society owes them something rather than [asking] what people can do for society."**
- **"More income equals more tax for carbon emissions – may be unfair if not producing most carbon emissions"**
- **"Change will not happen quickly"**
- **"Need industry to change practices – may need incentives and training."**
- **"Carbon allowance [would be] difficult to monitor and implement."**

Some assembly members noted conditions to their support for this possible future, or points that they felt would help its implementation

- **Recycling** – some said that "recycling needs to be more available";
- **Need to change values** – some said that a "change in values is a condition for change in behaviour."

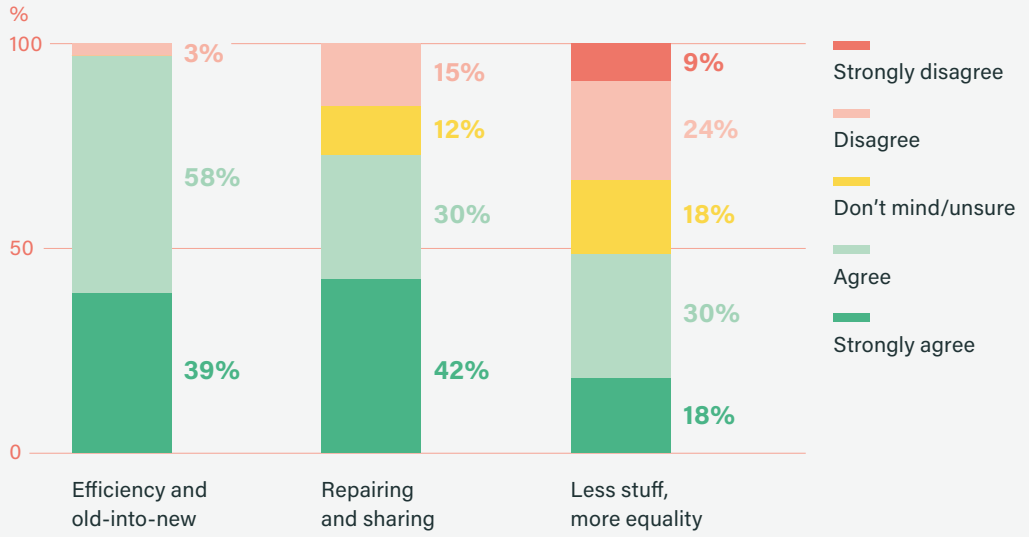
When we asked assembly members to vote on the three possible futures, this future received limited support from assembly members.

Vote results

Assembly members voted on the futures by secret ballot. There were two different ballot papers. The first ballot paper asked assembly members how much they agreed or disagreed that each future should be part of how the UK gets to net zero. The second ballot paper asked them to rank the futures in their order of preference.

Figure 1: Possible futures

How much do you agree or disagree that each of the possible futures should be part of how the UK gets to net zero? (%)



The votes from this second ballot paper were counted in two ways:

- **Counting assembly members' first preference votes only.** This tells us what assembly members would and wouldn't choose if they could have their most preferred future.
- **Using Borda count.** This involves allocating points for preferences – a first preference vote scored two points, a second preference vote one point and a third preference no points. Counting the votes like this tells us which futures are most acceptable to the greatest number of assembly members.

Assembly members showed **significant support for two futures**:

- 97% of assembly members 'strongly agreed' or 'agreed' that **'efficiency and old into new'** should be part of how the UK gets to net zero;
- 72% 'strongly agreed' or 'agreed' with **'repairing and sharing'**. 15% of assembly members 'disagreed' with this possible future; no one 'strongly disagreed'.

Assembly members were **less supportive of 'less stuff, more equality.'** 48% of assembly members 'strongly agreed' or 'agreed' that it should be part of how the UK gets to net zero. 24% 'disagreed' and 9% 'strongly disagreed'. 18% were unsure.

Figure 2: Possible futures

Please rank the possible futures in order of preference (% 1st preference votes)

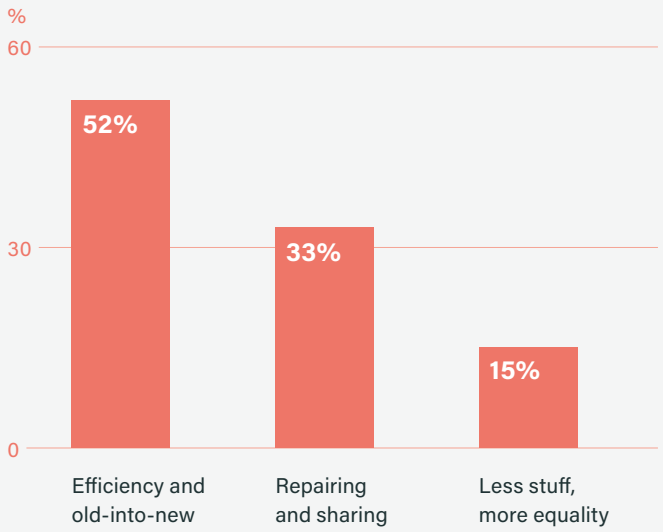
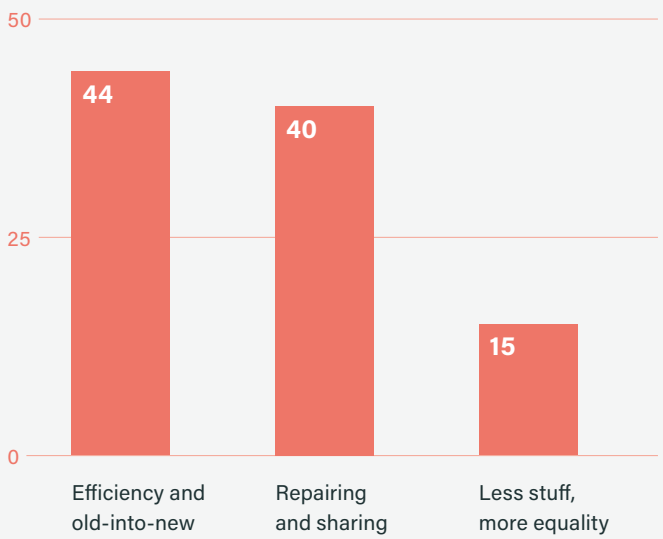


Figure 3: Possible futures

Please rank the possible futures in order of preference (Borda count)



The ranking votes reinforced these results. 'Efficiency and old-into-new' remained the most popular future, with 52% of first preference votes. 'Repairing and sharing' came second with 33% of votes, followed by 'less stuff, more equality' with 15%. The Borda count scores followed the same pattern, although with a smaller difference in popularity between 'efficiency and old-into-new' and 'repairing and sharing'.

Futures – conclusions

Overall, assembly members backed a future in which **both businesses and individuals would need to change some aspects of their current practices and behaviours.**

For **businesses**, assembly members strongly supported a future in which they would:

- **Make products using less, and lower carbon, energy and materials;**
- **Turn old products into new ones, and recycle more.**

They also supported steps that businesses could take to help people buy less, including **making longer lasting products**, and **offering repair services and sharing systems**.

For **individuals**, assembly members backed a move towards **greater sharing and repairing**, as opposed to buying new goods. They did not, overall support bigger shifts in how society works aimed at reducing the amount we buy, for example changes to how much people work and earn.

Assembly members consistently welcomed opportunities for **job creation, reduced waste** and **increased recycling.** They noted that **sharing** would work well for specific items such children's shoes, and felt it had potential benefits for communities and wellbeing.

Assembly members tended to see potential increased **costs for consumers** and **negative impacts on specific economic sectors** as concerns. They emphasised the importance of a **Just Transition** for those adversely affected by the changes. They also highlighted the **need for plans to be realistic**, suggesting for example changes to product design and information to make items easier to care for and repair.

C. Policy options

After considering the future of 'what we buy', assembly members moved on to consider how we might get there. Specifically, they looked at policy options in three areas:

1. **Reducing emissions from products and services;**
2. **Buying less;**
3. **Increasing recycling.**

For each of these areas, the Expert Leads recapped and explained potential policy options. Assembly members discussed these ideas in their groups before voting by secret ballot. They were also able to note additional suggestions for policy measures.

C.1 Reducing emissions from products and services

Assembly members looked at six policy options for reducing emissions from products and services:

- Resource efficiency targets and standards;
- Taxes on producers, products and services;
- Extended producer responsibility;
- Amended procedure for awarding government contracts;
- Voluntary agreements;
- Labelling and information.

We start by presenting the rationale for their views, taking each policy option in turn.

Jump to the vote results on page 332

Resource efficiency targets and standards

This policy option would involve industry ensuring that it met certain levels of resource and/or energy efficiency. For example, it might mean that products could only be sold if they met rules for how long they last, whether they can be repaired or reused, and/or how much energy or materials went into making them. The targets and standards could apply to all industry or only to high-emitting sectors, such as construction and fashion.

Assembly members identified the following pros and cons about resource efficiency targets and standards.

⊕ Pros

+ **Quick win** – some assembly members described them as "quick wins – removing [the] most polluting products cuts greenhouse gas emissions" or said the UK would "see effects quickly." Other said that "setting regulations at top level [is the] fastest option."
+ **Enforcing change** – some assembly members liked that they "can be done by legislation" or that it's "government enforcing change and drawing [a] line in [the] sand and [being] bold."
+ **Better production and design** – some assembly members suggested they allowed for "changes from start of production" or that they would "promp[t] better design."
+ **"Saves firms money in long run so they will support"**
+ **"Already know it works (already having an impact)"**

⊖ Cons

– **"Restricts choice"**
– **"Increased product costs"**
– **"Complicated to set up and inspect"**

Some assembly members noted conditions that they would want to see in order to support this policy option, or that they felt would help its implementation:

- **Include all industries** – some said that it "should target all industries (more fair) but could tailor";
- **Protect consumers** – some said they would support it "if consumers [are] protected from increased costs";
- **Take account of imports** – some said it "must take into account products from outside [the] UK" or asked "how would this work for imports?";

- **Needs correct assessment of carbon emissions** – some said that it would need "assessment of [the] product from cradle to grave", that it should take account of the "carbon footprint of products not just from production but how far they have travelled too", or noted that it "depends on [the] correct carbon measurement / footprint."

Taxes on producers, products and services

This policy option would involve (a) reducing or scrapping taxes on greener products or services to make them cheaper; and/or (b) raising taxes on more polluting products and services to make them more expensive. It could include taxes on advertising that go up according to the carbon content of the product or service being advertised.

Assembly members identified the following pros and cons about taxes on producers, products and services.

⊕ Pros

+ **Impact** – some assembly members said its "already proved to be working with energy use – keep going!" or that it's "possible and could make a difference." Some suggested we would "see effects quickly" or liked that it's "government enforcing change and bold."
+ **Encourages better producer behaviour** – some assembly members said it "encourages better producer behaviour" or that reduced "taxes on greener products [would make them]... more attractive to businesses."
+ **"No downsides"**
+ **"Tackles advertising"**
+ **"Carbon tax based on carbon footprint labelling/scoring"**
+ **"Makes green products more affordable"**
+ **"Increases investment from other countries if tax regime is favourable"**
+ **"Can be transparent legislation for businesses"**

⊖ Cons

– **May not change consumer behaviour** – some assembly members said that the "wealthy could continue to buy less green options" or that it "might not actually make people buy less e.g. if cost not driving factor."[10]
– **"Restricts choice"**
– **"Might be hard to negotiate"**

10 Assembly members considered 'taxes on producers, products and services' both as a way to reduce emissions from products and services, and as a way to encourage people to buy less (please see page 341). Assembly members made this point when they were considering the impacts of the taxes on consumer behaviour.

– **"Don't like additional tax"**

– **"Consumers may choose imports without this tax"**

– **"May encourage UK producers to move abroad for carbon-heavy goods"**

Some assembly members noted conditions that they would want to see in order to support this policy option, or that they felt would help its implementation:

- **Protect consumers** – some queried "will these [costs] just be transferred to [the] consumer?";
- **Ring-fence the tax revenue** – some said that the "tax revenue [should be] ring-fenced for carbon offsetting" or that the "tax must be ring-fenced to be spent on climate change";
- **Take imports into account** – some said we should "tax imported goods as well" or asked "how would this work for imports?";
- **Reward but don't punish** – some asked for a "focus on rewards not punishment." Others suggested "what about tax exemptions – would be positive."

Extended producer responsibility

Extended producer responsibility would mean that producers pay for the impact of their products and packaging on climate change. It could also include either or both of:

- Restrictions on the practice of intentionally making products that don't last long;
- Requirements for how long products need to last.

The UK government is already planning to introduce extended producer responsibility for packaging and may do so for other products.[11]

Assembly members identified the following pros and cons about extended producer responsibility.

⊕ Pros

+ **Impact** – some assembly members said that "firms paying for their impact...will lead to firms' behaviour change" or that it "already works – legislation makes companies produce low carbon products." Others said it "reduces how much producers pollute + what they do with that pollution."
+ **Longer lasting products and better services** – some assembly members said that "built in redundancy [i.e. products built not to last] should be made illegal" or that "if [products] are made to last longer then it'll be worthwhile." Others said it would result in companies "offering better services / builds stronger relationship."

11 https://www.gov.uk/government/consultations/packaging-waste-changing-the-uk-producer-responsibility-system-for-packaging-waste

+ **"Reduces waste"**
+ **"Government enforcing change."**

⊖ Cons

- **Only the UK** – some assembly members disliked that it "only affects UK industry." Others said it would be "impossible to implement because of current manufacturing standards abroad", that it would be "difficult to hold foreign companies to account" or that "international trades (e.g. products from China) make it difficult to guarantee extended producer responsibility."
- **"May increase firms' costs and so may cause them to go abroad"**
- **"Too much focus on recycling, but need to look at reduction"**
- **"Restricts choice"**
- **"We don't know what it will cost"**
- **"For how long should products last – not always producers' fault (depends on consumer)"**
- **"Not strong enough, could be a cost absorbed by the business. Would need to be a fine with consequences e.g. not able trade or sell certain products"**

Some assembly members noted conditions that they would want to see in order to support this policy option, or that they felt would help its implementation:

- **Protect consumers** – some asked "will [costs] be just transferred to [the] consumer?";
- **Ring-fence any tax revenue** – some said that any "tax revenue [should be] ring-fenced for carbon offsetting";
- **Combine with resource efficiency targets and standards** – some said it "should go hand in hand with 1a [resource efficiency targets and standards] – it's about making producers be responsible";
- **Take account of imports** – some said it "must take into account products from outside [the] UK."

Amended procedure for awarding government contracts

This policy option would amend the procedure for awarding government contracts, so that it giving preference to low carbon companies and products. It could involve creating an approved list of low carbon technologies, products or materials (e.g. renewable energy, the use of wood in building construction, recycled materials) for use by public sector bodies.

Assembly members identified the following pros and cons about amending government contracts in this way.

⊕ Pros

+ **Government leadership** – some assembly members said that "government should take the lead" or that "government are big spenders [which means they have] big impact and influence."
+ **Benefits for green companies and competition** – some assembly members liked that it "makes green companies competitive" or that it would "make green companies more competitive so would encourage competition between companies." Others liked that it's "rewarding companies that are low-carbon."
+ **"Healthy for reducing carbon in products"**
+ **"Doesn't restrict product choice"**
+ **"Simple and easy to do"**
+ **"No brainer"**

⊖ Cons

– **"Not enough – business in private sector"**
– **"Could lead to higher cost to taxpayer"**
– **"Complex – carbon can't be the only factor. Also cost, timescale"**

Some assembly members noted conditions that they would want to see in order to support this policy option, or that they felt would help its implementation:

- **Budget** – some said government and public sector bodies "must have [the] budget to pay for more expensive but green products / services";
- **Standards** – some suggested it "needs standards – legislation";
- **Governance** – some assembly members questioned "who …[the] governing body [would be]."

Voluntary agreements

Voluntary agreements mean trade organisations, producers and/or retailers adopting voluntary commitments. They would commit to reducing carbon emissions from the production or use of products, and/or to only selling low carbon products. There could be rankings and awards, so that product manufacturers and sellers are publicly celebrated for low carbon performance.

Assembly members identified the following pros and cons about voluntary agreements

⊕ Pros

+ **Promoting competition and spreading best practice** – some assembly members suggested that it "can help promote competition and spread best practice amongst businesses." Others said "firms respond to reputation risks / opportunities" or that they liked that it was "not strict and promotes competition."
+ **Awards and rewards** – some assembly members said that "consumers do pay attention to ranking and awards" or liked that there "can be [an] advertising plus for companies – rewards there."
+ **"Gives choice"**

⊖ Cons

– **Won't create change** – some assembly members disliked that it's "voluntary" saying that we "need to force people to change", or that it "won't amount to enough – must force change." Others said that voluntary agreements are "not bold enough on their own", that "businesses might take easy options" or that "voluntary agreements [are] not worth the paper they are written on...profits trump everything."
– **"Can't trust companies / may present biased info"**

Some assembly members noted conditions that they would want to see in order to support this policy option, or that they felt would help its implementation:

- **Independent** – some said it "can't be industry-run; it has to be independent" or that "awards must be given by [an] independent body";
- **Take services into account** – some asked "how [would it] work for services?"

Labelling and information

Labelling would show the carbon emissions caused by different products and services. Labels could also show which products are more durable and designed for reuse. This could be accompanied by information campaigns. These would educate individuals about the emissions caused by different products and services, and how to reduce them.

Assembly members identified the following pros and cons about labelling and information

⊕ Pros

+ **Consumer choice** – some assembly members liked that there are "still consumer choices", that it "gives choice", "gives consumer[s] the choice" or that it's "not strict and [is] voluntary." Others felt it "respects [the] public and gives choice."
+ **Increasing awareness** – some assembly members said that "knowledge is power" or that it "brings [it to] people's attention." Others said that "[education and awareness for consumers was] our top principle."[12]
+ **Will lead to change** – some assembly members said they "think it will lead to behaviour change e.g. smoking campaign", that they "think people would change", or that "visual things impact people."
+ **"The manufacturers' incentives"**
+ **"Easy and simple – traffic light system"**

⊖ Cons

– **Won't create change** – some assembly members felt it was "not bold enough on its own" or that it "might not change purchase of familiar products." Others described it as "light touch – how much difference is it actually going to make? Easy thing to do – probably won't make a huge impact."
– **"Harder to trace products' carbon from abroad"**

No assembly members noted conditions for this policy option.

12 Please see Section A at the start of this chapter.

General comments

Some assembly members made general comments about policies to reduce emissions from products and services. Many of these comments touched on the idea of **trust**. Some mentioned it directly. Others expressed concerns about company behaviour and compliance, emphasised the need for regulation, or called for transparency:

> “What a total nightmare! i.e. a minefield of complexity and avoidance, and ‘gentlemen’s agreements’ between companies – transnational and international.”

> “How to regulate?”

> “Penalties, charges or taxes against those who create polluting products should be made public and transparent. [There] [s]hould be real and significant fines and consequences that act as a real deterrent.”

> “Important for [the] ‘ordinary person’ to be able to trust labelling and marketing messages. Can Government reward ‘honesty’ and punish dishonesty.”

> “Like honesty and transparency … but how to be confident of [it]? Independent scrutiny body? Outside and independent of government.”

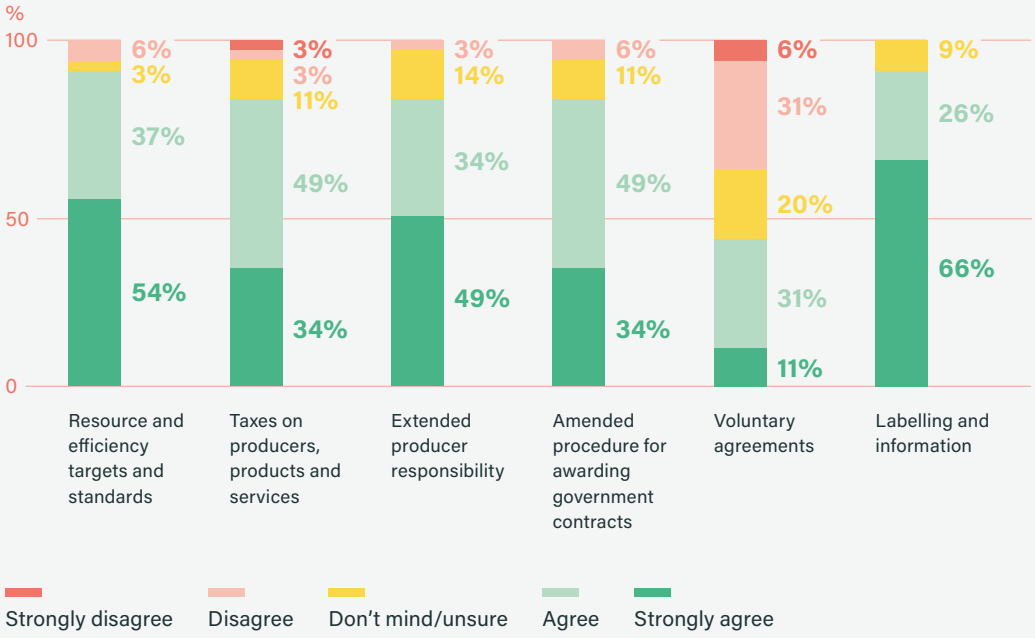
Other assembly members said that “government should set standards”, that we should look for “quick wins”, or that they liked measures that “encourag[e] better design.” Some said they “like [the] suggestion of [a] Carbon Tax that applies to all companies regardless of where they’re based ifthey trade/operate in [the] UK.”

Vote results

Assembly members voted by secret ballot on policy options for reducing emissions from products and services. There were two ballot papers. The first ballot paper asked assembly members how much they agreed or disagreed that each policy option should be part of how the UK gets to net zero. The second ballot paper asked them to rank the options in their order of preference. The votes from this second ballot paper were counted both in terms of first preference votes and via Borda count.

Figure 4: Reducing emissions from products and services

How much do you agree or disagree that each of the following policy options should be part of how the UK gets to net zero? (%)



A large majority of assembly members 'strongly agreed' or 'agreed' that five of the six policy ideas should be part of how the UK gets to net zero:

- **'Labelling and information'** – 92% 'strongly agreed' or 'agreed'
- **'Resource efficiency targets and standards'** – 91%;
- **'Extended producer responsibility'** – 83%;
- **'Taxes on producers, products and services'** – 83%;
- **'Government contracts'** – 83%.

Only a small number of assembly members 'strongly disagreed' or 'disagreed' with any of these proposals. No one disagreed with 'labelling and information'.

In contrast, only a minority of assembly members (42%) backed **voluntary agreements**, with 37% 'strongly disagreeing' or 'disagreeing' that they should be part of how the UK gets to net zero. 20% of assembly members said they were 'unsure' or 'didn't mind'.

Figure 5: Reducing emissions from products and services

Please rank the following policy options in order of preference

(% 1st preference votes)

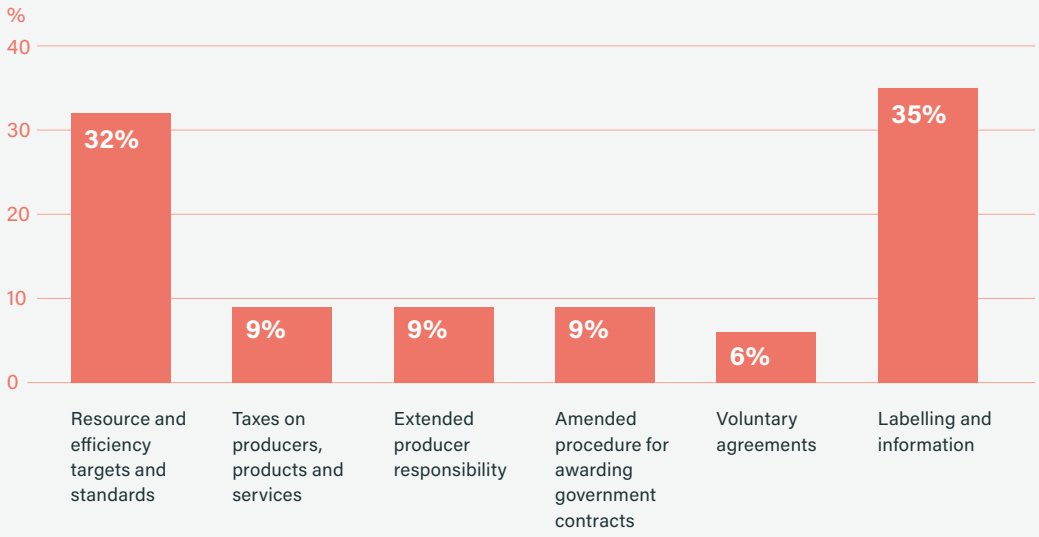
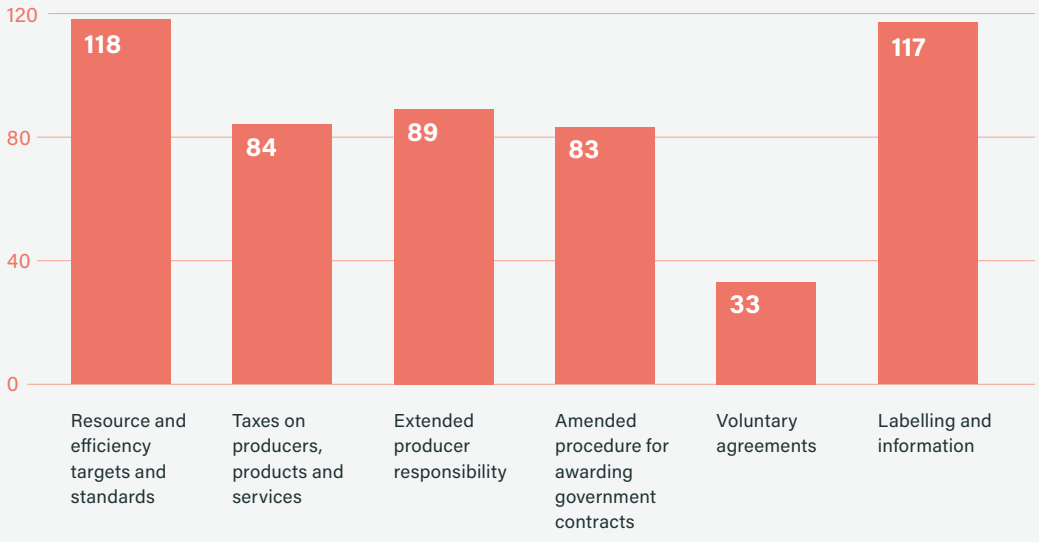


Figure 6: Reducing emissions from products and services

Please rank the following policy options in order of preference

(Borda count)



The ranking vote largely reinforced these results. 'Labelling and information' and 'resource and efficiency targets and standards' strengthened their position as the two most popular policy options. They were followed by the three other proposals that received strong support in the first vote. Voluntary agreements remained the least popular option.

C.2 Buying less

Assembly members looked at six policy options around 'buying less':

- Advertising bans or restrictions;
- Changes to income tax or working hours;
- Personal carbon allowances;
- Measures to enable product sharing;
- Taxes on producers, products and services;
- Extended producer responsibility.

We start by presenting the rationale for their views, taking each policy option in turn.

Jump to the vote results on page 341

Advertising bans or restrictions

An advertising ban would stop polluting products or sectors, like fast fashion, being allowed to advertise. Advertising restrictions could limit advertising around towns or in other public spaces.

Assembly members identified the following pros and cons about advertising bans or restrictions.

Pros

+ **Impact** – some assembly members suggested that "advertising has a large impact on consumption therefore this policy will have a large impact" or said they liked the idea of "advertising restrictions to reduce consumerist behaviour."
+ **Target worst polluters** – some assembly members liked that it "can target [the] worst carbon offenders" or that an "advertising ban would take the spotlight off more polluting products."
+ **Practical** – some assembly members said it "felt [the] most practical and implementable" or that it can "easily be done."
+ **"Should do it, even if small difference"**
+ **"Retains consumer choice e.g. smoking"**

⊖ Cons

- **Might not be effective** – some assembly members said it was "not clear how effective it would be", or that it "won't make [a] big difference."
- **Hard to implement** – some assembly members said it would be "really difficult to implement (i.e. advertising versus PR or comms)" or asked "can advertising bans work if the internet is hard to police?" Others commented that "restricting 'negative' advertising and marketing...and promoting 'good and responsible' advertising is ok ... but very difficult to regulate online?"
- **"Negative impact on [the] economy if buying less"**
- **"Adverts can do good as well e.g. smoking"**

Some assembly members noted conditions that they would want to see in order to support this policy option, or that they felt would help its implementation:

- **What is banned** – some assembly members said they would want "advertising restrictions or bans with [a] particular emphasis on junk foods, high sugar, fast fashion etc", or that they supported a "selective ban on advertising for high carbon footprint products (not [a] blanket ban) based on scoring." Others disagreed, saying we should "ban all adverts." Some said any bans or restrictions "nee[d] to be [based on] facts."
- **Take a positive approach instead** – some assembly members suggested that to avoid negative economic impacts you could "encourage positive advertising instead? e.g. for green products."
- **Who is targeted** – some assembly members said that bans should be "for adults, not just children."

Changes to income tax or working hours

This policy option could involve people on higher incomes being taxed at an increased rate (e.g. 60%+ rather than 45%). Alternatively, it could mean a limit on working hours, such as the introduction of a four-day week.

Assembly members identified the following pros and cons about changes to income tax or working hours.

⊕ Pros

+ "Four day week would be a positive thing if vulnerable people are protected"
+ "Fair for high earners (therefore high carbon) to pay more"

⊖ Cons

- **Unrealistic** – some assembly members said it is "not going to happen", is "non sense" or is "not politically viable (Conservative Government)."
- **Unfair on high earners** – some said it is "not fair to penalise those who earn more" or "unfair to assume individual high earners are using lots of carbon."
- **Avoidance** – some assembly members suggested that "some people will move money abroad."
- **Affordability** – some assembly said we "can't reduce salaries – people can't afford it" or queried "how to have a four day week and make sure lower socioeconomic groups have enough money...."
- **Impact on certain sectors** – some assembly members commented that it "could be difficult to implement for those in caring professions" or queried "how to have a four day week ... [how to ensure] the NHS and care professions are protected."
- **"Doesn't take into account individual circumstances"**
- **"Reduction in hours – would initially have to be voluntary"**
- **"People hate tax. We're taxed enough already"**
- **"Can still make carbon on days off"**
- **"Not clear how this could work effectively ... very complex"**
- **"Those who create wealth could have limited potential"**

Some assembly members noted conditions that they would want to see in order to support this policy option, or that they felt would help its implementation:

- **Ring-fence tax revenue** – some said that they would want "tax revenue ring-fenced for carbon offsetting";
- **Reduce consumption first** – some said there would need to be a "reduction in consumer need first [before moving to a four-day week], otherwise competitors [abroad] could win contracts [for the UK market] based on outputs / production volumes";
- **Focus on different types of work** – some said policy-makers should "focus on different types of work – e.g. condensed/flexible hours or work[ing] from home."

Personal carbon allowances

Personal carbon allowances involve individuals having annual 'budgets' to 'spend' depending on the impact of their purchases. Everyone would have the same number of credits to start with, but schemes could include permission for credits to be traded or owed, like money.

Assembly members identified a number of pros and cons about personal carbon allowances.

⊕ Pros

+ **Choice, including considered choice** – some assembly members liked that "you can choose how you use [the] allowance." Others liked that it "will make people think about choices" or that it "unitises the carbon use (you can see how much an air fare is losing for instance)."
+ **"Would be effective at tackling carbon if it was possible"**
+ **"New way of doing things"**

⊖ Cons

– **Trading credits would increase inequality and allow the rich to exploit the poor** – some assembly members said that "extra credit could be purchased by high earners – exploiting low income / vulnerable people whilst not impacting their lifestyles." Others said that "trading might have bad consequences (e.g. going without heating)", that it would "increase inequality" or that it "favours [the] rich, buying from [the] poor."

– **Access to essential items and freedoms** – some assembly members talked about the "risk of unforeseen circumstances [meaning] ... people can't buy food", or noted that you "can't always choose how much carbon you use e.g. disabled [people]." Others said a "carbon allowance can take away people's freedom of travel or movement." Some said they had "fears over rationing."

– **Problematic to enforce** – some assembly members suggested it would be "impossible to administer / police", or "open to abuse." Others said it would entail "big brother monitoring." Some asked "how do you prevent richer individuals finding ways to circumvent carbon allowances?"

– **Impractical** – some assembly members felt it was "too complicated for normal people" or said they had concerns around "practicality." Others said it would be "nice if it worked but not sure it's practical."

– **"Concern it wont be accepted 'at the top' (politicians)"**

– **"Don't know how much it would cost to set up"**

– **"Bad for [the] economy"**

– **"Too communist"**

Some assembly members noted conditions that they would want to see in order to support this policy option, or that they felt would help its implementation:

- **No trading** – some said there should be "no trading" or that those responsible should "ban 'trading' – should be a set price to buy";
- **Fairness** – some said it "needs to be done fairly and [be] properly controlled." Others said they would support it only if "it's fair across the board";

- **Accounting for personal circumstances** – some said that a "personal carbon allowance needs to account for circumstances and location e.g. having a disabled child in Scotland will require more carbon consumption to access help." Others asked "how [would it] wor[k] for children, [or those with] additional needs or [a] disability?";
- **Only for large ticket items** – some assembly members said personal carbon allowances could be used "only [for] large ticket item[s]…and things that are simple to quantify", suggesting it would work for "flying… not food." Others felt personal allowances would be "unwieldy and difficult as a broad approach. However, [they] could be applied to big ticket items and travel but some dispensations would be necessary." Some suggested that "personal carbon allowances could work for some big item spends / services (e.g. flights / car purchases) but [that it] feels unworkable across a wider range", or that they "could be applied to big ticket items over a longer period of time e.g. number of flights over 5 years."

Some assembly members noted conditions that they would want to see in order to support this policy option, or that they felt would help its implementation. Some said they would "**prefer** [**an**] **award / reward system"** as opposed to one that penalises people. Others suggested that those responsible would need to be "**strict with fines**", or that it "**feels like a last resort** – like rationing."

Measures to enable product sharing

This policy option would involve creating systems for more shared ownership. It might include:

- Laws to ensure that businesses offering rentals or sharing are trustworthy and low carbon;
- Incentives for manufacturers to design products which are easily shared (e.g. durable, identifiable);
- Technical and financial support to businesses who offer sharing/renting;
- Giving individuals incentives to take products back after use (e.g. paying a deposit which is returned depending on how well-kept the product is).

Assembly members identified the following pros and cons about measures to enable product sharing.

⊕ Pros

+ **Returning products** – some assembly members commented that it's "good to return phones and technology", that they "liked [the idea of] returning bought products".
+ **Practical and workable** – some assembly members said it is "practical" or that they had "seen it working already e.g. reusable cups at festivals."
+ **Encourages sharing** – some assembly members said they felt "enabling product sharing is very positive." Others said they liked that it "encourages sharing – i.e. cars or house swaps – social/well being."
+ **"Encourages looking after of goods – rewards"**
+ **"Good idea to regulate i.e. trustworthy"**
+ **"Good idea in principle"**

⊖ Cons

– **Impractical for some sectors** – some assembly members said it is "unfeasible for certain sectors – i.e. emergency services" or "cars (e.g. legal dimension of insurance / speeding tickets)."
– **Won't have desired effect** – some assembly members suggested it is "not as effective" or that we're "already doing it with cars – doesn't reduce demand."
– **People won't look after things if they don't own them** – some assembly members talked about the "risks [of] irresponsible borrowers" or our "culture: if don't own, don't value/ look after."

No assembly members noted conditions about this policy idea.

Taxes on producers, products and services

The final two policy options that assembly members considered in this category were 'taxes on producers, products and services' and 'extended producer responsibility'. Assembly members had already discussed these policy measures as ways to reduce emissions from products and services. Here they considered whether or not to encourage people to buy less. Assembly members' views on the pros and cons of these options are included on pages 326 and 327 above.

General comments

A small number of assembly members made general comments about policies to reduce the amount we buy. Some suggested that measures in this area "will increase employment in certain roles or job types" or that "we need to learn from others." Some commented that an "increase in tax will be unlikely to change behaviours."

Vote results

Assembly members voted by secret ballot on policy options to encourage people to buy less. There were two ballot papers. The first ballot paper asked assembly members how much they agreed or disagreed that each policy option should be part of how the UK gets to net zero. The second ballot paper asked them to rank the options in their order of preference. The votes from this second ballot paper were counted both in terms of first preference votes and via Borda count.

A clear majority of assembly members' 'strongly agreed' or 'agreed' that four out of the six policy measures should be part of how the UK gets to net zero:

- **Taxes on producers, products and services – 83%**
- **Enabling product sharing – 77%**
- **Extended producer responsibility – 74%**
- **Advertising bans and restrictions – 74%**

Few assembly members supported '**changes to income tax or working hours**' (**17%**) or '**personal carbon allowances**' (**25%**). A majority of assembly members 'strongly disagreed' or 'disagreed' with both these policies, with levels of disagreement reaching 75% for 'changes to income tax or working hours'.

Figure 7: Encouraging people to buy less

How much do you agree or disagree that each of the following policy options should be part of how the UK gets to net zero? (%)

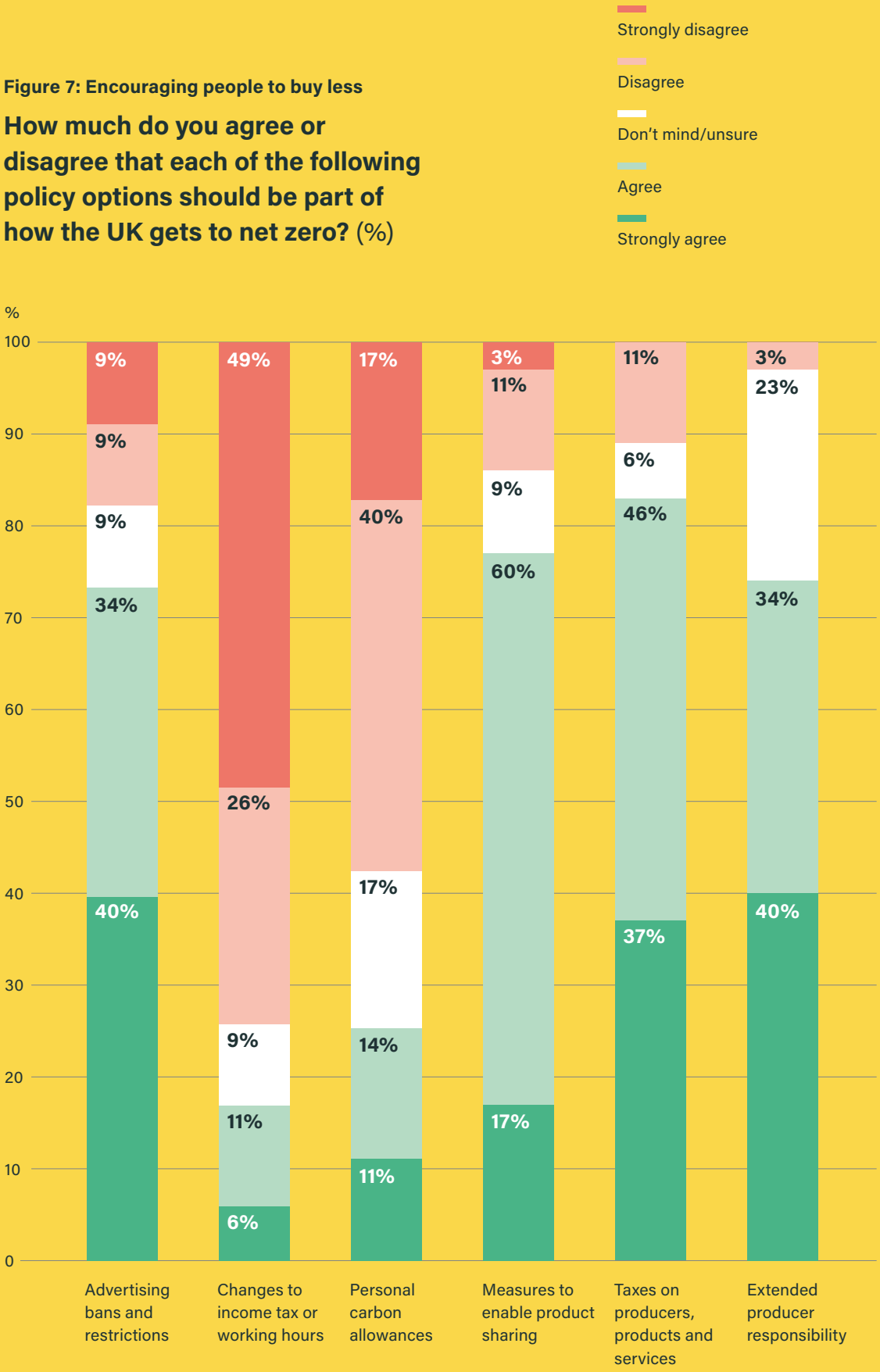


Figure 8: Encouraging people to buy less

Please rank the following policy options in order of preference

(% 1st preference votes)

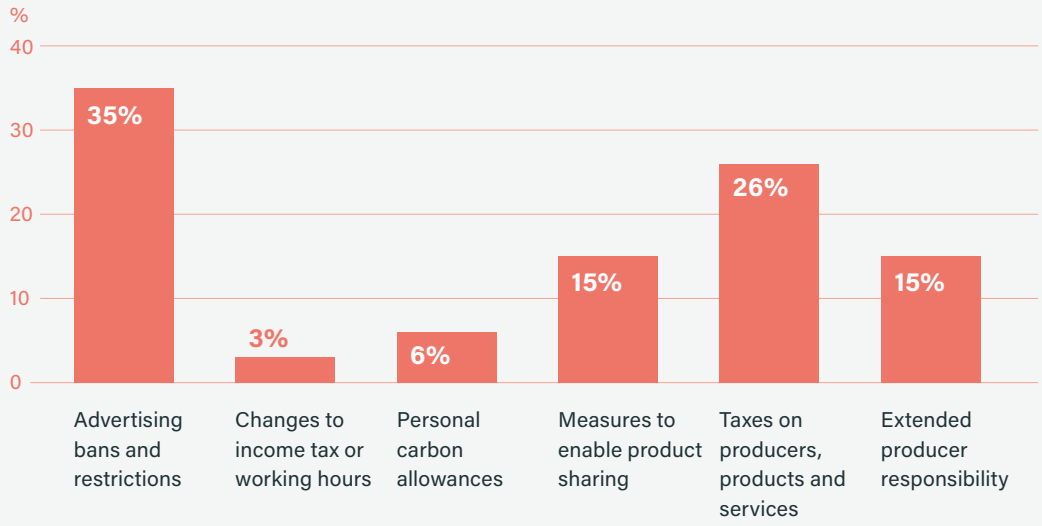
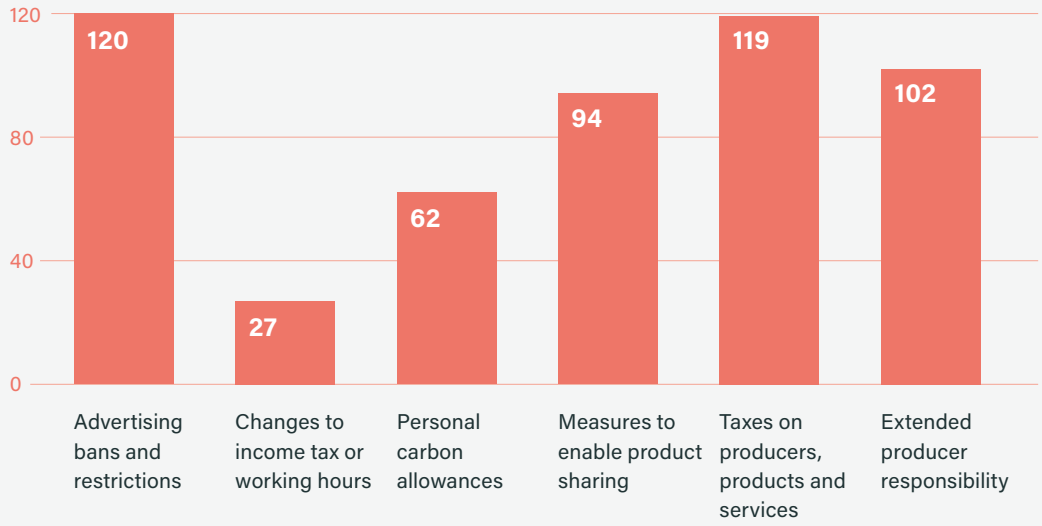


Figure 9: Encouraging people to buy less

Please rank the following policy options in order of preference

(Borda count)



The ranking vote largely reinforced these results. 'Advertising restrictions and bans' and 'taxes on producers, products and services' emerged as the most popular policy options. These were followed by the two other policies that had scored well in the first vote. 'Personal carbon allowances' and 'changes to income tax or working hours' remained the least popular options.

C.3 Increasing recycling

Assembly members looked at six options for increasing recycling:

- Recycling requirements;
- Pay-as-you-throw schemes;
- Deposit return schemes;
- Increased doorstep recycling;
- Grants and incentives for business;
- Product labelling and information campaigns.

We start by presenting the rationale for their views, taking each policy option in turn.

Jump to the vote results on page 351

Recycling requirements

Recycling requirements would involve retailers and/or consumers being responsible for recycling products, with a ban on landfilling. It could eventually mean that councils do not collect 'black bin' rubbish. The requirements could be phased in over many years to allow individuals and businesses time to adapt.

Assembly members identified the following pros and cons about recycling requirements.

Pros

+ **Change in company practice** – some assembly members said it "will encourage greener products from companies" or that "recycling requirements are great as it forces firms to change, therefore there will be a large impact."
+ **"Would increase recycling"**
+ **"Would reduce emissions"**
+ **"Good principle"**
+ **"Less cost with no black bins"**
+ **"Reducing landfill"**

⊖ Cons

- **Fly-tipping** – some assembly members noted "concern about fly-tipping", the "risk of fly-tipping" or fears about "making fly-tipping worse." Some said that "if councils do not collect 'black bin' rubbish [we would have] fears over litter and fly-tipping", or queried what would happen to "existing non recyclable items – fly-tipping?" Some suggested that the "introduction of [the] waste licence has already led to fly-tipping" or that "fly-tipping is a consequence of [the] cost of collection of waste."
- **Time** – some assembly members disliked that it is "not effective immediately" or that it "would have to be phased in." Others said "it's a long way away, good idea but need [the] infrastructure. Not a quick win."
- **"Can't get rid of black bins. Will always have waste that can't be recycled"**
- **"Encourages stream of cars to take things to the tip"**

Some assembly members noted conditions that they would want to see in order to support this policy option, or that they felt would help its implementation:

- **Get on with it** – some said "we should set a target soon and don't wait!";
- **Education** – some said we "need to educate people [about] how to recycle effectively";
- **Standardised approach** – some said it "needs to be uniform" or that it "need[s] [a] standardised approach across the country (and packaging labels [that] matc[h] bin colour)";
- **Incentivise too** – some said they wanted "incentive[s] pair[ed] with requirements in order to make it a 'better pill to swallow' therefore firms are more likely to go along with it."

Pay-as-you-throw schemes

Pay-as-you-throw schemes involve individuals and businesses paying for waste that is not recycled (i.e. the amount of waste in their 'black bin'), but not for recycled or composted waste. The schemes could be introduced with exemptions or to reflect household occupancy (e.g. more bins for more people).

Assembly members identified the following pros and cons about pay-as-you-throw schemes.

⊕ Pros

+ **Encourages behaviour change** – some assembly members suggested it would "encourag[e] people to buy less over time – gets people to recycle who don't already." Others said it would "sto[p] bad behaviour", that "people would improve [their] behaviour" or that "having to pay makes a difference."
+ **"Increase recycling but less strict than 3a [recycling requirements]"**
+ **"Looks like it could work elsewhere"**

⊖ Cons

- **Impact on the less well-off** – some assembly members suggested it "could hit low-income households. Everyone is paying council tax already." Others said it's "wrong to hit [the] vulnerable", that it "favours [the] rich, who can afford to throw", or that "recycling options are worse for low-income areas."
- **Fly tipping and anti-social behaviour** – some assembly members felt it would "mak[e] fly-tipping worse", that it would "encourage antisocial waste disposal i.e. in neighbour's bin" or that it had "fly-tipping risks and putting rubbish in other people's bins or wrong bins."
- **Practicality and enforcement** – some assembly members queried "not practical? Weigh as you take it?" Others said "some people won't pay – makes no difference" or expressed concerns about the "cost of enforcement."
- **It won't work** – some assembly members said that "punishing people is not going to work" or that "it sounds like a good idea, but it's not going to work."

Some assembly members noted conditions that they would want to see in order to support this policy option, or that they felt would help its implementation:

- **Avoid impacting the less well-off** – some commented that it's "good but needs to relate to income / [the] tax band of [the] property to avoid impacting low income households";
- **Scrap payments** – some said they would support it "only if households don't pay (already pay with council tax)";
- **Consider shared bins** – some queried "flats/shared bins?"

Deposit return schemes

Deposit return schemes encourage the collection of used containers, so that they can be recycled or reused. The customer pays a small sum on top of the retail price when they buy a product (e.g. a bottled or canned drink), which is refunded when the container is returned to a collection point. The bottle or can is then either refilled or sent for recycling. Deposit return schemes could be extended to incentivise individuals to sort other unwanted goods they own (e.g. clothes, furniture) for reuse, remanufacture or recycling.

The UK government has promised a deposit-return scheme for plastic, glass and possibly metal by 2023.[13]

Assembly members identified a number of pros and cons about deposit return schemes.

⊕ Pros

+ **Tried and tested** – some assembly members said "it already exists and works – encourages reuse." Others said "we used to do this and it worked" or that it's "tried and tested." Others said it is "like existing European schemes" or that there is "evidence of [it] working abroad."
+ **Encourages good behaviour** – some assembly members suggested it "discourages throwing away including litter" or that it "rewards good behaviour." Others commented "like this one, good evidence, excuse to pick up litter (incentive)."
+ **"Incentivises people in lower income areas"**
+ **"More fair"**
+ **"This could be rolled out for cleaning products and then work out how to solve the food problems"**
+ **"Simple"**
+ **"Already in government plans"**

⊖ Cons

– **Need for infrastructure** – some assembly members disliked that it "needs infrastructure" or the "infrastructur[e], but mitigated by the benefits of setting up [the] schemes."
– **"Some people won't bother if they don't understand"**
– **"Open to abuse for people to contaminate the containers"**

13 https://www.gov.uk/government/consultations/introducing-a-deposit-return-scheme-drs-for-drinks-containers-bottles-and-cans/outcome/introducing-a-deposit-return-scheme-drs-in-england-wales-and-northern-ireland-executive-summary-and-next-steps

Some assembly members noted conditions that they would want to see in order to support this policy option, or that they felt would help its implementation:

- **Make it easy and accessible for all** – some said they "don't mind who pays you back i.e. company / council but [it] needs to be easy." Others said it "needs to be accessible including for disabled people."
- **Look at who pays you back** – some asked "who gives £ back?"
- **Try it first** – some recommended that we "see how [the] government['s] existing plans go, then see."

Increased doorstep recycling

Increased doorstep recycling would involve local councils providing doorstep recycling for all recyclable materials. The UK Government has said it will expect all councils to collect at least the same 'core' list of recyclable materials from householders, although the exact details / dates are to be confirmed.[14]

Assembly members identified the following pros and cons about increased doorstep recycling.

⊕ Pros

+ **Consistency** – some assembly members liked the "consistency", or that it "gives everyone the same recycling opportunities across the UK." Others commented that it's "positive to make recycling collection consistent and standardised. Need all households to compost." Some suggested that a "standard process for recycling will help clarify the message on what can be recycled."
+ **Extends current system** – some assembly members said it "already exists – should be scaled up – with incentive/penalties." Others liked that it "extends the current system and [creates a] uniform approach around the country."
+ **"National policy and central system"**

⊖ Cons

– **Extra cost for individuals** – some assembly members noted "already high council tax rates – higher costs will inevitably be passed on to individuals." Others highlighted "concern about cost to [the] taxpayer" or said "councils can't afford it – higher council tax?"
– **"Costs for local councils"**
– **"Will still have landfill"**

14 https://www.gov.uk/government/publications/environment-bill-2020/10-march-2020-waste-and-resource-efficiency-factsheet-part-3

Some assembly members noted conditions that they would want to see in order to support this policy option, or that they felt would help its implementation:

- **Funding and incentives** – some said it "shouldn't be added to our council tax", or asked "how to fund [it]? [It needs] [b]udget for councils from central government to do [it]." Others suggested it "need[s] incentive[s] for councils to do it";
- **Information** – some said we would "need clear information on what [we] can recycle", that it needs to happen "plus public awareness", or that it is "dependent on 3f [product labelling and information campaigns";
- **What is recycled and making it work for everyone** – some said that "councils should recycle even what households can't be bothered to do." Others stated that it "need[s] to account for people with medical issues and medical waste";
- **Who benefits** – some specified that "benefits need to go to [the] local area."

Grants and incentives for business

This policy option would involve government providing grants to businesses to:

- Improve recycling (e.g. for batteries, steel);
- Develop new materials (e.g. alternatives to cement);
- Make goods from recycled materials; and/or
- Use more efficient production methods.

It could also include financial support for businesses wanting to move away from manufacturing to providing more sharing services, such as repairs or rentals.

Assembly members identified the following pros and cons about grants and incentives for business.

⊕ Pros

+ **Supports businesses** – some liked that it "provides support for business" or makes it "easier for business." Others said it would be "popular for business as [it's a] safe option."
+ **Encourages positive behaviour and ideas** – some assembly members said the "reduced risks would encourage people to recycle." Others felt it would "encourage businesses to come up with new ideas for reducing emissions" or "motivat[e] businesses to come up with innovations." Some liked the idea of "grants for business to improve recycling." Others said it's an "incentive [to] pair with requirements in order to make it a 'better pill to swallow' therefore firms are more likely to go along with it."
+ **"Business need to play their part"**

⊖ Cons

- **Not guaranteed to achieve what we want** – some assembly members felt change was "not guaranteed" or that there is "no guarantee that this would effectively lead to reduced emissions."
- **"Will change as governments change"**
- **"Can't see benefit straight away (other options are more short term/quick)"**

Some assembly members noted conditions that they would want to see in order to support this policy option, or that they felt would help its implementation:

- **Who receives the funds** – some asked "why give businesses grants to develop new materials? Wouldn't it be better to invest in universities instead (to do this research)??" Others agreed, saying "if it was grants to universities for research, would be easier to accept";
- **Supporting set-up** – some suggested "grants initially for set up e.g. first 2 years."

Product labelling and information campaigns

Product labelling would show more clearly and consistently which products and materials can be recycled. Labelling could be accompanied by information campaigns. These would encourage recycling and composting, and educate people about why they are important. They could also include information about which materials can be recycled.

Assembly members identified the following pros and cons about product labelling and information campaigns.

⊕ Pros

+ **Better labelling** – some assembly members said that "labelling is ... visual [and] effective for people to make greener decisions." Others liked the idea of "more clear labelling for recycling" or "labelling (clear) to give information and choice."
+ **"Helps individuals choose and doesn't restrict choice"**
+ **"Education increases general awareness of all we do, and its consequences"**
+ **"Tackles an existing problem and consumer confusion"**
+ **"Easy and doable"**
+ **"Small change but could be effective"**

⊖ Cons

- **Impact** – some assembly members described labelling and information as "light touch – how much difference is it actually going to make? Easy thing to do – probably won't make a huge impact."

Some assembly members noted conditions that they would want to see in order to support this policy option, or that they felt would help its implementation:

- **Standardised approach and matching colours** – some suggested that we "need [a] national standardised approach to recycling, even international standards e.g. red packaging = red bin – match packing label to bin." Others said it "needs national policy", "needs a national approach rather than local councils having different approaches", or the "same colour bins." Some noted:

> "When we sat around the table: everyone had a different recycling coloured bin. With the best will in the world, it has to be made easier: we have [a] blue bin for recycling, green bin for general waste, brown for garden waste. Difficult for people to understand. A traffic light system would help. Costs a fortune though to change the bins. Stickers could be applied rather than changing the bins."

- **Increased doorstep recycling** – some said it is "dependent on [policy option] 3d [increased doorstep recycling]."
- **Virgin materials** – some said it's "important to consider [the] use of virgin materials as well as emissions."

Vote results

Assembly members voted by secret ballot on policy options around increasing recycling. There were two ballot papers. The first ballot paper asked assembly members how much they agreed or disagreed that each policy option should be part of how the UK gets to net zero. The second ballot paper asked them to rank the options in their order of preference. The votes from this second ballot paper were counted both in terms of first preference votes and via Borda count.

A clear majority of assembly members 'strongly agreed' or 'agreed' that four of the policy ideas should be part of how the UK gets to net zero:

- **Product labelling and information campaigns – 92%**;
- **Deposit return schemes – 86%** (no assembly members disagreed with this idea);
- **Increased doorstep recycling – 85%**;
- **Grants and incentives for business – 77%.**

Only a minority of assembly members supported 'recycling requirements (46%, compared to 40% who 'strongly disagreed' or 'disagreed') or 'pay-as-you-throw schemes' (28%, compared to 49% who 'strongly disagreed' or 'disagreed').

Figure 10: Increasing recycling

How much do you agree or disagree that each of the following policy options should be part of how the UK gets to net zero? (%)

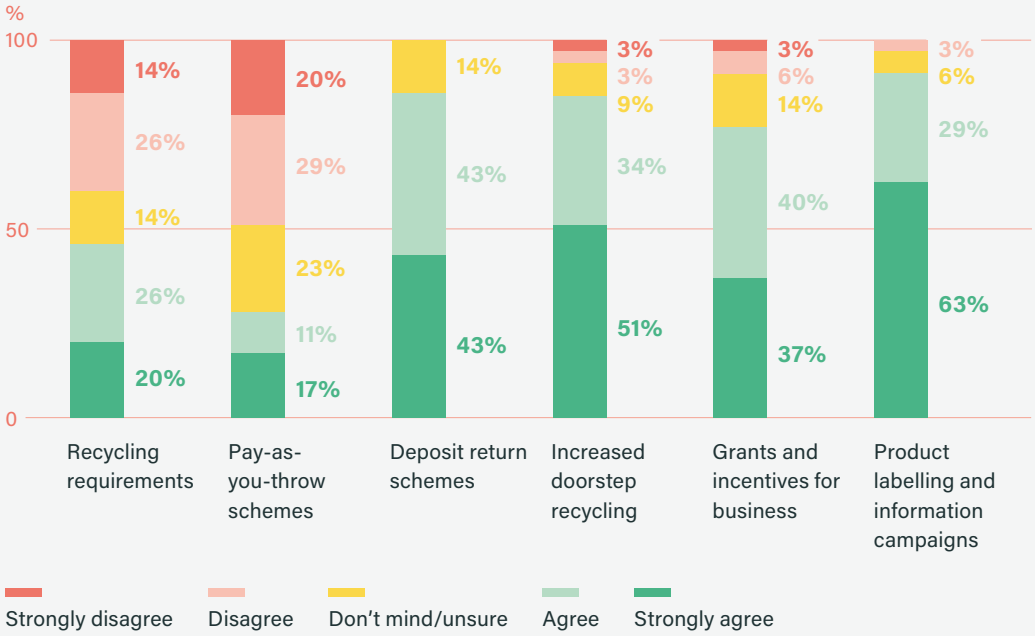


Figure 11: Increasing recycling

Please rank the following policy options in order of preference (% 1st preference votes)

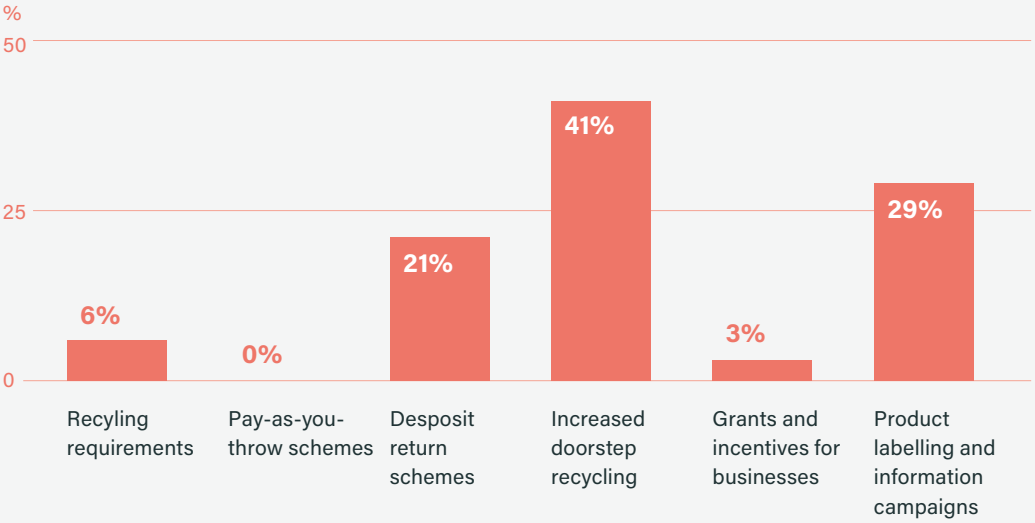
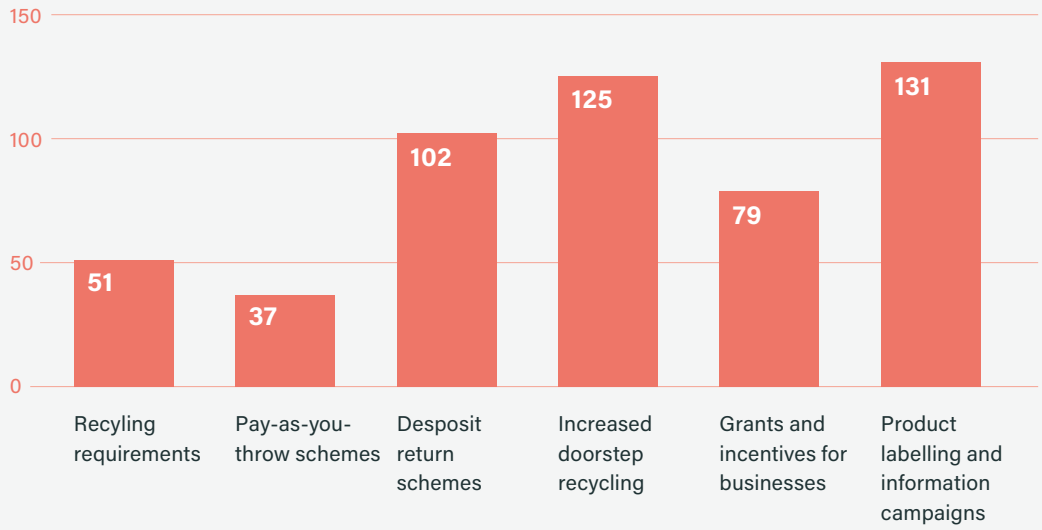


Figure 12: Increasing recycling

Please rank the following policy options in order of preference
(Borda count)



The ranking votes largely reinforced these results. 'Increased doorstep recycling' and 'product labelling and information campaigns' emerged as the most popular options, followed by 'deposit return schemes.' 'Grants and incentives for business' scored reasonably well in the Borda count, although less well in terms of first preference votes. 'Recycling requirements' and 'pay-as-you-throw' schemes again brought up the rear.

Policy options – conclusions

Assembly members showed strong support for a wide range of measures to:

- Reduce emissions from products and services;
- Encourage people to buy less;
- Increase recycling.

They were also clear about what they did not support.

In total, **clear majorities of assembly members backed thirteen policy measures**.

Policy idea	Aim	% assembly members who 'strongly agree' or 'agree'
Labelling and information about the carbon emissions caused by different products and services	Reducing emissions from products and services	92%
Product labelling and information campaigns about what can be recycled and why it's important	Increasing recycling	92%
Resource efficiency targets and standards	Reducing emissions from products and services	91%
Deposit return schemes	Increasing recycling	86%
Increased doorstep recycling	Increasing recycling	85%
Amended procedure for awarding government contracts that gives preference to low carbon companies and products	Reducing emissions from products and services	83%
Taxes on producers, products and services	Reducing emissions from products and services Buying less	83%[15]
Extended producer responsibility	Reducing emissions from products and services Buying less	79%[15]
Grants and incentives for business	Increasing recycling	77%
Measures to enable product sharing	Buying less	77%
Advertising bans and restrictions	Buying less	74%

Assembly members noted a wide range of positives about these ideas. They saw benefits in measures that are **proven** or that they felt **would make a difference**. They also favoured **simplicity** and **practicality**; policies that **retain individual choice and help make it more informed**; and **co-benefits** such as increasing competition or improving product quality.

Some assembly members noted conditions to their support for these policies or points that they felt would help implementation of the ideas. These included a need to **take account of imports, ring-fence any tax revenue generated**, and **protect consumers from increased costs**. Other recurring themes were issues around **trust and compliance relating to business**; some assembly members stressed the need for transparency, honesty, and reliable / independent information and schemes. They also advocated strong enforcement.

15 Assembly members considered 'taxes on producers, products and services' and 'extended producer responsibility' twice. This is because they are ways both to reduce emissions from products and services, and to encourage people to buy less. The scores shown for these policy options are the average across both votes. 'Taxes on producers, products and services' scored 83% of both occasions. 'Extended producer responsibility' was slightly more popular as a way to reduce emissions (83%) then as a way to encourage people to buy less (74%).

Assembly members did not back voluntary agreements, changes to income tax or working hours, personal carbon allowances, recycling requirements or pay-as-you-throw schemes. Their concerns included that measures would be ineffective or impractical, that they would penalise the less well-off, or that they would have unwanted side-effects such as an increase in fly-tipping.

D. Anything else to tell government and Parliament

At the end of weekend three, assembly members had the opportunity to add any further thoughts on 'what we buy' and the path to net zero:

- **Imports and displacing emissions** – some assembly members said that "we should include imports in net zero" or that "how we deal with imports absolutely should be considered and included by Parliament and government." Others said that "we shouldn't 'displace' our emissions to others and/or absolve ourselves of what is – at least in part – our problem."
- **Global leadership** – some assembly members stated that "we should be environmentally / climate responsible in terms of our global trading and deals with other countries – we should lead by example."
- **Just Transition** – some assembly members noted a need to "learn the lesson form the closing of the mining industry i.e. don't abandon communities", or said we should "be proactive to put things in place ahead of the transition to help and support people and communities and encourage new industries." Others stated that we need "to support people who will lose their jobs in the oil and gas sector (e.g. retrained)." Some suggested "ring-fenc[ing] the taxes on oil and gas as a way to contribute to a transition fund."

- **Renewable energy and fossil fuels subsidies** – some assembly members said that "government shouldn't be deterred by the lobbying of fossil fuel advocates, but should lead the strategy towards more renewable energy alternatives and the employment opportunities therein." Others said they "need to understand why there's a fossil fuel subsidy", talked about "tax breaks given to oil and gas companies" or asked "how much are the current fossil fuel subsidies?"
- **Plastics** – some assembly members said they were "concerned about making sure [the] plastic question is raised to Parliament."
- **Recycling of old appliances** – some assembly members said people "need more incentives to recycle their old appliances. Some things you can't repair: that's where businesses have to think about the future. Could be made easier to do: incentivise businesses to do that."
- **Waste** – one assembly member suggested that we should "stop needless waste by building contractors, retailers etc to prevent over-ordering, over-stocking etc."
- **Education and information** – some assembly members emphasised the need for education and information suggesting that "if people don't understand what they are buying, they will be led by advertising."
- **Long-term, cross-party commitment backed by a permanent citizens' assembly** – some assembly members emphasised the need for cross-party commitment a permanent citizens' assembly, including making suggestions about the assembly's membership:

> "Long-term commitment from government. Policy should be set out as cross-party. Worry that [a] new government coming in will change things."

> "Feel very strongly about government and Parliament's commitment, whoever the party is: a permanent citizens' assembly to oversee and hold them to account on the work done is essential."

> "Permanent citizens' assembly: good thing because the assembly will be picked amongst citizens to monitor the implementation of the policies."

> "Need a continuation of the citizens' assembly to monitor the plans taken by whoever takes charge of climate change: communication and co-ordination are key."

> "We need new people. A good mix of people. It can't be the same people as the current assembly."

> "Might be good to get a fresh pair of eyes. Fresh opinions. People's availability will be key."

> "Would it get too political? People would have a political agenda: there should be more young people on [the assembly]. People in their early 20s and teenagers: the next 30 years are not going to affect my generation, but it will affect younger people. Young people should have more of a say. The younger the person is, the least likely they are to have political affiliations: new way of looking at things. Young people have got really good ideas: look at things completely differently. Who would choose is on the citizens' assembly? Could easily become political."

Conclusions

Throughout their discussions, assembly members expressed consistent views on how 'what we buy' should change to help the UK reach net zero by 2050. Their recommendations entail changes for **businesses in particular, but also for individuals.**

They envisaged a future with five key elements:

- Assembly members strongly supported a future in which **businesses make products using less – and lower carbon – energy and materials.** They backed a range of specific policies to support this aim, including 'resource efficiency targets and standards' (91%), an 'amended procedure for awarding government contracts that gives preference to low carbon companies and products' (83%), 'taxes on producers, products and services' (83%), and 'extended producer responsibility' (79%).
- Assembly members supported the idea of **individuals repairing and sharing more**, with less purchasing of new products. They backed '**measures to enable product sharing'** (77%) including technical and financial support to businesses who offer sharing or renting services.
- Assembly members' felt strongly about the need for **better information to promote informed choice and changes in individual behaviour**. They supported 'labelling and information about the carbon emissions caused by different products and services' (92%) and 'product labelling and information campaigns about what can be recycled and why it's important' (92%). They also backed 'advertising bans and restrictions' on high emissions products or sectors (74%).
- Assembly members supported a range of **measures aimed at increasing recycling by individuals and businesses,** including 'deposit return schemes' (86%), 'increased doorstep recycling' (85%), and 'grants and incentives for businesses' to improve recycling, develop new materials and make goods from recycled materials (77%). Their preferred future included businesses doing more to turn old products into new ones.
- Assembly members called for **long-term commitment from government and Parliament**. They emphasised the importance of cross-party support to prevent policies changing when governments change, as well as the need to look at both quick wins and long-term solutions.

Some assembly members raised additional points for government and Parliament to consider around a need to **take account of imports**, **ring-fence any tax revenue generated by the above policies**, and **protect consumers from increased costs**. Some also highlighted **trust and compliance issues relating to business**, asking for transparency, honesty, strong enforcement, and reliable / independent information and schemes. Assembly members welcomed measures that would **create additional job opportunities**, and stressed the need for a **Just Transition** for people and sectors adversely affected by the path to net zero.

Assembly members were equally clear about what they did not support. **Assembly members did not back voluntary agreements, changes to income tax or working hours, personal carbon allowances, recycling requirements or pay-as-you-throw schemes.** Their concerns included that measures would be ineffective or impractical, that they would penalise the less well-off, or that they would have unwanted side-effects such as an increase in fly-tipping.

Where our electricity comes from

Chapter 8

Summary of recommendations

1. Large majorities of assembly members strongly agreed or agreed that **three ways of generating electricity should be part of how the UK gets to net zero:**
   - **Offshore wind** (95%);
   - **Solar power** (81%);
   - **Onshore wind** (78%).

2. Assembly members tended to see these technologies as **proven**, **clean** and **low cost**, with wind-based options suitable for a "windy" UK. Offshore wind had key additional benefits, particularly being **"out of the way"**. Solar power was viewed as flexible in terms of where it can be located, among other advantages. Some assembly members suggested a range of points to bear in mind when implementing all three technologies. These included their location and environmental impact, progress on electricity storage, ways to incentivise and facilitate uptake, visual design, and where they are manufactured.

3. **Assembly members were much less supportive of bioenergy, nuclear and fossil fuels with carbon capture and storage** – although, particularly for bioenergy, significant numbers of assembly members were unsure about its use:
   - 40% of assembly members 'strongly agreed' or 'agreed' that **bioenergy** should be part of how the UK gets to net zero, 36% were 'unsure', and 24% 'strongly disagreed' or 'disagreed';
   - The equivalent figures for **nuclear** were 34%, 18% and 46%;
   - **For fossil fuels with carbon capture and storage** the results were 22%, 22% and 56%.

4. For some assembly members, their view on **bioenergy** would depend on how bioenergy is produced, including what is being burnt, how production is regulated, and therefore what its environmental and CO_2 impacts are. Assembly members' dislikes about bioenergy included concerns around burning trees and crops, land use and environmental effects, as well as a feeling that better alternatives exist.

5. Assembly members' had three main concerns around **nuclear**: its cost, safety, and issues around waste storage and decommissioning. Their dislikes of **fossil fuels with carbon capture and storage** centred on safety risks (if carbon leaked during storage or transfer), the continued use of fossil fuels, and a feeling that it only provides a "short-term", expensive solution when better alternatives are available.

6. Assembly members did not hear detailed evidence about **tidal, wave, hydro and geothermal** technologies. However assembly members were in principle supportive of the use of these final four ways of generating electricity, particularly for suitable local areas.

Where our electricity comes from

How the UK generates its electricity is a central question on the path to net zero. The UK still produces a significant amount of its electricity from fossil fuels, particularly gas. This emits carbon dioxide, which contributes to global warming and climate change. All the UK's electricity generation will need to come from low carbon sources if its net zero target is to be met. The UK is also likely to need more electricity in future due to an increase in electric vehicles and electric heating.

What did the assembly consider?

All assembly members heard evidence, deliberated and voted on this topic. They heard about six main ways of generating electricity, before considering whether or not each of them should be part of how the UK gets to net zero:

- Onshore wind
- Offshore wind
- Solar
- Bioenergy
- Nuclear
- Fossil fuels with carbon capture and storage

The evidence session for this theme took place during the assembly's online weekends.[1] It covered:

1 The assembly also heard introductory evidence on this topic at the start of weekend two. This ensured assembly members were aware of key issues about where our electricity comes from, before discussing related themes such as surface transport and heating our homes. The subject of hydrogen was touched on during this weekend two introductory session and is picked up in comments from some assembly members in this chapter. Similarly, assembly members who looked at air travel heard evidence on synthetic fuels during weekend two, another area touched on by some assembly members during this chapter.

- What each of the above six generation methods are and different views on their desirability;
- The design of the electricity system and how it may need to change;[2]
- Some limited evidence on generating electricity using hydro, tidal, wave and geothermal technologies.[3] Assembly members were able to express their views on these methods in their discussions and on their ballot papers, albeit in a more limited way than for the six ways of generating electricity listed above.

Assembly members had the opportunity to question each speaker[4] in detail.

After the evidence session, assembly members discussed what they had heard. They then voted by secret ballot.

What's included in this chapter?

Assembly members had less time overall to discuss 'where our electricity comes from' than they had had for the themes covered in previous chapters. They therefore primarily focussed on just one question: which of the above six ways of generating electricity should be part of how the UK gets to net zero. Assembly members looked at this question in some depth.

This chapter presents their views in the following order:

A. **Vote results:** the assembly's final recommendations on which of the six ways of generating electricity should be part of how the UK gets to net zero;

B. **Rationale and conditions:** assembly members' rationale for their votes, as well as areas they would like to see considered around the implementation of each of the six options;

C. **Other technologies:** assembly members' views on the technologies that they heard less evidence about – hydro, tidal, wave and geothermal;

D. **Cross-cutting considerations:** points raised by assembly members that cut across all the ways of generating electricity.

The chapter ends by summarising the conclusions from across these sections.

2 This included information about measures needed to ensure that the supply and use of electricity are balanced in real time – including storage (e.g. via batteries) and interconnectors (cables to other countries).

3 The assembly did not have sufficient time to look at every way of generating electricity. It therefore focussed mainly on the technologies with most potential to generate a substantial amount of low carbon electricity in a cost effective way.

4 The assembly heard from three speakers on where our electricity comes from: Mike Hemsley, Committee on Climate Change (informant); Professor Patricia Thornley, Aston University (informant); Professor Jim Watson, University College London (informant). All speakers' presentations are available as slides, videos and transcripts at climateassembly.uk/resources/. An 'informant' is a speaker who we asked to cover the range of views and available evidence on a topic.

Contents of this chapter

A. Vote results

Assembly members voted on ways of generating electricity by secret ballot. There were two different ballot papers. The first ballot paper asked assembly members how much they agreed or disagreed that each method should be part of how the UK gets to net zero. The second ballot paper asked them to rank the methods in their order of preference.

The votes from this second ballot paper were counted in two ways:

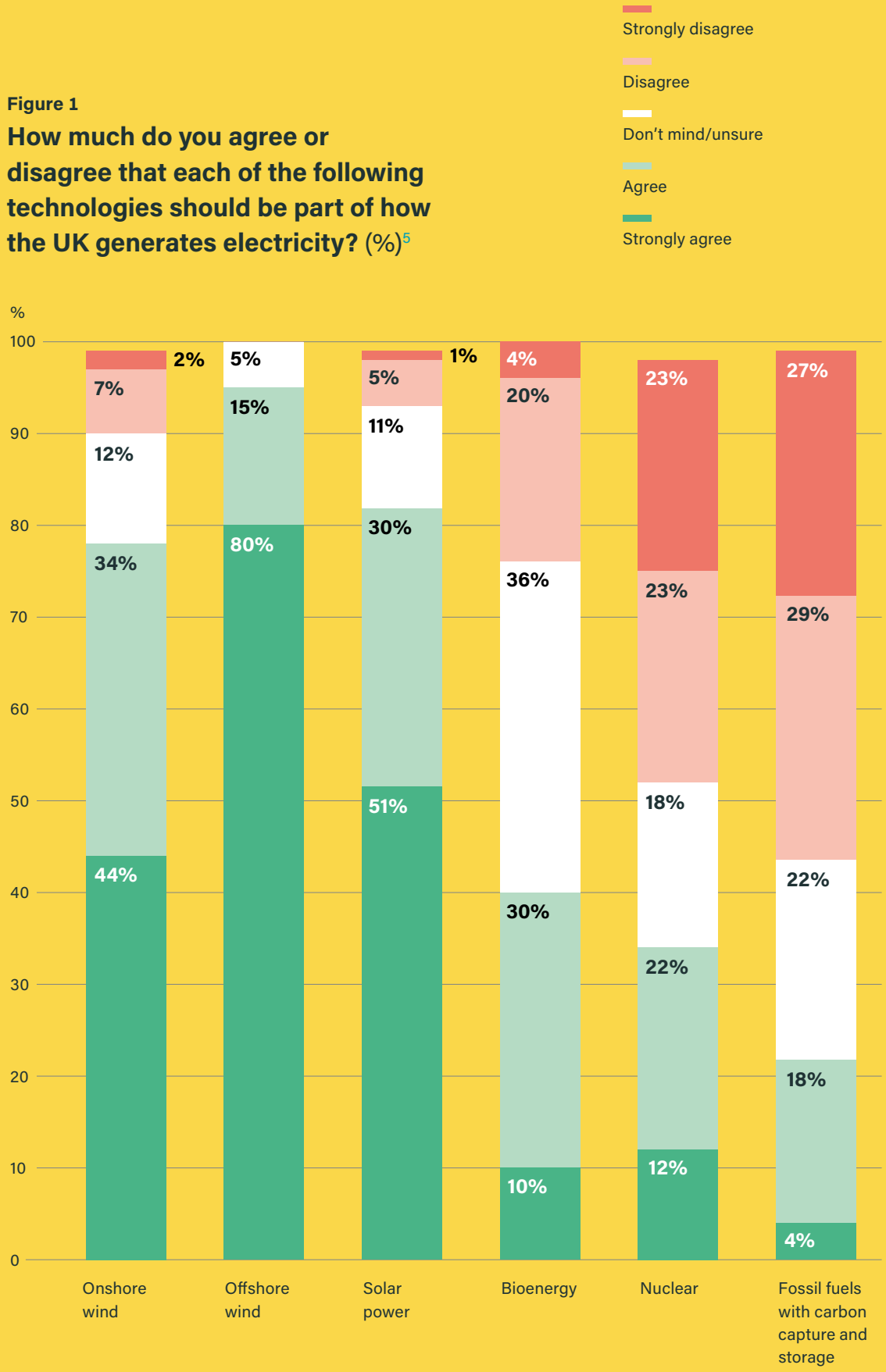
- **Counting assembly members' first preference votes only.**
- **Using Borda count.** This involves allocating points for preferences – a first preference vote scored five points, a second preference vote four points and so on. A sixth preference vote scored no points. Counting the votes like this tells us which methods are most acceptable to the greatest number of assembly members. This is particularly useful for this question, as it is likely that more than one way of generating electricity will be needed.

A majority of assembly members strongly agreed or agreed that three ways of generating electricity should be part of how the UK gets to net zero. In their order of preference these were:

- **Offshore wind** (95% of assembly members 'strongly agreed' or 'agreed', with a large majority of 80% 'strongly agreeing'; no assembly members 'strongly disagreed' or 'disagreed');
- **Solar power** (81% 'strongly agreed' or 'agreed', with 51% 'strongly agreeing');
- **Onshore wind** (78% 'strongly agreed' or 'agreed', with 44% 'strongly agreeing').

Figure 1

How much do you agree or disagree that each of the following technologies should be part of how the UK generates electricity? (%)[5]



5 Where bars in the graph don't add up to 100% this is because some assembly members abstained.

The other three methods saw much lower levels of support, and higher degrees of both uncertainty and disagreement. In assembly members' order of preference:

- 40% of assembly members 'strongly agreed' or 'agreed' that **bioenergy** should be part of how the UK gets to net zero, 36% were 'unsure', and 24% 'strongly disagreed' or 'disagreed';
- The equivalent figures for **nuclear** were 34%, 18% and 46%;
- **For fossil fuels with carbon capture and storage** the results were 22%, 22% and 56%; a majority of assembly members 'disagreed' or 'strongly disagreed' that this way of generating electricity should be part of how the UK gets to net zero.

The results of the preference votes largely reinforce this picture. A majority of assembly members (65%) chose offshore wind as their first preference method, with all other options a long way behind. In the Borda count, offshore wind, onshore wind and solar were again more popular than the other methods – with onshore wind scoring slightly more highly than solar power in this vote. Assembly members' order of preference for the other methods was again bioenergy, followed by nuclear, with fossil fuels with carbon capture and storage bringing up the rear.

Figure 2

Please rank the following technologies in your order of preference
(% first preference votes)

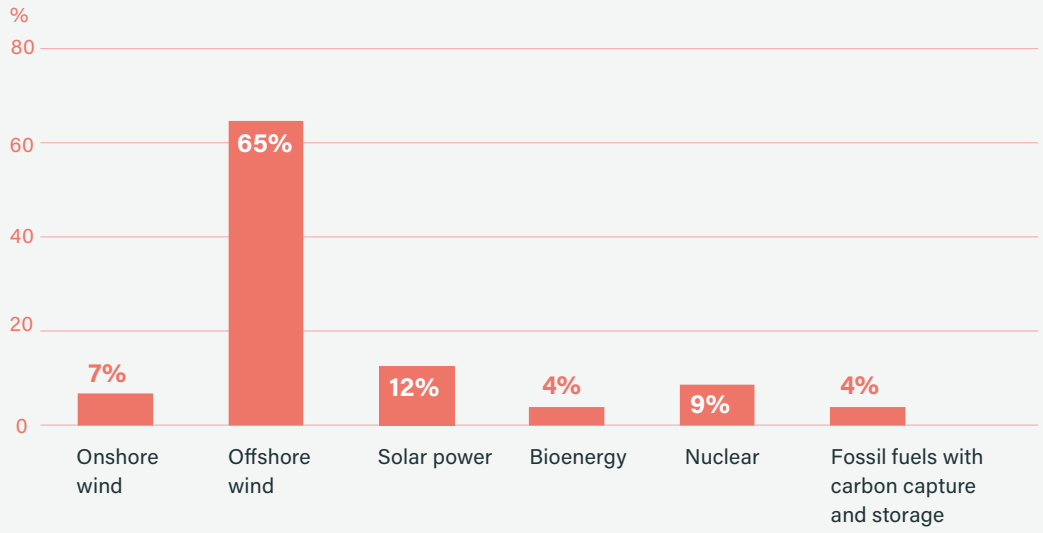
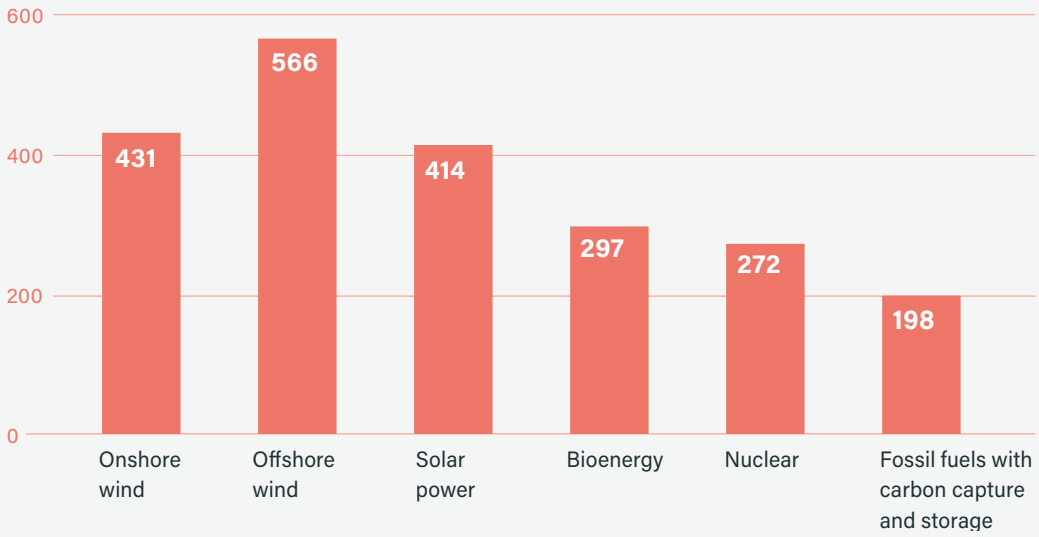


Figure 3

Please rank the following technologies in your order of preference
(Borda count)



B. Rationale and conditions

This section contains:

- The reasons that sit behind assembly members' votes, as just reported;
- 'Conditions' that some assembly members felt would support the use of each technology or that they suggested should be in place for it to be used.

Given the detailed nature of assembly members' comments, we have categorised the pros and cons for each of way of generating electricity under six headings:

- Environment impact and land use
- Practicality, efficiency, readiness and scale
- Costs, the economy and jobs
- Public support
- Safety and risk
- Other

The category titles are our words, not assembly members', and are just there to make assembly members' thoughts easier to navigate. All the content under the headings is assembly members' own.

We have kept in contradictory opinions in order to show the full range of views amongst assembly members. The results of the votes above tell you what conclusions assembly members reached having considered all these points, and the weight of feeling in support (or not) of each way of generating electricity.

B.1 Onshore wind

Onshore wind means wind turbines that are located on land. Assembly members discussed this technology in small groups, noting pros and cons.

⊕ Pros

Assembly members identified the following areas as points that they liked about onshore wind.

⊕ Environmental impacts and land use

Some assembly members liked that onshore wind is "**sustainable**", "**renewable**," "doesn't run out" and is "environmentally friendly." Others described it as "**clean energy**", "cleaner", "low carbon" and "not dirty (i.e. does not use fossil fuels)." Some said they liked that "no CO_2 [is] produced (except in construction)" or that it is a "non-polluting operation."

Some assembly members labelled onshore wind "a **natural** way of ...[generating] electricity" or noted that it "uses natural resources to produce energy." Some highlighted that there is "**no waste**", "no nuclear waste" or "no residue at the end."

A number of assembly members commented on **wind turbines' appearance**, expressing a range of views. Some were **positive** commenting that they are "majestic", "pretty in the right location", "pleasant to look at on the horizon" or that they like "seeing wind turbines...[and] think they look nice, even the modern ones." Others were **more muted** suggesting that "some don't mind the look of them", or that "turbines are more attractive than slag heaps." Some noted that "one or two turbines can be built on their own (i.e. in industrial areas)" and that these "are not huge farms, so that makes them quite attractive." Others commented "houses aren't attractive in the environment so why do we have a problem with wind turbines?" Some assembly members presented **a different view**, saying "they are an eye sore, but if the potential is there this outweighs the negatives.... Other things are eye sores (e.g. power stations, masts), we have had to get used to them, we'll get used to this."

Some assembly members talked about **benefits for future generations.** Comments included that "we are all responsible for what happens to the world, and this is one solution." Others noted a "lack of [negative] impact for future generations" or that "they are temporary and when they are done the landscape returns and the impact is gone."

One assembly member said "if placed where it's effective, you can have dual land use."

⊕ Practicality, efficiency, readiness and scale

Some assembly members said that onshore wind is a "**proven technology, it works**, we have it already up and running." Some suggested that "no testing [is] needed" and "we know if we build more it will be fine." Others described it as a "very well researched tech ...[which is] gaining traction as a well established technology", is "available now" and "practical."

Some assembly members suggested that it is "**easy** to do – technically" and "easy to use," including being "low maintenance," "easy to fix and maintain" and "easy to set up." Some commented that it is "easier (than off-shore) to maintain – to access and upgrade as technology improves."

A number of assembly highlighted the benefits of using onshore wind at a **small scale and in strategic locations**. Some assembly members suggested that "whilst 'wind farms' can be seen as a negative, for some farmers, having a single turbine to generate power can be vital." Others said that "there may be an opportunity to extend use beyond feeding into the grid to power specific factories or other sites" or that it "works on [a] smaller scale / homes as well as [a] larger scale." Some suggested that "there would be [an] opportunity to expand production in strategic locations to minimise energy lost in transmission."

Some assembly members said it is "**scalable** – 10 x more potential than currently so can produce lots of energy." Others noted that it can be done "at a large scale" or suggested that there is the "ability to produce a large amount of energy (even if storage [is] currently problematic)." Some assembly members commented that "it's an existing technology so can be more easily scaled up."

Some assembly members noted that "we are an island so there is always wind" or suggested that this is a "**good source of energy for the UK**." One assembly member pointed out that it "can still be windy at night, unlike [the sun and] solar energy."

Other individual assembly members suggested that "you can store the energy in batteries", that "power can be moved easily" or that there's the "ability to build on existing infrastructure." One assembly member felt that it "could be used with geothermal well."

⊕ Costs, the economy and jobs

A sizeable number of assembly members described onshore wind as **"low cost",** "cheap", or "cheaper", with some suggesting specifically that it is "cheaper than off-shore to build, maintain and (mostly) to transmit the energy." Some labelled it "cost effective," suggesting that "production is virtually free once its built – represents good value." Some said that "costs are coming down" and that because of "economies of scale...[it] will only get cheaper." Others suggested that it is "becoming much more attractive for companies to build." Some assembly members described it as "**free energy."** Others said "we should be exploiting free energy, and it will be available for generations."

Some assembly members felt onshore wind would have **benefits for the economy and jobs.** They suggested it would be "economically good as [turbines] create a lot of on-going engineering jobs" or that "there could be a positive impact on industry in manufacturing them." Others said more generally that "we could exploit the opportunities of this technology as a country."

Some assembly talked about the **potential to make and raise money.** Some members suggested that there is a "possibility to make money as individuals from it", while others felt they are a "good investment for energy companies as [they] can have confidence." Some noted the "benefits from wind farms giving donations to local causes."

Public support

Some assembly members **wondered whether public hostility had been "over-hyped" or was being "given too much attention":**

> *"We were informed the Government stopped awarding contracts in 2015, when 80% of the public thought onshore wind was acceptable. Would public opinion have changed since then; would more people find it acceptable?"*

More than one assembly member talked about a "local example of [a] wind farm near where I live – after initial resistance, people have accepted it." In one case they said this was because people "can see land is being used well (wasn't useful for much else, not fertile, etc.)." Some assembly members felt that "people are used to wind turbines so not so difficult to introduce" or suggested that concerns about public acceptability "should not be allowed to overly influence decision-making." Some assembly members said that onshore wind turbines may not be people's choice but they are "what people need."

Some assembly members suggested that **people being able to see wind turbines is positive**; some commented that "when located in towns, it's good to make people realise where the energy comes from" or that "you can see it producing our energy and that there are no emissions."

One assembly member suggested it's "quiet."

⊕ Safety and risk

One assembly member said onshore wind is "safer compared to offshore wind."

⊕ Other

Some assembly members said that onshore wind has "**very few negatives**" or that "there are lots in my area – I have no problem with them. There's nothing to dislike about them." Other assembly members also expressed general support, saying they "like the idea of onshore wind", that it is "good and productive" or it's "good to see lots of it happening."

One assembly member suggested that "everyone benefits" from its use.

⊖ Cons

Assembly members identified the following areas as points that they disliked about onshore wind.

⊖ Environment impacts and land use

A sizeable number of assembly members expressed concerns about **land use**. They noted that turbines "take land that could be used for something else" or suggested that they are "probably not the best use of land, we're a very populated nation." Others felt that it would "hinder farming and food producers" or that the land "might be better used for growing local produce", for "housing", or "for trees." Some said that "there is room for onshore wind (land space available to increase the number of turbines) but not endlessly," while others felt we "would need lots of them for it to be worthwhile – need them to take up huge amounts of land." Some assembly members said that "there is lots of demand for land use in some parts of the UK we may not be able to find appropriate sites."

The sizeable number of assembly members who commented on **wind turbines' appearance** had a range of views. Some **disliked the "visual impact"** or "local visual impact", saying that turbines "don't look nice", ruin the landscape, and are "ugly", an "intrusion", an "eyesore" or "spoil the view and nature." Some said they were "particularly concerned [about the] impact on areas of natural beauty, such as mountains." Others described them as "not scenic" and suggested that they "need to be sited away from the beaten track/somewhere it doesn't look awful." Some lamented the fact you "would see it when you are walking about" or "wonder[ed]

what they will look like in 2050: will they be rusty and unclean?" **Others' dislike was slightly more muted**, with some assembly members suggesting that the "visual is a concern, but not too much, as benefits outweigh the negatives" or that they're "not good for resident's views, but [it's] just one of those things – a chance you take if you live in the countryside." Some said they didn't like the "visual impact...but not that bad." Others said "they are ugly" but that "this might improve as the technology improves."

Some assembly members voiced concerns about "**negative impact on wildlife**" or the "impact on migrating birds," with some asking "what about endangered species, peatland, birds." Others mentioned "bird strikes, bats" whilst noting we're "glad they are taking steps to try to reduce the impact on birds."

Some assembly members noted concerns about **habitat loss or "environmental impact"** more generally, with some picking out hedgerows and peatland as particular areas of concern. Others said turbines "destroy natural habitat" or suggested that "the 'changed' wind that comes off the turbines can be damaging to landscapes and eco-systems." Some queried whether there are "additional risks of damage to land used in this way, eg flooding or erosion?" Others said that "there could be an impact of manufacturing on the environment (especially if imported)." Some assembly members talked about "concrete bases", "non-recyclable materials" and "cradle to grave impact – consider where they are sited and impact – e.g peatlands, road building – need to assess lifetime cost."

Practicality, efficiency, readiness and scale

Some assembly members disliked that wind turbines are a "**variable source of energy**", labelling them "unreliable if wind not blowing", or saying they are "intermittent", "unpredictable" or that you "can't rely on wind for electricity." Some suggested that a wind farm located on the West coast "might not produce its full capacity. Do you want to take up all that land space for 85 000 wind turbines?"

Some assembly members said that "on days where there's too much [electricity] produced, [we] **haven't got the facilities to store it** at the moment", with others simply noting "can't store it." Some felt this meant we "should use it to generate synthetic fuel from CO_2 in [the] atmosphere – in this way [we] don't need batteries or H2. Synthetic fuel has longer lasting utility than batteries and H2 needs new infrastructure."

Some assembly members commented of the **location of wind turbines**:

> *"Windfarms need to be close to where the energy is used to be more effective. But we see lots of them far away from cities. The more the energy travels, the more you lose in the transfer, so that's a problem."*

Others noted that the "best places to locate the turbines might not be the places where the most energy is needed, therefore transmission costs and losses increase." Some worried that turbines might be located "in places that might not continue to supply the energy to us (i.e. Scotland if they get independence)."

Some assembly members commented on **efficiency and capacity.** Some suggested that onshore turbines are "less efficient than offshore" or that they "produce small amounts of energy compared to their claims." Others suggested that the "tech could be improved if made smaller – there's inertia with the bigger turbines needing more wind." One assembly member noted "I have a local windfarm and power generation is listed in energy by household (it produces energy for 1000 homes) which is nothing compared to the amount of houses in the area."

Cost, the economy, and jobs

Some assembly members said they disliked the "**cost**" or "costs of manufacture." Others said that the "price for electricity generated should be lower" or that there was "some suggestion that maintenance costs are high." One assembly member disliked that "**many [turbines] are made abroad**", although another countered that "there is a lot of production in Hull."

Public support

Some assembly members said that they "can result in **local controversy**" particularly because of the visual impact and suggested that "local communities should be more involved in deciding whether they are located near them or not – who makes the decisions." Others said "**public acceptability** is a limitation" and they are "not seen as popular with the public", with some noting "personally, I don't dislike them, but I understand that others don't want them in their area."

Some assembly members raised **issues about living close to wind turbines**. Some noted that "living close to them means you get reflections from them like mirrors" or that they "can be distracting to look at at times – maybe better away from roads." Others said there is "noise if close but not that bad" or "noisy – but you do get used to it." Some felt the "noise impact" and "noise pollution" were more serious particularly if "scaled up": "a friend lives close to a windfarm and it makes their life miserable. Constant humming sound which can drive you bonkers." Others said that "delivery of the turbines...[is] unsuitable for small roads – disruptive."

Safety and risk

Some assembly members said onshore wind turbines are "not capable of handling **strong winds**" or "can be damaged by high winds so need to be turned off above a certain wind speed." Others asked "can blades be dangerous if they come off?"

Other

Some assembly members worried that turbines are "**unfair** on rural communities who have them while urban dwellers benefit." Others said they were "concerned about the development of large-scale wind farms in Scotland, which benefit England..., but have a negative impact on the Scottish environment and landscape."

Some assembly members said onshore wind "is **not as good an option as building off-shore**."

Conditions

Some assembly members noted conditions that they would want to be in place for onshore to be used, or that they felt would help its use. They highlighted a need to:

Think carefully about location

Some assembly members felt that "they have a place, but should not be located everywhere." What constituted a suitable or unsuitable place was different for different assembly members, for example:

"As long as it's in the right areas, so not on natural beauty areas, but better on useless land."

"Use land that cannot be used for other things e.g. agriculture."

"Onshore wind can also be built on marginal land without much other use, and can be integrated with other solutions for reducing our emissions (such as new forests) or placed next to other construction projects so the land required for onshore wind can be reduced even while it is massively scaled up."

"As long as not outside your house."

"...they need to be dispersed.... Don't have to be huge farms."

"There is plenty of sparsely populated land (e.g. in Northern Ireland) where you could site turbines."

"Put out of the way, e.g. motorways."

"Need to be placed in best places to ensure UK has access to the energy."

"Focus where maximum benefit and least damage."

Look at small scale uses and better visual design

Some assembly members stated a "preference for personal, small scale" as opposed to "large developments", while others suggested that there "would need to be measures put in place to minimise the size of on-land turbines as technology develops (i.e. not as big as off-shore ones)" or suggested "more focu[s] on the models without sails that have less visual impact on the landscape." Some noted that they "don't seem to have variations in the design – could it be miniaturised (i.e. on aircrafts don't have massive blades)." Some suggested that factories could "have their own windfarms to power their plants? e.g. Nissan plant has its own windfarm." Others asked whether they could "have these on our personal homes, i.e. wind trees?" or said "we could consider the use of household wind trees (aeroleaves) for household power generation. They are small and can work at low wind speeds."

Tackle public acceptability

Some assembly members felt there would be a "need to change public perception" and made suggestions about how to win round the public.

"If the public knew wind turbines are a low cost option, they might become more acceptable."

"If they were all over the place and people could see the cost benefit analysis that might help."

Consider land use

Some assembly members said that their support would "depend on how the land is used, i.e. farm around [them]" or suggested that you could "use the land for two different things" or that the UK should be "combining onshore wind turbines with other things e.g. tree cover."

Make them in the UK

Some said they would be "in favour if they were made in [the] UK – better for local jobs".

Sort out storage and infrastructure

Some assembly members said that "battery storage needs to be good and with infrastructure to support this." Others said we "need the infrastructure to get the energy to the grid and avoid wasted energy (sometimes more is available than can be used)". Some asked how we plan to dispose of the batteries.

Manage impact

Some assembly members suggested that "commercial businesses need to be managed to ensure that they don't damage the landscape" or that onshore wind needs "needs proper assessment of environmental impact."

Reinstate grants

Some assembly members said that "grants from government were stopped and need to be renewed" or that "Government support pulled for them and it needs to come back to then lower cost and give support for renewables."

Ensure security

Some assembly members suggested that we need to "protect against foreign ownership/ outsourcing to ensure supply and protections."

Relax planning rules

Some assembly members suggested that "[l]ocal authorities need to be more flexible with regulations and rules relaxed."

As seen in Section A, assembly members expressed significant support for onshore wind in their votes.

B.2 Offshore wind

Offshore wind means wind turbines that are located at sea. Assembly members discussed this technology in small groups, noting pros and cons.

⊕ Pros

Assembly members identified the following areas as points that they liked about offshore wind.

⊕ Environment impacts and land use

A significant number of assembly members commented that offshore turbines are "**out of the way**", "can go a long way out in the ocean" or are "out of sight, out of mind". Some assembly members suggested this had visual benefits in not "spoiling the landscape", with some saying you "don't have unsightly turbines on the land" or that you "get the benefits of onshore turbines without the disruption of [the] natural landscape." One said "this is the proper place for wind turbines" while another noted the "aesthetic – visually nicer and appealing [than alternatives]." Other assembly members suggested offshore wind "**affects fewer people than onshore**", is "further away from people's houses", or "doesn't intrude in any way– away from people so no one will have issues with noise etc". Others said they are "not in people's back gardens / in the countryside."

Some assembly members suggested that there would be "**minimal disruption to wildlife**", only "[l]ow impact (on the environment)" or that this the technology that is "least disruptive to nature." Some assembly members expanded on this theme stating:

> *"Despite some disruption to marine habitats during construction they could actually help preserve marine life by creating 'safe haven' areas eg no fishing, no shipping."*

> *"Overall good for environment – may have disturbed marine life when built, but then keep ships away once installed. Mussels grow on the base etc."*

Some assembly members described offshore wind as "**clean**", "healthy," "green energy", "**renewable**", or an "unlimited source of energy." Others said it creates "no pollution" and does not produce CO_2.

Some assembly members suggested offshore wind is a "better use of our resources...which in turn **frees up the land."** Others felt it "saves the land for other uses" or that the "land management issues associated with onshore are gone."

Practicality, efficiency, readiness and scale

Some assembly members said that there is "**more space at sea**", "lots of space around our coastline" or that we've "got lots of water [to put them in]." Others suggested that we "could power the whole country by using just a small percentage of the seabed", that it would be "easy to increase numbers" or that it "**can be scaled up massively**."

Some assembly members said offshore wind **produces a "great amount of power**", has "more potential than [we] realised," or has the "capacity to provide a lot of electricity – e.g. Woley Windfarm generates enough electricity for 600,000 homes." Some suggested that it "could meet most of ... demand, it can play a big part, just need something for reliability when no wind." Others said turbines are "able to be a lot larger [at sea] and produce more electricity" or that offshore turbines are "**more efficient**" than onshore ones. Some assembly members suggested that "offshore ones [turbines] are a lot a bigger. ...[fewer] offshore produce the same amount of energy.... Means that we want to put more offshore – and reduce the onshore."

Some assembly members commented that we **"already use it, know it works"** or that it is "reliable" or "more reliable than other technologies." Individual assembly members suggested that it could be "a good long term solution", is "manageable" or that "we have the technology to potentially install in [a] less disruptive way e.g. oil platforms."

Some assembly members felt we should "**use a resource we have plenty of – wind**!" while others said there are "stronger winds at sea" or "always wind at sea". Some liked the fact "they are **floatable**" with some noting that "they can be moved to where the wind is (we understand that some are on platforms and can be towed)."

Cost, the economy, and jobs

Some assembly members felt that offshore wind could "create a lot of jobs", including "well paid high skilled maintenance jobs" or jobs in "making them/ installing etc." Some suggested that there would be "job opportunities for people formerly working on oil and gas platforms in [the] north, [meaning a] negative becomes a positive, transition of the industry." Similarly, some noted that "we have many seaside towns supporting the oil industry and so can repurpose these which is **good for jobs / economy**." Others suggested we "can start exporting once its built" or that it has "export potential."

Some assembly members said offshore wind is "**cheap**, and getting cheaper to install" or is "cheaper than fossil fuels." Others suggested that "strategically sited they could reduce transmission costs as very few parts of the country are very far from a coastline."

Public support

One assembly member commented that "people are used to them."

⊕ Safety and risk

No assembly members made comments in this area.

⊕ Other

Some assembly members said offshore wind has "no major negative", has "very, very few disadvantages", or has "fewer disadvantages (than onshore wind)." Some labelled it the "best option by miles" and a "brilliant idea", saying "I'm all for it." One assembly member commented that "we are doing it a lot in the South East of England. It is a variable source and best to generate electricity. All positive."

⊖ Cons

Assembly members identified the following areas as points that they disliked about offshore wind.

⊖ Environment impacts and land use

Some assembly members disliked the **visual impact** of offshore wind, saying it is "intrusive" or an "eye sore" and noting you "can see [them] from the land." A few members made comments about one particular wind farm:

> *"It can still be an eye sore offshore (e.g. just been built off [the] beach in Aberdeen), it's a massive change but you get used to it, it's not a huge problem for me but can see an issue for others."*

"Donald Trump tried to stop them – he was the only one who complained! The problem was the views from his golf course. Locals didn't mind that."

"Trump didn't like it in Aberdeen. Complained to the Local Council. Did go ahead despite taking the Council to Court."

Some assembly members were concerned about the **impact on "marine animals", "sea creatures", "sea life", "migratory birds" and of "drilling into the sea bed."** Some noted particular concerns about the "cables and where they come onshore and impact on things like sand," or the "construction phase...but also possibly ... the wind currents they produce." Some assembly members suggested that the "impact isn't well tested/understood" or that we "might want to see more assessment of that damage." Other assembly members caveated their concerns, for example:

"Going to have some impact on marine diversity but 'you can't make an omelette without breaking eggs.'"

"Concern about affecting marine life (but like what was said about initial disturbance but overall good for marine life)."

"Potential impact on birds (but of limited concern because if sited off migration routes should have limited significant impact)."

"There are minimal ecological impacts. The wildlife comes back in 20 years. Not a huge downside for me."

Some assembly members highlighted **issues around pollution and ethics**, noting the "use of heavy metals in the development of the batteries [for storing electricity]" and asking "how can we ethically build them." Some assembly members highlighted "mining/metals and minerals and the negative impacts they create in building the turbines – local energy better." Some assembly members felt there is a "high pollution risk, which is harder to control offshore than onshore."

Individual assembly members said they "worry about drilling underground" or had concerns about the "human impact on people that live nearby, but research is needed."

⊖ Practicality, efficiency, readiness and scale

Some assembly members felt that offshore turbines are "**harder to maintain**" or "difficul[t] to build", noting issues with "accessibility to install and maintain. " Some assembly members suggested that "you need big infrastructure to get out and maintain them." Others said that "increased maintenance costs...[are] not just because of [the] location but also because of the harsher environment."

Some assembly members questioned turbines' **durability**, asking whether the turbines would be "affected by storms, eg strength of wind", whether they are "safe, strong and durable" or whether the turbines will "last as long" as onshore turbines.

Another concern for some assembly members was **intermittent supply and issues around storage.** Some said it was "not guaranteed energy" or commented on the "unreliability of the wind", suggesting that "with Britain's changeable weather it won't work all the time." Others said it is "only efficient when windy currently – need to develop battery storage or share it with other countries." Other assembly members mentioned "concern about the storage of electricity." One assembly member highlighted **"**the amount of backup generation, spare capacity we have to build…", suggesting "we need almost as much spare capacity as we need generating capacity, for when the wind drops. This needs to be also a green technology or we have to sacrifice 'greenness'."

Some assembly members wondered if there would be "difficulty transporting electricity from offshore to where it's needed?" or suggested there would be a "loss of power as it's transferred."

Cost, the economy, and jobs

Some assembly members said there is a "**big upfront cost** which would take a long time to recoup [and] means people are reluctant to do it." Others said there are "big expenses/costs associated with drilling into the seabed" or said they disliked the "cost to install and maintain, compared to onshore turbines." Some assembly members highlighted "**maintenance costs**": "if they go wrong would have to send a boat out specifically for that windmill. Would be quite expensive." Others commented that we "would need a lot of them and therefore [it] would cost a lot."

Some assembly members said we "need to be careful we do not have too many…[i]mpacts on fishermen." Some assembly members worried about "shipping routes" or "danger to shipping". Others commented they were "worried about the **adverse effect on shipping and fishing**, but Chris [Stark] confirmed that [offshore wind] only uses 1% of space so now [we are] not worried."

One assembly member disliked "paying rent to the Queen (via the Crown Estate) – one of the richest people in the world."

Public support

No assembly members made comments in this area.

Safety and risk

Some assembly members voiced concerns about "**safety during installation and maintenance** – similar conditions to offshore oil and gas industry which is dangerous." Others said they "don't know the downsides, not a deep sea diver, don't know the **risks** of building offshore turbines" or asked more generally "[w]hat happens if something goes wrong?" Some assembly members said they were "concerned about **security**: vulnerability of the cable that brings the power to land being attacked."

Conditions

Assembly members also noted conditions that they would want to be in place for offshore wind to be used, or that they felt would help its use. They suggested a need to:

Consider environmental impacts

Some assembly members suggested we "need to factor in [the] impact of this on [the] natural environment still" or said they "would like reassurance that this is being considered", querying whether we "fully understand their environmental impact yet." Others said we "must choose sites that don't interrupt migration routes or breeding sites for marine/bird life" or that "siting must be properly assessed with regards to environmental impacts – birds etc." One assembly member commented:

> *"I...think offshore wind comes with its own environmental issues, such as habitat degradation of the sea bed. It affects bird populations, particularly juveniles. So, I do think it has to be implemented correctly and the effects to the natural world need to be strongly considered whenever sites are being selected."*

Resolve issues with storage

Some assembly members said there needs to be "good research into energy storage" or that we "need storage or [an]other back-up solution."

Put them out of sight

Some assembly members asked to "keep them away from [the] coastal environment / resorts" or commented "why not put them all out of sight?"

Understand risks better

Some assembly members said we "need to find out more about the risks associated with installing offshore turbines."

Integrate offshore wind with other elements of the energy mix

Comments included:

> *"Need to integrate [offshore wind] with other elements of [the] energy mix – e.g. float barges making synthetic fuel by turbines, and then plug this into [the] existing fuel system which is better than having to build extensive cabling back to shore. Can also add in solar, wind and wave. By 2050 this would be cheaper."*

Promote UK construction and ownership

Some assembly members said they "would like to see an emphasis on British construction and ownership to ensure they are making a wider contribution to the economy."

Use floating turbines

Some assembly members particularly liked the idea of floating turbines.

Individual assembly members said their support would "depend on [the] volume (of turbines) required", that it "would be good to keep perfecting them, make them better and better" or that "there could be trade deals done with France & Ireland to share offshore wind energy consumption."

As seen in Section A, assembly members expressed very strong support for offshore wind in their votes.

B.3 Solar

Solar refers to solar panels that are located on homes and other buildings, or at a larger scale on land (e.g. in fields). Assembly members discussed this technology in small groups, noting pros and cons.

⊕ Pros

Assembly members identified the following areas as points that they liked about solar.

⊕ Environment impacts and land use

Some assembly members said they liked that solar is a "**natural** source of energy" or that "we have what it uses already – sunlight!", with some commenting that "it's a good idea to use the sun." Others described it as an "infinite supply of energy" or a "**regular source of energy**, especially as [it] doesn't require full sun all the time, just light." Some said that "the UK has significant periods of daylight everyday", although they acknowledged differences between the north and south. Others suggested that "it's reliable and will last." Some assembly members said solar is "very **clean**" or a "clean form of energy." Others said there is "[n]o pollution during energy production."

Some assembly members said that it's "a simple method and a **good use of land.** I have experience of it and it's great!". Others suggested that you "can still use fields where solar panels are located – including for grazing. It allows a habitat to remain intact." Some said solar is "environmentally friendly" or that there is "no impact on wildlife."

Some assembly members suggested that solar panels are "**not an eyesore**", are "clean looking" or "look okay." Others said that they are "less of an eyesore than turbines (particularly when located on buildings)." Some liked the fact solar is "silent" or "not in people's way", with some suggesting there is "**no disruption to anyone.**"

⊕ Practicality, efficiency, readiness and scale

A sizeable number of assembly members said that they liked the fact that solar is **flexible –** that it "can be put anywhere" and used for many things:

+ **Many places:** assembly members talked about locations including "rooftops, fields, homes, businesses", "buildings, land and sea", "new buildings", "older properties and buildings", "public buildings", and "cars". Some noted that you can "use it in places we don't usually use or usually waste, eg roofs, windows" and that it's "good to make use of that space." One assembly member said that "they are about to put solar farms onto [my] local park and ride scheme." Another commented that "unlike onshore wind technology and the implication for space..., solar can make use of all the existing urban environment that we have got. Some assembly members said they had "heard of roof tiles being made of out of solar panels" or said that the "technology can be "applied diversely, eg in windows, and the tech is improving all the time."

+ **Many uses:** some assembly members said they could be used to "heat water" and "power homes."

Other assembly members asked "why can't all roofs have solar panels" or suggested solar panels "could help if they were on everyone's houses." Some suggested that solar "can be done at scale" or is "**scalable**" because it "can be put anywhere." Others liked the fact that it "could go up to 10% (of our electricity needs)."

Some assembly members said that solar is **proven** – that it "is used a lot around the world already", "works" or is a technology which is "established and well developed." Others said it has "established efficiency." Some described it as a "**simple technology**" that is "**easy** to develop both at large and small scale." Others suggested that it is "easy to install and maintain and can be upgraded quite easily." Some assembly members approved of the fact it "**can be local to you**" or is "located near homes…[so] no power loss." Others suggested that a "localised direct supply… [would] remov[e] the need for transport."

Some assembly members felt that solar "**works well in partnership with other existing technologies**" or "could be a (smaller) part of future energy", with "variable demand covered if combined with wind." Others suggested that it "can be combined with storage." One assembly member said it "can be integrated with existing systems." Others commented that there "is always sun somewhere in the world so it lends itself to **export/import."** Some wondered if we should "outsource to the Sahara where there is lots of sun" or suggested that we "could power share with other countries."

⊕ Cost, the economy, and jobs

Some assembly members said that solar is "**getting cheaper",** "not too expensive" or that the "lifetime cost is low." Some suggested that the "decreased cost of manufacture compared to when the technology was originally developed (has dropped exponentially) makes this a feasible technology." Others noted the "low cost of installation" or said that it's "free once the technology is installed."

Some assembly members pointed out the **potential to make and save money**. Some commented that "people can use them to lower [their] own bills" or that some people generate "so much energy that [they] can sell it back to the grid." Others noted that it can "save people who have them on their houses a lot of money" or that in the "long term [it] can be a good investment for domestic bills." Some assembly members said that "there are schemes available to support it, you can sell back to the grid/energy provider." Others said that "loans are available from (some councils) for installation on households" and one assembly member noted that they "like the concept of renting roofs to the "Council" for solar generation." Another individual assembly member shared that "when I sold my house the solar panels definitely contributed to the sale of the house (it made it easier to sell)."

Some assembly members particularly liked the idea of **solar farms**, suggesting that they could involve bulk buying and therefore reduced costs. Others felt that solar panels are "expensive as [an] individual cost, but solar farms [are] ok as long as they are in the right place."

⊕ Public support

Some assembly members suggested that solar "gives people **individual autonomy** to generate power" or that you "can choose and manage your own power supply – **sense of control**." Others said it "can be individual; on own property and you can control [the] energy coming in." Some noted that you can be "independent of the national grid."

Some suggested that solar is a "a **recognised** technology" or that "the public understands how solar works". Others said that it is "**accepted** by people."

⊕ Safety and risk

Some assembly members suggested there is "**no risk**" or said that that they "can't see serious side effects (other than the rare earth point...)."

⊖ Cons

Assembly members identified the following areas as points that they disliked about solar.

⊖ Environment impacts and land use

A significant number of assembly members expressed concerns about **land use**. Some said that solar panels can "take up space" or that "solar fields could be put to better use." Some suggested that they could have an impact on "land for food and on habitat." Others said that there is "no space below" so "you can't have sheep", or suggested that "we need our fields for trees and plants" or for "biofuels." Some assembly members commented that "it's not good to be covering hectares of land – "**big solar farms** can increase the risk of flooding in areas: stops water going in[to the] soil and increases run off. Can put pressure in certain areas. Can't be used on its own." Others commented that they "don't like fields of panels" or "don't like it so much on land."

Some assembly members felt that solar panels are "**not very attractive**/look ugly on houses" or are "not aesthetically pleasing." Some said that "on some modern houses they look fine, on others they look anachronistic/silly – can spoil the look of a street."

Some disliked "**polluting** PV manufacturing", noting the "reliance on lithium and cobalt for the battery technology" and the mining of them as their particular concern. Some said there were "**ethical issues**" in these area and that these "apply to other variable renewables too." For other assembly members concerns centred on the "**impact on [the] local environment and biodiversity** ...primarily because of the surface heat produced."

Practicality, efficiency, readiness and scale

A sizeable number of assembly members suggested that "**we're not a sunny country** all of the time – shortens the timespan for being able to generate the electricity, particularly in winter which is when we need the most energy for heat/light." Others said that we're a "miserable overcast country", "power output [is] not when people use most electricity", or that solar is "not viable because of reliability." Some suggested that "solar does have a place in the Sahara desert…[c]ould put huge farms [there], but not so much a place for it in the UK." Others objected to the fact that solar only works "during daylight" or lamented the "lack of night-time generation, i.e. if no battery storage."

Some noted the potential for particular problems in the North, suggesting that "shortened daylight hours in the North may make it less viable to rely on / more subject to variance and may require substantial transmission of the energy generated (including loss and cost factors)."

Some said there "are limits to its scale in UK" or that "when productivity is low (e.g. winter) [we] would still need a baseline supply from another non variable source." Some assembly members caveated their dislike, suggesting that "if storage is possible in batteries for later use, then there is potential." One assembly member said it "can't be the only solution."

Relatedly, some assembly members said that **there would need to be "investment in batteries/ storage problems**" or suggested that "questions remain about storing the excess – needs to be efficient in storing energy." One assembly member commented on "**grid capacity** – more energy being produced than can be used / stored and therefore creates wastage."

Examining suitability from a different angle, some assembly members suggested that solar panels **wouldn't work for every building** because they "cannot work for people in flats or high rises – so there is an equity issue". Others said that "not every house is suitable (don't have south facing roofs)." Some expressed **doubts about how much electricity solar generates or its efficiency**, suggesting that they "only generate a small amount", that "amount of electricity they generate is questionable", or that they are "not powerful enough to power the house." Others suggested that they are "less efficient than wind", or that people are "struggling to improve [them] and make [them] more efficient."

Some assembly members suggested that "installations **only have a short life**", "**need to be kept clean**" or "need [to be] upgraded every few years."

Cost, the economy, and jobs

Some assembly members disliked the "**cost** of installations", suggesting the solar panels are "expensive to put in at the moment" or that "installation costs are something people have to pay up front which could be a barrier." Others suggested that solar panels represent "poor value for [the] average person in a house as there's a slow payback." Some assembly members said that they "can't afford the capital outlay to pay for them," noting that the price "has come down over the last ten years" but is still "£10k for the panels and then more for battery storage." Some reported that the "batteries to store the solar power are expensive – this is a disincentive". Other assembly members said that installing solar panels results in an "increase of business rates and [is] therefore not cost effective"; they suggested that "government needs to step up and change that."

Some assembly members noted a **lack of incentives**, saying that the "reduction in feed in tariffs has become a disincentive", that "government has stopped giving you money to have it on your house" or that "deals used to be available but aren't any more."

Some assembly members said there were "**potential implications when selling houses**" or talked about "problems with insurance/ selling houses", suggesting that "legislation needs to change on this."

Individual assembly members said solar is "underfunded and needs more research: or asked "how will it get paid for? Should not be only homeowners who need to pay." One assembly member suggested there is a "danger that developers who can't get planning permission to build on green belts are building solar farms to earn money."

⊖ Public support

No assembly members made comments in this area.

Safety and risk

One assembly member expressed "concern about outsourcing to areas (Sahara example) as we don't want to be dependent on others."

Conditions

Assembly members also noted conditions that they would want to be in place for this technology to be used, or that they felt would help its use. They suggested a need to:

Resolve issues around batteries and storage

Some assembly members said they "do not have to be chemical batteries, other methods are available and should be considered," or that "there needs to be suitable ways of managing batteries and the materials in them (concerns about hazardous materials and recycling)." Others said battery storage being available "is a condition" of their support for solar and that "battery research is needed." Some assembly members disagreed with points about batteries, saying that "our task is carbon emissions, so the battery concerns are a smaller issue."

Make it cheaper

Some assembly members said it needs to be cheaper: "if the price comes down, people will put them on their homes." Others suggested "incentivis[ing] the buildings that use electricity during the day to have solar panels (offices, factories etc)." On a similar theme, some assembly members commented that you "need to invest to make it cheaper" with some noting that there "should be government subsidies again as people were benefitting from them", or grants, or "interest free [government] loans." Conversely, some assembly members said they had "concerns about whether subsidies should be put here", querying "is it worth it" or suggesting it "should only be done where there is enough sun, i.e. in the South." Others suggested "mass production (if there were panels on every home) the cost would come down a lot."

Change regulations

Some assembly members said "at the minute you have to get approval to fit panels (we think from Building Control) – should be reversed so that it is a requirement (or at least incentivised)." Others said we should "chang[e] building regulations to ensure that every new build has to have solar panels fitted although 2016 legislation to have solar fitted to homes was rescinded because of pressure from developers." Some assembly members said that they "also like Tesla roof panels, which are cheaper and act as a roof."

Look at who pays

Some assembly members suggested that "power companies should pay for installation, not homeowners (rent a roof schemes)." Others agreed saying it "should not be only homeowners who need to pay."

Think about different types of building

Some assembly members commented on different types of building that could have solar panels. These included new builds with some suggesting that "...solar panels should be mandatorily installed on all new buildings to feed into the grid", that "new housing in the South should all have solar panels fitted when they are built as part of the planning permission", or that "solar panels should be made compulsory on all new house builds. Government can set a date and costs will tumble." Comments about other types of building included:

"Should be government guidance that suggests every public building should have it... [This] seems like a sensible, logical solution."

"Need to be putting them on commercial buildings in the south."

"Make it mandatory for commercial buildings to use roofs for solar capture."

"Any building that could have solar panels should have them on it and community and public buildings should have panels on them that can be shared with the local community."

"Solar panels should be installed on all possible roof areas, private homes & business. This should be installed & managed by the energy companies with a small roof rental fee paid to the owner of the building. No expense to home owner and all electricity uploaded to the national grid."

Target the right areas and houses

Some assembly members said that "solar is more variable than wind and therefore probably most suited to certain parts of the country. Therefore support would be conditional on it being developed in the right areas where the technology will work best, rather than [it being] a default option." Others said that whether it's a good idea "depends on orientation of [the] house (better when south-facing) – you can get solar panels with motors on them which move around to catch more of the sun as the day goes by."

Consider land use

Some assembly members had opposing views about land use. Some asked to "avoid farming land", with some saying they would "rather have wind if [we're] going to use farm land for electricity generation." Others said that we "should make better use of solar panels in fields, e.g. where sheep are already grazing" or that "solar farms should allow for crops or animals e.g. sheep to graze underneath and possibly more direct light to enable grass and quick growing crops to grow." Some assembly members asked "whether it would be possible for solar and wind power sites to be co-located (a layered array) as this could be a more efficient use of land." Other assembly members asked whether it is possible to "attach solar panels to windmills?"

Promote equality

Some assembly members said they "would like to see more equal availability, e.g. people who live in high-rise flats can't put up panels."

Improve visual design

Some assembly members said solar panels would "need to be visually good looking – more presentable as part of the building e.g. solar roof tiles." Others asked if there "are ways to make them look nicer" or wondered if there could "be better control of how they're administered so they fit in visually a bit more?" Conversely, some assembly members said we "have to accept that things aren't going to look nice to deal with climate change" or that we "need to take a holistic view on whole impact."

Improve efficiency and scale

Some assembly members said that "efficiencies need to be improved, ideally getting more energy out of smaller solar [panels]." Others said it "needs to be scaled up to meet demand and part of a combined solution with wind."

Conduct more research

Some assembly members said it's "underfunded and needs more research."

Two assembly members made further points:

> “Our lifestyle behaviour would have to change to accommodate using renewables efficiently (which appliances get used at which time in the day etc).”

> “Alternative solar – i.e. focusing sunlight onto a hotbox (i.e. a dark box to absorb heat). These are cheaper to construct and can be used to generate energy.”

As seen in Section A, assembly members expressed significant support for solar in their votes.

B.4 Bioenergy

Bioenergy means burning wood or crops to generate electricity. Assembly members discussed this technology in small groups, noting pros and cons.

⊕ Pros

Assembly members identified the following areas as points that they liked about bioenergy.

⊕ Environment impacts and land use

Some assembly members liked “the cycle of carbon capture and release and the balance” or the “**cyclical nature** of the process.” Others noted that it “takes CO_2 out of the atmosphere, but then puts it back out, but this is a balanced system.” Relatedly, some assembly members described bioenergy as “**carbon neutral**” or suggested it “can be carbon neutral if done right.” Others said it “emits little to no net greenhouse gas emissions” because of the “cycle”.

Some assembly members liked that bioenergy is “**renewable**”, suggesting that “with fertile soil we should always have a renewable source.” Others said that “pellets are a straight replacement for coal and therefore [a] more **reliable** form of electricity. We know exactly what we can produce.”

Some assembly members said that they “‘love [the] idea of **growing more crops**” or “**growing trees** to absorb CO_2.” Some noted that “crops like willow are native/indigenous trees.” One assembly members said it’s “better for environmental health as no radiation …[unlike] nuclear.”

⊕ Practicality, efficiency, readiness and scale

A sizeable number of assembly members liked when bioenergy “uses waste” saying it “makes sense when it’s an off product” or “if it already exists and [we] need to get rid of it, that’s great.” Assembly members talked about different kinds of waste:

+ Some focussed on timber and forest management, saying they liked the idea of "**using waste from the timber producing process** – so bits that are not normally used can be used up", or we "have to cut down forests which creates natural waste that isn't of any use – needs to be disposed of so producing biomass from it is good." Some suggested we can "can use parts of trees that aren't being used for other purposes e.g. branches" or said it's "good to use forest residue as if [we] don't take trees away forests become clogged up and trees don't grow properly – need to take trees away anyway for management.";
+ Some mentioned "**unused crops**", or proposed that "**councils could collect garden waste and burn [it] for bioenergy (some are)**";
+ Others talked about using "**rubbish that can't be recycled**", suggesting it would result in "less rubbish in landfill", or wondered if we could "also burn sewage / plastics etc." One assembly member commented: *"recycle our waste bins, domestic sewerage, farming and commercial waste to make biofuel. Landfill sites cannot accommodate all of the waste in the future";*
+ Some said they felt that "landfill is a worry so [we] like the idea of using **methane from landfill** for energy purposes." Others suggested that "**chicken waste products**...[are] a better option than burning trees" or that "taking any waste is a good idea, but why do you have to grow [things for] it."

Some assembly members liked that bioenergy can produce **useful by-products**. Some said you can "use heat as a by-product" or "use waste as fertiliser at the end." Some suggested that producing heat "could be especially positive if developed in localised ways – providing both [heat and electricity] to communities." Others noted that you can also create "fuels (e.g. ethanol from sugar beet."

Some assembly members liked that "**existing power stations can be converted to use biofuels**." Their reasons included that:

+ It "reduce[s] construction costs and redundant sites";
+ The "refit [of] existing coal power plants [allows you to]...keep jobs in communities that would otherwise lose jobs." Some noted that "coal plants ... are often located in areas of deprivation" and suggested that the "current skills power plant staff have are transferable to biomass technology";
+ Others said that "...chang[ing] from coal to wood" creates "less CO_2" and is "cheaper." Some assembly members said that they "liked that 58 factories have already converted to use their own biomass for electricity and this made it cheaper for them (cut power costs from 80%)."

Some assembly members suggested that bioenergy "**could be useful" in "some places**...e.g. waste products, handling food waste BUT [is] not [the] main solution for energy." Others said it "has its place in aviation or other areas where we usually use fossil fuels" or that it "provides a good back-up supply." Some assembly members said that "because it's constant...it could partially fill a gap for when other renewables are being variable (e.g. wind and solar)."

Some assembly members suggested that it's "**scalable**", "could produce a high percentage of our energy" or "generates lots of energy." Some said they liked its "**efficiency**" or noted that it "**only takes two years**."

One assembly member said "when a tree decomposes it will release the carbon..., so when burning it you're making use of something that's going to happen anyway." Other points made by individual assembly members were that "it is doing well so keep doing it", that you "could use abandoned or derelict land e.g. former mines" or that "you can produce this in different ways." One commented "you are storing energy."

Cost, the economy, and jobs

Some assembly members suggested that bioenergy creates "income for farmers" or is "good for second generation farmers that don't want to be investing time in land management – can grow crops easily." Others said that it "could be **beneficial for farmers** looking to change land use as we move away from as much animal farming."

A number of assembly members said that it's "**cheaper** than extracting fossil fuels" or can be "stored with minimal energy costs." Some said that it "**employs a lot of people**."

Public support

No assembly members had comments in this area.

Safety and risk

No assembly members had comments in this area.

Other

Some assembly members liked the fact you can do it "locally" or that it offers "**local solutions**." Others said it is "a solution that works at a small scale" and gave an example of where bioenergy is already being used on an estate. One assembly member said the "overall impact is positive, despite potential for pollution."

⊖ Cons

Assembly members identified the following areas as points that they disliked about bioenergy.

⊖ Environment impacts and land use

Some assembly members suggested that it "**could be worse for the environment** if not done effectively, sustainably", that "in some circumstances it's worse for climate change, so it depends on what you're growing and where, and what you're burning", or that "getting people to stick to the sustainability criteria might be a challenge if the incentives aren't there." Some worried about the "**impact on biodiversity**" including querying whether there was a "risk of a monoculture possibly if planting lots of these crops?" Some talked about the "USA experience of growing corn for ethanol" suggesting that the "environmental impact was high" and that they had "similar concern about palm oil and associated deforestation."

Others felt there was a "danger that it incentivises farmers to overwork the land, apply fertilisers to promote growth for bigger yields and destroy the soil." Similarly some said there was a "danger that soil doesn't get a rest." One assembly member noted that "I don't like anything that is going to destroy the environment for animals (habitat destruction). When cutting down trees – this causes a lot of disruption to animals." On a similar theme, some assembly members suggested there are **"too many incentives to cheat and for bad behaviour"** or that "bio fuels seem too easily exploited."

Some assembly members suggested that bioenergy "doesn't so much reduce carbon as recycle it" or "**putting CO_2 back into the atmosphere is not good**." Others said that it is "not carbon neutral" or "do[es] not reduce the CO_2 and potentially uses up a lot of land which could otherwise be capturing and storing carbon." Some assembly members queried what happens to the carbon footprint "when [you] factor in harvesting, shipping" or suggested that it can be "carbon intensive" because "some emit a lot of carbon e.g. wood pellets exported from US to Europe to burn." Others suggested it "produces more CO_2 than coal and fossil fuels (produces in burning 5% more CO_2)" or that it's a "red herring to say that it was more carbon friendly." Others noted mixed messages, saying "wood [is a] common cooking fuel, but [we're] being told [we] shouldn't use wood and coal, seems a backward step, still emitting carbon."

Expanding on a point touched on above, some assembly members suggested that bioenergy "**doesn't seem like the best use of land**":

- Some felt that we "need more **land to grow trees**" or that it's "inefficient if we use land for it, when we need land for other things (farming/trees etc)";
- Others expressed concerns around **food production:** "How much land will we need to sacrifice to growing bio-fuel crops, instead of using the land to grow food?" Some assembly members said that "food production is more of a priority for land use (especially in light of COVID-19)" or asked "couldn't we use the crops for food instead rather than growing soy in a different country and bringing it in?" Others said that "growing crops specifically for this is not a good use of limited arable land."

Some assembly members said that they are "concerned that we will keep using more and more bioenergy and this will have a negative impact on land use."

Also developing points already mentioned, some assembly members said that they disliked "**transporting things long distances**" or that the "transportation and equipment needed for bioenergy leads to pollution." Some said specifically that "importing other waste products increases [the] carbon generated by transport." Some assembly members made more general comments about **importing**, saying they disliked that "wood chips are being imported rather than produced locally" or questioning "will it be done in [an] environmentally friendly way."

Some assembly members expressed concerns about **burning waste**, with one assembly member saying that a local incinerator that had been built for pellets subsequently started to burn household waste as well. Others said they "worry about the big chimneys from the plant... particularly when burning waste...." Relatedly, some assembly members suggested that there would be "**pollution** from the smoke" or that it's "not good for air quality or lungs." Others described it as "not clean", or said that it "releases carbon monoxide" or that there is a "risk of harmful toxins."

Some assembly members worried about the "**chemicals used to grow the crops and also side effects of growing new crops**." Some assembly members said they had personal experience of "allergies from expansion in growth of oil seed rape" and asked "might miscanthus have a similar impact?"

Practicality, efficiency, readiness and scale

Some assembly members said that it's "**strange to burn something you grow**" or that it's a "shame to keep planting trees and chopping them down." Others asked "how many trees do you have to chop down to get enough energy" or suggested it would be "difficult to get the [right] balance of growing trees and burning [them]." Some said it was "strange to balance [it] with something that is so damaging e.g deforestation", or suggested it "could lead to deforestation" or that we would have to be "careful [we were] not contributing to deforestation – need replanting." Others said that "using forest by-products doesn't seem right" or that they disliked "crops being grown to burn." Some assembly members felt that burning trees "defeats the object" because "a young tree does take a lot of the carbon out of the atmosphere but by burning it we put it back in so we don't get away from the existing cycle." Others said "we should plant forests instead, to store carbon, and leave them where they are not burn them for electricity."

Some assembly members suggested that bioenergy "requires a lot of organic matter and water – **have we got the resources**?" Others noted that it "requires space and water." Some suggested that "it's **not efficient**" or "doesn't contain a lot of energy compared to fossil fuels." Others questioned, "can we get all our needs from this?"

Some assembly members said they had questions about "**scalability**", suggesting that the "capacity for development isn't clear." Others wondered if it was possible to do it at scale "without growing crops specifically to fuel a plant."

A number of assembly members suggested that **other technologies are better**. Some asked "why bother putting money into something that might not work?" when there are "already other established technology options (wind, etc...)." Others noted the need for "transportation for what is going to be burnt, which doesn't apply to wind/solar" or said that only "10% [is] used for electricity the rest for fuel – so is it worth using it for electricity? – think there are better options." Some commented simply that we "have better ways of producing the energy."

Individual assembly members commented that it's "complicated to do", that it "won't work in long term" or that you "need to wait some time before wood can be harvested." One assembly member said we "should use bioenergy for other things besides electricity, e.g. materials."

Cost, the economy, and jobs

Some assembly members said it is "**expensive** to set up bioenergy plants", "more expensive to generate energy in this way" or suggested that bioenergy is "expensive and makes a small contribution to energy supply." Some suggested that it's "a lot of money for something that could be worse for the climate." Other assembly members expressed concerns about "**cost effectiveness** for the farmers who will be growing the trees – will they get extra money for doing so?" One assembly member referenced the "...experience of NI government losing lots of money on subsidies."

Public support

No assembly members made comments in this area.

Safety and risk

Some assembly members said that they disliked the "**need to capture the carbon**" or expressed "concern that it might be storing up problems for the future."

Conditions

Assembly members also noted conditions that they would want to be in place for this technology to be used, or that they felt would help its use. They suggested a need to:

Look at what is being burnt

Assembly members made points including:

"Less keen on growing crops specifically to burn"

"Depends what is burnt, has to give carbon neutral effect"

"Must not burn natural trees/forests/woodland, but only burn waste or what is left"

"It's an advantage if reusing waste, not adding to it"

"Don't cut old growth forests for biomass, only use fuel from plantations"

"Got to plant a lot of trees, and forestry management to get to net zero. This forestry management will have bio side-products as they manage the woods. Can't let this decay and using this for small amounts of bio-generation makes sense."

"Could we also harvest kelp offshore? Why only think about this onshore?"

Make sure it's done sustainably

Some assembly members suggested that "strong regulation would be needed to ensure it's not more polluting than fossil fuels" or that it "needs strict rules to ensure that it is done sustainably." Others suggested that it "needs to be done correctly to make sure it works" or "needs to be managed." Some said you need to "balance…the 36 [sustainability] factors on the graph in the presentation [by Patricia Thornley]." Other comments included:

"There are a wide variety of forms of bioenergy and each must be considered carefully based on its overall carbon emissions at all points in the supply chain and consumption. Currently wood pellet energy production is causing mass clear cutting of old growth forests in the United States so this supposedly carbon neutral form of energy is actually causing more carbon emissions than fossil fuel. Any adoption of bioenergy needs to be carefully considered against its entire carbon picture."

"I disagree that biofuels should be used if the fuel sources are being transported from great distances – as they are now from North America."

Create a balance with other energy sources

Some assembly members suggested that bioenergy "needs to be balanced with other energy sources" or that we "need a little bit of everything."

Individual assembly members suggested a need to think about "where it's sited" or provide farmers with subsidies. One commented: *"Native trees should be grown rather than non-native so that natural habitats are created which is far better for native wildlife and restoring our countryside."*

Some assembly members suggested that "globally, people will need this."

As seen in Section A, assembly members expressed limited support for bioenergy in their votes.

B.5 Nuclear

Nuclear means using heat from nuclear reactions to make electricity. Assembly members discussed this technology in small groups, noting pros and cons.

Pros

Assembly members identified the following areas as points that they liked about nuclear.

Environment impacts and land use

Some assembly members felt that nuclear is "**clean**" or clean in terms of emissions, commenting that it is "currently one of cleanest in emissions so good as a short term solution." Others said it is "clean (if we can dispose of [the] end products)", or that it "doesn't produce any greenhouse gases at all." Some noted that there is a "low carbon footprint from production." Some assembly members said it creates "no pollution" or "less pollution than other technologies." Some assembly members described it as "**sustainable**." One assembly member suggested that there is "no effect on water/land/ecosystems if [there are] no accidents."

Practicality, efficiency, readiness and scale

Some assembly members commented on **scale**, suggesting that "it could supply up to 75% of our electricity needs", "can generate a lot of electricity", has "massive potential" or is like "turning on a tap." Others talked about the "sheer volume that this technology can produce...", saying that the "scope is vast" or "at [the] levels we need in the future." Some suggested that "it would take 300 turbines of 10MW to produce the same amount of electricity as Hinkley Point C. In fact, three times that as a turbine only operates at 30% capacity." One assembly member said "if done correctly, [it] could be a total solution."

Some assembly members liked the fact it is a "**constant** source" that is "available all of the time" or is "not a variable source." Others described it as "**reliable**" or "consistent", or said that it produces a "stable supply" of "guaranteed energy." Some branded it the "only reliable (constant) source of carbon neutral electricity" or "an effective source of power." For some assembly members it "seem[ed] **efficient**" or is "extremely efficient." Others said it "gets more energy faster, compared to the other technologies." One assembly member commented that it "lasts a long time."

Making a somewhat related point, a number of assembly members suggested that nuclear could **provide a** "**baseload**" of "stable" energy "which works hand in hand with wind and solar, [and which we] can crank up to address peak times." Others commented on the "ability with a small number of sites to provide a good baseload that can be topped up with variable sources." Some liked the fact you can "control output."

Some assembly members suggested that nuclear "**use[s] [the] existing infrastructure** available" or uses "systems already in place." Others said it "could continue to use sites with existing connectivity infrastructure in place even when decommissioned."

Some assembly members liked the fact it is "**proven**" or an "**existing technology**." Some approved of the fact it **"doesn't use fossil fuels"** or is **"not reliant on fossil fuels."** Others saw a "role for the nuclear plants that already exist to make up for that [fossil fuel] gap (so we don't have to use more oil and gas), but [said they were] not sure about building new ones."

Cost, the economy, and jobs

Some assembly members said it "can create **jobs** in remote areas" or "creates a lot of jobs in Cumbria." Others said there would be "jobs in the building and management of it" or "lots of high skilled jobs." Some assembly members suggested that "where nuclear power stations already exist, people want them because of the jobs."

For some assembly members nuclear was "**cheap** to run once built", "cheap to operate" or just "cheap." Others said "once it gets going it's cheap (although not cheap to build)."

Public support

Individual assembly members said there are "no complaints from locals near Sizewell" or that they "like idea of smaller plants, depending on local people and whether they want it and the waste from the smaller plants."

Safety and risk

Some assembly members said that they were not overly worried about **safety** for a variety of reasons:

> *"Safety is paramount even on the build. Checked and checked again. We have a good record, can't see building a new one being a source of concerns."*

> *"Growing expertise in managing nuclear waste means risks should be able to be managed."*

> *"I used to be anti-nuclear, but I've now changed my view. As a resource, it can be used in a safe way. The waste can be managed better than carbon capture and storage."*

One assembly member said "when it goes it wrong it goes badly wrong, but equally we accept other risks in our daily lives, when statistically nuclear isn't as bad." Another assembly member gave the example of "air pollution from fossil fuels which cause[s] deaths and is accepted as normal."

Some assembly members made international comparisons, suggesting that "France is a good model of how it works safely" or that "Three Mile island or Fukushima used a different type of reactor." Others suggested that "if France can be confident in running nuclear sites safely surely we can (and given parts of France are closer to the UK than other parts of the UK then their risk is our risk anyway)." Other assembly members said more broadly that it can be "made safe" and that the risk of something "disastrous" is "low." One assembly member said "I appreciate the environmental dangers but on the other hand we need it."

Other

Some assembly members expressed varying views on **imports**, either seeing it as a plus that we "could import from other countries", or alternatively liking the fact of "not having to." One assembly member said it "uses brainpower and knowledge, employs intellectual thought."

⊖ Cons

Assembly members identified the following areas as points that they disliked about nuclear.

⊖ Environment impacts and land use

Some assembly members suggested nuclear is **"not clean"** or has a **poor overall carbon footprint**. Some said that there are "no greenhouse gases but it does produce nuclear waste which could be worse than a greenhouse gas. It's low carbon but not clean." Others said that "mining uranium uses a lot of energy" or that "there are huge amounts of embodied carbon in the concrete used to build a nuclear power station and to decommission it." Some assembly members said that nuclear is "not actually renewable."

Some assembly members worried about "half-life – what **impact on wildlife**." Others said more generally that they were concerned about "environment impact" or whether it will be "harmful to [the] environment in the long term."

⊖ Practicality, efficiency, readiness and scale

Some assembly members said that the "**timescales are too long** compared to wind and solar", suggesting that it "takes 20 years to build...[and] wind can be cranked up much more easily." Others said it "takes a long time to develop" or that the "timescales for building are unknown and unpredictable".

Some assembly members raised **practical issues around nuclear waste**, suggesting we will "need new sites for storing waste" or asking whether it is "moral to store [waste] outside of this country." Some declared "doubts about ...[the] efficiency of waste management."

Some assembly members suggested that nuclear is "**outdated**" or said they are "huge plants... the technology is backward thinking." One assembly member disliked that it "uses lots of space." Some asked "why use nuclear when we can generate power from wind?" For some assembly members, the "need to keep it going all the time" was a disadvantage, with others suggesting it "takes 3 days to start and 3 days to stop so **isn't flexible**."

⊖ Cost, the economy, and jobs

A sizeable number of assembly members described nuclear as "**expensive**", or "incredibly expensive", with some suggesting that the "costs are astronomical". Some specifically mentioned the "huge expense to build new plants", commenting it is "twice the costs of other plants" or "twice that for a wind farm." Others highlighted "expensive decommissioning", the "costs of management", the "very expensive steam train – very harmful by-product", or said that "safety makes it cost a lot." Others noted the "costs of waste management" suggesting that "waste needs managing over 100s of years" and that it's "not worth it when we have wind to use." Others labelled nuclear "the most expensive technology available", said that "the costs go up once you start to build" or that costs are "unknown and unpredictable."

Some assembly members said "wave isn't being pursued because of the cost, so why are we focusing on nuclear? I.e. there are so many other options." Some suggested that "the huge amounts of money needed for nuclear could be spent on renewables...."

One assembly member said nuclear "doesn't employ as many people at plants." Another said "unlike other options this is unlikely to bring down individual bills."

Public support

Location and public acceptability – some assembly members predicted "location issues" with some saying "they've got a bad reputation similar to Onshore Wind for example – build-it, but not near me!" Others talked about "not wanting to live next door to something like this, whether it's a plant and/or a waste site..." or said that "no-one wants one [a nuclear power station] nearby." Others said that the "risk of accidents means public acceptability might be low." Some assembly members said that "the smaller models described are still quite large industrial units and identifying appropriate sites might be difficult." Some assembly members said that the "small scale option is a nice idea but with NIMBYISM...."

Weapons connection – some assembly members talked about the "possible use for weapons – big danger" or said it is "seen to exist originally for nuclear bomb[s]."

Safety and risk

A sizeable number of some assembly members said there have been "too many disaster stories, and they are massive disasters." Others said nuclear is "really **dangerous**" or that it would be "incredibly scary, if something happened." Some noted that the "impact of a nuclear disaster (e.g. Chernobyl, Fukushima) can be terrible." Others used words including "cataclysmic" or "catastrophic." Some assembly members talked about the "risks" being "too large" of "unpredictability/ leak/ accident." Some assembly members said they "don't think they can make it safe", suggesting there's been "a disaster every 10 years." Others felt "climate change and rising water levels" bring new concerns, or said that "building them on the coast is ridiculous – especially in times of rising sea levels." Others said that nuclear was "not worth the costs and risks comparatively." One assembly member said that a "beach is radioactive in my area. The dangers are not appreciated. House prices have fallen." Another commented that "all the materials at the plant are irradiated."

Another sizeable number of assembly members raised a range of **concerns about "nuclear decommissioning / waste storage":**

- Many worries centred on the **long-term impact** and whether we are "kicking the can down the road – [a] big no no." Some assembly members asked "what happens after a hundred years" or suggested that "storage facilities don't last forever." Others said that it would "adversely affect my children and grandchildren due to the long-term waste." Some commented that "some of the waste can be radioactive for thousands of years. Where are you going to put that and how can you be sure someone won't dig it up at some point and have an issue?";

- Some assembly members said storage was "**dependant on geology to be stable** – what happens if [there's] a big earthquake and waste leaks?";
- Others discussed **current examples**. Some argued that waste is "being managed quite well at Sellafield" but others disagreed saying that "it's only being temporarily stored." Others suggested that "there are 20 nuclear submarines in Plymouth waiting 30 years to be dismantled. It hasn't been done as there is no safe way to do it. There will be more in the coming years."

For some assembly members there was "obviously no solution to the waste issue or it would have been found already." For others "UK designs for new builds are faulty." One assembly member said they had concerns about the "transport of nuclear fuels."

Some assembly members commented that "the generation process is more scientific and complicated compared to others, so can't completely understand how it works. Makes it harder for us to be confident that its use it OK."

Conditions

Assembly members also noted conditions that they would want to be in place for this technology to be used, or that they felt would help its use. They suggested a need to:

Phase out nuclear

Phase out nuclear "as their life span ends" in favour of renewables

Build a minimum amount

"Build a minimum amount to provide a baseline but focus on variable options in the main." Others said that nuclear "should only be a backup when needed."

Sort out the waste

Some assembly members said we "need to work a lot harder on nuclear waste management to ensure safe and secure storage to manage the public perception for what is an efficient technology."

Import it (possibly)

Some assembly members said that you could "build in other countries, where there's more support/acceptance with [the] public (e.g. France) and import energy BUT [there are then] worries then about security and international relations."

Reuse sites

Some assembly members suggested that "if we can repurpose the sites and reuse them that would be good."

Be self-reliant

Some assembly members said that we will "need to import energy if we cannot make out own, so nuclear may be needed."

Some assembly members added an additional thought:

> "How much of a consideration, really, is the cost? We are told that we can't afford things as a country, but coronavirus has shown that we can spend money when we need to. The point is that the politics of these decisions is important and relevant."

As seen in Section A, assembly members expressed limited support for nuclear in their votes.

B.6 Fossil fuels with carbon capture and storage

Fossil fuels with carbon capture and storage means capturing and storing around 90% of the carbon dioxide released by burning fossil fuels like gas and coal. Assembly members discussed this technology in small groups, noting pros and cons.

⊕ Pros

Assembly members identified the following areas as points that they liked about fossil fuels with carbon capture and storage.

⊕ Environment impacts and land use

Some assembly members liked that you "can capture 90% of CO_2" or said it "**seems to tackle head on the challenge of reducing the carbon in the atmosphere** through storage." One assembly member commented that "we learned that the chemicals (amines) used to capture the carbon can be recycled and reused."

⊕ Practicality, efficiency, readiness and scale

For some assembly members, the **potential to use existing markets, technology and infrastructure** was a plus. Some noted that it "use[s] fossil fuels therefore [we] can use existing markets" or that "we know the technology [for fossil fuels]." Others said they liked that we can "use existing power stations," that the "facilities [are] already there" or that we "already have the power stations, all we need is to capture the carbon that's coming out of them." Some said we have "evidence that fossil fuels work." Relatedly, some assembly members suggested and that we are "not limited in supply [of fossil fuels]", that we "**still have fossil fuels to use**" or that this "uses fossil fuels while we still have them." Others were much more muted in their praise, suggesting that there are "no positives – except familiarity."

Some assembly members felt this option could be **used short-term or as part of a transition**. Some said if we are "still burning fossil fuels [it's] important to consider how can do that while still working out how to improve renewables." Others said there's a "possibility that it could be the least disruptive, as [we] could continue to use fossil fuels, at least in the transition phase." Some suggested that it could "be used…[in the] short-term where there's no other solution", or that this is the "same technology as we use currently so [it] can be adopted as an intermediate solution to give us time to work on other alternatives."

Some assembly members said that fossil fuels are "**easily found**" or that "we're doing it already and can access it easily (i.e. it's onshore I think)." Some assembly members said it "**can be done"** or "can be done quickly." Some commented that we "need to balance the grid – if [we] have sporadic wind/solar energy, [we] need something **reliable** like CCS to balance it with." Others described is as "more reliable (no seasonal/weather effects)."

Some assembly members focussed on the technology for carbon capture and storage, suggesting it is **proven** and **viable:**

"CCS has already taken place at industrial scale in America. It is a proven technology. It is not just being trialled."

"Norway has been doing that for 10–15 years. Not as scary as we think it is. Seems like a possible alternative."

"CCS is a valid technology for when making cement or things that we really need to use large amounts of electricity for and for which there is no alternative."

Others commented that "CCS [is] underway and oil wells [for storage are] a viable option...." Also in relation to on carbon capture and storage, some assembly members said that it's a "good idea to put carbon underground", that it's "easy to put away under the sea" or "quite safe once stored (we believe)."

Individual assembly members suggested that it could "generate lot of electricity from single location", or that the CO_2 "doesn't take up much space (as it's converted to liquid)." Another said that they liked that it's a "switch on / switch off electricity source." One assembly member commented that I "wondered in the past – when not knowing so much about climate change – why it wasn't possible to get a giant space hoover to suck all the carbon out of the atmosphere, this technology sounds a little bit like that!"

⊕ Cost, the economy, and jobs

Some assembly members suggested it "could create **jobs** if it led to re-opening some coal mines" or that it would be "good for UK regions with coal mines." Some felt it would be "**cost effective**" or "**cheaper.**" One assembly member said "if we are well placed for geological storage sites we may be able to sell off storage space to supplement investment in other technologies in the short term."

⊕ Public support

Some assembly members suggested we could "carry on [our] lives as normal, able to burn coal/wood" or that there would be "**little change to our way of life.**" Some assembly members suggested that there "is a reason people are looking at it as it allows us to keep our way of life."

⊕ Safety and risk

Some assembly said they are "**more favourable towards this than nuclear**" or liked it more than nuclear "with regard to potential waste leaks as [it's] not going to kill people immediately."

⊕ Other

One assembly members said that they "trust that technology will come up with answers."

⊖ Cons

Assembly members identified the following areas as points that they disliked about fossil fuels with carbon capture and storage.

⊖ Environment impacts and land use

A sizeable number of assembly members said that they disliked the **continued use of fossil fuels**, suggesting that "carrying on as normal, doesn't do much to help climate change", or that it "just sidesteps the issue." Others said it is "not real change – doesn't address the... need to change energy production long-term," or commented that "we're already too reliant on them [fossil fuels]" – "it is not a future proofing solution." Some assembly members said that this "feels like the lazy option. Fossil fuels will run out eventually, so hesitant to carry on as normal if we can invest in other technologies." Others agreed:

> *"Fossil fuels – their time is up. Let's move on to clean energy, don't go back to fossil fuels."*

> *"Investing in this is money that is not invested in renewables – just invest in that instead. This is delaying doing what we will have to anyway."*

Other assembly members said they do not want to "suppor[t] a dirty industry" or suggested that fossil fuels have "lots of negatives that aren't attributed to the carbon" including that the "harvesting of fuels causes disease" or the "impact on [the] environment when [they are] extracted." Some commented "burn but capture seems illogical when there is no need to burn, why not just leave fuels where they are." One assembly member suggested that "there is a big lobby pushing for this which points to business as usual." Another said that "current CCS is used to increase production of fossil fuels (to extract more oil / gas from reserves)."

Some assembly members disliked that you "only get some of it out when capturing carbon" or noted that "**still 10% of carbon dioxide from fossil fuels [is] going out into the atmosphere.**" Others said they "don't like [the] idea of **creating waste** and just putting it aside. Renewables don't have that problem."

For some assembly members fossil fuels with carbon capture and storage was a "time-bomb for later." Others said it "**reeks of short-termism**", "doesn't protect future generations", "moves the problem to the next generation", gives the "future generation headaches" or is a "short term answer, not [a] long term [one]." Some assembly members commented that "if the intention [is] to make use of one main technology, [the] cost of carbon capture feels like an expensive way to go, and seems like it's taking a burying 'head in the sand' approach' – oh we've got this space, let's just put it there!" Some branded it "a selfish approach" or said "out of sight out of mind." Others said it seems "like a sticking plaster / temporary solution" or a "magic unicorn people are chasing when simpler solutions are in front of us." One assembly member suggested it was "not sustainable."

Practicality, efficiency, readiness and scale

Some assembly members suggested it "seems unrealistic", is "not viable", "not reliable" or is "nowhere near being ready." Others said that the "capturing process is new" or that "carbon capture **isn't ready** as a technology at the moment compared to others which are better options." Some said that the "technology is at an early state, not yet ready" or asked "why invest in the unknown if other options are available."

Some assembly members suggested that this way of generating electricity is **"not that efficient**" or that there are "limits to where this could efficiently be undertaken due to storage sites." Some assembly members disliked the "energy required to do the CCS" or the "energy cost." Some noted that "**a lot of energy is required** to run the CC process (10% of the electricity being generated at a power plant)."

Some assembly members suggested that "storage capacity is limited – it's 100 years so it's only a short term solution." Individual assembly members commented that it "takes more land to build pipes", or branded it "old fashioned." One said:

> *"In the future I think the only use of fossil fuels should be for when there is no current alternative such as air travel. And since carbon capture has limited space – though there is a lot – it should also be reserved for other circumstances, such as industrial processes that produce a lot of CO_2 but that can't be done another way."*

Cost, the economy, and jobs

Some assembly members suggested that that it is an "**expensive** process", "ridiculously expensive" or that it "doubles the costs of new power stations." Others said that the "initial cost is high", "seems prohibitive" or "will require a lot of investment." Some suggested that for it "to be viable to pipe the stored carbon to offshore repositories ... expensive new infrastructure would have to be built along the coasts." Others noted that "tech for CCS is expensive...[but] might get cheaper."

Some assembly members commented that "**wind [is] cheaper** than fossil fuels, then add cost of CCS and [it's even] worse."

Public support

Some assembly members recalled that "a Speaker during one of the early weekends said that we don't want to push CCS. **Might make people feel we don't need to change** as we have that to fall back on. There are lots of other options that don't carry risks." Others agreed saying "a lot of people don't want to have to change their lifestyles: if presented with CCS, you can carry on doing what you are doing, people are more likely to do that."

Safety and risk

A sizeable number of assembly members said they were worried about **risks with carbon capture and storage**. For some this was about the **"risks of leakages during storage**" including "major leak[s]." Some asked "how can you be 100% it's never going to leak or something's not going to disturb it?" or "what happens if there's an earthquake with lots of carbon stored under the sea." Others worried about **risks during transfer**, noting "the CO_2 is transferred to its destination under high pressure – this creates a huge risk if [a] pipe fails". One assembly member commented "I'd rather have a turbine fall over in the sea."

Others queried how carbon dioxide "can be stored without damaging **water supplies**" or suggested there's a risk of it "turning to acid if mixed with water." Some asked about the **impact on "marine life", or the "soil and the sea** if the carbon leaks out."

Some assembly members expressed concerns about the **involvement of big business**: "What happens if the carbon leaks out – do we pay them to capture it again?"

For some assembly members, their conclusion was that "they [those responsible] have no idea what the implications are", won't "know [the] impact until something happens" or that there are "too many unknowns about safe storage and the impacts of leakage." Making a slightly different point, some assembly members said that CCS "is a gamble and we don't know if it will work."

Other

Some assembly members said that fossil fuels with carbon capture and storage "should be [a] last resort and phased out by 2050."

Conditions

Assembly members also noted conditions that they would want to be in place for this technology to be used, or that they felt would help its use. They suggested a need to:

See it as a transition only

Some assembly members said they'd support this technology "if we see it as a transition, not as a long term solution. It will take time to switch to 100% renewables." Other assembly members suggested that "we're not going to be able to build the wind/nuclear technology capacity we need within the next 30 years. So, we need to convert these plants to get to net zero – using carbon capture feels like a necessary interim solution."

Bring the costs down

Some assembly members said that "if [we] could get cost down [we] would be more favourable."

Regulate and monitor

Some assembly members said that "CCS needs [a] high level of regulation and monitoring to ensure it is being done safely and that it remains safe when buried."

Develop the technology

Some assembly members said that the "technology needs further development before it can be widely used."

Find more storage space

Some assembly members said that we "need more space to bury the CO_2 than the original fuel that was extracted (we think)."

Look for alternatives to storage

Some assembly members suggested that "if it is stored in volcanic rock it becomes a solid, if put into [the] north sea it remains a liquid – why not capture it and turn it into plastics or gravel rather than putting it underground where it might leak." Others said we "should absorb the carbon in more natural ways."

Bear hydrogen in mind

Some assembly members said that "if we use hydrogen from gas in the future, then CCS is essential" or that we should "use the CO_2 generated to produce hydrogen, as opposed to capturing and storing it."

Availability of fossil fuels

Some assembly members said that their support for this technology would "depend on how much fossil fuels the UK has left."

Use it where needed

Some assembly members suggested that you "could use this option for [synthetic fuels for] bigger machinery, eg HGVs, aeroplanes and agri-machinery."

Tax it

"I would like to see an end to use of all fossil fuels, but if the technology is not yet there, then high carbon taxes to deter and reduce their use would also help pay for more research."

As seen in Section A, assembly members expressed little support for fossil fuels with carbon capture and storage in their votes.

C. Other technologies

Assembly members had only heard a very small amount about other technologies – hydro, wave, tidal and geothermal – in one of the presentations. The ballot paper nonetheless gave assembly members the opportunity to leave comments on these options, if they wished to do so. Seventy-two assembly members wrote down their thoughts.

C.1 General comments

Some assembly members made general comments about all four technologies, or several of them at once. Most comments were **positive**, with very few assembly members mentioning points that they disliked. Some assembly members noted conditions that they would want to be in place for these technologies to be used, or that they felt would help their use.

Pros

Consider in the right areas

Several assembly members suggested using these technologies in targeted local areas. Remarks included:

"I think all these options should also be considered in ... areas of the UK where they have the natural resources to be able to use these technologies."

"In the locations where the special conditions exist (e.g. appropriate topography) these alternative technologies need to be applied – we shouldn't focus only on the few mainstream low carbon technologies."

"I think there is an opportunity for local areas to explore these smaller forms of electricity generation where these are viable options but that the majority of the nation's resources should focus on the technologies described ...[earlier]."

Stability and a mix of renewables

Some assembly members emphasised the need to use a mix of renewable technologies:

"I think we need to maximise all possible sources of renewable energy to ensure all year round electricity."

"Despite the cost, hydro and tidal power should be expanded wherever possible as they can provide a more stable source of energy production. A large mix of clean renewable energy sources can meet most of our demand and must be heavily invested in."

"Resources should be natural, have longevity, and be reasonably predictable. We should not ask if we can afford to do it but if we can afford not to do it. Tidal, Geothermal and Hydro are front runners."

Support for tidal, wave and hydro

Several assembly members expressed support for tidal, wave and sometimes hydro in particular:

"I prefer tidal, wave and hydro as they are renewable as well"

"Tidal and Wave should be considered more."

"Money used for Nuclear should be transferred to Wave and Tidal development. I think it's crazy we are spending so much money on a hazardous energy when we can essentially power the UK on clean safe renewables."

"I think tidal and wave power are worth more consideration – they are natural resources like the wind and sun, but whilst the last two are variable according to the weather, tides and wave power are a constant and powerful source of energy."

"...consideration should be given to tidal and wave technology. These could be operated in conjunction with offshore wind installations."

"Tidal, wave & hydro needs to be developed since as an island we need to take advantage of that...initially it will be expensive but hopefully will become more competitive compared to other forms of production."

"As we are an island I thought more would have been made of both tidal and wave power generation. I understand they may be more expensive but so was wind power in the beginning."

"Given we are an island, with access to our coastline no greater than 70–80 miles from anywhere in the UK, shouldn't we be looking at wave/tidal energy especially for communities that rely on oil for heating and/or are not attached to the national grid."

Individual assembly members made the following points:

"I like all these options a lot, they all provide very clean energy. I think that all forms of clean energy should be used in the areas they are applicable."

"These should also be considered as they are also minimally detrimental to the environment"

"All these types are currently quite expensive but I believe, as with everything, the more people adopt them and the more research is done, the cheaper they will become. I like the idea of all of these technologies especially Hydro and Tidal/Wave and would like to see them implemented in some capacity in the future."

Cons

Unproven

Some assembly members said that these technologies are "interesting but relatively unproven" or "all largely untested and would require significant investment." Some suggested that the "technology for some of these may not be so mature."

Too slow

Linked to the above, one assembly member said that "time is a major factor", suggesting that "we need to prioritise technologies that are already established and proven, and not on tidal, wave, etc."

Conditions

Protect the environment

"I think there is a small place for all of these but with stringent controls. The natural environment, wildlife and biodiversity should always be considered and given priority. A decommissioned nuclear plant on the coast, which has already had its environment devastated, could be a consideration for tidal or wave power and once in place the environment vastly improved and enhanced." Another assembly members said that "the environmental impacts of these schemes must be properly assessed."

Continue research and development

Some assembly said that we should "continue to investigate these other options as the reduction of climate change is as important as apparently high financial cost. " Others said "if they can be shown to work in reducing global warming, they should be tried" or they "...nee[d] to be researched more and will play [a] part in the future." Some assembly members said "tidal and wave are being tried, but need more research to scale up" or "tidal and wave technologies seem like good options for an Island nation like the UK, but I think there needs to be more investment and incentives to continue R&D in these areas."

Develop storage options

"Other technologies such as wave and tidal would be good options for the UK especially, but only if we would be able to store the power and transport it/use it at a later time."

Work together internationally

Some assembly said we need to "work internationally and exchange research programmes especially with countries with similar geographic and geological terrains" or suggested that "with emerging existing technologies an international effort would yield greater results." Some assembly members commented that it is "important to look at international collaboration regarding all these different technologies and their use in the best geographical locations", particularly if "we can invest further in, and make use of, more efficient emerging technologies available to transfer electricity in a suitable way...."

Promote local energy

Some assembly members suggested that **"**the government should look at options to create more energy locally than nationally" or that "devolution is required for local government to take advantage of localised energy generation." Some gave the example of Southampton, which "can use geothermal as it suits their geography."

Individual assembly members suggested that "study of the estimated efficiency should be the key factor to what technology needs to be chosen in every case", that technologies should be considered "only if they contribute to reducing [the] domestic cost of energy to the consumer" or that "we have to look at the resources available here in the UK, costs and long term sustainability." Another assembly member said it "would [be] great if technology could harness both wind and hydro power in the same unit."

Some assembly members suggested that another technology, hydrogen, was the "way forward."

C.2 Hydro

The assembly members who commented on hydro specifically mostly made positive comments:

- **General support** – "I love the idea for hydro … where it is possible"
- **Suitability for the UK or particular local areas** – one assembly member said "I've seen and am very impressed with the micro-hydro scheme at Old Walls near Widecombe in the Moor. This scheme generated about 400 MWh/year of electricity, equivalent to the energy consumption of about 90 homes. These could be promoted in many, many villages around the country with moorland and hillside stream run-off. With surpluses feed back to the grid to offset maintenance. Need to overcome established planning regulation – i.e. reason for saying no!" Others said more generally that hydro has "a bigger part to play in local areas where the location would allow these technologies to thrive."

One assembly member voiced a concern about hydro, suggesting that it "may need the building of dams resulting in **loss of land**."

C.3 Wave

Assembly members who commented on wave technology specifically all made positive comments:

- **General support** – "would love to see wave tech develop"
- **Combine with offshore wind** – one assembly member said "I believe wave energy is seriously under utilized in offshore wind farms. Having fixed pillars in the sea provides the basis for utilizing vertical oscillations (wave energy) for effectively unlimited energy generation." Another assembly made a similar point: "If we're building offshore turbines which are fixed to the seabed, why not attach wave turbines to these?"

C.4 Tidal

Assembly members who commented on tidal technology specifically mostly made positive comments:

- **General support** – some assembly members expressed general support. One said they "really feel that Tidal is a possible way to look. I know it isn't cheap but the more it's invested in the cheaper it should get like solar/electric cars.... Hopefully it's something we start to see being talked about more." Another said "I feel tidal should be backed more", a third that "[I am] quite interested in tidal technology";
- **Suitability for the UK** – some assembly members said "as we are an island, it makes sense to continue to look into tidal generation... As this would be a consistent source of energy" or that "I think serious consideration needs to take place on British estuaries to establish whether tidal power can be harnessed";
- **Better than nuclear** – "I would prefer tidal to nuclear, if the construction costs were comparable, as it's less risky and requires less future maintenance";
- **Local potential** – "Tidal …[has] a bigger part to play in local areas where the location would allow these technologies to thrive i.e. Swansea tidal lagoon…";
- **Stable supply** – "Tidal systems in the right places would give a regular twice a day power generation and as the tide varies around the coast some could be working while others are not – wave generation depends on the wind to create the waves so you might as well use wind power."

Some assembly members said there were **points they disliked** about tidal or were unsure about:

> "Not sure tidal is a great idea as it can affect nearby wildlife and [has] very expensive start up costs."

> "Tidal may be expensive to set up and not provide enough energy."

> "Tidal would generate immense energy, but it's intermittent, and is not convenient"

One assembly member "this [can] be taken to other areas beyond the Severn? Would want to make a judgement and would need to know about cost and [the] impact on [the] marine environment, but interested."

C.5 Geothermal

Only a small number of assembly members commented specifically on geothermal. Most comments were positive:

- **General support** – some assembly members said "I love the idea for … geothermal energy production where it is possible" or that "geothermal could be a good option";
- **Proven and low impact** – one assembly member said that "geothermal for me is the way forward. UK currently using it [in] Southampton – drilling only 1800 down so not impacting the earth's crust and [it provides an] endless supply of heat energy…";
- **Good for some areas** – one assembly member said it could have a "bigger part to play in local areas where the location would allow [it] … to thrive."

One assembly member expressed doubts, suggesting that **"geothermal could possibly release more CO_2 into the atmosphere."**

D. Cross-cutting considerations

Assembly members' ballot papers gave them the opportunity to add 'anything else' they wanted to say about where our electricity comes from. Some assembly members used this space to make additional comments about individual technologies, in which case their thoughts have been incorporated into the tables above. Others however made cross-cutting points.

Some assembly members noted the need to **pursue a combination of technologies**. Some made general comments, saying "I think we should use a mixture of them", "I feel that all options presented/discussed should be considered as a combination to get the best from each option", or "I don't think that one option is a 'cure all' however I feel that a combination of the options would allow us to bring net zero much closer to becoming a reality." Others' made more specific suggestions or included key factors they would want borne in mind:

> "I think we should provide most of it by offshore (e.g. 55%), then 30% by both solar and onshore (15% each), then provide a base load through nuclear (10%) and finally the remaining 5% could come from bioenergy, wave and maybe tidal. Also I believe there should be ways to transport electricity from one part of the country to the other so that if it's extremely windy in one part of the country and not the other then the electricity supply will remain balanced."

> "All options should exist symbiotically and constant sources like nuclear and bioenergy are necessary to supplement variable sources like wind. Ultimately using variables will change to way we consume electricity (as a service – using it when it's windy is cheaper) making us more flexible as a society."

> "I don't think any one option is the solution, they all have their strengths and weaknesses, therefore we should use a few different solutions together. I do believe that we should move away from fossil fuels entirely, we will run out eventually anyway if we keep consuming them at the rate we are…."

> "The UK should aim for a combination of low risk low impact technologies."

> “It cannot be a singular solve-all solution, different communities will be able to harness and use different types of electricity.”

> “It needs to be a mixture. Not reliant on one source – different for homes than industry.”

> “Not enough thought has gone into integrated energy production. So for example, I believe the UK should concentrate on offshore energy production with energy plants simultaneously taking advantage of wind, solar and wave energy and using this unlimited energy to produce synthetic fuels at source from air mining. The energy plants could be static (akin to oil platforms in the North Sea)… or floating vessels much like ocean going fuel tankers, albeit that floating vessels would be less efficient at capturing wave energy.”

Some assembly members stressed the need to **keep our options open and/or conduct further analysis, including looking a new technologies.** Comments included:

> “I think the UK should keep its options open. When it chooses an option it should do a cost benefit analysis (if it can) on each technology. I don’t know if this is possible but could two small projects be compared when a new option is considered?”

> “Lets keep our options open and look at new energies. If we have come this far there must be more we can do. Capturing cow methane? More use of waste from household for energy? Hydrogen?”

> “Continue to research and utilise advancing technologies.

> “The pros and cons should be constantly under review. We must have a holistic view of what is good for the planet as well as humanity.”

Others said there **should be a focus on storage solutions for variable energy**:

> “I think the main thing is to find a way to store the power created from wind turbines, solar panels, etc. so it doesn’t go to waste and we can use it efficiently.”

> “Due to the variable amounts of energy produced by wind & solar, energy storage will be key. While the production of batteries has an environmental impact there are other energy storage options that we need to invest in as well. This includes pumping water and lifting weights to store energy when we have an excess [and] … to generate energy when we have drop in supply. This will be key to invest in while also rapidly scaling up our onshore and offshore wind capacity.”

> “I would like to see electricity storage technology developed. So that the excess generation of electricity can be stored.”

Some assembly members felt is “**important to differentiate the renewable energy with no waste product to the low carbon alternatives that may create a potential problem for the future generations.**” Similar comments included: “if we can achieve net zero and produce the energy we need without having to resort to technologies that have a waste product at the end of it why risk it no matter how small the risk….” or “the generating of electricity which leaves waste, nuclear or stored carbon, for future generations is irresponsible. “

Some assembly members highlighted the **principles or criteria that they felt should underpin how the UK generates its electricity**. Some assembly members said it is “important to consider

costs and effects to the environment", or that "achieving net zero is pretty pointless if you're going to wreck the environment with nuclear or fracking", while others cautioned "think carefully about risks to people. Not all about costs." Some suggested "we should be investing in tech we already have in order to meet our targets on time", or that we should "utilise the science we have and know works on a national scale rather than methods still being tested or [that have]… no real life evidence (e.g. CCS on a national scale)." Others said we should "prioritise resources we have, not resources which have to be imported." Other suggestions included:

> "The way forward should be based on the principles broadly agreed to in week one. This situation is a unique opportunity to reconfigure not only our energy systems but also our human inter-reaction with our environment and fellow human kind. An unseemly rush to get back to business as usual will be catastrophic for generations to come."

> "I am concerned about our energy security considering a lot of our generating capacity is owned by foreign (often state controlled) companies. I think all the nuclear power capacity is owned by EDF for example, and wind power contracts in Scotland all seem to benefit Denmark's Ørsted, Sweden's Vattenfall, China's Red Rock and France's EDF, as well as some German state-owned installations. The transition to renewables needs to have UK societal and economic benefits as well as environmental."

> "I would like to see the energy produced in the UK and creating jobs for employees most affected by energy production change."

> “ The price of electricity does not matter so long as it is a similar price as our competitors so it does not put our manufacturing at a disadvantage and it is a level playing field against other European countries.”

> “ Cost, benefits, pros/cons of all options need to be highlighted and documented leading to end user fair and affordable outlays.”

Some assembly members said “we should look at usage and ways to reduce it”:

> “ There are two fundamental ways to reduce our emissions. The first is by switching to renewable energy sources, however this has costs and takes time. The second is by reducing our energy demand. And we will need to do both to meet our targets. Reducing our energy demand is the quickest, easiest, and cheapest way to reduce our carbon emissions. Reducing our energy demand while quickly transitioning to already existing widely-scalable clean renewable energy (such as wind) will allow us to get to net zero quickly and cost-effectively.”

Relatedly, others noted that “the choice of which generating technology to choose and at what level is to some extent dependant on how electricity is used. For example if we had many more electric vehicles, there would be greater potential for off peak usage and more available battery storage and this would get over some of the disadvantages of solar and wind generation.”

Individual assembly members said that “commercial interests should be managed within national interests e.g. potentially renationalise”, or asked “are Hydrogen power plants an option?”

Conclusions

Assembly members expressed clear preferences for how the UK should generate its electricity.

Large majorities of assembly members ‘strongly agreed’ or ‘agreed’ that three ways of generating electricity should be part of how the UK gets to net zero:

- **Offshore wind** (95%);
- **Solar power** (81%);
- **Onshore wind** (78%).

Onshore wind scored slightly more highly than solar power in the Borda count, suggesting that assembly members slightly preferred it to solar power overall.

Assembly members identified **multiple points that they liked about each of these technologies**. Overall, they tended to see wind-based options as suitable for the UK, low cost, proven, clean, and good for the economy and jobs, among other advantages. They saw offshore wind as having key additional benefits, particularly being “out of the way”, but also in terms of the space available for turbines and its minimal impact on wildlife. For solar power, assembly members listed a wide range of positives including flexibility of location, the potential for individual autonomy and profit, and the recognised, proven and clean nature of the technology.

For all three ways of generating electricity, assembly members suggested a range of points to bear in mind around implementation.

Assembly members also discussed and listed their dislikes about offshore wind, onshore wind and solar. However they overwhelmingly felt that the advantages outweighed these points.

Assembly members were much less supportive of bioenergy, nuclear and fossil fuels with carbon capture and storage – although, particularly for bioenergy, significant numbers of assembly members were unsure about its use:

- 40% of assembly members 'strongly agreed' or 'agreed' that **bioenergy** should be part of how the UK gets to net zero, 36% were 'unsure', and 24% 'strongly disagreed' or 'disagreed';
- The equivalent figures for **nuclear** were 34%, 18% and 46%;
- **For fossil fuels with carbon capture and storage** the results were 22%, 22% and 56%; a majority of assembly members 'disagreed' or 'strongly disagreed' that this way of generating electricity should be part of how the UK gets to net zero.

Assembly members' comments on **bioenergy** suggest that, for many, their view would depend on how it is produced, including what is being burnt, how production is regulated, and therefore what the environmental and CO_2 impacts are. Some assembly members said they also found the evidence on bioenergy hard to follow. Assembly members' dislikes about bioenergy included concerns around burning trees and crops, land use and environmental effects, and a feeling that better alternatives exist.

Assembly members had three main concerns around **nuclear**: its cost, safety, and issues around waste storage and decommissioning. Their dislikes of **fossil fuels with carbon capture and storage** centred on safety risks and the continued use of fossil fuels, with assembly members also suggesting that it only provides a "short-term", expensive solution, when better alternatives are available.

Assembly members did not hear detailed evidence about **tidal, wave, hydro and geothermal** technologies, but in principle many clearly felt positive about their use particularly in suitable local areas. Assembly members tended to be most positive about tidal and wave technologies, followed by hydro. They saw these as natural and logical given that the UK is an island, also suggesting that they could be combined with offshore wind. As with the other technologies, assembly members noted a range of conditions for decision-makers to bear in mind around their implementation.

Greenhouse gas removals

Chapter 9

Summary of recommendations

1 Assembly members suggested that **a combination of greenhouse gas removal methods will be needed** to achieve the UK's net zero target.

2 Clear majorities of assembly members 'strongly agreed' or 'agreed' that **four greenhouse gas removal methods should be part of how the UK gets to net zero:**

- **Forests and better forest management** (99%);
- **Restoring and managing peatlands and wetlands** (85%);
- **Using wood in construction** (82%);
- **Enhancing the storage of carbon in the soil** (62%).

3 Assembly members saw these methods as the most "**natural**" and as **having significant co-benefits**, including around preventing flooding and erosion, and promoting biodiversity, access to nature and enjoyment. Assembly members also set out a number of conditions around their implementation, including that it was planned and managed well (for example, planting the right trees in the right places), support for farmers, sustainability, and ensuring a balance of land use.

4 Assembly members were **less supportive of Bioenergy with Carbon Capture and Storage (BECCS)** and **Direct Air Carbon Capture and Storage (DACCS).** Only 42% of assembly members 'strongly agreed' or 'agreed' that each of these methods should be part of how the UK gets to net zero, while 36% (BECCS) and 39% (DACCS) 'strongly disagreed' or 'disagreed'.

Common concerns about BECCS and DACCS included the potential for **leaks from carbon storage sites** and a feeling that they **failed to address the problem**, including a risk that they are "treated as [a] magic solution" that "takes the focus off the amount that we are emitting in the first place." Assembly members also saw these methods, particularly DACCS, as being **less natural**, **costly** and **unproven** in terms of the technology they require.

5 **Whilst BECCS and DACCS received limited support, some assembly members were keen that further research and development took place**, noting for example that these technologies could perhaps then be used more in the future or that they might be needed to "mop up" remaining CO_2.

Greenhouse gas removals

Achieving the UK's net zero climate change target by 2050 necessitates reducing greenhouse gas emissions as much as possible. However reducing emissions alone will not be enough.

By the middle of this century some emissions will still remain. For the themes considered by Climate Assembly UK, this is particularly true of air travel and farming. The assembly's recommendations in these areas suggest remaining $C0_2$ emissions by 2050 of between 45–55 million tonnes per year. That compares to emissions of 366 million tonnes in 2018.[1]

At the penultimate assembly weekend, assembly members considered how best to remove these remaining emissions from the atmosphere.

What did the assembly consider?

All assembly members heard evidence, deliberated and voted on the question of how best to remove greenhouse gases from the atmosphere. They heard about six potential removal methods:[2]

1. Forests and better forest management
2. Restoring and managing peatlands and wetlands
3. Enhancing the storage of carbon in the soil
4. Using wood in construction
5. Bioenergy with Carbon Capture and Storage (BECCS)
6. Direct Air Carbon Capture and Storage

1 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/863325/2018-final-emissions-statistics-summary.pdf

2 The Expert Leads explained to assembly members that there are other methods of removing carbon dioxide from the atmosphere. These additional methods are currently more speculative; more work needs to be done to enable them to be used at scale and to ensure that the risks associated with them can be managed properly.

The evidence session covered what these methods are and different views on their desirability. Assembly members had the opportunity to question each speaker[3] in detail.

After the evidence session, assembly members discussed the six methods. They then voted on them by secret ballot.

What's included in this chapter?

Assembly members had less time overall to discuss 'removing greenhouse gases from the atmosphere' than they had for the themes covered in previous chapters, with the exception of 'where our electricity comes from'. They therefore focussed on just one question: which of six greenhouse gas removal methods should be part of how the UK gets to net zero.

This chapter presents their views in the following order:

A. **Vote results:** the assembly's final recommendations on which of the six greenhouse gas removal methods should be part of how the UK gets to net zero;

B. **Rationale and conditions:** assembly members' rationale for their votes, as well as areas they would like to see considered around the implementation of each of the six methods;

C. **Cross-cutting considerations:** points emphasised by assembly members when looking back across all six options at the end of their discussions.

The chapter ends by summarising the conclusions from across these sections.

Contents of this chapter

3 The assembly heard from three speakers on removing greenhouse gases from the atmosphere: Chris Stark, Committee on Climate Change (informant); Bill Spence, independent (advocate); Dr Douglas Parr, Greenpeace (advocate). All speakers' presentations are available as slides, videos and transcripts at climateassembly.uk/resources/. An 'informant' is a speaker who we asked to cover the range of views and available evidence on a topic. An 'advocate' is a speaker who we asked to give their own view, or the view of their organisation. Assembly members knew whether speakers were informants or advocates.

A. Vote results

Assembly members voted on ways of removing greenhouse gases from the atmosphere by secret ballot. There were two different ballot papers. The first ballot paper asked assembly members how much they agreed or disagreed that each method should be part of how the UK gets to net zero. The second ballot paper asked them to rank the methods in their order of preference.

The votes from this second ballot paper were counted in two ways:

- **Counting assembly members' first preference votes only.**
- **Using Borda count.** This involves allocating points for preferences – a first preference vote scored five points, a second preference vote four points and so on. A sixth preference vote scored no points. Counting the votes like this tells us which methods are most acceptable to the greatest number of assembly members. This is particularly useful for this question, where it is likely that more than one way of removing greenhouse gases from the atmosphere will be needed.

More than 50% of assembly members 'agreed' or 'strongly agreed' that four of the methods should be part of how the UK gets to net zero. These were **forests and better forest management (99%), restoring and managing peatlands and wetlands (85%), using wood in construction (82%) and enhancing the storage of carbon in the soil (62%).**

Of these four methods, assembly members were:

- Most supportive of forests and better forest management, with 81% 'strongly agreeing' with its use and no assembly members 'disagreeing' or 'strongly disagreeing';
- Least sure about enhancing the storage of carbon in the soil. A number of assembly members raised concerns that they didn't fully understand how this option worked. This could have increased the number of assembly members saying they were unsure. Assembly members also noted points that this disliked about this option (see Section B).

In comparison to the first four methods, **BECCS** and **DACCS** saw much lower levels of agreement – 42% each. They also saw higher levels of disagreement, with 36% (BECCS) and 39% (DACCS) of assembly members 'disagreeing' or 'strongly disagreeing' that they should be part of the path to net zero.

Figure 1

How much do you agree or disagree that each of the following greenhouse gas removal methods should be part of how the UK gets to net zero? (% votes)

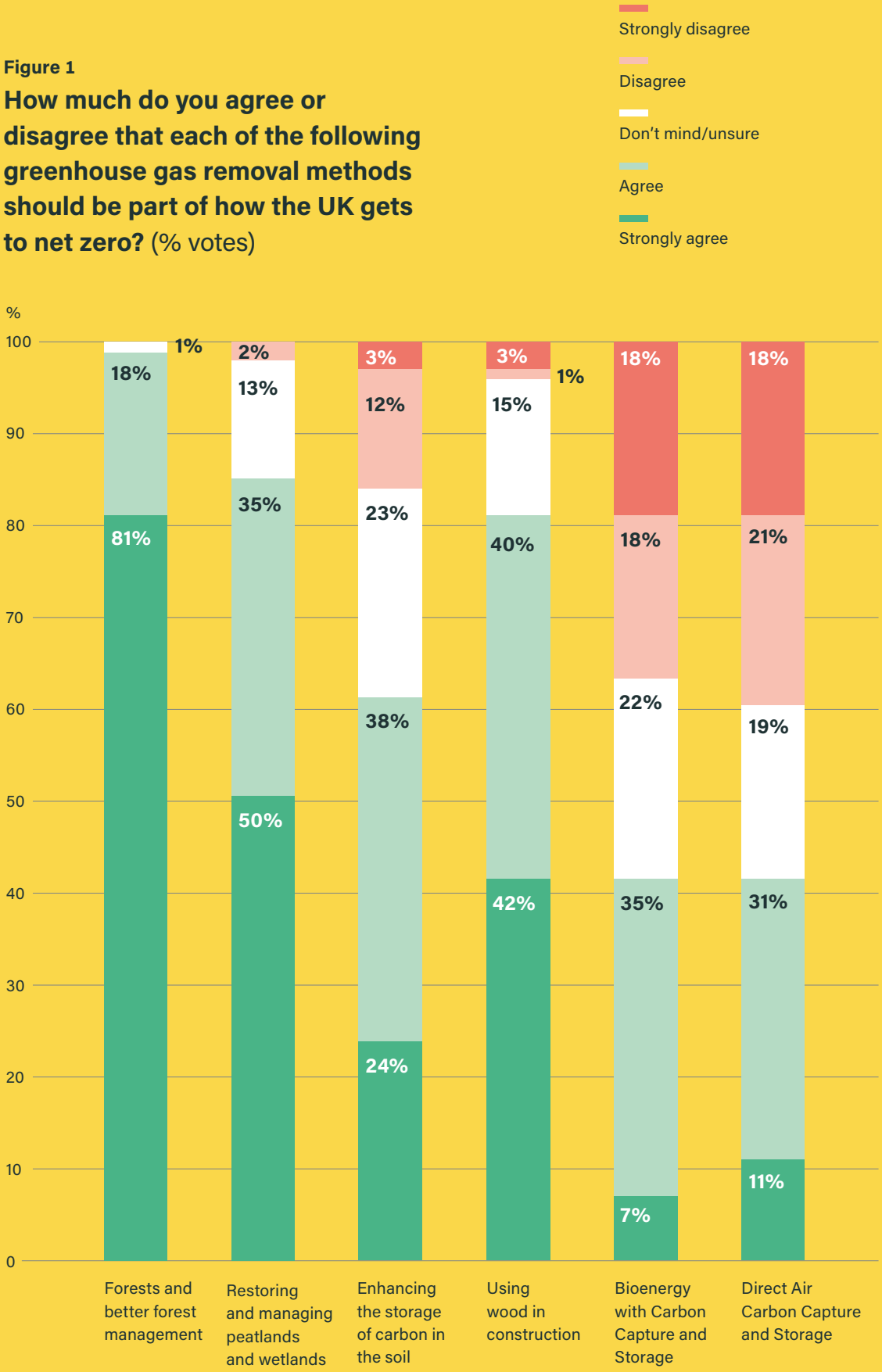


Figure 2

Please rank the following greenhouse gas removal methods in your order of preference (% first preference votes)

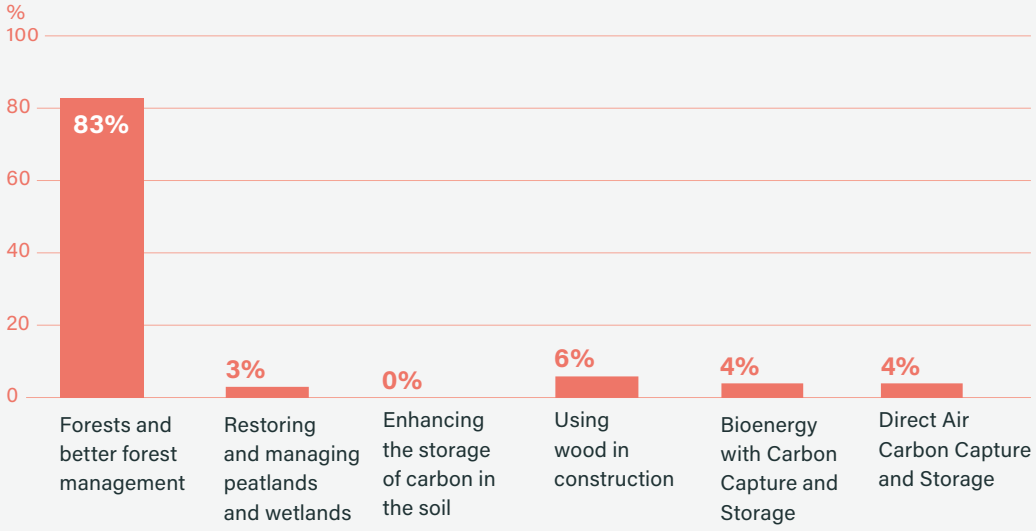
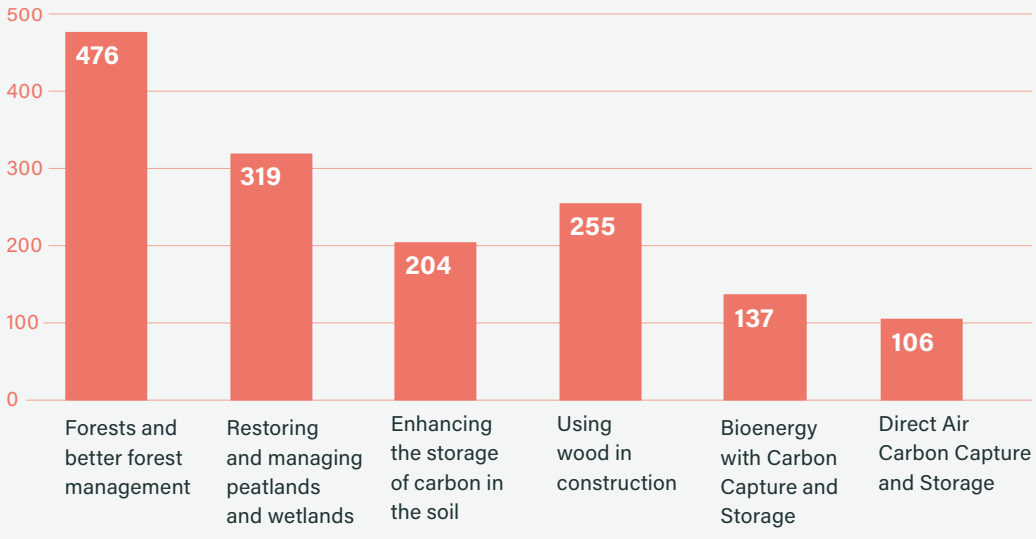


Figure 3

Please rank the following greenhouse gas removal methods in your order of preference (% first preference votes)



Assembly members' ranking of the methods painted a similar picture. **Forests and better forest management** remained assembly members' preferred option, receiving 83% of first preference votes. It was again followed by **restoring and managing peatlands and wetlands**, **using wood in construction**, and **enhancing the storage of carbon in the soil**, in that order.

As with the first vote, **BECCS** and **DACCS** scored less well, with the former scoring slightly higher than the latter.

Some assembly members commented that they would have liked more information about all six methods, expressing "a desire to be able to quantify things either by land area or investment cost needed to achieve the removal of one tonne of CO_2."[4] Some also commented in relation to DACCS that they didn't "see how we can make a decision on it, when so little is known."

B. Rationale and conditions

This section contains:

- The reasons that sit behind assembly members' votes, as just reported;
- 'Conditions' that some assembly members felt would support the use of each method or that they suggested should be in place for it to be used.

Given the detailed nature of assembly members' comments, we have categorised the pros and cons for each of way removing greenhouse gases from the atmosphere under six headings:

- Environment impact and land use;
- Practicality, efficiency, readiness and scale;
- Costs, the economy and jobs;
- Public support;
- Safety and risk;
- Other.

The category titles are our words, not assembly members', and are just there to make assembly members' thoughts easier to navigate. All the content under the headings is however assembly members' own.

We have kept in contradictory opinions in order to show the full range of views amongst assembly members. The results of the votes above tell you what conclusions assembly members reached having considered all these points, and the weight of feeling in support (or not) of each way of removing greenhouse gases from the atmosphere.

4 Assembly members heard evidence about the relative cost of the different methods. It was not possible to give them the more precise figures requested because there are a range of plausible costs for direct CO_2 removal methods. Methods also carry a variety of wider costs and benefits that hinder simple cost comparisons.

B.1 Forests and better forest management

Forests and better forest management refers to planting and managing forests. These absorb carbon dioxide, a greenhouse gas. Assembly members discussed this option in small groups, noting pros and cons.

⊕ Pros

Assembly members identified the following areas as points that they liked about forests and better forest management.

⊕ Environment impact and land use

A large number of assembly members described forests and better forest management as "**natural**", "very natural", "more natural", "nature first", "working with a natural way" or the "most natural way of solving the problem." Some said "we would like to start with natural processes", that "[we are] all for nature based approaches" or that it's the "best solution as [it is] given by nature." Others commented that the "problem is a man-made one, [it] should have natural solutions" or that we "will need some man made interventions but more natural is better." Some felt that "all of the nature ones [greenhouse gas removal methods] made sense to do all together" or that it's "naturally there, there's already forests growing so to continue this makes sense." Some assembly members commented that we are "seeing with covid-19 that nature is coming back when humans step back ... skies are clearer and birds are singing and maybe it's a wakeup call." Others said a "more holistic approach [is] needed to help the planet heal – forests are part of the ecosystem and we are integrated with that too."

Another large number of assembly members suggested that this greenhouse gas removal method would have "**multiple benefits**" "other benefits", or that there's a "double benefit of bringing in more forests"**.** Almost all these assembly members said their comments related to one or more of the points covered in the rest of this subsection.

Some assembly members suggested forests and better forest management are "good for wildlife", "encourage wildlife", would bring "increased **biodiversity**", or that "when well located [forests] can have additional biodiversity benefits." Similar points included that they provide "natural habitat for a lot of animals", "enhance habitats for biodiversity" or that a forest "takes 10 years to grow, 100 years to [reach] maturity so [you] get 90 years of them taking in carbon and in that 90 years it's offering habitat for animals." Other assembly members commented that "humans have damaged the environment significantly, we need to restore natural habits whilst helping the environment." Some felt it would be "good for native trees" or "improves nature."

Some assembly members made more general points, saying forests and better forest management have "**good overall environmental impacts**" or that they would be good for the "ecosystem." Others said we "can integrate animals in [the] forest (for agriculture) and provide a mixed and balanced ecosystem" or that they wanted to "restore natural forests."

For some assembly members it was important that forests "help reduce flooding", provide "**flood protection**", or are a "flood defence." Others noted they "potentially [have]...knock on effects re flood management." Some said they "provide shading" or "provide **shelter in hot climates**."

Some assembly members talked about a **"mental health**/wellbeing value – people can clear their heads when they walk through a forest." Some commented that it's "nicer to live in an area with trees", that they would be "happy to have forests next to me" or that they "like it on face value, I like the countryside, nature and going for walks." Others talked about "**enjoyment**, joy from forests" or said "at least no one will be offended by it." Some suggested that "reforestation can increase local amenity e.g. nature walks etc."

Some assembly members suggested that "once planted [a forest] doesn't take any energy", that it "doesn't use electricity" or that it has a "**smaller carbon footprint** to implement than building CCS technology." Some said it is a "**good use of land** that appears to have significant carbon capture impacts per area of land compared to other natural options."

⊕ Practicality, efficiency, readiness and scale

Some assembly members felt that forests and better forest management **combine well with other greenhouse gas removal methods.** Some assembly members suggested they "could be used as part of a natural cycle, in combination with building materials or bioenergy", or similarly that "trees, when they have reached their useful carbon capture life can be used for biofuels or for building (dual benefits)."

Some assembly members made similar points or talked about other ways forests and better forest management could be used:

+ **Construction and manufacture** – some said it could be used to "supply wood to use in construction", or that the wood could be "used for housing or furniture." Others said "we shouldn't just look at buildings for construction, what about wooden street signs etc";
+ **Education** – some noted the "need to cut down and replenish [forests]" and suggested that this could be linked to "school initiatives: extracurricular activities – would be great to see more of it here in the UK – [there is an] example in Poland";
+ **BECCS** – some suggested that "material cleared during forest management can be used for biofuels (without growing crops specifically for this)" or that "this option is not isolated from the other land-use options, they're linked, e.g. management of forests can be used to generate biomass."

For some assembly members forests and better forest management are a "good option for the UK – we have a lot of **space** for forests and tree planting...." Others felt "we have the space to do it particularly in [the] north of England and Scotland", that "small farms could be used for planting" or that we "can make better use of land." Some said "only 5% of land is needed to do enough of this – that's not a lot."

A number of assembly members felt it would be "**easy** to do", the "easiest to execute" or suggested that it can be "**easily multiplied** and repeated around the country", with others labelling it "achievable."

Some liked that it "**doesn't rely on new technology**", "doesn't need too much technology" or "avoids emphasis on tech answers which may be being pushed more than appropriate to keep 'big boys' in jobs."

A number of assembly members noted that "we know it works" or that "trees are good at removing CO_2 – it's a **proven method**." Others suggested that it is **efficient**, saying it "stores lots of carbon." Some assembly members said "it **takes the CO_2 out straight away**" or that we "can achieve [it] quickly." Others disagreed, saying "it's obviously important [and] worthwhile but [it's] a long-term solution."

⊕ Costs, the economy and jobs

Some assembly members said forests and better forest management would be "**low cost**", "cheapest", "**cost effective"** or that they "could be upscaled relatively cheaply and quickly." One said they're "low cost, and will make an impact so [we] might as well." Another suggested they're "cheap and could be income generating."

Some assembly members suggested forests "attract tourists (e.g. Lake District)", or that they are "good for access for people – they can go and use the forest, means more leisure activities available, **good for [the] local economy**." Others said it "makes money for the country", or that "forestry can bring jobs as well."

⊕ Public support

Some assembly members talked about the "aesthetics of forests" saying that "trees and forests are **beautiful**." Others contrasted forests to the other options noting that "with bioenergy and CCS, it's more infrastructure (i.e. ugly buildings)." Some said they "**like the idea** of new forests and trees where not planted before", that we "wouldn't exist without trees" or that they are a "fan of trees – suggest encouraging landowners to give over [a] % of their land to trees."

One assembly member said it "brings people closer to nature." Another commented that "where I am from, where my family is from, on the continent, tree planting has always been part of our daily lives – you put it in, you take it out – it's a green option."

⊕ Safety and risk

No assembly members made comments in this area.

Other

Some assembly members stated they are "all for it", or that it's "very important – it's a major part of the solution i.e. whether that be in conjunction with BECCS or direct air capture for example." Others said it's a "**win-win**" with "a few niggles but overall a good idea." Some commented that they were "not sure why it's not at the top of the agenda, there's literally **no bad point to it**", or that "as long as [it's] not impacting wildlife, what's bad about planting more trees."

Some assembly members expressed scepticism about suggested downsides, saying it's "been mentioned that one of the cons is that this method takes up land that could be used for other uses such as crops, farming, but that's not much of an argument especially when we're encouraging people to eat less meat and have fewer cows in fields." Others said it's "better to do something rather than nothing, so [we] should pursue this." Some assembly members said it "seems like **common sense**", is a "no-brainer" or "should be happening irrespective of other solutions."

A number of assembly members said they felt it was a "**global** solution – planting trees anywhere on the planet has benefits for all" or should be a "global effort not just the UK." Some commented that "other areas in the world where we can plant trees could further increase the forest mass around the world."

Cons

Assembly members identified the following areas as points that they disliked about forests and better forest management.

Environment impact and land use

A number of assembly members suggested forests and forest management **might not be that effective.** Some said we "mustn't be naïve about how much carbon a tree can remove – it can only do so much" or it "doesn't take all carbon dioxide out of the atmosphere." Others noted it "takes 10 years for them to start absorbing CO_2 and the tree becomes less productive at 100 years." Some questioned "how much difference will it really make?" or felt it **wouldn't work long-term**, noting "presenters said trees store carbon for decades, but this is not a decade's problem, it's a longer problem." Others suggested that "if the trees are cut down and burned this could have the reverse effect on CO_2 levels", while some branded it "carbon 'relocation' rather than storage – the carbon will be released at some point...."

Some assembly members warned that we need to "be careful about [the] **impact on wildlife**" or the "impacts of non-native tree planting on **biodiversity**" including "for native trees." Others said that the "10 year optimum turnaround for forest trees before harvesting" was a concern "because of habitat and biodiversity impacts." Some suggested that there could "perhaps [be a] loss of biodiversity."

One assembly member highlighted the potential "health impacts on people of non-native planting e.g. allergens."

Practicality, efficiency, readiness and scale

Some assembly members asked "where are we going to get sufficient land from? ", or commented "[I am] unsure whether we have enough **space** to accommodate new forest... So much green space and farmland is lost to roads and housing where I live." Others questioned whether there was "enough available / suitable land for it to make a real difference in the UK (particularly in the south)", saying we "are a small country" and "5% feels like a lot of land." Others said it "won't be the 'one big solution' – needs too much land."

Relatedly, some assembly members worried about the "**impact on other land use**." Some commented that "there need to be options other than using the land we need for growing food", or that we "could use land for other uses e.g. crops or biofuels etc" or "wind". Some assembly members asked "how scalable is it?" or suggested it has "**limited capacity**" because we can "only [have a] certain amount of trees."

For some assembly members there were other questions around **feasibility**. They asked "who will be prepared to give up land?" and "who will pay for the land?". Others said "there have been plans to plant more trees in the past and nothing has happened. Don't want to put a lot of money into something that doesn't end up happening."

A number of assembly members said it "takes a long time for them [trees] to grow and [we] need to grow a lot of them." Others said it "takes time before we see benefits" or we are "racing against the clock, so **need [a] more aggressive solution**." Similarly, some assembly members commented that "trees take a long time to grow... [that means we] need something else as well – think need all the options to contribute."

Costs, the economy and jobs

One assembly member asked "how much will it cost?"[5]

Public support

No assembly members made comments in this area.

Safety and risk

No assembly members made comments in this area.

Conditions

Some assembly members noted conditions around the use forests and better forest management – points they felt would aid its implementation or that should be put in place. They suggested a need to:

Get the legislation right

Assembly members made comments including:

> *"We were told the law surrounding protecting tees is really weak, which means any developer can cut down any amount of trees unless it's a special tree, so we need stronger legislation that protects trees and forests to enable this approach to work."*

> *"Don't know if there's a regulatory body that has an overview of all the forests but need one to ensure things are done correctly."*

> *"There's a clear role for government to make sure that whatever is decided about forests sticks." It "needs to be set in law if it is to work."*

5 Assembly members heard evidence about the relative cost of the different methods. It was not possible to give them the more precise figures requested because there are a range of plausible costs for direct CO_2 removal methods. Methods also carry a variety of wider costs and benefits that hinder simple cost comparisons.

Plant the right trees, in the right places

Some assembly members said they were happy with this idea as long as it's the "right kind of trees in [the] right places." For some this meant "as long as there is biodiversity" or as long as "it enhance[s] local areas and biodiversity." Specific comments included:

- *"Difficult to convince people to not just plant miles of spruce as need a variety of hard and softwood trees – need natural biodiversity";*
- *"Need to plant the right type of trees – there was an issue in Scotland where they planted a lot of evergreen trees which made a very dark woodland and they ended up having to chop it down and replace with deciduous";*
- *"Best types of trees for carbon capture are the fast growing ones – but they are not always native. Important to not bring [in] non-native species."*
- Non-native trees can harm "both the visual [appeal]... of an area as well as local habitats";
- *"Must be done with consideration to the wildlife";*
- Some assembly members put forward a potential solution: "Local groups safeguarding specific forests encourages buy-in, makes sure things are done well and also focuses on protecting biodiversity rather than a large developer with an interest in just sequestering carbon alone. ... local groups would ... have a vested interest in the biodiversity of the area and help manage it better."

Others noted the need to think about what is planted where for other reasons:

"Mustn't impact on land use too much / need to find the right locations."

"It would be better to use less productive land, land that wouldn't be used for crops."

"Must be managed alongside farming."

Some said we should "grow fast-growing trees which are useful."

Plan properly and manage forests well

Related to the above some assembly members noted that "a proviso is tree planting can be done badly so need to have a plan to ensure it's done properly and work on tree management." Specific comments from assembly members included:

- We need "careful management as concerned about the space";
- *"There needs to be management in the sense of risk of wildfires – sensible barriers in place to mitigate this";*
- **"**All these systems have to work together. If you have a forest, you need to manage it. Some of the wood could be useful for composting or biomass – all the systems have to gel, work together to be effective." Others suggested we "[u]se the trees for construction, but fell them in a good way that doesn't damage wildlife" or that it "needs more emphasis on using wood for house building." Others disagreed saying "[w]e should also protect trees more, ie not cut them down for buildings etc";

- "Better forest management [is] essential to knowing when and how to use trees (e.g. when to cut down)." It "needs to be done properly to be efficient" and we need to "make sure [we are] thinning trees effectively."

Think about what mature trees are used for

Some assembly members said that support was "conditional on what trees are used for when they reac[h] their carbon capture maturity" with some strongly opposing any use for bioenergy. Others felt we should "use the wood" and not "waste" it, with some suggesting we "use the wood for building so it doesn't release the CO_2 so fast."

Combine it with other options

Some assembly members said it "needs to be done with other things", that it's a "brilliant thing to do but not enough on it's own" and that it "isn't enough on its own but is a starting point." Specific comments included:

- It "makes the most sense when combined with peatlands/wetlands and soil options as it allows land to be used to capture carbon in the best way in each place";
- "It "should not be an either/or alternative" – we "need to consider a hybrid solution between the 6 options...";
- *"Not as much of an impact as BECCS – can't solve the issue on it's own";*
- We "may need to use other less natural models to address carbon levels in the short term – could revert to these more natural processes later down the line?"
- "Option a) is only my favourite if it [is] used to support options d) [using wood in construction] and e) [BECCS]."

Win support, including through incentives

Some assembly members said this "needs the support of landowners", while others suggested that "we need to entice anyone with any land, no matter how small, to plant trees." Some assembly members asked: "Forests aren't seen as progress, is that why it's less appealing to policy-makers? This option needs to be packaged in a way that's more positive." One assembly member said it would be important to "make sure that farmers are not pushed out or demonised (can do this with grants for farmers)."

Protect jobs and incomes

Some assembly members said we need to assess the potential "job creation benefit.... if forests are planted on former farmland, which may reduce jobs overall." Others said that "farmers need compensation for lost income."

Start now

Some assembly members suggested that we "need to start doing it now as [it] takes at least 10 years." Others suggested that we could "start by not cutting down existing trees."

Other assembly members asked whether "land-use [can] be combined, for example can trees be grown spread out over a large area of land?" and whether "hedges store carbon too?" Others suggested that this "needs to be co-ordinated nationally" and "must be combined with putting less emissions into the atmosphere." Some assembly members mentioned a need to look at forests abroad too "e.g. deforestation in Brazil, not enough international pressure to stop that but that's the only way for them to make money – need to support them in other ways."

As seen in Section A, assembly members expressed very strong support for forests and better forest management in their votes.

B.2 Restoring and managing peatlands and wetlands

Restoring and managing peatlands and wetlands refers to restoring or managing some naturally wet areas of land so that they absorb more carbon dioxide. Assembly members discussed this option in small groups, noting pros and cons.

Pros

Assembly members identified the following areas as points that they liked about restoring and managing peatlands and wetlands.

⊕ Environment impact and land use

A significant number of assembly members said restoring and managing peatlands and wetlands would "protect against flooding", "aids with **flood protection**", "could help to prevent flooding if maintained correctly" or is a "flood defence." Others said it "holds back water to stop flooding" or that it "will abate a lot of the flooding (of which there has been an increase over the last few years) and will stop this in high risk areas." Some assembly members suggested **particular benefits for coastal areas**, suggesting that "when done in coastal areas [it] can help with flooding" or it's "beneficial for coastal erosion and flood planes where it can be a more bog like environment." Others suggested it would "ensur[e] land is not drained and sold for housing that would create flood risks elsewhere" or that "reducing flood risk / flood management needs" would have "additional economic benefits."

Some assembly members described restoring and managing peatlands and wetlands as "**natural**", "a natural solution", or "part of the natural world." Some said that they "like nature orientated solution[s]" or that they "trust it more than man-made solutions." Others commented that "it's not interfering, it's more restoring things and removing existing management." Some said "it speaks to restoring nature."

A number of assembly members talked about the **importance of protecting and restoring peatlands and wetlands.** Some commented that "peatlands and wetlands have been there for thousands of years – we need to protect them" or that this is a "reason to protect and preserve current wetland areas that may be at threat." Others suggested that "managing what we have is important" and that we "should be doing it anyway." Some talked about a "need to stop current destruction of these areas" or said it was "not just a case of restoring wetlands but also keeping the ones that are still there. [...] Need legislation to protect the wetlands."

Relatedly, some assembly members liked that it "look[s] after the countryside and wildlife", or is "**good for wildlife**", "good for birds", or "**good for biodiversity**." Some commented that "it maintains the wetlands for wildlife too", or particularly noted benefits for "moss, frogspawn & heather." Further comments included:

> *"They are beautiful, a source of nature and wildlife, birds fly in huge flocks, it's beautiful."*

> *"Peatlands and wetlands have some of the ...[highest] levels of biodiversity in the UK so returning these spaces to nature – plants animal/insect species has importance for the wider ecosystem e.g. pollination."*

Some assembly members liked a "focus on restoration of peatlands and wetlands **to stop further release of CO_2**." Others said that "peatlands and wetlands keep in CO_2 which is good. Some commented that there is "good **potential for CO_2 absorption**", that it "captures CO_2" or "enhances storage." Others said that they "like that it's a carbon sink – holds carbon better than many other processes" or that it "locks up carbon unless it dries out / burns."

One assembly member described it as "environmentally friendly." Another said they "prefer forests or growing crops instead BUT disturbing the land is damaging."

Practicality, efficiency, readiness and scale

Some assembly members noted that we "**have the knowledge and technology to do this**" or that we "know how to restore it – unlike man made solutions where we don't know enough – there's no risk."

Some assembly members suggested that it is a "**good ide[a] where applicable**":

> *"Every option should be used where it will offer the most benefit. For this one if it's there then yes, retain it and keep it. It's not applicable to everywhere."*

Others said it has "strong potential as part of a mixed approach", "should be a part of our plans" or that it's "for a local level rather than at national level – it can only work where they are situated." One assembly member said it "can be used inland as well as [in] coastal [areas]."

Some assembly members commented that we "can start this fast", that it "seems to be the quickest method that will have an impact" or that it's "a **quick solution**, unlike some other measures."

Costs, the economy and jobs

Some assembly members felt it would be **"good for [the] local economy"** or that "there will be jobs in managing these areas."

Some suggested it would be "**low cost**", "not high cost" or a "cheap way to store carbon." Others said that "this appears to be one of the cheapest options to action – can be done very cheaply and offers the most benefits v least cost (apparently)." Other agreed suggesting it has "limited potential on its own– but if you bring this in in conjunction with forestry management then it seems like a really cheap and good way to capture carbon." Some assembly members suggested it was costly not to protect peatlands and wetlands, saying "the issue is building in these areas and the small number of properties that are there. It's costly to keep these areas dry, when it would be easier if they were wet."

Public support

Some assembly members suggested that you "could use wetlands for **leisure** too", that they are "good for leisure" and provide "good access for people." Others commented that they are a "nice place to go for a walk – introduce children to wildlife (pond dipping, catching tadpoles...)."

One assembly member felt that restoring and managing peatlands and wetlands was a good idea in order "to have an impact on the landscape and farming practices as a signifier of what needs to be done to change our ways of living."

Safety and risk

No assembly members made comments in this area.

Other

Some assembly members said it "**delivers multiple benefits**" or has "lots of benefits." Some asked "why wouldn't you want to do it!", with others describing it as "effective", a "win-win" or a "**no-brainer**."

Some assembly members said they were "not sure why we're not already doing it – doesn't have any negative effects, is cheap to do, [and] has economic benefits after a certain period of time." Others commented that it has "**no real negatives**", "I like it – it's not offensive to people", or that they have "nothing against it."

⊖ Cons

Assembly members identified the following areas as points that they disliked about restoring and managing peatlands and wetlands.

⊖ Environment impact and land use

Some assembly members disliked that restoring and managing peatlands and wetlands **"takes up a lot of space** (land)", with some suggesting that there is "pressure on land use" or that it "could be a challenge finding adequate land for this." Others described it as a "waste of land."

Some assembly members said you "**lose the land for any other use** (except leisure)" or that the "land could be better used for other things e.g. food production." Other assembly members said "population growth is an issue, which means we need more housing", that "farming in the fens will be lost" or that we could "grow trees instead." Further comments included:

> *"Would it mean flooding a lot of fertile areas e.g. around Norfolk, Cambridge? Do we want to abandon crop growing in these areas? Not sure [we] want to flood these areas outright."*

> *"The wetlands can't be used for anything else, e.g. as opposed to forests. Although it won't use up much land so it's not depriving much land from being used in other ways."*

⊖ Practicality, efficiency, readiness and scale

Assembly members raised two **concerns about capacity and scalability**:

- **"Geographical considerations"** – a large number of assembly members commented that they were "not sure it [is] scalable", that it has "limited potential, only some areas of the UK are suitable", that there are "not many suitable areas" or that there are "limited areas for expansion." Some said there is a "question of scale – [it is] not a major solution." While others commented that "Doug [Parr] said there weren't identified locations";
- **"Limited capacity for significant CO_2 absorption"** – other assembly members said there "were also questions about whether established wetlands would be able to continue to capture more carbon or really just hold onto what they had already absorbed." Some said "to capture CO_2 it must keep growing; what happens when it reaches equilibrium."

Some assembly members summarised by saying you "can only do it in certain areas and those areas might already be done so limited impact."

Staying with concerns about **impact**, some assembly member expressed scepticism saying it "seems that we just need to keep places wet? Only applies to certain areas of the country – how effective could this be?" or that "it's nice on the surface, but will it be effective?" Others commented, "good [option]... – how much potential does it have though? How much C02 extraction exactly? If they dry out, what is released?"

Relatedly, some assembly members commented that it "can't be [the] only solution", that "we're going to need multiple solutions" or that it's "**not the whole answer**, won't fix the entire problem." For some assembly members restoring and managing peatlands and wetlands is "limited in where it can happen, [but] they mustn't be allowed to dry out."

A number of assembly members raised **climate- and season-related issues**:

> *"Concern about whether we can make sure it doesn't dry out – would this be more difficult as temperatures rise, harder to keep wet? This may be a bit 'chicken and egg'."*

Similarly, some queried if it was "practical due to global warming", or noted that "climate change is affecting patterns of rainfall – would it cost to restore/keep areas wet, given that there is likely to be less rain in the future?" Other assembly members suggested that it "can sometimes store carbon in winter but release [it] in summer if it dries out", or that "in a very hot summer a fire could burn up a lot e.g. what happened in Yorkshire." Some said that it's "not viable long term" or that the "science is less certain about long term storage of the CO_2."

Some assembly members suggested that there would be "**issues with land ownership**" although some felt these would be "manageable with incentives". Others said they were "worried about it being down to landowners to maintain this unless they were given an incentive to look after it" or said they were "not sure it's practical to enforce land-use changes."

Some assembly members felt it "might be **a slow solution** – how long would it take to restore damaged areas?", while others commented that "it will take a long time to see the benefits, we need something faster." Some compared it to other options, saying the "length of time it takes to form peat: 1 ha of peatland vs. 1 ha of good middle aged forest. [...] Quicker to restore a forest, to grow trees than create a new peatland." Other assembly members disagreed: "Speed isn't an issue. We have until 2050 to reach net zero. 30 years to put it in place. If trees take 10 years to grow, that's fine. If these methods last a long time once they're in place, that's good."

Individual assembly members raised a number of additional concerns. One said "what will happen to buildings on existing wetlands?" Others worried that "flooding may be an issue, such as the wetlands in Glastonbury" or said "in East Anglia, for example, there isn't enough water for the new towns which are being developed so I don't know how there will be enough water to keep the fens wet." One assembly commented "given it can reach equilibrium, will need to remove peat and then burn it."

Costs, the economy and jobs

Some assembly members said the "**cost** and effort of land management" was a "downside", suggesting it was "hard to manage" or that it "sounds like a full time job to manage it." Others said it was "not a big enough impact to justify the sacrifice of land and the management cost." Some queried "if it comes down to time, resources and money is it the right ... focus? If we have limited resources, we should concentrate on the most **cost-effective** areas."

Public support

No assembly members made comments in this area.

Safety and risk

Some assembly members expressed concerns about the "releasing of CO_2 if the peatland is damaged" suggesting that there is "potential for it to go wrong if one of them dries out - a carbon bomb."

Conditions

Some assembly members noted conditions around restoring and managing peatlands and wetlands – points they felt would aid its implementation or that should be put in place. They suggested a need to:

Combine it with other solutions

Some assembly members said it "needs to be part of [a] whole package" or "has to be done in combination with other measures." Others said more specifically that it "would only really make a significant contribution if combined with good practice in forestry and soil storage as different things will only work in different areas" or that we need to "align this with the 'what we farm' options and preferences." One assembly member commented:

> *"Peatlands and wetlands are an important investment that must be protected and expanded wherever possible. However, given that we only have a small amount of space suitable for peatlands and wetlands overall, we must also implement all other natural carbon capture solutions alongside to ensure we can capture as much carbon as possible."*

Consider impacts on farmers, farming and land use

Some assembly members said that "farmers need to change their methods" or more specifically that there should be "changes in wider farming practices in line with peatland/wetland management, eg ditches." Others suggested that a "mechanism to compensate farmers needs to be in place." Some assembly members said that "if crops are still grown, [I] would be in favour" or cautioned "don't use all our cropland. Need to use the right land, e.g. moorlands where it's not good for crops anyway. Don't use fertile land." Others asked for consideration of the "impacts...action today have on future opportunities such as farming and land use for the future." More generally, some assembly members expressed "uncertainty over what will be lost."

Manage it well

Some assembly members said it "needs to be well managed" or that they supported it "as long as [it's] managed properly." Others said that it "needs to be managed and monitored to ensure it is effective and carbon isn't being released" or that it "needs management to keep the areas wet." Others said we "need to make sure these areas are being restored."

Maintain but not restore

Some assembly members said that existing peatlands and wetlands should be maintained, but that they wouldn't support restoring them or creating new ones.

Bans, regulation and legislation

Some assembly members suggested that "regulation is essential" or more specifically that we "should ban use of peat for compost" or that there's a "need for governments to take a hardline against compost with peat as this creates a demand." One assembly member said: "This should be done through very strong legislation to protect the areas from harm, including criminal sanctions for burning peatlands for grouse hunting."

Individual assembly members said if it "means less use of chemicals, [I] would be in favour", or expressed concerns about the destruction of peatlands to build windfarms. Others raised questions:

> "What do utility companies (which have to pay maintenance / management) think of it?"

> "National parks, charities etc already do it. Not sure how much is already happening."

One assembly member suggested that "peatland and wetland re-wilding efforts should be done with the guidance of local environmental groups to ensure buy-in and support from the local community". The same assembly member said we need to "put in place water supply back-up measures to prevent any drying or damage during our increasing heat-waves."

As seen in Section A, assembly members expressed strong support for restoring and managing peatlands and wetlands in their votes.

B.3 Enhancing the storage of carbon in the soil

Enhancing the storage of carbon in the soil means changing the way soil is managed so that it can store more carbon. Assembly members discussed this option in small groups, noting pros and cons.

Pros

Assembly members identified the following areas as points that they liked about enhancing the storage of carbon in the soil.

⊕ Environment impact and land use

Some assembly members said that enhancing the storage of carbon in the soil "**improves soil quality**" or suggested there would be "benefits for farmers from soil fertility." Others suggested there is a "general advantage to using soil wisely – it is common sense" or that it "must be a good idea – potential of carbon in the soil." Others said "tilling carbon into the soil so it gets absorbed and enriches it ... [means it's] more fertile, similar to [using] compost."

Some assembly members said it would "contribut[e] to the health of the land and food grown through the use of **less chemicals**" or suggested more broadly that there would be "less pesticides", and "less use of chemicals (fertilisers)." Some described it as a "natural process (chemical free)" or said it would involve "using natural fertilisers, rather than synthetic." Other assembly members suggested there is "nothing to lose, I hate chemical fertilisers, we will get healthier foods, it's a win/win" or said "we're eating foods that come from the soil, so we need to make sure it's of high quality and doesn't contain anything that could jeopardise health." One assembly member commented that a higher "quality of food [would be] produced...."

Relatedly, for some assembly members enhancing the storage of carbon was "a **natural** approach" or "natural-ish." Some suggested it "runs with nature rather than intensive farming", "doesn't disturb the land" or stated that "even if it doesn't capture that much carbon still prefer natural – reaching net zero is not the only thing that's important." Others felt it "has **added benefits (e.g. to the environment**), that it's "good for wildlife and birds" or that it "leads to good management of the land."

Following a different train of thought, some assembly members commented "like this one, **requires changes to farming we would want to happen anyway**. It's a win-win." Other similar views included:

> *"Like that farmers have their way to make an impact – they have to pay a price. They know that they will have to be a big part of the action in the future."*

> *"Could also support the transition to layered farming, diversifying the food produced from a single piece of land."*

Some assembly members talked about **a return to the "old ways"**:

> *"It would be positive to go back to the old ways, using crop rotation, which is beneficial to carbon capture."*

> *"Out of the 6 methods [this is] probably the one I had least knowledge [of], asked the question and it's like going back to the old ways of farming – instead of using modern fertilisers with chemicals, so [I] can see the advantage of that."*

> *"I live next to an arable farm, I have lived there 30 years, it was a quiet farm, used to leave fields to rest, but now it is so intense, they are growing things so quickly...."*

Individual assembly members made a number of additional points, including that they liked that it "uses waste", "enhances storage" or that it "doesn't stop us using soil for crops, albeit different crops grown differently." One said it woild be "fast to absorb carbon", another that a "no-till option should be considered."

Practicality, efficiency, readiness and scale

Some assembly members described it as "**well understood**", said "we have the knowledge and technology to do this" or that "changing farming methods is low cost and well understood." Others noted that "some people are doing this already", or suggested it would be "**easy** to implement", "could be quite easily achieved with small changes", "**can be done quickly**" or that we "can do this now." One assembly member said they thought it would be "effective." Another said it "might be more expensive than other practices... [it takes] much longer. [But it] [w]ill develop practices we can continue in the future. It's long term."

Costs, the economy and jobs

Some assembly members said it "is **cheap** to do" or "low cost." One assembly member suggested it "needs more labour so creates more jobs."

Public support

Some assembly members suggested it "may mean less production over time ...but at the same time **encourag[es] less food waste/changing diet** so this may not be a bad thing anyway...." One assembly member said that it "works for vegetarians (there will be less livestock production)."

Safety and risk

No assembly members made comments in this area.

Other

Individual assembly members made a number of additional points. One said it is "great in theory if it works." Another that it has "no downsides." One said that "all the previous options have a benefit and should be done [including this one]" or that we "do need to use this as part of [the] solution but in a limited way."

One assembly member said they "saw an example of it being done on the telly – sounds interesting – documentary showed someone using direct ground sowing instead of ploughing. It was a researcher trying to get farmers to do it, but the farmer [him/her]self wasn't that keen on it."

⊖ Cons

Assembly members identified the following areas as points that they disliked about enhancing the storage of carbon in the soil.

⊖ Environment impact and land use

Some assembly members worried that it would mean **importing more food**, commenting "if we don't grow it – it will have to be imported and that causes more carbon emissions" or "if we are not having our own facilities to produce livestock – where will it come from – it will have to be imported." Some said that it "may lead to more food imports and the carbon footprint this would entail."

⊖ Practicality, efficiency, readiness and scale

Some assembly members said that "farmers will be reluctant" or that it "will be **hard to make this happen**, to shift away from modern methods, there are vested interests in farming." Others said that "farmers need to support it" or that "without financial incentives it might not work." Some commented that "farmers will be slow to change their methods as [they] are very traditional – it's passed through the family so very hard to change tradition." Others said that it's "difficult to leave land untouched in this way."

Some assembly members felt it has "**limited potential** so don't focus on this option", that it "won't be a solution in itself" or queried "how much [carbon] can soil absorb?". Others suggested that "land saturates quickly, so not an on-going solution" or asked "after a certain amount of time the land gets saturated: how long can you store carbon? How long can you keep doing that?" Others made similar, but slightly more positive points:

> *"Feels like a temporary solution: what do you do once the soil is saturated? Adding carbon into the soil might have benefits though (i.e. water retention is beneficial ....)"*

> *"...we should definitely do it, but it can only do so much, it may not be scalable to take in a lot of carbon compared to other solutions which take much more."*

> *"It would be a good idea, but it can only contribute so much to the solution."*

Others said it is "not done at scale right now" and "it would need to be used in conjunction with other technologies due to the limited capacity." One assembly member commented that "it's natural, but [I] like it less than managing forests as [it's] less impactful and [I'm] less sure about how it works."

Some assembly members expressed a different concern, noting "**uncertainty [about]... how long the carbon will stay underground**", or saying they were "unsure of how stable this type of storage is."

One assembly member suggested it "doesn't work with other strategies for reducing carbon (which will also need land). Need to combine scenarios to see what feasibly works." Another said we would be "less able to use this matter (i.e. compost material storing the carbon) for other purposes, e.g. as natural fertiliser."

Costs, the economy and jobs

Some assembly members suggested that "less produce makes **food more expensive and [means] less jobs** – goes against progress made in the past. People can't afford to pay for food any more." Others worried about a "knock-on effect on...[the] **economy**."

A number of assembly members said they disliked that we "will **have to financially support a lot of farmers** to do it – not sure how it can be low cost if [we] have to do this or where the money will come from given we will be losing EU subsidies too." Others made similar points, suggesting it "could require financial support for farmers from [the] taxpayer – more expensive than peatlands or forestry etc ...." Others agreed that it will "need [a] subsidy for farming" or that it would result in a "lower profit margin for arable farmers, so needs subsidy." Some asked whether the "costs of supporting farmers outweigh the benefits."

Relatedly, some assembly members suggested it "**will take more work to farm**" and is therefore "asking a lot of our farming community." Others said there is a "need for work to be done with farmers as this is a radical change", or that "there needs to be support for farmers" who "are struggling anyway...." Some assembly members highlighted the **potential economic impact on farmers**:

> *"There could also be an economic impact on farmers if they aren't producing as much food, the burden will be on them if they are making even less money."*

> *"Will lead to lower crop yields and possibly lower food quality which will mean lower prices for farmers."*

> *"Cost to farmers of changing their practices (because of need to disturb the soil much less), although they could develop new skills."*

Public support

Some assembly members noted potential impacts on **diets and lifestyles**. Some said that the "issue with crop rotation is food becomes seasonal" or asked "how comfortable do we feel telling people what they can eat and restricting their diets? I'm comfortable with eating a seasonal diet, but are we comfortable telling others what they can / can't eat." Some noted a "potential concern that it may not be healthier", noting that "in [the] past government had to add salt and sugar to prevent dietary problems associated with seasonal diets." One assembly member suggested it "could create friction as its hard to get people to change behaviour." Another said it "will it have a negative impact on the food supply chain with the demand to grow crops quickly. This could act as a limitation for buy-in to this method."

Safety and risk

A significant number of assembly members raised concerns about impacts on food production:

- **Food security** – some assembly members saw it as a "threat to food security" or asked questions about its security implications:

  "...would we maintain [the] same level of self-sufficiency?

  "Will it affect food security in UK and can we afford to do it – will it make food more expensive?"

  "Yield – Concern about lower yield of food and the impact this would have on food security. Will we be reliant on other countries, what will happen if there is another pandemic? We need to be more self-sufficient than we are as a country"

  "Concerns about having left EU and whether dropping yields would mean less self-sufficiency."

- **Crop yields and food production** – some assembly members phrased their concerns in terms of yields, saying it "will impact on yields", or "could reduce the amount of food from the land." Others suggested that the "growing of crops will be reduced" and that we "need to think about that given the level of food poverty." Others thought it "may lead to loss in food produce – and while more natural processes are good, we do need to keep eating food." Some said they are "not too keen on this one as it was changing farming practices that reduce yield at a time when we are talking about using more land for other energy practices."

Some assembly members worried that it "can't be good for carbon to be going into [the] ground or then our crops?" or expressed a "fear of carbon damaging the soil – least favourite of the options because of this." Others said it "might cause problems further down the line."

Other

One assembly member disliked that it "would need regulation."

Conditions

Some assembly members noted conditions around enhancing the storage of carbon in the soil – points they felt would aid its implementation or that should be put in place. They suggested a need to:

Incentivise and subsidise farmers

Some assembly members said that "financial incentives [are] required", that "subsidy and support for farmers will be key" or that there "would need to be subsidies for farmers to adopt these practices as it lowers the productive yield of the land area." Others agreed saying to "get that kind of change of agriculture, it's going to take financial incentives" and they "would have to be good incentives." Others suggested that there is a "likelihood of needing to offer farmers grants to use this approach..." or that we "need to provide grants."

Combine it with other options and provide more information

Some assembly members commented that it "would only really make a significant contribution if combined with good practice in forest, peat and wetlands management", "if coupled with reforestation [it] might be a good option", or that they're "[h]oping there's a hybrid solution that encapsulate the first 3 options and [is] not ... overly reliant on one or another." Others made similar points, whilst also noting a need for more information:

"It can be done as well as – shouldn't be instead of - may require a focus on getting information out to understand it better"

"As [with] the previous 2 options it can be done as well as. May require some focus and provide more information to help people understand it better but should be considered regardless of the other choices"

Look at less essential areas first

Some assembly members suggested that "air travel is a luxury – more pressure should be placed there" or commented that "farming is an essential industry – flying isn't."

Tackle food waste

Some assembly members asked "how much food is wasted currently?" or said we "would need to reduce food waste e.g. stop throwing away 'funny-shaped vegetables' – role of supermarkets is key."

Think about where to do it and how land is used

Some assembly members said that it "must not be done on land used for farming" or that "if crops are still grown, [I] would be in favour." Others suggested it "should be done where it can – every little helps" or noted "a lot of land [is] being used for golf courses in the UK. This isn't essential. London has 11000 acres of golf course."

Consider fertiliser use

Some assembly members said "if it means less use of chemicals, [I] would be in favour" or noted that "we don't want [our] dislike of this option [to be taken to] mean that we're totally on board with polluting land with lots of fertilizer."

Others assembly members commented that we "need farmers", that there's a need to "get farmers involved" or that "farmers will need firm guidance." Others said that the "focus should be more on growing more of what we eat so we can become more self-sustaining."

As seen in Section A, assembly members expressed some support for enhancing the storage of carbon in the soil in their votes.

B.4 Using wood in construction

Using wood in construction means storing carbon by using wood instead of other materials to build houses and other buildings.

Trees naturally absorb and store carbon as they grow. This carbon stays trapped in the wood, again naturally, if they are cut down and used as timber in buildings. This process also creates space for new trees to grow and absorb more carbon from the atmosphere. An additional benefit to the climate is possible if timber is used instead of other materials such as concrete, which are currently manufactured with high carbon emissions.

Assembly members discussed this option in small groups, noting pros and cons.

⊕ Pros

Assembly members identified the following areas as points that they liked about using wood in construction.

⊕ Environment impact and land use

Some assembly members felt that using wood in construction was a "**good way to store carbon**", with some comparing it to other options saying we "prefer [it] to CCS as [it] captures all the CO_2" or that it "locks the carbon in the building compared to BECCS which still releases some carbon back into the atmosphere..." Others suggested it provides "good long-term storage of carbon, while being put to a practical use." Some commented that it is a "good building material – plus [it's] natural and carbon storing" or, similarly, that it's "a great construction material taking carbon out of the atmosphere – makes a lot of sense to be using wood as a building material." Others said simply it's a "good way to reduce CO_2."

For some assembly members a positive was that it "**avoids more CO_2 intensive products** (e.g. steel/concrete)", "reduces the need for cement and concrete" or would "change building practices away from using PVC etc which have negative carbon impacts in production." Others said there would be "knock on benefits...[from] reducing the demand for concrete, iron and other materials", or that it's "not the golden solution but [we] should utilise it so that it replaces more carbon intensive material such as concrete." Some labelled it a "low carbon building option, if they're [the trees are] from the UK." Others liked the reduced need to use bricks.

A number of assembly members said using wood in construction is "**sustainable** and practical", a "sustainable approach – Australia [has] lots of wooden buildings outside of cities" or that "compared to BECCS this is definitely a more sustainable method – using the wood for construction rather than for fuel alone." Others felt that "when [you] look at [the] long life cycle, it's good" or that "when compared to [other] building materials the life cycle of wood has a lower overall impact on the environment." Some said it's "not the same as the deforestation in [the] Amazon – it's just cutting fast growth timber from sustainable forests."

Others suggested that "even if wood has to be imported it would logically be shipped which is a low carbon form of transportation." Some assembly members suggested that "wood can be recycled – I use pallets in my garden" or that "wood used in buildings can be used and reused even if the building is demolished."

Some assembly members said that they "like the idea because it's **green** and because it doesn't produce carbon dioxide" or that "using renewable materials is positive." Some suggested it's "**natural**", a "natural option", a "natural proces[s]" or that it's "always been done and [is a] natural low cost way to store carbon."

⊕ Practicality, efficiency, readiness and scale

For some assembly members, using wood in construction **works well with other greenhouse gas removal methods.** Some said it "will mean there's a use for the increased timber that we're growing", that it will "use the wood from the forests we plant" or that it "combines the goal of forest growth and using the wood so that forests are regenerated." Similar comments included:

> *"Works well with [the] idea of planting forests as [they] need to be planted on [a] long term basis to get large trees for construction – works well with forest management – need trees in different stages – can also help with BECCS."*

> *"Fits the jigsaw: grow trees and then do something with them, so the carbon is locked up."*

> *"Trees absorb the greatest amount of carbon in the early period of their life so when they're felled that's their productivity done. To use the material then makes sense. The natural technology locks the carbon for [the] lifetime of the build which can be for 20–40 years plus."*

Some assembly members were **sceptical about the potential negatives** of the method. Some noted that it "can be laminated/ fire- treated to be used in higher builds" or that "new tech, e.g. coatings, is improving quality." One assembly member commented said that "personally [I] think it's a great idea – asked Chris [Stark] on Saturday about what happened to buildings knocked down or destroyed where the carbon is released into [the] atmosphere but buildings in UK last longer up to a few hundred years so less of an issue when we are trying to reach net zero in 30 years." Others suggested there is "not necessarily any difference in strength and appearance versus current [buildings]" or that wood "can be durable." Some commented that they "feel positively about it because…[there are] very old houses e.g. in Stratford that have lasted for hundreds of years with wooden beams etc" or that we "have wood frame houses that are still here many years later…but do we have the skills to still do this?"

Some assembly members said that "wood can be used in lots of different ways" or that "wood is a very **flexible** material – can be used in lots of different ways in construction." Others suggested that "you can build more quickly using wood – but this comes at the cost of being 10% more expensive" or that it's "**quicker** to build with wood construction." Some suggested it would be "**warmer** – wood houses are easier to keep warm than concrete" or that wooden houses would provide "better insulation."

Some assembly members said using wood in construction is "**tried and tested**, practical, saves CO_2", that it is "well used", "being used already (USA, South Africa, Nordic countries)" or "we know how to do this already." One assembly members said it is "simple."

Individual assembly members noted a variety of other points. One said they were "excited by new engineering using wood", another that it "creates a useful product which satisfies a national need", another that it "grows quickly and [is] good for [the] purpose." One liked that it is a "long-term project as [you are] growing trees over a long time and then using wood."

Costs, the economy and jobs

Some assembly members suggested it "could be **cheaper** (as a material in construction/house price)", or is "cheaper" or "low cost." Others foresaw a "lower cost of house building, with pre-building off site" or suggested that "wooden houses / buildings could be cheaper – advantage for first-time buyers." One assembly member described it as "more commercially viable."

Public support

Some assembly members commented that wood is "**aesthetically pleasing**", "pretty", "a good and pleasant material", or a "lovely material". Others said they "love this idea – timber houses are beautiful aesthetically", "[we] like a nice wooden house", or we "love the architecture and wooden beams, but [are] concerned about safety and cost." Some suggested it "looks nice – can be used for local businesses, smaller builds so not just homes."

A number of assembly members were pleased that it "**can't build tall buildings** as people don't want to live in the air":

> *"Like the idea that we won't have as many tall buildings in our cities – like buildings that are in keeping with [the] landscape. After covid the increase in home working [means] we won't need as many high rise office blocks. Some of these are redundant anyway – parts of the [hotel the assembly took place in] in Birmingham were not let; wasn't really needed in the first place."*

Some assembly members said "we are **familiar** with wood building", or that it's "well known." One assembly member suggested that "carpenters will like it." Another liked the "opportunity to build more with wood." A third felt positive about the "incremental change in the way we live."

Safety and risk

No assembly members made points in this area.

Other

Some assembly members said that "in principle [it's a] **good idea** to use wood" or that it "sounded positive – **can't see any negatives**." Others said it's a "no-brainer as long as [it's] used in conjunction with other methods", that we "should use it where we can", that they are "positive about it" or that there are "no downsides." One assembly member said:

> *"Wood has been used for centuries when constructing buildings. It is probably the most common building material used in bigger countries such as America, Australia etc. We would also need to grow more forests/woodlands to supply the wood material over the longer term. A win/win situation."*

⊖ Cons

Assembly members identified the following areas as points that they disliked about using wood in construction.

⊖ Environment impact and land use

Some assembly members raised concerns about **imports and sustainability**. Some worried that "UK wood supply might not be sufficient", said they had "concerns about there not being a sustainable source of wood to allow the scale needed," or disliked that "in the short term, we'll need to import timber to do this." One assembly said:

> *"There's a lot of construction going on in Cornwall [where I live]– need a lot more forest to match it. Scale not feasible, and amount of time needed to grow all the trees needed."*

Some assembly members asked "how do we know wood is coming from sustainable forests and not from other countries not done sustainably?" or said they disliked "importing from other countries (e.g. Baltic) if the wood is not from sustainable sources." Others felt that "shipping trees from elsewhere to use in UK construction would be a problem because of the fuel used." Some assembly members suggested that "lots of regulation [would be] needed to make this local and sustainable."

Raising a different point, some assembly members asked "if this means low-density housing, do we have the space for that?" or said "lower density is more land – meaning that we have to build out instead of up." Some assembly members expressed "concern about **land use**, other things may be more important e.g. forests and farming."

⊖ Practicality, efficiency, readiness and scale

A large number of assembly members raised concerns around "**implications for building durability and strength**":

- **Maintenance** – some assembly members said they had "concerns about the ongoing maintenance of buildings like this" or that they "will need...repairs." Others talked about "wet rot, dry rot, pests" or said that wood buildings are "not so good for wear and tear: could be a problem with water and pest damage. Wood expands and contracts, can cause problems." Some of these assembly members suggested that these were "hurdles we can get over probably."
- **Quality and longevity** – some assembly members queried "longer term durabiltity" or the "quality and longevity of the building." Some commented that "industrial wood is different to nature's wood – if they build cheap nasty houses, it will be a short-term solution" or that "timber framed buildings in 1970s turned out to be a disaster – had to be torn down because [they] weren't built straight, wood got wet etc." Others suggested wood is "not as permanent as steel or concrete."

– **Life span** – some assembly members suggested that "timber frame houses have a short lifespan" or that we "need to balance [the] sacrifice of not using normal building materials with what the benefit is – don't want to sacrifice something if have to tear them down and rebuild them in forty years."

Other assembly members said that "brick homes feel more secure" or referenced the "'three little pigs' i.e. doesn't seem sensible to build homes out of materials that don't seem as strong as brick/stone." Some said they were "unsure about their efficiency (heat/energy etc)" or queried "**whether wooden houses were appropriate for the UK's climate**."

Some assembly members disliked the "**difficulty of building tall buildings** with it", that it "can't yet be used for taller buildings" or that it "only works for low rise buildings." Some assembly members suggested that not being able to build tall buildings "may be an issue with population growth", commented that we "can't all live in semidetached houses" or said that using wood would be "impractical for the big housing estates we need in the UK." Others asked "what's required for us to make the transition away from building very tall buildings in commercial use?"

Some assembly members suggested using wood in construction is "limited by the amount of wood available" or said they were "not sure what **scale** this can be done [at]." Others said it "can't be done at [the] scale needed" or that there are "some questions about [the] scale of this – needs to be done with other approaches – like it less than forests and peatlands." Some assembly members raised concerns about **capacity**, suggesting there is "limited capacity in UK – i.e. only need 330,000 new houses to meet demand, so where will we use the wood?" or said that there would be "lots of problems getting enough manufacturing capacity in the UK." Some assembly members said it "takes **a long time to grow**" or asked "where is the wood going to come from? If it's hard wood, that takes a long time to grow."

A number of assembly members were **sceptical about the impact of wood in construction on emissions**. Comments included:

"If they don't last long, you'll be releasing carbon"

"Other technologies might have more impact – need to find a better concrete that is longer lasting and doesn't use so much carbon"

"Materials used to make things out of wood aren't so low carbon either e.g. plastics injected"

"Can't absorb carbon once built (only store)"

"Potentially robbing Peter to pay Paul – would demand for timber decimate the forests?"

"Hard to see [a] major impact on carbon, won't fix it all"

One assembly member asked "is there any political will – there was a Code for Sustainable Homes that was scrapped."

Costs, the economy and jobs

Some assembly members raised "concern about **cost**", suggesting it "might raise construction costs" or that the "current prices of wood as a building material seem to be too high for people to do this voluntarily." Some suggested a need to "consider people who aren't on the property ladder; will they be able to afford a property – they shouldn't be burdened."

A number of assembly members suggested that "we'd need a **new skill set and change to modern building practices**" or that there would have to a "change to business skills e.g. brick layers." Some asked, "would construction companies want to do it, given steel frame is quicker and easier to put up than a wood frame, and easier to shape? Do they have the skills, if they haven't been using wood for ages?" One assembly member suggested a need to find an "economic balance with the take away from steel production."

Public support

One assembly member felt that the "public will be sceptical." Another raised a "concern this is being proposed by policy-makers to sidestep more difficult questions about housing stock – they should be focussing on making sure everyone has a home in the first place rather than using carbon reduction as a diversion e.g. addressing [the] high proportion of second homes in certain areas."

Safety and risk

Some assembly members worried about "**fire safety and safety issues**", asking "will houses burn?" or saying they were "worried about fire in cities." Some said they had a "question as to whether the laminate made it safer" or asked "do the chemicals used as fire retardants have negative impacts on human health/emissions?" Others said there is a "greater risk of fire in properties built with wood", while some talked about the Grenfell tragedy:

> *"Remember Grenfell tower. Reason why we use steel now is because of concerns over fire. It [wood] will also be weaker when it is wet."*

> *"The buildings burning down – concerned about lack of regulatory control (e.g. Grenfell) to manage this."*

Some assembly members expressed concerns about "risks of flooding and severe weather – how strong are they?"

Conditions

Some assembly members noted conditions around using wood in construction – points they felt would aid its implementation or that should be put in place. They suggested a need to:

Manage it properly

Some assembly members said they would support it "as long as it is managed effectively" or that "if it is done properly then it's a good idea." Some commented that "while off the top of your head you are thinking don't chop trees... when properly managed it makes a lot of sense." One assembly member noted: *There are 800 year old buildings made of timber and very new concrete buildings falling down. It's how we manage them that is the important thing."

Reduce fire risk

Some assembly members said that "growing the trees will take time, which will buy time for finding ways of reducing fire risk." Others said they would support the idea if "the fire risk can be reduced" or if "there are ways to make it less flammable." Some commented that it "must be fire safe." Other assembly members suggested we need "legislation to ensure that building with wood is done correctly (addressing the safety concerns)" or that we "need robust regulation."

Do it sustainably

Some assembly members said they were “happy as long as it is managed and done sustainably”, while others suggested a need to “regulate to ensure sustainability and keeping it local.” Some assembly members said it “needs to be done properly, using a tree at the end of its’ life” or that the “danger is trees are just used for building houses and felled before their most efficient period of capturing carbon.” Others said they “need to be built to last, with the right wood, otherwise carbon will be released.” Some said there is a need to look at “what happens to the wood afterwards” and that it “still doesn’t solve the problem of what to do with the timber at the very end of its life.” Others suggested that “unless you set up a good recycling system with CCS” the end of life question was “a risk.”

Consider which building to use it for

Some assembly members said that “demand for new houses should be met by using timber” or “definitely for new build houses but not for hospitals and key buldings.” Conversely others queried, “our building stock is old...how much new construction will there be?” Some assembly members said they would “like to use it where we can but not to the detriment of the safety/ longevity of a building.” Some asked “can terraced housing be made of wood? This needs a mindset change to buy and maintain buildings like this.”

Think about other uses too

Some assembly members noted that we can use wood for “furniture, doors, houses”, or said “we need to cast our imagination wider, use it for bridges, infrastructure etc.”

Use UK trees and fit plans to supply

Some assembly members said they would support it “if we can use UK trees”, that it’s “less advantageous if we have to import wood” or that it “needs greater supply of UK wood (would defeat purpose if wood was imported).” Relatedly, others suggested that “scale needs to be limited to supply.” Some assembly members pointed out that some “cement is made abroad.”

Develop skills, technology and infrastructure

Some assembly members suggested that "we need to learn the skills to build and maintain the buildings" or that "we need time to develop the skills to do it at scale." Others said that it "needs further development e.g. lamination method for strengthening wood" or that we "need factories to process the timber and build the sections for the buildings." Some asked "Government to incentivise [the] building industry to change and re-skill."

Think globally

Some assembly members felt it "requires [a] global response" and is "more suitable for some countries than others." Relatedly, some assembly members talked about their own experiences abroad:

"Lucky enough to spend a year in California and 2 years in Japan, earthquake areas, don't build with bricks. Normal domestic buildings are made of wood. ... don't have the longevity – 30 years maximum – striking. Don't expect the longevity of brick building. Talking to people – living in rural Japan: when a couple gets married, they build their own house, there is no second hand house market – very different approach. Heard it said: you plan a brick building to last 100 years in the UK. More in tune with current living – decades vs hundreds years. If you build houses every thirty years, it is more in tune with the way we live currently."

"Relatives who live in the US. Even in New York – lots of wood in building – cheaper to build, and it does decay – have to change panels...."

Other points made by individual assembly members included:

> "…should be done in factories to be more efficiently built – built to the way you want it – … build faster/ ensure less waste – go for wood – the way we build now is not efficient."

> "…would need to be mandated to create the economies of scale that would make it an affordable option for builders, particularly in larger commercial buildings."

> "Happier for longer-growing trees."

> "Need good quality timber and timber products."

> "Treat the wood, but take care what chemicals used."

In the votes, assembly members expressed strong support for using wood in construction. Please see below for the results of the votes.

B.5 Bioenergy with Carbon Capture and Storage (BECCS)

Bioenergy with Carbon Capture and Storage (BECCS) means using wood or crops for energy, capturing and storing the carbon dioxide released when they are burned. Assembly members discussed this option in small groups, noting pros and cons.

⊕ Pros

Assembly members identified the following areas as points that they liked about BECCS.

⊕ Environment impact and land use

Some assembly members said that there's a "place for it because of the energy it creates and can be used for" or that it's a "carbon-neutral **way of getting energy**." Others liked the energy production but at a small scale:

> *"Energy production and captures positive elements – but for use at a small scale"*

> *"For heating – small plants could be useful, could have its own role. Still, not to that large extent where you have a massive power plant."*

One assembly member said it "encompasses lots of good elements, but not at a large scale."

Some assembly members said they were "not massively positive about this option but do like idea of growing crops and plant material to burn for fuel…." Others said "I quite like it – use the trees we're growing" or "the idea is good – **use what we grow**." Some suggested it's "**sustainable**, once [you've] used the crops you can regrow." One assembly member said it's a "natural fuel [and a] win-win. The carbon has been absorbed recently." Others argued:

> *"The wood that is imported is fast grown in places where it makes sense to…[grow] them, shipping the wood is low cost in terms of emissions. When turned into pellets and burned using this technology for energy and subsequently capturing the carbon for storage it is a virtuous circle that has got benefits to it."*

Some assembly members said they liked it "**if it is making use of waste** products to generate energy" or that the "only advantage to this would be if you were burning waste."

A number of assembly members said "CCS will be a game changer", "with the CCS attached – there is a **huge impact**", or it "should have a large effect." Others suggested that it's the "greatest chance of getting us to net zero in the timeframe" or that it "does a lot in a short space of time." Some talked about the "sheer volume of carbon dioxide we can achieve through this approach", with some commenting it's "more…than the natural options." One assembly member said "BECCS is my first choice because of the sheer volume of removal of CO_2." Others similar comments included:

> *"Think it will be effective. Will be higher in cost than natural approaches but we are going to need to spend some money to make a big difference."*

> *"Come round to BECCS compared to before – if it's done properly it can be hugely positive, given how much CO_2 this method can take out of the atmosphere. Needs to be regulated to ensure its done in the right way – i.e. not growing forests just for the sake of burning wood."*

⊕ Practicality, efficiency, readiness and scale

Some assembly members said BECCS "**has a part to play along with other solutions**" or that it "should be part of a broad range of solutions – we have to try everything." Others said that it "can take up [the] remainder after other methods [are] exhausted - has potential" or that it "would be OK in moderation, but prefer natural processes." Some assembly members said "we do need to keep the lights on when the wind stops blowing – analysis seems to show we're still going to have to use gas – so CCS is needed (although not necessarily BECCS)." Some commented that "technology is an important part of the solution."

Some assembly members suggested that "in the future, there will be a lot more bio-energy. [....] ... there is potential – option worth considering – in 100 years, might be the main method we are using for energy. That **might be the future**." Others made similar points:

> *"My favourite option – I understand that it takes time. Even if it captures 60% now with the tech we have in the future it will become more efficient."*

> *"This is probably the way forward. Use the trees to heat our homes."*

A number of assembly members noted that a **range of resources needed for BECCS already exist.** Some said "we have the plants needed for the biomass" or that "existing power stations can be converted." Others said that "we have enough storage space" or that the "storage is there". Some mentioned it "seems good in theory that we can use the empty space left by oil and gas extraction to store carbon" or talked about the "potential of so many empty gas and oil fields in [the] north sea that it could be stored in... expensive to get them there, but would revert to a solid over time." One assembly member commented:

> *"I was very opposed to CCS initially, I was imagining CO_2 ready to leak out, but Chris Stark talked about it bound in the rocks: no possibility of leakages. Doesn't create risks for future generations. [My] [o]pinion about CCS shifted a lot...if carbon is bound in a solid inert form under the sea, with no risks of escaping, much more keen...."*

Some assembly members suggested BECCS is an "**end-of-life solution for timber** which has been used in construction" or that "if we have to renew the forests – then it seems to make sense. It's better as a by-product instead of for its own sake." Similarly other assembly members commented:

> *"If done well, it's a plausible idea. For example, the forests need to be well managed and the biomass should be created as a by-product of other processes."*

Some assembly members said we have "**good knowledge of how it works**" or "some proof/maths that it can reduce the problem." One assembly member said it's "achievable." Another said "my own experience of heat networks is positive."

⊕ Costs, the economy and jobs

Some assembly members talked about an "**economic revitalisation potential** (e.g. Teeside)" or said they "like [the] idea of converting old coal fired power stations to biomass, you can employ the same people."

⊕ Public support

Some assembly members said it "will make use of industrial expertise, technological knowledge, it will create lots of interest – **it's a 21st century solution** which will be appealing."

⊕ Safety and risk

One assembly member felt "reassured regulation will make it safe."

⊕ Other

Some assembly members said they **preferred BECCS to other options**. Some commented it is "better than the soil option if you can contain the CO_2" or that it "seems a better idea than the fossil fuel power plant CCS." Others suggested that it "offers things that other processes don't. It can be used for essential fuels instead of fossil fuels e.g. aviation." Some suggested that it "may be more effective than other options." One assembly member said "I like the concept."

⊖ Cons

Assembly members identified the following areas as points that they disliked about BECCS.

⊖ Environment impact and land use

A large number of assembly members suggested BECCS **failed to address the problem**. Some said they are "worried that it takes the focus off the amount that we are emitting in the first place" by sending "the message that there is a magic technology taking carbon out of there":

> *"Just using technology to hide our own mess for the future. It's not a solution. We need to change our way of living and not just rely on tech to clean up our mess."*

> *"They are only capturing the CO_2 they have produced in the first place, why not not produce it in the first place."*

> *"Not convinced that this will actually reduce carbon, will just be taking out what it puts in."*

Similarly, some assembly members said we "can't always rely on a quick tech fix" or suggested that "this is being pushed politically – a tech solution is politically more convenient than the behaviour change options that are needed." Some said they "don't see it as a very long term solution" or commented:

> *"If net zero is meant to be about securing the long-term / our children and grandchildren's futures then this seems like simply pushing the problem under the carpet for others to solve later."*

Relatedly, some assembly members noted "concern people will get carried away with technologies like this, we mustn't rely solely on new technologies and simply carry on as normal. **What happens if it doesn't work**?" Others said it "seems like doubling down…If it works, great, but if it doesn't we're screwed." Some assembly members asked "what if we waste 10 years and don't get the carbon reduction we need?" or "if we still have this problem in 100 years what happens then?"

Some assembly members raised further points about its **impact on emissions**, noting that it "only takes in a certain amount – not net zero in itself" or commenting "as a concept it seems very difficult to imagine how it achieves net zero, might it cause increases in CO_2?" One assembly member noted that you "need energy to do this."

Some assembly members disliked the "**amount of land it will need**", felt it "needs lots of land (if at scale)" or noted "concern about biomass and too much land take if people get carried away." Others suggested it "takes up a lot of space that could be used for a lot of other things e.g. crops or forestry or houses", "uses up land that could be used for other purposes" or said they were worried about the "impact on food production and biodiversity." One assembly member commented: "At the risk of being wrong: we've not been self-sufficient in food since before WW1, I'd prefer food security as a priority."

Some assembly members disliked "**imports** from other countries" or queried "can we grow enough? Will we have to import fuel?" Others commented "really against this – the ethics of where [we're] buying this from…", or "didn't realise we may need to import trees to use for bioenergy for this – this defeats the purpose of trying to get to net zero." Some asked, "would some of the trees need to come from abroad – so there would be shipping costs and emissions from shipping – seems ludicrous" or noted "at Drax, wood is converted to chips and dried. Theirs is from Sweden and the US. It goes through several stages before it is burnt." Some assembly members said:

> *"…biomass burning is currently using trees from the United States where there is less regulation compared to other countries. They have been known to fell old growth forests to chop down into wood pellets to burn – so actually by burning such wood this carbon is released back into the atmosphere that would otherwise have been stored in the trees…."*

Some assembly members commented "don't grow trees to cut them down and burn them", it's a "bad thing if we are **just planting things to burn**", or "growing stuff to burn it…conflicted by the burning element, hard to tolerate. What are the real implications at scale – is it feasible." Others said that they "don't have a problem with capturing carbon, but [it's a] bad idea to be burning wood, might as well burn coal and capture that." Some suggested it "seems to be a long way round – to grow trees, burn them and then capture their emissions."

Some assembly members worried about the "**impact on wildlife**" or said they were "worried about nature e.g. birds nesting" when forests are thinned. Others suggested there is a "risk of changing the make up / health of the oceans" because of where the carbon is stored.

One assembly member said I "generally, prefer more natural solutions e.g. forest management." Another commented that they "can see problems with deforestation – timber has to come from somewhere – can't believe it's a viable proposal."

Practicality, efficiency, readiness and scale

Some assembly members said they are "sceptical of the whole thing given it hasn't been tested fully to any **scale**" or suggested there is "no proof of doing it at scale." Others had related concerns, querying its "feasibility at scale – high cost, infrastructure?", or asking "will it be very local, e.g. heat networks? Is it plausible across the country?" Some questioned "is there enough biomass?"

Relatedly, some assembly members said that the "technology is new", "**not proven**", "not well understood" or that they are "not convinced it is viable." Others commented specifically that "carbon capture is new, not well tested – will it work?" or suggested "we don't know if it actually turns back into rock," or that there is "no evidence of how the natural rocks in proposed storage sites will really react to the 'carbon sponges' over time." Some suggested that the "**technology doesn't even exist yet** – it's 'pie in the sky'." Others queried "will it be done on time?" or commented "at the moment we have no way of carbon capturing – plant was supposed to be built 5 years ago...."

Some assembly members felt BECCS is **less preferable than other energy sources**. Some said that we "may as well use coal" or that "if you've got the carbon capture technology, why not use it for gas and coal – industrial revolution showed we moved away from timber burning for a reason, it's inefficient – leave it in the timber in the first place." Others suggested it "only takes carbon out of the atmosphere to the extent that it reduces other forms of power generation. So, does it make sense to do this at all – should we not, for example, use wind power instead?"

Some assembly members suggested that "**having enough storage is a challenge**" or that it "sounds good on paper but how much space under the ground will it need?" Individual assembly members commented that it "would need a lot of infrastructure", or that "I don't like the idea of storing CO_2: much better to create synthetic fuels...." One said "pellets are an issue – it's complicated." Another assembly said that "burning wood for generating electricity is a very inefficient method. For the same of amount of electricity generated, it creates 4 times as much CO_2 as natural gas and approximately 1.25 times more than coal. Also, it has a very low energy density, and you need a lot of it. So it's not a very efficient or effective method of generating electricity, or reducing CO_2."

Costs, the economy and jobs

Some assembly members talked about "**high costs**", "very high cost" or "expensive capital." Others said it "seems like a higher cost than other solutions", that it's "too costly therefore not feasible" or that the "initial high cost would put people off." Some said it's "expensive (particularly when the investment is in an unknown outcome)." Some assembly members asked "would people be willing to pay?", "will government pay?" or "who's going to pay for the buildings needed? Tax payers or private companies?" Some assembly members suggested "there would be a lot of costs involved in re-skilling and re-training people to grow trees." Others noted "cost....[is] expensive, although will there be a bigger reward in the longer term?"

Public support

Some assembly members said they disliked "**transport** options [for] getting the fuel to the plant" or that "Drax has huge trains bringing fuel to the plant." One assembly member said: "[I] live next to a biogas plant: doesn't have CCS. It is a nightmare because the farmer is supposed to grow maize to supply the plant – hundreds of trucks coming in and out of his farm for about a month: creates a lot of emissions. [....] Huge amount of maize is imported: keeps the plant going for the whole year. Should not have had the go ahead. He is not operating the plant as he should do."

Safety and risk

A very large number of assembly members said they were **worried about leaks**. Points included:

- **It's a risk** – some assembly members commented that "there are many examples of things we previously believed were safe and now know they weren't – it's [carbon storage] a risk we don't have to take". Others said they "wouldn't feel confident that the carbon wouldn't escape", or that it amounted to "taking [the] problem out of the air and putting it in the ground, not solving anything, it might leak out there." Some suggested that the "carbon store part is a concern. Time only will tell if it's a viable option, not enough information to know at this point." Others suggested that "CO_2 under pressure is used to drive out oil, but when stored will high pressure CO_2 create earthquakes and the release of CO_2? It's not viable long term, risks [are] too high";

- **Distrust of man-made answers** – some assembly members suggested that "nature approaches can't go that far wrong, but this can really go wrong – high risk – don't feel there is proof that this will work e.g. leakage, problems with transport." Others said "we don't know enough about [the] dangers of man-made solutions – it's all new and [the] risk is too high" or that "all the man-made solutions have the potential to destroy, ... need to keep them to a minimum...";
- **Potential for disaster** – some assembly members talked about a "risk of accidents and CO_2 being released back into the atmosphere" or said they are "very concerned that it's speculative and what will happen if it fails, if the CO_2 escapes? An uncontrollable disaster? CO_2 is a big risk as a stored gas, uncontrolled release." Others talked about a "risk that in 10, 20, 50 years time there could be a massive carbon release as sites fail and this could lead to environmental melt-down." Some asked, "what happens if there is an earthquake?" Others said "it'll work but burning and storing CO_2 is dangerous, therefore build demand for other options e.g. using wood for construction, synthetic fuels."

Some assembly members said they "would rather have a small amount of nuclear waste in the north sea than a load of carbon dioxide" or that it "feels like burying rubbish underground." Others had concerns about "transport to storage in oil fields", with some suggesting it was a "terrifying concept – 50m tonnes of CO_2 being transported. That's a lot."

Other

Some assembly members said there is "too much push from industry on this – are they influencing the climate change committee?" or that "CCS feels like a bit of a PR stunt, pushed by big companies. But a tree can already do this."

One assembly member said I "don't see BECCS as a solution – burning something so quick that could be used for construction – can't capture all of the carbon – feel like it's wishful thinking that this could be the solution – should be considering the other options – massive amount needed to grow to meet need for something that is going to be used up very quickly, which leads to massive deforestation."

Conditions

Some assembly members noted conditions around BECCS – points they felt would aid its implementation or that should be put in place. They suggested a need to:

Think about scale

Some assembly members said we should "use [it] as a small scale solution" or that it "would be OK as long as it's done in moderation." Others said "75% BECCs is too much, use other options."

Only use it where there is no alternative

Some assembly members asked "could it be capped...to air travel and agriculture: could it be restricted to meet the needs of what can't be reduced?" Others said it's "fine when used for essential fuels e.g. bio fuels for airplanes, where only alternative is fossil fuels."

Use natural approaches first

Some assembly members said we "need to prioritise natural options", "need to use up options 1–3 first before resorting to this" or "should be using natural approaches straight away as we know they will work and use these technologies in the background as over time we will understand them better, they will improve, cost may improve." Some commented that we "need to have some more reliable forms of energy for when not windy etc, so carbon capture is helpful for those times – didn't like idea of burning wood for this – if this is necessary then fine but sceptical on cutting trees down to burn them when we might as well keep using gas and capture carbon from that." Others suggested that "historically, carbon has been stored in the soil and converted into oils and diamonds, and coal etc... We need to push that carbon option. "

Undertake research and development

Some assembly members said it "needs further development" or "needs to be encouraged. [...] Let's put money and investment and explore." Others commented "if these CCS techniques improve, if storing in geological space if safe, then it's possible." One assembly said it "needs more funding to improve the system and ensure Carbon Capture is secure."

Consider which raw materials to use and where they come from

Some assembly members said they would be happy "only if we use waste products, not if we import" or that we "must focus on doing this with waste – don't use 'useable' materials for this." Some said "with wood – must use waste, eg from the 'wood in construction' option." Others said "don't import materials for this method" or suggested that "using this method would require close regulation to ensure practices such as those in the US are not repeated here." One assembly member commented: "Bioenergy with carbon storage seems to be a fantastic carbon neutral source of energy. However, the biomass needs to be from the UK and not imported."

Consider and manage risks

Some assembly members said we "need to weigh up the risks and rewards", that "storage facilities need to be well managed" or that "I would be in favour if it was proven it would be 100% secure."

Queries around funding

Some assembly members said they would be in favour "if the cost can be reduced." Others raised queries:

"There was funding by the UK to create a CCS facility – it was abandoned as economically unviable. Why did this happen?"

"Why hasn't the government supported this – is it because of the cost or because the science isn't there?"

Must not be used for enhanced oil recovery

Some assembly members discussed that any carbon captured "must not be used for the process of enhanced oil recovery" saying it would make BECCS "entirely self-defeating and will lead to even greater emissions."

Individual assembly members commented that it "needs to be part of a range of GHG [removal] measures", that it "must be done sustainably, eg no fertilisers to rush growth", or that "technology is great, but humans need to start taking responsibility for our impact on our surroundings." Others individuals said they would support it if "we use reverse pipelines to transport the carbon to the storage area" or "if we can meet the capacity for this and Wood for Construction." One assembly talked about their own experience of living next to a biogas plant, already noted above:

> "Need controls: otherwise causing so much trouble. Planning application required that he grew the maize himself. He is not operating the plant as he should. Reported. Inspectors. But there's a line of communication between him and council officials from the local authorities."

As seen in Section A, assembly members expressed limited support for BECCS in their votes.

B.6 Direct Air Carbon Capture and Storage (DACCS)

Direct Air Carbon Capture and Storage (DACCS) means using technologies to capture carbon dioxide directly from the air, then storing the carbon. Assembly members discussed this option in small groups, noting pros and cons.

⊕ Pros

Assembly members identified the following areas as points that they liked about DACCS.

⊕ Environment impact and land use

Some assembly members liked that DACCS "can be located at sea so **not using land**", that we "don't need to grow anything – land can be used for other things" or that it's "not taking up land as much."

Some noted that it "**can capture a lot of CO_2**" or "could take more carbon out than just net zero." One assembly member commented: "I believe the direct carbon capture and storage will actively address the challenge we face of removing carbon by 2050." Others said it's a "really good idea – has the potential for large capacity."

Some assembly members suggested DACCS is "very **clean**", "cleaner" or that it meant our "energy requirement can be met by clean energy." One assembly member commented: "I feel this is the cleanest method of removal with the smallest carbon footprint associated with it, that has the most capability for significant removal of CO_2."

⊕ Practicality, efficiency, readiness and scale

Some assembly members said it "**can be located anywhere**" or that it doesn't **"**need to attach next to a power plant, can put [it] wherever." Others suggested it "could be carried out close to the storage spaces (e.g. offshore, or close to offshore connections) so reducing transportation compared to other CCS options" or that it "can be located to reduce [the] cost of transport."

Some suggested it "can be placed beside off shore windmills which seems like the perfect solution", that it "**could be wind powered**" or that it "could be done at sea e.g. powered by wind farms."

Some assembly members labelled it "part of the mix of options to remove GHG" or felt it "has potential as **part of the mix of solutions**." Others said it "doesn't hurt to have it – not a huge part to play but every little helps? One of many parts of the strategy", that it's "possibly a quick solution if all other measures fail" or that the "only real positive could be that it's an in-between solution." Some assembly members felt it's a "good idea, but shouldn't be done on its own. It is a new tech and so we don't know how effective it will be or how cost effective – should be a back up option but not the main part of the approach to net zero." Others said it's "**good to develop new technologies**" or that "science can help us and innovation can be used to remove the excess CO_2."

A number of assembly members noted that we "have the North Sea for storage" or that the "**storage capacity exists** (under the north sea)." Some liked the "**simplicity** of the method" or noted that "one of the speakers described it as a floating boat stuck next to a power plant in the north sea…if it's as simple as that, it sounds OK."

Some assembly members suggested there was an "**opportunity for international collaboration**":

"This needs to happen, but could be more effective elsewhere in the world, e.g. set it up near the equator to use solar energy, run in partnership with the UK investing."

"Saudi Arabia would be a good place to develop this, with the sun for renewable power and all the ex-oil storage. We should be thinking about worldwide approaches here."

Individual assembly members made a range of other points. One said I "quite like the idea.... How big would the plants be? Would we have fields of direct air capture like wind turbines or would we put them out to sea?" Another said "the mechanical units can be small, don't have to be big." Others noted that "lots of research has been done" or that it "only takes 2 years to convert it to rock. I thought it would have been much greater than this." One suggested that we "could use the carbon captured for useful things like carbon fibres (same for other CC technologies)." Another said I "prefer it to BECCS." One said there are "no physical inputs [of biomass] required."

⊕ Costs, the economy and jobs

Some assembly members suggested that we "will start to get a return which will drive down costs", that "**costs could fall**" or that the "cost could come down over time." Others suggested it "may give the **biggest bang for buck**", or that "oil and gas companies will make it viable and **will make money from it**." One assembly member said it would "create jobs, lots of people involved in the research side."

⊕ Public support

No assembly members made points in this area.

⊕ Safety and risk

No assembly members made points in this area.

⊕ Other

Some assembly members said it "has the right end goal" or that they "**feel positively about the idea in theory**, makes sense to me." Others labelled it a "good idea in principle but [the] technology needs to develop" or a "good backup – continue to research into it..." Others said "what's not to like from the concept? Removes carbon from the air no matter what the source" or "great if it works, could be a good idea, keep researching, but the main focus should be other areas." Some assembly members commented:

"What is wrong with spending money on it. You have to invest to make something work. I'd like to see Government step up and give it a go. Another potential benefit of the impact of Covid where we saw the impact of engineers on making ventilators – can't we harness the same process."

⊖ Cons

Assembly members identified the following areas as points that they disliked about DACCS.

⊖ Environment impact and land use

A significant number of assembly members said that DACCS is "**not as natural** as other options", that they "prefer natural solutions" or that "if it saves the same amount as natural options, then would prefer the natural." Others said that "it's a gut instinct that it goes against nature", that it "feels like trying to create technology to do what nature should do" or that we "should not need to be investing in new technologies when there are better solutions to minimise carbon release and maximise carbon storage naturally." Some feared it "takes away the focus from natural processes available now - too many questions as to whether the technology can be invested in and developed in the long-term and whether in the end it can do what it intends" or suggested "this is just what a tree does – unless this is going to do the same job of thousands of trees, don't think it's worth it. Should just plant trees instead."

Another significant number of assembly members suggested that "**we should try to reduce the carbon emissions, not just capture them** once they've been emitted." Others said it "seems like playing round the edges rather than tackling the problem of reducing emissions", that it's "like burying problems and putting your head in the sand", that it "potentially lets companies off the hook from changing other practices" or that there's "too much pushing of 'carbon storing' options which just kicks [the] can down the road. Need lifestyle changes instead, and the associated public information exercise." Some assembly members said it "should not be used as an excuse to carry on using fossil fuels, need to find better ways forward", that we're "concern[ed] this will let us slip back to using more fossil fuels" or that it seems "reactive rather than proactive." Similarly some registered "concern that it will be ... treated as magic solution and we don't do other important things before 2050." Others noted "concern people are jumping on things that will create jobs, we should make sure it's going to reduce carbon emissions to the extent we need it to."

Another significant number of assembly members disliked that it "**needs a lot of energy**", the "energy it takes", that it's "very power intensive" or that it "requires electricity to run in the first place." Others suggested that its "energy use can defeat [the] purpose" or that "this will need loads of CCS and the carbon capture uses lots of power so we might get into a spiralling situation." Some noted it is "energy intensive to run so still needs to be fuelled – inefficacy", that you "need power to run a pipe for the CO_2" or that it "only works if using low carbon electricity sources, not if using high carbon electricity – requires lots of low carbon electricity." Similarly, some said "this also relies on the energy used to power the technology being produced in a carbon neutral way, which may not be the case so seems counter-productive."

Some assembly members said they disliked the "**land use** implications", that it "requires lots of land for the fans" or that it "takes up a lot of space that could be used for a lot of other things e.g. crops or forestry or houses." Others asked "what about the land take (especially with take from wind farms)?" Some worried about "where will they be put, **impact on people**, land take, **visual impact**" or about "visual and noise impact."

A number of assembly members felt there were "**no multiple benefits** (as with forests/peat)" or that the "only benefit with this one…[is] storing carbon" while "other options" had benefits including "biodiversity benefits from forests." Some said "even BECCS" provides "energy you can use."

One assembly member suggested "it's being pushed by big companies. It's a back-up plan for moving away from oil, as profits go down from that. It's a nice tidy way to dump things in the ocean." Another referenced the "example of 'enhanced oil recovery' practices used since the 80s to enable access to further reserves of oil", noting "concerns that this practice could be continued via this technology" and lead to increased emissions.

Practicality, efficiency, readiness and scale

A very large number of assembly members commented on the **newness of the technology**. Suggestions included that it is:

- **Unproven and untested** – "Tech isn't proven yet" "Seems too simplistic, untried and untested. Sci fi." "Not tested, not proven whether effective, not tested at a large scale" "Not practical and the technology is still unproven" "We don't know if the technology works";
- **Experimental** – "Experimental "Very experimental" "Still experimental" "Still very experimental - a long way off, can't really depend on it like you know you can depend on forests doing this – one for the future – rather than for now." "Not convinced it will work and if we know enough as tech is new and experimental";
- **Theoretical** – "Very early stages (theoretical) and futuristic and not well understood" "It's still theoretical. Not done on a large scale. Where can the carbon be stored reliably?" "Sounds too good to be true. It's great in theory but not actually working." "Technology is not there yet. Cautious about having air capture devices. Almost theoretical at the moment, might not be ready for the next 30 years. Not on the priority list";
- **Not far enough developed** – "Early technology so unsure if practical" "Not far enough developed to make a big impact" "The technology doesn't exist yet" "Technology again. The technology is just not there yet" "New technology, not sure exactly how it works yet" "Too unknown";
- **Far-fetched** – "Sounds far fetched / a lot of unknowns" "Fanciful – seems like magic."

Some assembly members said simply that it was a "new method." One said it was "vague."

Some assembly members queried "is it **scalable**?" or noted that we "can't do it at the moment, at scale." Some said it is "**not practical for the short term**" or is a "medium term option, but prioritise everything else. Putting all the resources in options we are not sure about is not the best idea."

Some assembly members said they were "**sceptical they can get as much carbon as they say they can**" or that they thought it would be "limited in terms of [the] amounts of CO_2 that can be extracted." Some commented that it is "**very inefficient** – has this just been pitched to make the other option (BECCS) more efficient? Don't know why it's on the list."

Some assembly members suggested **other options are better**. Some said it "seems to have a lot of similarities with BECCS. BECCS could be better potentially. But it is hard to tell, still pretty theoretical." Others said they were "not a convert. They have been looking at it for a while. Big investment: will take a long time to build. Could be worth investing, but it is so uncertain: but could be a huge amount of money. The other options are so much easier to reach net zero."

Some assembly members suggested there is "**no commercial interest** without Government sponsorship or investment" or that "one of the biggest problems with carbon capture was getting people to invest into it which has been the case for the last 20 years. Not sure if priorities on this have changed enough."

Individual assembly members said they "don't see it as a very long term solution", or that it's "very difficult as the main place for capture will be at power stations." One asked "where could these be sited? Would every village need one or would large industrial units need to be built to capture and store?"

Costs, the economy and jobs

A large number of assembly members said it is "very expensive", "**expensive**", "high cost" or "likely to have a very high cost." Some assembly members highlighted the "initial cost" or "cost of installation" in particular. Some assembly members disliked the combination of uncertainty and expense:

> *"High cost – put the money into something [we're] more sure will definitely work."*

> *"More money and doesn't have a guarantee of success."*

Others suggested that the "money could be better spent in other areas" or that it "does the same job as a tree but [is] expensive." Some asked "who will pay", "would people be willing to pay", or "who will initially gain and who pay?" Some said it's "expensive – goes on our energy bill." Others felt that "the cost of the energy that needs to be used for it makes it less effective than BECCS and so less viable" or said they were "not sure if [it is] cost effective yet as new technology."

Public support

One assembly member said it "can be done at scale (acknowledged) but [I] still don't trust it."

Safety and risk

Some assembly members said that "**storage of CO_2 is not a good idea**, worried about it escaping", that they "wouldn't feel confident that the carbon wouldn't escape" or expressed concerns about the "risk of uncontrolled release of CO_2 for future generations." Some asked "how safe is the storage?", "how long can it be stored for?" or noted they were "concerned about storing carbon in the earth's crust – what impact will it have?" Others raised concerns about the "safety of carbon transport", or said they "feel hesitant about carbon capture technology in general (this and BECCS)."

Some assembly members expressed "concern about air suction, chemical processes, and mineral extraction – potential issues include safety, cost, jobs, how green." Others listed "concerns about leakage and turning the water acidic", "concern about unknown long-term impacts, e.g. air quality" or said we have "no idea of what the **environmental impacts** might be."

Other

One assembly member said they felt DACCS was a "waste of time", another that it "feels like the option of last resort. Use it to mop up the last bits of CO_2." One assembly member said "we've got no information about the costs or about the quantity of CO_2 removed."[6]

Conditions

Some assembly members noted conditions around direct air capture and carbon storage – points they felt would aid its implementation or that should be put in place. They suggested a need to:

Undertake research and development

Some assembly members said that "research and development [are] needed", that we should "look at it, but [it] needs more research" or that they "will go for anything that will work, even if it's a small benefit – but it needs to be tried and tested." Others said they see "value in exploring and investing in it alongside other options", that "everything is new and experimental at some stage" or that "investment must be increased." Similarly some said "maybe with more R&D they will come up with an acceptable solution. They have to start somewhere." Others said they see "potential for further development" or that it's an "option for [the] future but not so much now."

6 Assembly members heard evidence about the relative cost of the different methods. It was not possible to give them the more precise figures requested because there are a range of plausible costs for direct CO_2 removal methods. Methods also carry a variety of wider costs and benefits that hinder simple cost comparisons.

Only use it if it's proven and affordable

Some assembly members said they would support the idea "if the technology is there and proven", that if it's "proven to work and affordable then it's a great idea" or that "if the tech to make it go solid comes in then brilliant."

Manage costs

Some said they would be in favour "if the cost is not too high", while others said "if it doesn't show itself to be viable then we will have to stop spending money on it."

Use it in moderation only, or as a last resort (at least at first)

Some assembly members said it "should only be used in moderation as a way of capturing that last bit of carbon that can't be captured by a combination of natural methods of carbon storage and moves towards generating carbon neutral energy." Others said it should be a "last resort solution – if nothing else works" or "only an interim measure while still using fossil fuels and other technologies are being developed." Some commented that we "should be using natural approaches straight away as we know they will work and use these technologies in the background as over time we will understand them better, they will improve, cost may improve."

Use a mix of options, potentially prioritising natural ones

Some assembly members said "we shouldn't shut down any option – there has to be a place for all options", that we "need a balanced approach to capturing CO_2; can't rely on just one option" or that it "could be OK, but don't put all eggs in one basket, priority should be natural measures." Other assembly members commented that they "still think natural approaches are best but not sure they can be enough, this and BECCS have so much larger scope in potential BUT we don't know that they definitely work."

Don't let it distract from better solutions

Some assembly members warned to "[b]e careful that it doesn't detract from other best practice approaches", that "[i]f it is developed, it shouldn't be an excuse to carry on using fossil fuels" or said that "[t]echnology is great, but humans need to start to taking responsibility for our impact on our surroundings."

Individual assembly members made additional comments including:

- "Concerned about the carbon cost of setting this up and building the plant."
- "Companies should be required to capture the CO_2 they are responsible for generating, as long as it's regulated properly. They should be mandated to do this. But, don't want them to see this as a get out of jail free card and not do other things first. Will this mean a carbon trading scheme?"
- "If it does work, be sensitive to where they are put and the impact on people."
- "Excess power to be used for this when it is available i.e. extra electricity generated by the different technologies (e.g. nuclear now and wind/solar in future) be directed towards CC when not able to be used elsewhere."
- "Can we join this with BECCS all in one place?"
- "Needs to be beneficial in the long-term."
- "Need to be able to trust the scientists; we need to be sure they know what they are doing."

One assembly member said we can't store electricity, but can store synthetic fuel. They said they had called "a company in Canada using this approach" who said it "can be scaled, but is currently expensive."

As seen in Section A, assembly members expressed limited support for direct air capture and carbon storage in their votes.

C. Cross-cutting considerations

After discussing each of the six greenhouse gas removal methods in turn, assembly members had the chance to reflect on the methods overall.

These notes and discussions didn't tend to raise new issues. However they did emphasise the following points as important to significant numbers of assembly members:

- **A preference for 'natural' solutions** – significant numbers of assembly members said they preferred the first four options, which they felt were more "natural." Some also restated a variety of concerns about carbon storage;
- **The need for a combined approach** – one group of assembly members noted "general agreement that instead of looking at a single solution we need to combine solutions, as well as changing our lifestyles." A significant number of individual assembly members made similar points, including:

  > "Combination of all of them: no single silver bullet. All techniques should work together. I think these should all be part of the broad range of ways to reduce the carbon in the atmosphere."

  > "I feel that all 6 options should be used. The first 4 methods would be dependent on the geographics and should be options at a local level. The options which include capture and storage would be better at a national level."

  > "I think it has to be a combination of different methods on different scales rather than relying on one or two methods."

A small number of assembly members commented more specifically on combining options involving trees and wood. For example:

> "It would be a good idea to combine the tree-based options so it is completely efficient e.g. plant trees and then once they've matured we can cut them down for construction and once we need to take down the building we can use it as bioenergy and use BECCS."

- **A wish to focus on reducing emissions, rather than capturing them afterwards** – for example, comments included:

  > "Need to concentrate on reducing carbon at source rather than capturing it."

  > "The focus should be on producing less rather than offsetting."

  > "We can't just rely on removing carbon from the air we need to change how much we are putting in as well."

  > "I think pursuing the technology of carbon capture through CCS, could make gas emissions seem more solvable, therefore acceptable, when we should be really focusing on using nature, renewables, reduction and change."

There was also a significant, although slightly lesser, number of comments about the **role that BECCS and DACCS could play**. For example:

> “I like the natural solutions as far as possible. Then for the extra stuff we invest in the additional technologies. All of them will be needed.”

> “I believe it is important to start with natural solutions which can start now and as technology matures in carbon capture and storage we then take advantage.”

> “First two solutions – all for it but would like to see investment in the last two.”

> “I believe we should adopt a blended approach at this stage and not depend on any specific solutions. When the CCS technology is more developed and cheaper we could employ more of this. Similar for direct air capture. All the approaches will require international co-operation and incentives to remove greenhouse gases.”

One assembly member raised an additional point, noting that CO_2 can be made into plastics and gravel, as well as synthetic fuels. They suggested that these options are also important for greenhouse gas removals.

Conclusions

Removing greenhouse gases from the atmosphere is a complex topic containing many uncertainties, and yet assembly members' conclusions are in many ways clear and striking.

Four greenhouse gas removal methods received significant support: **forests and better forest management (99%), restoring and managing peatlands and wetlands, (85%), using wood in construction (82%) and, to a lesser extent, enhancing the storage of carbon in the soil (62%).**

These were the options that many assembly members felt were most "**natural**." Assembly members also tended to see these options, particularly the first two, as **having significant co-benefits**. These included advantages around preventing flooding and erosion, increasing biodiversity, access to nature and enjoyment.

Assembly members said they would like the implementation of these methods to be planned and managed well – for example, planting the right trees in the right places, managing forests properly, and minimising risks around the use of wood in construction. They also suggested a need to **think about and support farmers**, particularly in relation to restoring and managing peatlands and wetlands and enhancing the storage of carbon in the soil. **Sustainability**, including an aversion to importing trees and wood also came up a number of times. For some assembly members, thinking about **the balance of land use** was important too.

The more technological or "man-made" options of **BECCS and DACCS** secured lower rates of approval and higher rates of disapproval. 42% of assembly members 'agreed' or 'strongly agreed' that each of BECCS and DACCS should be part of how the UK gets to net zero, while 36% (BECCS) and 39% (DACCS) 'disagreed' or 'strongly disagreed'.

Many assembly members were worried about the risk of **leaks from carbon storage sites.** Many too felt that these options **failed to address the problem**. This was for a variety of reasons, including that they risked "tak[ing] the focus off the amount that we are emitting in the first place" and "kicking the can down the road."

Assembly members also voiced concerns around the methods being **less natural**, their **costs,** and the **unproven nature of the technology**, particularly in relation to DACCS. They noted the **amount of energy used by DACCS** and suggested this might be counterproductive.

Whilst BECCS and DACCS therefore received limited support, some assembly members were keen that further research and development takes place, noting for example that these technologies could perhaps then be used more in the future or that they might be needed to "mop up" remaining CO_2.

In general, there was a feeling amongst assembly members that a combination of greenhouse gas removal methods would be needed.

Covid-19, recovery and the path to net zero

Chapter 10

Summary of recommendations

1 **A large majority of assembly members (79%) 'strongly agreed' or 'agreed' that, 'steps taken by the government to help the economy recover should be designed to help achieve net zero'.** Their rationale included that the government should: limit, or put conditions on, investment in high carbon industries; make the most of the economic opportunities presented by the path to net zero; deal with Covid-19 and climate change together where possible and take advantage of the current opportunities for change.

2 **Another large majority (93%) of assembly members 'strongly agreed' or 'agreed' that, 'as lockdown eases, government, employers and/or others should take steps to encourage lifestyles to change to be more compatible with reaching net zero'.** Assembly members backed homeworking and changes to how we travel, and again noted that this "tough and sad time" presents an opportunity for change. They also saw a key role for government in providing leadership and information, alongside roles for business and local areas.

3 Assembly members **tended to avoid expressing 'strong' views about whether or not Covid-19 and lockdown had made them think or feel differently about the how the UK should get to net zero.**[1] Their comments generally reflected the changed context created by Covid-19 rather than requests for alterations to specific recommendations made earlier in the assembly.

4 Overall assembly members agreed that their thoughts and feelings about the path to net zero in general had changed (62%). They talked about a new sense of opportunity for change, and altered perceptions of what is possible (e.g. what government can do). They also noted lifestyle changes that are already happening. Some highlighted the economic impacts of the pandemic, suggesting for example that they make reaching net zero more difficult.

5 **73% of the assembly members who had looked at 'how we travel' during assembly weekends two and three said that Covid-19 and lockdown had changed their thoughts and feelings about how to get to net zero in this area.** Key themes in their discussions included:

- **Changes happening to air travel**, with some assembly members suggesting that people may continue to fly less;
- **Homeworking** becoming more acceptable;
- **The impact on public transport**, with people currently less willing to use it and questions about whether or not that will last long-term;
- **Increases in cycling and walking**, although some questioned whether these would hold during the winter.

6 **Only a minority of assembly members said that their thoughts and feelings had changed about the other topics discussed prior to lockdown.**

1 They tended to choose 'agree' or 'disagree' in all four relevant votes, rather than 'strongly agree' or 'strongly disagree'.

Covid-19, recovery and the path to net zero

The arrival of Covid-19 in the UK saw an additional item added to the assembly's agenda. At the request of both Parliament and assembly members themselves, space was made for consideration of the changed context for reaching net zero created by the Covid-19 pandemic, and its impacts.

The resulting session took place at the final assembly weekend on 16th May. At the time, strict lockdown measures were in place in all four UK nations.

What did the assembly consider?

Assembly members did not hear detailed evidence on the changed context created by Covid-19. This was partly because of time constraints but also because it was too early in the pandemic for the type of detailed information the assembly had heard on other themes to be available. Instead the assembly heard one presentation from the Expert Leads[2] that provided a series of think points for the assembly to discuss.

The assembly then considered three questions:

1. **Whether or not steps taken by the government to help the economy recover should be designed to help achieve net zero;**
2. **As lockdown eases, whether or not government, employers and/or others should take steps to encourage lifestyles to change to be more compatible with reaching net zero;**

2 The content of the presentation was agreed by all four Expert Leads. It was given by Chris Stark, Committee on Climate Change (informant). An 'informant' is a speaker who we asked to cover the range of views and available evidence on a topic. As with all speakers' presentations to the assembly, a video of the presentation is available at climateassembly.uk/resources/, alongside the accompanying slides and transcript.

3. **Whether or not Covid-19 and the lockdown had made them think or feel differently about how the UK should get to net zero.** The assembly looked at this last question both in general terms, and in relation to the themes on which they had reached decisions prior to lockdown – 'how we travel', 'in the home', 'what we eat and how we use the land', and 'what we buy'.[3] After their discussions, they voted by secret ballot.

Assembly members' views on these questions are significant. There is no other group that is at once representative of the UK population, and well-acquainted with the sorts of measures required to reach net zero.

The assembly's interim briefing and what this chapter includes

On 23rd June 2020 Climate Assembly UK released an interim briefing covering some of its recommendations on *Covid-19, recovery and the path to net zero* in advance of Government announcements on these issues. These recommendations contributed to the Committee on Climate Change's (CCC) Annual Progress Report to Parliament later the same month.[4] The report presented the CCC's advice to Parliament and Government about how the economic recovery from the pandemic can be made compatible with net zero.

Part A of this chapter reproduces this interim briefing, which covered the assembly's views on steps that should or should not be taken around the recovery from Covid-19.

Part B moves on to look at whether or not Covid-19 and the lockdown have made assembly members think or feel differently about how the UK should get to net zero.

Both sections start with the relevant vote results. They then move on to look at the reasons assembly members' gave for their views.

Contents of this chapter

3 Assembly members looked at 'where our electricity comes from' and 'removing greenhouse gases from the atmosphere' after lockdown started.

4 Committee on Climate (2020). Reducing UK emissions: 2020 Progress Report to Parliament.

A. The recovery

Assembly members discussed two questions linked to the recovery from Covid-19:

- Whether or not steps taken by the government to help the economy recover should be designed to help achieve net zero;
- As lockdown eases, whether or not government, employers and/or others should take steps to encourage lifestyles to change to be more compatible with reaching net zero.

After their discussions, they voted by secret ballot.

A.1 Vote results

Assembly members took part in two different votes.

Figure 1

"Steps taken by the government to help the economy recover should be designed to help achieve net zero" (%)

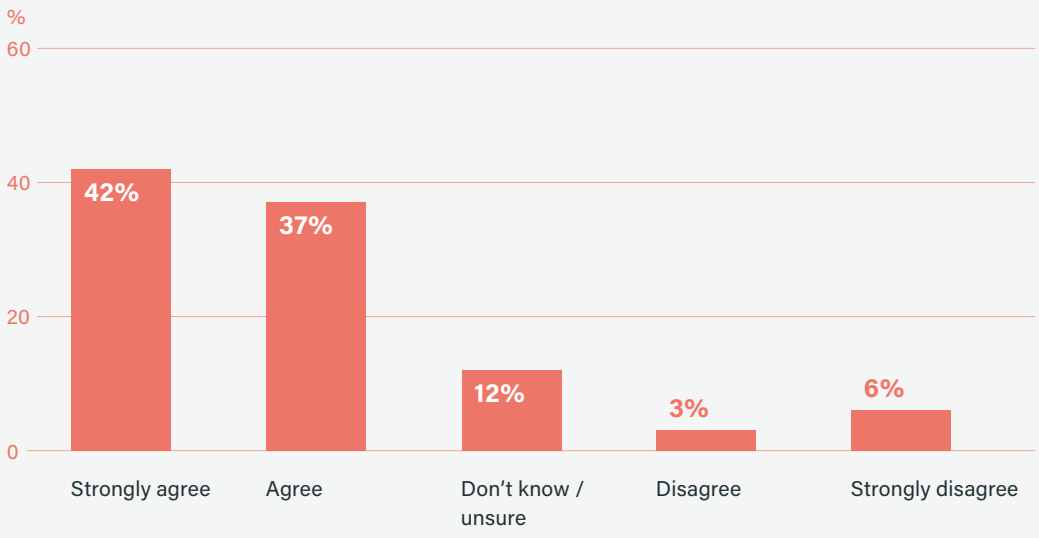
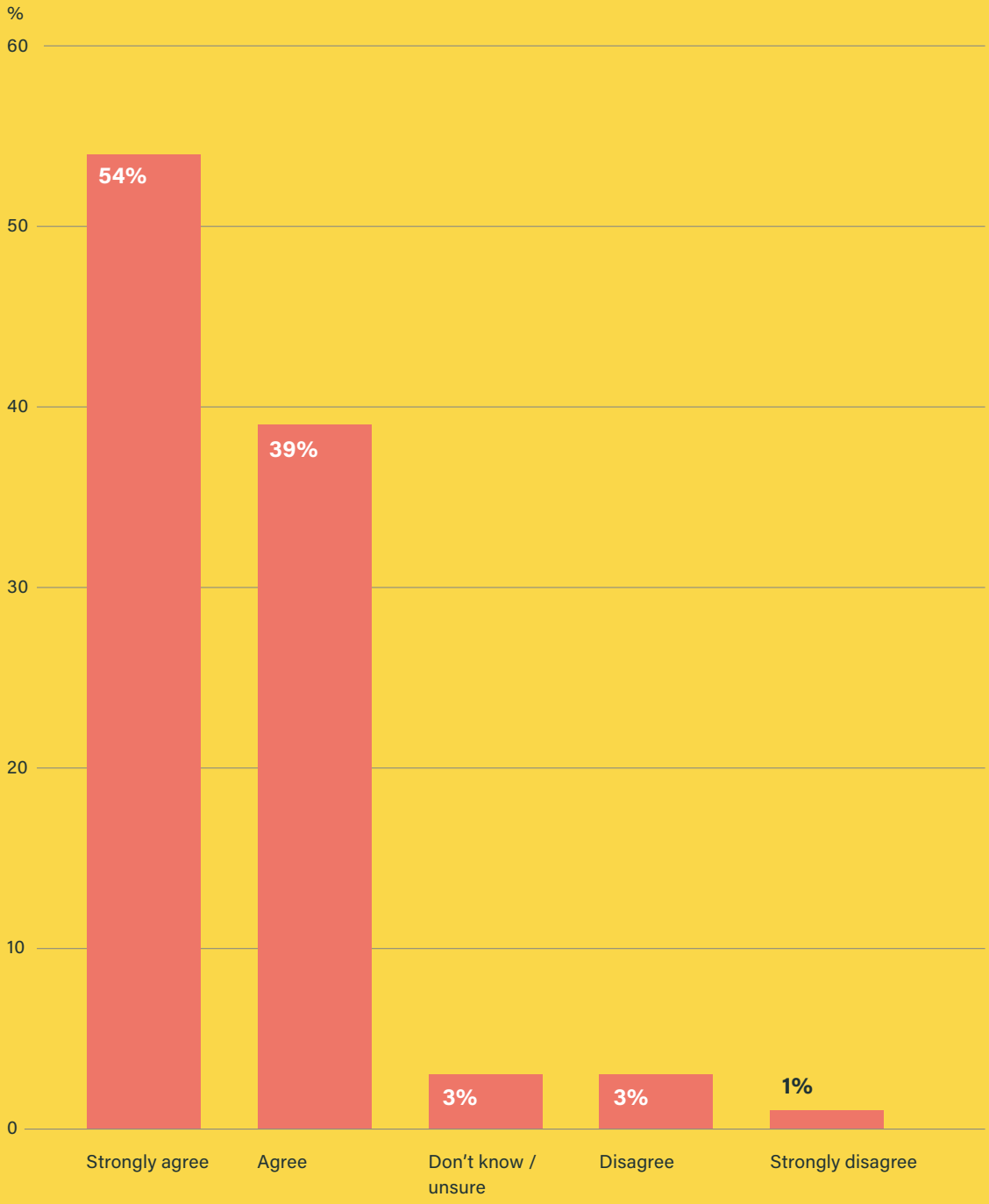


Figure 2

"As lockdown eases, government, employers and/or others should take steps to encourage lifestyles to change to be more compatible with reaching net zero" (%)



A large majority of assembly members (79%) 'strongly agreed' or 'agreed' that 'steps taken by the government to help the economy recover should be designed to help achieve net zero'; 9% 'strongly disagreed' or 'disagreed'; 12% chose 'don't know / unsure'.

A large majority (93%) also 'strongly agreed' or 'agreed' that 'as lockdown eases, government, employers and/or others should take steps to encourage lifestyles to change to be more compatible with reaching net zero (see the graph on the next page); 4% 'strongly disagreed' or 'disagreed'.

A.2 Rationale

Assembly members' discussions prior to the vote shed light on the rationale behind their decisions, as do comments from their ballot papers. The results of the votes (above) show their final decisions.

A.2.1 Steps to help the economy recover

Assembly members started by discussing 'whether or not steps taken by the government to help the economy recover should be designed to help achieve net zero.' We have grouped their comments under seven headings, for ease of navigation.

Limiting or putting conditions on investment in high carbon industries

The idea most frequently mentioned by assembly members was limits to, or conditions on, investment in high carbon industries. Views included:

> "Any money spent bailing out dying fossil fuel industries (the aviation industry, north sea oil) is money wasted on industries that won't survive anyway."

> "I don't think oil or gas companies should be given bailouts, you're wanting to stop them anyway, so why support them – support the people who work for them but not the companies – that's because they aren't compatible with net zero."

> "Shouldn't actively fund the worst offenders."

- “Yes opportunity to apply some pressure to industry and incentives must not prop up old systems.”
- “[Provide an] incentive to manufacturers to go into green products, minimal support if not green.”
- “Net zero should be one of the things that the Government is looking at for the economic recovery, alongside other things. For example, when negotiating bail outs or investment, ask for companies’ carbon footprint or put in place net zero requirements.”
- “Depends on what big industries survive this – they’re going to ask for a lot of money. Government shouldn’t give it too easily. Should have conditions which are green related along with any bailout. Air France agreed to climate change regulation – that’s a good way to do it. One condition would be to get industry to invest in particular technology.”
- “It would be too easy to just carry on as before and to take advantage of cheap oil and other special offers e.g. cheap travel, cheap clothes, factories churning out cheap goods to ‘get the economy going’. We need incentives to reduce emissions, to improve [the] quality and longevity of products. We need penalties for people who do not consider the environment when building or rebuilding businesses.”
- “Assist companies who provide climate enhancing services and not climate harming services.”

Some assembly members disagreed with the above or added caveats. For example:

- “Where strings can be attached, do. But…support the economy in areas which lose jobs, like should have happened with the coal mines.”
- “Retraining is important.”
- “Some worry about highly trained people … aviation: how are they going to find jobs.”
- “You may have to bail out some industries that are less green in the short term, so that you can invest in greener areas in the longer term.”
- “It [helping to get to net zero] should be a factor but not the be all and end all. To rule something out just because it doesn’t help net zero is too extreme – e.g. letting airlines go to the wall.”
- “All industries have a right to succeed and people have a right to be employed.”
- “Bailouts may be a necessary evil otherwise the economy will fail. We need to support what we have in order to survive.”
- “Some fossil fuel sectors bring in a lot of money so it’s hard not to support them.”
- “Bail outs are helpful for small business.”
- “Concern about knock-on effects on supply chains – airports etc.”

Some assembly members made different but related points, for example:

- “Avoiding lock in of fossil fuel use [is] key – best chance to do this is now to avoid going back into the trap of fossil fuels again. That would be disappointing.“
- “Because oil is cheap – put a tax on oil.”

Rethinking and investing in infrastructure

One of the most frequently made points related to rethinking and investing in infrastructure. Some comments here were general, for example:

> "This is an opportunity to rethink infrastructure practically and in a net zero friendly [way]."

> "Government must steer in the right direction, with the right objectives – after emergency, focus is on infrastructure. So this is a prime time for Government action, and for the right investment in the right places."

Others noted more specific ideas – for example, around building insulation, offshore wind, e-vehicles and related infrastructure, broadband, cycling, solar for new builds, safer public transport (e.g. "taxis that have screens and hygiene security'), batteries for energy storage and online libraries to facilitate home study. A small number of assembly members mentioned types of infrastructure where they would not want to see investment – for example "less road building", "no new airport runways."

Supporting low carbon industries

Some assembly members said they would like to see investment in low carbon industries. Overlapping with the points made about infrastructure, assembly members mentioned sectors including the renewables industries (e.g. "Government should bring back incentives for renewables"), "development and deployment" of electric vehicles (e.g. "make them cheaper but allow people choice"), and heat pumps. Other related points included:

> "If people [members of the public] are shorter of money they're not going to be able to do that [invest in steps that help get to net zero]. Interest free loans? Costs coming down?"

> "Feels [like] government should bail out companies with green plans, and in turn their taxes will fund the government."

Reaching net zero is an economic opportunity

Some assembly members suggested that there are economic opportunities on the path to net zero. Views included:

> "It's not an either-or matter [economy – climate change] can spend on technologies like wind turbines, for example, that provide jobs and help the economy to recover."

> "Investing public money – everything we do in terms of net zero has got to be approached from an economic point of view i.e. it needs also to help bring money into the country as much as help to reach the net zero target – and this is possible in spending on projects such as renewable technologies and being able to 'export' the knowledge and technology to others."

> "It's an opportunity to encourage new businesses, kick start with renewable energy businesses to get to net zero."

> "Use this to our benefit – mix together economic recovery and achieving net zero to get what we need."

> “Yes – it’s a perfect opportunity, create new work for job losses, new skills for example in turbine installing and manufacturing and make them in this country.”

> “Any investment in things like wind turbines not only help us get to our net zero target, but it creates jobs and spends the money in the UK which gets money flowing in the economy and helps us both create jobs and increase demand side spending. This is a win/win situation.”

> “We need a green industrial revolution.”

Tackling Covid-19 and climate change together

On a similar theme to the last heading, some assembly members said they didn’t feel a choice needed to be made between dealing with the current situation and meeting climate targets. Comments included:

> “Feels that climate change is as big a crisis as Covid-19, e.g. wild fires across the world, famine, air pollution. Don’t want the government to put climate change on the back burner because of Covid-19.”

> “With planning and a bit of structure we can tackle both climate and Covid-19. We shouldn’t go back to where we were before.”

> “Yes, we should integrate our recovery with green steps, because it’s do-able.”

> “Well it seems pretty silly to try [to] save the economy whilst shirking from problem solvers [albeit]…because of the costs. I understand we need to hopefully tackle this economic crisis, but it would make sense to incorporate both issues into one as we have made an agreement to hit net zero as that is beneficial for the future. I don’t want to be known as a coward when faced with these issues, and bury my head in the sand. It just doesn’t make the issues change or go away.”

Others emphasised the continued importance of the net zero target, saying for example:

> “I am very concerned that the Covid-19 pandemic will push the net zero target further down the agenda of public policy and this should not be allowed to happen. Net zero should be at the forefront of the policy priorities going forward and should be woven in to each aspect of the recovery. The benefits of doing this (and the risks of not doing this) should be emphasised to the public at every opportunity so that individuals and employers … also make the best decisions when returning to ‘normal’ life.”

Taking the opportunity for change

Some assembly members felt that the current economic challenges presented an opportunity to do things differently. Rationales included:

> “It’s the way back – economy has to restart, government has an opportunity where people are waiting to get back to normal. There’s not [an] other better time.”

> “Biggest investments were made after the war (i.e. another time when economic recovery was needed) – fundamentally changed things e.g. education, health, housing. Massive investment but it was needed to push us in the right direction.”

- “The Government is being forced to think up the best way forward so [it] can incorporate new ways of thinking.”
- “The public is learning how to deal with change and we should take advantage of this developing attitude to introduce and enact the substantial changes that will be required.”
- “It’s a good opportunity to try to change attitudes.”
- “There is a current public consciousness to climate change and people will be more accepting of change after an event which had such a devastating effect on the global economy and society.”

Caveats, uncertainty and disagreement

Assembly members who chose ‘unsure / don’t know’ in the vote, made the following points on their ballot papers:

- “The government needs to get the economy back up and running. Climate change should not be put on back burner until [the] economy picks up. It should be addressed and preferably integrated into our recovery”
- “In an ideal world yes. I am sure they will have to help business get back on their feet first.”
- “The country has to be successful for its citizens to thrive so this has to be balanced.”
- “This really depends on how long the current situation lasts and the state of the global economy when things improve.”

Assembly members who ‘disagreed’ or ‘strongly disagreed’ that ‘steps taken by the government to help the economy recover should be designed to help achieve net zero’ made the following points on their ballot papers:

- “Again, this will not happen as there is going to be a catastrophic depression that will change matters.”
- “This will only hinder the recovery.”
- “I do not think that [the] steps government takes to help the economy recover should be specifically designed to help achieve net zero. If support is needed and it does not meet the requirement of achieving net zero that should not mean it is disregarded. Many more factors should be considered when this decision is made.”
- “I think coronavirus is a real crisis, and the steps taken to deal with it have been severe. I am not convinced that the climate ‘crisis’ is in comparison a real crisis, and I think it is in many ways a confected crisis. I do not think the science is ‘settled’ with regards to the impacts of man, and our increasing CO_2 emissions on the global climate, although I do believe we each have a personal responsibility to live our lives as sustainably as possible. In this regard, I do believe the government can play a role, and positively encourage us to take personal responsibility to live our lives more sustainably. In addition, I think we have to be realistic on what as a nation we can achieve. As far as the UK is concerned, we only contribute around 1% of global CO_2 emissions, so the priority should probably be on rebuilding our economy post coronavirus, as opposed to inflecting greater economic self harm through expensive green initiatives, that will have negligible benefit.”

Five assembly members who 'agreed' that steps taken by the government to help the economy recover should be designed to help achieve net zero noted **caveats** on their ballot papers too. These assembly members said:

> "Balancing action – there will be a need to formulate a path that will aid the economic recovery."

> "Agree, but possible to over-do it. A balance needs to be kept."

> "…but not in any way that risks the recovery."

> "Obviously there should be a focus on balancing the budget and reducing the deficit first. Keeping interest rates low to not crowd out private industry and to try and restore jobs lost. The government should initially encourage a market-led approach in this time with changes to regulation and after recovery focus on government led infrastructure projects."

> "If the opportunity arises to help the economy recover and also to achieve net zero, then the government should take it. However as the country is likely to be in a difficult financial position, it should think carefully before investing in anything and ensure the results will be beneficial."

Some assembly members also raised caveats during discussions. For example:

> "We're not a nanny state, government shouldn't tell us what to do. But incentive should be there, just not dictating."

> "Personal responsibility is key."

> "Feels economy will get much worse before it gets better. There's so much uncertainty around Covid-19 and still need to wait and see."

> "Not keen on big schemes right now as they may not be used a lot after this is over."

A.2.2 Steps to encourage lifestyles to change

Assembly members discussed what should happen as lockdown eases. Specifically they considered whether or not 'government, employers and/or others should take steps to encourage lifestyles to change to be more compatible with reaching net zero'. We have grouped their comments under six headings, for ease of navigation.

Encouraging homeworking

Homeworking was one of the most commonly mentioned themes. Assembly members' views included:

> "Homeworking is brilliant – less traffic, less flights, quicker – government has to encourage it somehow either with incentives or penalties."

> "As employers have adapted by helping workers to work from home where possible I feel this should be encouraged."

> “For people who can work from home, and have been able to demonstrate that they can still be productive, companies will be more willing to allow this to continue, and this will reduce the volume of traffic / emissions on our roads. The government could send encouraging messages in this regard.”

> “I think especially for businesses they can encourage lifestyle changes through working from home and therefore less commuting. This would help with a reduction in driving and surface transport. It may also mean office spaces can be smaller and therefore businesses will be less polluting in the resources they use.”

> “Companies could have smaller offices, smaller heating, air conditioning and energy bills. They could use these savings to give extra benefits and incentives to their employees to help insulate and heat their homes and pay for the changes that may be needed to reach net zero. This could be a tax free Government backed initiative.”

> “I don’t think it should be forced. No one should tell people what to do, or never to go back to work, but I think people should have the options to work from home and travel less.”

> “The lockdown has proven that in the modern world work doesn’t have to fit such a robust schedule, particularly in white collar jobs. It is very very possible to continue a remote working world to permanently ease congestion and improve life quality.”

> “Homeworking should be encouraged: saves time, less commuting; businesses having seen it is possible; it won’t be hard for people to adapt to; I’ll be able to get a dog!”

Encouraging changes to how we travel

Assembly members also frequently mentioned changes to how we travel, particularly in relation to: (1) encouraging and incentivising cycling, making it safer and providing proper infrastructure; (2) a reduced need for business travel, particularly flying. Assembly members’ views included:

> “People should be encouraged to continue walking, running or cycling every day, and this hopefully would cut down on the use of cars for short journeys.”

> “This will require the government and employers to work together to ensure that everyone can go about their lives safely. This will mean massive investments in bicycle networks and walkable city streets. This will allow people to move safely, as well as lead to a healthier population and workforce who will be better able to fight the virus.”

> “Cycle to Work scheme is for health and the environment. Yes, the government should do things. There’s a mandate to do so. They can’t use [the idea that we won’t listen] as an excuse now, people do listen, especially if the incentives are good.”

> “…government should encourage businesses to consider remote video calls/working rather than regular domestic / international business flights, which they’ll probably begin to do anyway as in the future it may not make financial sense to fly in the way they have been doing before (less airlines operating means less choice, means potentially higher costs)…”

> “I think that an employer or the government might look at video conferencing rather than flying or staying overnight in a hotel as a cheaper option which might also help climate change. This should be encouraged if it will also help in reaching net zero.”

> “It would be a missed opportunity for the government, employers and individuals [to] not take advantage of our aim to achieve net zero as lockdown eases. Everyone has had to adapt to a different lifestyle and certain elements of the lockdown – travelling by land and air – should see a permanent reduction if we change our working practices and how often we really need to take flights.”

Taking the opportunity for change

Assembly members recognised that Covid-19 has created a “tough and sad time” and several have been severely personally affected. They did however also note an “opportunity” for change in both lifestyles and how the economy works. Assembly members who voted ‘strongly agree’ made this type of comment frequently:

> “There is a great opportunity to restart the economy on a greener pathway and such chances should be seized upon.”

> “Because there is going to have to be big changes for the economy to recover and if we can tie net zero aims into everything that happens on this then it is a great opportunity”

> “A huge mind-set change has occurred. This is an ideal opportunity to incorporate the assumption that any changes implemented should be compatible with n[et] zero.”

> “Change has already begun which is a first step and can be built on.”

> “Now is the time when people are ready to adapt. It’s harder to get people to adapt when they are stuck in their ways.”

> “People have seen how it is not that difficult to make simple changes like work from home more often so this is the best opportunity to introduce changes that will help us reach net zero.”

> “We have momentum, there is an opportunity to change things for the better during this time of adjustment and flux. This is a window that we must use before people become weary of more change and exhausted by further upheaval.”

> “It’s important that we utilize this period of transition and inactivity in certain sectors to reinvent the way our country functions in order to make it more environmentally friendly.”

Some assembly members also described the current situation as a “huge wakeup call.” Related comments included:

> “Covid-19 has been a salutary warning that homo sapiens are not in total control of the environment and are not omniscient.”

> “Think it [net zero] should be at the centre of government policy. It’s about flexibility – you need to be prepared for things that are looming. We should start early and make the most of the momentum.”

Others said “it’s the only way to achieve net zero”, “it’s better for everyone if we embrace it”, or asked “why on earth wouldn’t they.”

Providing leadership and information

Many assembly members also made suggestions about roles. In terms of the **Government's role**, comments included:

> "Has to be an onus to do this – some businesses will change, but many will be focused on the bottom line. Has to come from the Government, plus people power / public support. A quiet revolution."

> "Government needs to shape the narrative."

> "Government are going to have the largest impact on people's lifestyle, so they need to take the lead. And they are the ones who can invest in new ways of doing things to stimulate demand for it."

> "The government needs to start somewhere – a mix of government and private investment beyond us just all doing our bit."

> "This is an opportunity to get people to change, and it is important for government to lead that change."

> "That's why we have government! We expect them to guide us. I hope they'll learn from the pandemic."

Some assembly members also made comments about **information provision**, for example:

> "Government could communicate with every household the way they've done with coronavirus."

> "Government should inform all households of ways to change lifestyles to aid [the] environment."

> "The coronavirus crisis has shown that the public will respond to changes if they have sound, clear and trustworthy information and explanation as provided by our scientific advisers throughout the epidemic."

> "Employers can reduce overheads by people working from home (and meeting from home instead of flying round the world), and the government should build on people's experience of being advised by regularly promoting this message."

Assembly members also talked about the **role of businesses.** Some suggested changes that businesses could make, for example "provid[ing] incentives to work from home" or "provid[ing] showers/changing rooms so people can cycle to work and tidy themselves up afterwards." Others suggested that change was in businesses' interests because they "will want to reduce overheads" or because they "already value their environmental reputation." Some felt that change is already underway:

> "Experience is that all talk between [the] business and [the] trade union is about how [they are] going to do things differently around this."

Others said there "is no reason not to when they have been able to manage so far e.g. less business travel, more homeworking" or that "even if 30% of businesses make a change, it could make a difference." Some suggested that there is a need for government to incentivise change

or an "opportunity for government to advertise to business [the] benefits of being greener e.g. reducing travel."

Some assembly members said that we "need to concentrate on **local change**, as well as national" or that "Government should [take steps to encourage lifestyle change], and local authorities too. People did take notice [during the lockdown] so they do have influence and people will listen [to them]."

Points made less frequently

Points made by smaller numbers of assembly members included the following.

Encouraging healthier lifestyles

Some assembly members felt that steps should be taken to encourage healthier lifestyles, with some noting that conditions like diabetes and obesity put people more at risk from Covid-19. These comments tended to focus either on transport – for example "encourage walking / cycling which is good for the public health where it is possible to do so" – or diets:

> "Now is a really good chance to tie-in the way we eat with net zero, obesity etc, prevalence of take-aways, how badly we eat in this country, how much we waste."

Supporting individual choice and differing needs

Some assembly members talked about the importance of allowing individual choice and catering for different needs. Comments included:

> "Leading by example but the reality is that it's in an individual's choice – to follow or not – giving the opportunity to help individuals to make the right choice by providing all the information / resources to make those choices."

> How changes are introduced is key and need to find a balanced approach that recognises the needs of different people – cannot be one size fits all."

> Feel like there'll be two halves – those who are able to make these changes to how they work (conference calling etc and this will also open up job opportunities for those who otherwise would not be able to – physical limitations) and then there are those whose lives are linked to social interaction e.g. a yoga teacher who needs to interact with their participants, or teachers in schools – hard to socially distance in these settings. Or for those for whom social interaction is important for their mental health and wellbeing. These sorts of circumstances will have a bearing on how people change or not. Needs an awful lot of thought to what is possible or not possible and both have to be solved mutually – one cannot be to the detriment of the other."

> These should only be suggestions, and incentives to encourage a lower carbon footprint."

One assembly member said that change should be "encouraged yes, forced no."

Providing incentives

Some assembly members said there should "100%...be incentives/penalties – people won't do things just by themselves. If everyone is doing it then people will do it – if it's clear for people to follow." Similar comments included:

> Need incentives to encourage people to do the right things – what's in it for them?"

> But will have 'to bribe people' e.g. enhanced bike to work schemes and make it really obvious and easy."

> Many people want to change but will be carried along by others who do not understand or who are not aware of the impending problems."

Promoting green industry and jobs

Some assembly members suggested this is a "great opportunity to push green industries, new industries – focus on these in the future and not go back to dying industries. And for those who have lost jobs provide the means to re-train and gain jobs in these areas." Others mentioned specific industries that they would like to see supported, or suggested that "if businesses [are] not green then government should not help them but find other ways for people to be employed."

Disagreement, uncertainty and caveats

A small number of assembly members **disagreed or strongly disagreed** that 'government, employers and others should take steps as lockdown eases to encourage lifestyles to change to be more compatible with reaching net zero.' These assembly members said we need to "make plans for long term changes", that "we have come out of "Total Lock-Down' too soon" or that it "will not be foremost in their [government, employers] expectations." Some assembly members also felt strongly that it was too early to be discussing what should happen next at this stage of the pandemic.

Assembly members who voted **"don't know / unsure"** said:

> At the moment the focus will be on tackling the virus and finding a vaccine. As we regain control though, the government should assess and plan what changes need to take place."

> “It is very difficult to say if governments, employers or others should change as it depends on how they were acting before and governments and employers don’t necessarily have the same opportunities to make changes.”

> “This really depends on how long the current situation lasts and the state of the global economy when things improve.”

Assembly members who agreed that government, employers and others should take steps to encourage lifestyles to change also had **some caveats**. Individual assembly members said they “agree, but possible to over-do it. A balance needs to be kept” or “only where it makes economic sense. The economy must take priority over the global CO_2 agenda.” Other individuals said it “should not affect reductions in people’s incomes” or that we need to “be careful how we do it because the economy is in rough shape. Unemployment needs addressing in the short term.”

Conclusions – the recovery

A large majority of assembly members (79%) ‘strongly agreed’ or ‘agreed’ that ‘steps taken by the government to help the economy recover should be designed to help achieve net zero’. When giving their rationale, assembly members most frequently recommended that the government:

- Limit, or put conditions on, investment in high carbon industries;[5]
- Rethink and invest in infrastructure;
- Support low carbon industries;
- Make the most of the economic opportunities presented by the path to net zero;
- Deal with Covid-19 and climate change together where possible;
- Take advantage of the current opportunities for change.

Assembly members who were unsure or who disagreed with the statement tended to emphasise a need to focus on economic recovery first and foremost.

Another large majority (93%) of assembly members ‘strongly agreed’ or ‘agreed’ that, ‘as lockdown eases, government, employers and/or others should take steps to encourage lifestyles to change to be more compatible with reaching net zero’. Assembly members’ rationale included:

- A desire for government, employers and/or others to encourage homeworking and changes to how we travel;
- A feeling that the current “tough and sad time” presents an opportunity for change that should be taken;
- A suggestion that the government should provide leadership and information, alongside roles for business and local areas.

5 This was both the most frequently given rationale and the most controversial.

B. Impact on the assembly's thinking

In the second half of their discussions, assembly members considered **whether or not Covid-19 and the lockdown had made them think or feel differently about how the UK should get to net zero, and why**. Assembly members discussed this question:

- In general;
- For the themes on which they had reached decisions prior to lockdown – 'how we travel', 'in the home', 'what we eat and how we use the land', and 'what we buy'.

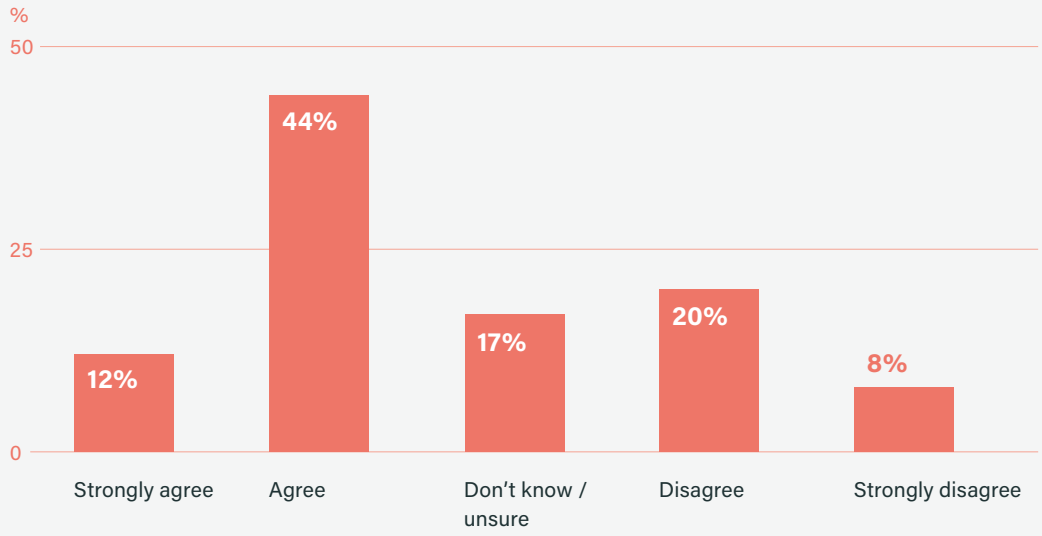
After their discussions, they voted by secret ballot.

B.1 Vote results

Assembly members took part in four different votes.[6]

Figure 3

Thinking about how to get to net zero in general, how much do you agree or disagree with the following statement: "The experience of coronavirus and the lockdown has made me think / feel differently about how the UK should get to net zero" (%)



6 All assembly members took part in the vote about whether Covid-19 and the lockdown had made them think or feel differently about how the UK should get to net zero *in general*. For the other three votes, just the assembly members who had looked at the relevant theme in detail participated. So, for example, only those who had examined 'in the home' in-depth voted on whether their views on heat and energy use in the home had changed.

Figure 4

Thinking about how we travel, how much do you agree or disagree with the following statement: "The experience of coronavirus and the lockdown has made me think / feel differently about how the UK should get to net zero" (%)

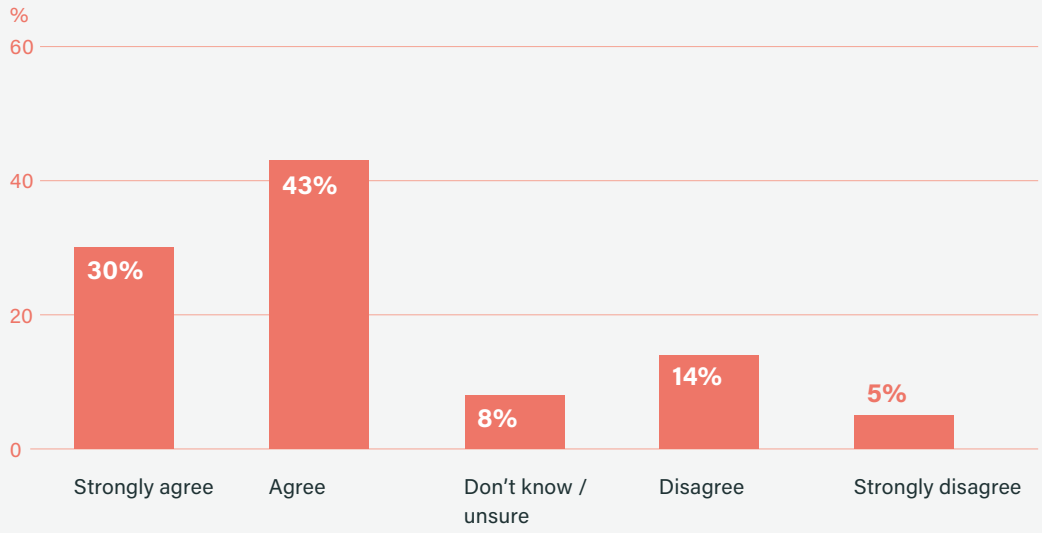


Figure 5

Thinking about heat and energy use in the home, how much do you agree or disagree with the following statement: "The experience of coronavirus and the lockdown has made me think / feel differently about how the UK should get to net zero" (%)

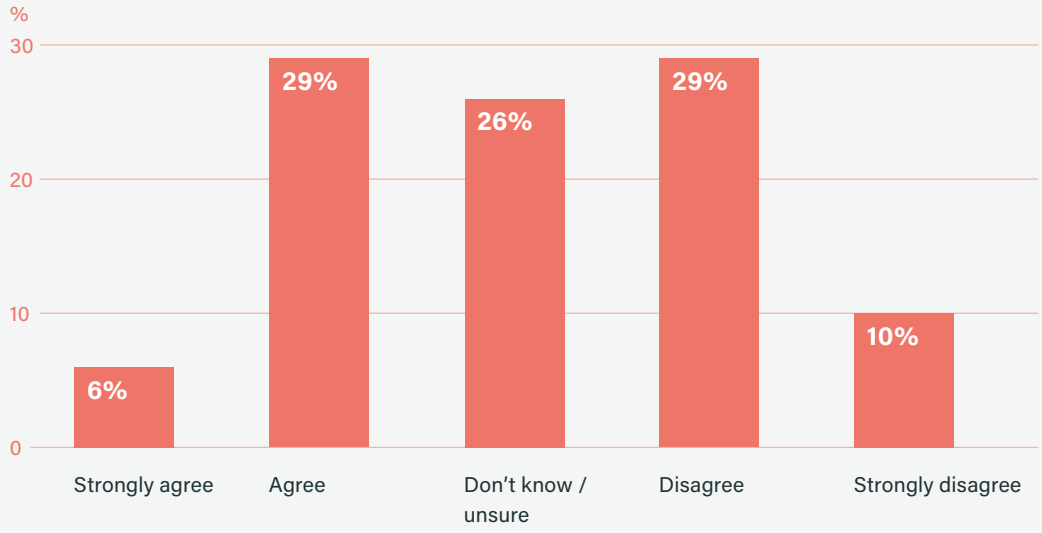
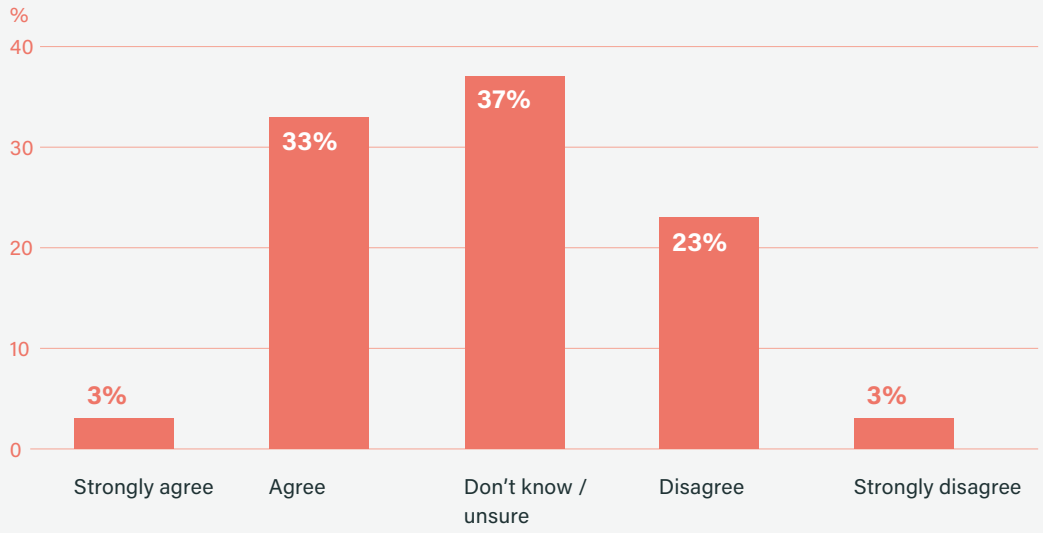


Figure 6

Thinking about food, farming and land use, and what we buy, how much do you agree or disagree with the following statement: "The experience of coronavirus and the lockdown has made me think / feel differently about how the UK should get to net zero" (%)



Assembly members tended to agree that Covid-19 and the lockdown had made them think or feel differently about the how the UK should get to net zero *in general*: 62% 'strongly agreed' or 'agreed' that this was the case; 28% 'strongly disagreed' or 'disagreed'; the rest choose 'don't mind / unsure'.

However the impact on assembly members' thoughts and feelings varied by topic. The **biggest impact was on views about 'how we travel':**

- 73% of the assembly members who looked at this topic said that Covid-19 and lockdown had changed their thoughts and feelings about the path to net zero in this area;
- 19% 'strongly disagreed' or 'disagreed' that this was the case;

For the other topics, a minority of assembly members said their thoughts and feelings had changed. Assembly members' views on heat and energy use '**in the home**' were the least affected:

- 35% of assembly members reported that their thoughts and feelings about the path to net zero for heat and energy use in the home had changed;
- 39% 'strongly disagreed' or 'disagreed';
- 26% said they 'didn't know' or were 'unsure';

For assembly members looking at **'what we eat and how we use the land'** and **'what we buy'**:

- 36% said their thoughts or feelings about how to get to net zero in these areas had changed;
- 26% 'strongly disagreed' or 'disagreed';
- 37% 'didn't know' or said they were 'unsure.

Across all the votes, **assembly members tended to avoid expressing 'strong' views,** choosing 'agree' or 'disagree' rather than 'strongly agree' or 'strongly disagree'. This may reflect the uncertainties and emerging nature of the current situation.

B.2 Rationale

Assembly members' discussions prior to the vote shed light on the rationale behind their decisons, as do comments from their ballot papers. The results of the votes (reported above) show assembly members' final decisions.

B.2.1 In general

Assembly members began by discussing ways in which their thoughts and feelings about how to get to net zero *in general* had or hadn't changed, and why.

Ways in which thoughts and feelings *had* changed, and why

We have divided assembly members' comments into ten overlapping categories to make them easier to navigate.

A wake-up call

Some assembly members said that Covid-19 "has been a bit of a wake-up call – we'd got complacent that bad things don't happen." Thoughts included:

> *"[I] realise it's much more important [now] – this catastrophe is easier to deal with than climate change."*
>
> *"Learnt that delay is dangerous – it will hurt us if we do not act."*
>
> *"Covid-19 has shown the old ways of thinking and doing things are not going to work anymore, and this has been a wake-up call that how we've been living isn't sustainable."*
>
> *"Believe even more strongly that we need to do something and not be unprepared for the climate crisis."*

Some assembly members highlighted the **visible changes to the environment that have happened during lockdown:**

"Seeing how excited people have been about wildlife popping up in different places / dolphins in Venice – ... maybe this is a way of encouraging people to make the changes needed."

"More obvious to me how much the environment is affected by emissions e.g. clear blue skies we've had. Even the clouds are brighter. The lack of traffic and cars."

"Challenge to climate change deniers because climate change is usually invisible – but has now been made visible. So [we] need to carry on some of the changes."

An opportunity for change

Some assembly members talked about a sense of opportunity. Some assembly members made **general observations** saying "it's a great opportunity to grasp the nettle" or "it's an opportunity to shift." Comments included:

"The world is going to be completely different, we just have to adapt and adjust – we cannot accept normal being as it was – this is an opportunity."

"Covid-19 is an opportunity to start things in a completely different way, a fresh start, rather than going back to the way we've been operating before."

"It's an opportunity for Government to move forward faster. Young people are talking about our environment; they are affected and they can see the difference. Mustn't go back to the way we were. Grasp the opportunity, take the good out of the bad. Keep people onside and bring them with you."

Some assembly members' comments were more specific:

"This is an opportunity to continue on with massive investment.... Introduce a climate emergency department that works closely with industry to develop new technologies/ approaches."

"Feasibility of large infrastructure has increased."

"Chance to redevelop the social structure in an environmentally friendly way."

"Opportunities to 'nudge' behaviour."

"We can incorporate green changes into our recovery from coronavirus. It doesn't necessarily require grand investments. Making small changes in our homes will be easier than changing the way we travel. Feel we should be making gradual steps anyway. The door has opened to this."

Some assembly members reported that they now "feel more **hopeful** [about tackling climate change]":

"Shows how quickly change can be implemented if there's a will. Has given hope that we can make quick changes. Feels like it might be possible to achieve net zero. Has made me feel more positive."

"Are [we] seeing the first shoots of a possible future world."

Others said that "significant change seems more likely" or that "totally unexpected things can happen."

What government can do

Some assembly members reported changed views about what government can do:

"Much more is possible now than what I had thought beforehand because it's shown that things can be done. Just seeing what the government has agreed to...."

"How quickly Government can act when needed – shows that change is possible."

"Ability of Government to act on scientific advice"

"There is a magic money tree."

"Government can make radical changes when necessary so maybe [they] need to make similar sweeping radical changes to the climate change agenda too. See climate change though the same lens as Covid-19 (an emergency). [I] feel it's far more realistic that we can begin making vast changes now; introduce them now as we've got used to a very different way of life anyway."

People's willingness to change

Some assembly members suggested that **"people have more willingness to change now"** or said they had had been surprised by people's willingness to change. Views included:

"Think [the] response from [the] public to [the] changes required to reduce emissions will be easier – they'll now be more open-minded to change."

"We're at a brink where we can change individually – think differently about what we need in our lives."

"It's made people reassess what is important."

"The lockdown will help with lifestyle changes: it's shown what is possible."

"People are willing to do things and the government is telling us what to do. People are more willing than I thought they would be."

Relatedly, some assembly members **talked about the role of information in making change possible:**

"Shows good leadership and information can make change happen."

"Shows [the] impact of top down messages."

"People will act differently if they know why"

"More important to make people aware of [the] impending climate crisis – [we] can work together if we feel threatened."

"Coronavirus – daily reports – crucial to do the same for climate change."

"It's more about reinforcement of the message/issue – media coverage – so much on Covid-19. [What] [i]f that model can be used for that level of coverage – e.g. daily carbon tracker on where we are in terms of heading towards net zero."

Lifestyle changes that have already happened

Some assembly members talked about **lifestyle changes that have already happened**, and suggested that they had altered their thoughts or feelings. Some focussed on **health** or **mental health**:

"The kids are really healthy."

"Kids are more relaxed, and love learning at home."

"Stress and mental health impacts of coronavirus, plus loss of jobs – siege mentality, building walls – will affect how we approach climate change / the society we live in when we tackle climate change."

"[We need] more focus on resourcing mental health support [around changes like this]."

"Can't see the grandparents in England; the lockdown has a very emotional and personal impact."

Some assembly members highlighted changes to **what we buy and how we buy it** as impacting on their views:

"Buying locally – farm shops are becoming popular."

"Shopped in local shops instead of supermarkets. Only used the car once a week. Don't want to use the car anymore. [...] You become smarter at doing things. Our overall consumption has been reduced. Not spending as much money at all."

"Shopping habits have changed and will stay (e.g. transition to once a week shop)."

"People have realised they don't have to go shopping every day and drive their car, although behaviour is already starting to revert back to what it was before lockdown."

"Focus more on children and schools, especially reducing what we want / buy – more urgent to do this now than before."

Some assembly members mentioned the influence of changes to **what we eat** or the **energy we use** on their thinking:

"People are more interested in food. This is linked to working from home. People used to go out to eat for lunch. There could be implications for healthy eating. We are eating lunches now as a family."

"It has been a good way to show people how to reduce their impact, for example not wasting food when making meals."

"People [are] at home and cooking more."

"We are using more gas and electric at home for cooking."

"We are using more electricity at home. We don't know what the future holds. There will be change, but not sure what exactly."

One assembly member said **"if this is how my lifestyle needs to change, then I don't want it."**

For a fuller discussion of assembly members' thoughts on these issues, please see:

- Section B.2.3 on heat and energy use in the home, page 520;
- Section B.2.4 on 'what we eat and how we use the land' and 'what we buy', page 524.

Commuting and homeworking

The most frequently mentioned way in which assembly members said their views had changed related to the shift from commuting to **homeworking**:

"Finding working from home doable and therefore flying, driving or trains for meetings [are] not necessary."

"Working at home is nice: we go for walks with the family. Let's fix the world! More clear that we need to sort everything out."

"Working from home could be implemented by a lot of companies."

"People and businesses have adapted to a new world, e.g. shown that we can work from home, e.g. twitter staff will now be working from home."

"It has shown that working from home is more viable. It can support a transition to more homeworking."

"Reducing emissions from commuting is important and people have been making compromises."

"Views have changed: changes in transport behaviour [are] very good – reduction in emissions – thin[k] a lot of it will stick – people have more time now as well, not having to commute."

"Coronavirus is going to be here for a long time, people will keep working from home – people might move out of cities as they're expensive ... – reduced congestion in cities...."

Some added that "there is a psychological impact currently, but take away the pandemic and working from home will be a positive change." Others said "companies will be able to save money on rental costs and energy bills" or that "Government should continue to push the message regarding working from home."

For a fuller discussion of assembly members' thoughts on these issues, please see Section B.2.2 on 'how we travel', page 514.

How we travel

In addition to comments on homeworking, some assembly members talked about other aspects of how we travel and changes to their thoughts or feelings. Comments about **aviation** included:

"We can't fly. I would normally fly 3 times a year to go on holidays, but this lockdown has made me think about flying."

"[I] feel a bit different to others. Feel this is going to be the death knell of the airline industry and probably public transport as well (not sure if people will use it to the same extent as before due to on-going concerns of the impact of being in close proximity to others). [I] feel people will think climate change is a luxury, a nice to have, but actually we need to get the economy going in some way and pay off the debts that we've all racked up. So, I don't feel as positive as the others."

"We were expecting airlines to pay for new technologies, but they may not be able to afford to invest in these technologies."

One assembly member who farms and owns holiday cottages noted that "bookings have gone through the roof – people holidaying in the UK, in the countryside in much greater numbers than in previous years." Others said that the "aviation industry will take years to recover, and people may end up holidaying in the UK."

On cars, some assembly members talked about the "impact of low petrol prices because the government won't want to increase taxes and people feel that the car is safer." Others said they were "worried that the government is telling us to use our cars" or said "it is important to reflect on the changes e.g car usage has come right down, which is great. We don't travel as much, but concerned about the next few months, especially when the weather turns bad, which will push people back into their cars." Some noted "reduced congestion" or said we should "aim to maintain the reduction in travel."

On **walking and cycling**, some assembly members talked about an "increase in cycling", "pedestrianisation of town / city centres" or a "heightened belief amongst people that there are alternatives – e.g. cycles, scooters, cycle lanes." Some cautioned that "in any alternatives, be aware of sectors of society that might be disadvantaged by that uplift (e.g. visually impaired people and electric scooters)."

Some assembly members said that they "now feel more strongly that we should invest in low CO_2 **public transport**", or that "more can be done now about travel – trains and changing how city centres are used." Others were more cautious, saying "I'm still keen on public transport, but re-evaluating now (worried about catching the virus)" or that the "pictures of London's buses are shocking – I'm worried about it spreading so will jump in a car."

For a fuller discussion of assembly members' thoughts on these issues, please see Section B.2.2 on 'how we travel', page 514.

New economic priorities and challenges

Some assembly members said that the economic implications of Covid-19 present **new challenges on the path to net zero:**

"Coronavirus is the most damaging economic thing post war. Debt will be astronomical. Not sure we can recover from it, so feeling more pessimistic about [our] ability to reduce emissions."

"The recession will have grave consequences for the climate."

"Funding will be a major problem – we could be set back 10 years."

"Biggest worry is how people are coping with this, e.g. my business is being affected. How are we going to construct the green infrastructure if supply-chain businesses fail?"

"Concern about how sustainable this is. How it will affect the economy, real issue of inflation – collapse of the pound. Currently we're ok as we're in the same boat as every other nation. [What will happen] [w]hen inflation starts kicking in and we can't afford the things we can at the moment."

Some assembly members said that they **now see reaching net zero as less of a priority**:

"Want to see things back as they were, so maybe net zero takes a back seat to people just needing to put food on the table."

"Perhaps we can only afford to take small steps towards net zero until we are back on our feet financially."

"This [the virus] is the priority now."

"People need to be able to survive short term first, then [we can] look at [the] bigger target of net zero, and look at opportunities there."

"It [net zero] may be harder to achieve as Government have other pressing problems. They will need to focus in other areas, rather than net zero."

Others suggested that "perhaps we need to **focus on net zero options that are cheap** in the short term and bring money back short term – e.g. direct air capture and storage [are] probably less feasible now." Some expressed "increased concerns about the finances and the finances of ideas that need more [money] – have we spent it all?"

Opportunities for a green recovery

Some assembly members suggested that the current situation presents a "chance to stimulate the economy through a **green revolution**":

"Economy has come to a standstill and now we're going to have to rebuild the economy and we've got a choice about how we re-build – can go back to the same as before or we can decide to invest more in wind turbines, large public infrastructure projects...."

"There are big financial implications. Where will the money come from? [...] They should find the money to fix the planet. Rewrite the economic system. Fix the world for good."

"Need to examine the way we run as an economy and how we work and manage our environmental impact."

Others said "we need to **invest in UK capacity, skills and industry** – we rely too much on China at present." Some felt "we need to be more creative to make it [reaching net zero] possible even if it might be slower and more difficult."

Areas mentioned less frequently

Smaller numbers of assembly members made a number of additional points.

- **What we've learnt –** some assembly members wondered "how to take into account what we've learnt during this time", or said we "can't forget about this, so how do we remember – risk of sliding back to [the] old normal and doubling down." Others said "alternatives that have been used (during this period) have made an example for the future."
- **How little effect the current situation has had on climate change –** some assembly members said they were "surprised at how little effect the current situation has had on climate change, so shows scale of challenge – do still need to make some changes even if little impact." Others said the "fact [there's] only [been a] 10% drop in emissions since coronavirus shows how big a change we need to make – huge task." Some reported being "a bit disheartened that the lockdown has not had such a big impact on climate change."

- **International context and the UK's global role –** some assembly members said that the "UK has a huge opportunity hosting COP26[7] after this crisis and that would be [the] time that the UK has to show leadership." Others suggested "let's build global co-operation, although worry politics of self-interest will resurface" or that "because it's a worldwide thing – due to this circumstance – maybe everybody will be open to change e.g. being receptive to better ideas and international cooperation on air travel."
- **Impacts on food supplies –** some assembly members suggested that "food prices will go up and there will be incentives to grow more at home. The idea of not having ferries to Europe is worrying for food supplies." Others agreed saying that "ferries are different [from other forms of transport] – they bring food. If they go bust food prices will go up." Some said "there is a realisation of food security being an issue [and that there] will be long-term consequences. Example of Japan in 1992 – they didn't import rice as they wanted to build food security – it drove up prices in [the] short-term – was seen as a matter of national security." Others queried "would food prices not go down as supermarkets create offers?"
- **Views around specific policies –** some assembly members questioned "is nuclear still a good idea? Too unsafe/risky" or said that "carbon capture also seems too risky." Some said "we need incentives so businesses can move towards more energy efficient equipment."

7 COP stands for Conference of the Parties. It is attended by countries that signed the 1994 United Nations Framework Convention on Climate Change (UNFCCC). Recent COP meetings have focussed on the Paris agreement that was signed at COP21 in 2015. The Paris agreement aims to keep global warming to less than 2°C above pre-industrial revolution temperatures – and to pursue efforts to keep it below 1.5°C.

Concerns about discussing the implications of Covid-19

Three assembly members expressed concerns about discussing the implications of Covid-19 for reaching net zero:

> *"We don't know enough and the topic is too big. [...] Our conversation isn't evidence rich or grounded in science. We can't understand the impact of the decisions we're might make; we shouldn't make decisions during a pandemic. To have the assembly make a statement is very difficult."*

> *"No-one knows what is going to happen."*

> *"After the pandemic isn't a given, so using this group to plan doesn't make sense. What are the parameters for this conversation? Timelines and so on. Are we assuming the pandemic is going to last 3 months, 6 months or longer? It is very difficult to make recommendations without this – given that the longer the pandemic lasts the more impact it will have on the economy and therefore the more emphasis would need to be placed on the economy."*

One of these assembly members went on to say:

> *"In my opinion the Citizens' Assembly is in no position to pass any comment on the 'implications' of coronavirus on climate change when so little is known about the long term full scale of the impact, suffering and hardships that coronavirus will have on peoples' lives. Failing to seek prior consensus from the Assembly as to whether the Assembly collectively wishes any statement to be made on its behalf linking net zero to coronavirus smacks of political hubris. At a time when lives are being lost and extraordinary sacrifices are being made at the height of a global pandemic is the Assembly seriously being asked to choose between deciding to fund the future NHS, social care, welfare and basic fabric of society vs net zero before the financial and social costs of the pandemic have even started to be felt? I refuse to be balloted on these rash, grossly naive and insensitive questions and I expect to see this response accurately conveyed to Parliament."*

One of the three assembly members chose not to participate throughout the remainder of the discussions reported in this chapter.

Some assembly members noted ways in which the experience of Covid-19 and lockdown had *not* made them think or feel differently about how to get to net zero.

Ways in which thoughts and feelings *hadn't* changed, and why

General comments

Some assembly members made **general comments**, noting for example that it "hasn't really shifted [my] views", or that we are "happy with the decisions we came up with." Others noted that it "hasn't changed the requirement to reach net zero ... the goal is still the same" or that we "need to make changes, but [we] needed to make these anyway, e.g. travel."

Reinforcing existing views

Some assembly members said that **the crisis had emphasised the importance of views they already held, or provided evidence for them.** Comments included:

"Emphasised that future plans should be focussed on emission lowering (with carbon capture as a last resort)."

"It's still a huge issue that needs to be faced. Lock down is enforcing the point that it is a global crisis – climate change hasn't just stopped because of coronavirus."

"Always thought the government should lead the way and there's a precedent now. People will do what they say if they believe it's for the greater good."

"The fact that the coronavirus is now here has given us numbers to support the fact that we would like to have less vehicles on the road but I've always desired to have less vehicles on the road...."

"These are the options we discussed [earlier in the assembly] – travelling less etc. Just had to have a crisis to push us to do it."

"The current situation emphasises and reinforces that any dramatic government actions taken to achieve net zero must be well planned, not undertaken in a panic or a rush."

Some assembly members gave **specific examples of views that had stayed the same.** These included that "we still need to insulate and heat our homes better" and "views on wind farms." Several talked about their **unchanged view that achieving net zero will be difficult.** Some said that "hitting net zero was ambitious to start with", or that "even though emissions have dropped, it is still not enough." Others said that they "agree that things aren't going to go back to how they were, but don't feel any more positively about reaching net zero – question [of] if government will prioritise it, especially in a recession." Some said that "politicians lack imagination – likely to go back to how things were" or that "climate deniers [are] still likely to ignore the evidence." Some suggested that "public debt could be used as an excuse for inaction."

Others said their **views hadn't changed but that they had noted changes around them.** For example, one assembly member commented that "you can see the change in the air and I like the wildlife coming out". Another said my "view [has] not changed – [but we] have made good steps towards lifestyle change." Conversely some assembly members said their views had remained the same because these changes won't stick:

"Don't feel coronavirus will change things much – people will return to spending and the economy will bounce back."

"We are creatures of habit and [the] short term. Think many will go back to [the] same routine."

Some assembly members suggested it was **too soon to consider whether the current situation had made them think or feel differently**. Some said "it's too soon to ask this question – ask again in six month's time. There's still so much which is uncertain. Depends on how it goes." Others noted that "the economic impacts have yet to pan out" or that it's "very early days, not sure what's going to happen. Let's wait and see."

B.2.2 How we travel

Assembly members who had examined 'how we travel' during weekends two and three of the assembly next moved on to discuss the impact of Covid-19 and lockdown on their thoughts and feelings about this topic in particular. 73% said that their thoughts and feelings about how to get to net zero in terms of 'how we travel' had changed.

Ways in which thoughts and feelings *had* changed, and why

Impacts on air travel

Some assembly members said that "there is definitely going to be a reduction in air travel over a decade", that "people will be scared to travel by air", or that "we don't know what will happen. My instinct says that people will travel differently. There will be an enduring reluctance for people to travel on airlines." Some said "people aren't going to want to fly until there is a vaccine. This is good because there will be less emissions."

Others questioned "assuming this lasts for 18 months then is the airline industry going to recover? Budget market will disappear, because of the testing needed and people needing to be packed in. Even if the government says that it's safe, will people want to do recreational travel?"

Some predicted that "airlines will suffer and we will holiday less", asking "will airlines hike prices and expect we will just travel less frequently?" Some commented that "the cost of air fares is certain to go up. The cutthroat market is gone. A lot of volatility in the flight prices", or said a "lot of airlines are now in difficulty – are they going bust? There will be less airlines." One assembly member said "my parents [are] looking to travel to Hong Kong for August – they are being told they have to have 2m distance so most seats will be empty. How will airlines make money from less people? It is still really risky. No one will want to travel too soon." Some suggested that "there will be fewer planes but a bit resentful of that (when seeing planes for cargo) – but see there will be an impact on passenger confidence to fly."

One assembly member said "I am [now] more inclined to favour reduced travel by air...." Another commented:

> *"I used to think that I needed to fly for holidays or to see family or for business, but I've now seen that we can make do with less flying. If we had of had the assembly meetings on air travel after the spread of coronavirus and the lockdown, I would have voted very differently for a solution that leads to less flying. Solutions I never would have imagined possible have now already happened. We don't need to wait to transition to a world with less flights. It's already here. Now we just need to invest in the alternatives."*

Homeworking

Some assembly members felt that "Zoom may change the way people work", or reported that they were "finding working from home is doable – and there are other benefits such as spending time with kids." Others suggested there would be "less requirement for travel, Government should encourage home working even once a vaccine has been found." One said that "for many job sectors we now know we don't need to constantly move around to get work done, to go to meetings or even to catch up with friends." Others commented:

"Working from home is going to be more acceptable. I thought it wouldn't work but I am doing it and it is working fine. [I had a] meeting with 8 people at work and 7 of the people on the meeting wanted to stay at home to work in the future."

"My company had a strong work from the office culture and weren't prepared at the start of lockdown and people are surprised at how well it has worked."

"Before Covid-19 I used to travel a lot for work – IT supporting GPs for the NHS. Now I do it mostly from home."

Broadband access

Some assembly members said that "there is a lack of investment in broadband by the Government, they need to provide better infrastructure and broadband. People have to have the choice [to work from home]." Others questioned how much lack of broadband access is an issue or said they choose not to have it.

Impacts on public transport

Some assembly members suggested that "we are going to struggle with public transport and more so with social distancing", that "it will have a detrimental impact on public transport usage" or that "people will not want to use public transport as much; people will want to drive; bus companies will go bankrupt because they won't be used as much." Some noted that "its going to be difficult to encourage more public transport but social distancing on public transport is not going to be profitable." Others said:

"I'm scared to go on public transport. I feel a bit stuck – too far out of town to cycle. I love going on public transport but feel wary of it."

"I am also worried about going on a bus. You never know how clean something is. I'll choose a car in future. You have to touch something on a bus. It took me longer to walk home. When will it be safe?"

"The key question is when will we feel comfortable going on public transport. Even on pavements we have the ability to walk apart but you don't have this feeling on the bus or train. People are going to opt for Uber or driving."

Some suggested that "that feeling may well continue into the future – even when the virus is under control" or noted "same for trains. We never thought about it beforehand – but now we are sceptical."

Some felt there would be "less requirement to invest in public transport because of decreased use", while others had the opposite view saying "they will have to put on more buses to allow for social distancing." Some assembly members felt that impacts on public transport "will not be a permanent issue, once a vaccine has been found." One assembly member commented that "people mentioned the issues with traveling on public transport in an epidemic, but we must think sensibly... This [Covid-19] will not be more of a threat than climate change seems to be."

Walking and cycling

Some assembly members said that "people won't want to use public transport, so [the UK] will need to invest in electric cars and cycle and walking infrastructure." Some commented that "the [government's] 2 billion investment in cycling infrastructure will help" or suggested that "public spaces have now been adapted to encourage the public to change habits and consider walking/cycling more." One assembly member said that "I can envisage a lot more people cycling. People seem to be happier taking bikes out and walking. [There is] [t]alk of new infrastructure to accommodate cycling." Some expressed greater interest in electric bikes, with one assembly member commenting "I'd be more interested in [an] electric bike than sitting on a bus."

Some assembly members had a different view, suggesting that "measures such as widening public spaces are all well for good weather, but generally and more so in winter months [the] elderly / vulnerable are not going to use this, they'll need to use their cars or public transport – which need to be readily available and operated in a carbon neutral way – otherwise we'll be going back to existing ways and habits."

Progress on electrification

Continuing the above discussion, some assembly members expressed support for electric cars:

"I still feel cars are a very important part of our future, especially in the short term, so electrification of cars will have to be massively subsidised for the next few years."

"I am more inclined to favour ... the expansion of electrically powered road transport."

"I was a very strong advocate for public transport, but being in an enclosed space with lots of other people seems a very likely way of spreading the virus, so I am leaning more favourably towards electric cars than I was before."

"People are very unwilling to use public transport and air travel now so we need to focus on improving electric cars and completely getting rid of diesel and petrol cars and also improve cycling infrastructure."

Some assembly members commented "electric buses in city centres – why not do [it] now." Some expressed an alternative view, saying "progress for electrification – electric car cost – maybe that won't get pushed forwards now."

Government ability to make change

Some assembly members said it shows that "prioritising what happens [is] in the gift of government", that "this pandemic has shown how Government CAN do something if it really wants to" or that "it has shown what we can do when forced to change ... the government has leverage and we can achieve things for the greater good [especially] ... when [we] work together." Others had a different perspective saying "it's not going to be as achievable, because of the impact on the economy. The Government will feel they can't shift their focus. This worries me. We are already behind other countries."

Scale of impact

Some assembly members said "it is going to have a mega impact" or that "life will change a lot because of the virus." One commented that "cleaner air and louder birdsong has had a profound effect on some of us."

Others felt that "this experience is going to change people's psyche towards travel" or asked "how will people act if they continue to hear that people are dying?"

Some assembly members disagreed saying "we'll get over it once there is a vaccine."

Speed of change

One assembly member said that "we can change even quicker than I originally thought possible." Another commented that "the opportunity to change and to see change quicker shouldn't be wasted by going back to how things were before Covid-19."

Other

Other comments included:

"How can governments make predictions to 2050 if they can't even make predictions about next year?"

"Appetite for buying from China / long distances will be reduced and [there will be] a push for manufacturing in the UK – looking for how things can be made in a greener way."

"The shift to public transport, bus subsidies, car share schemes, should be abandoned."

"More people are going to be travelling by car."

Ways in which thoughts and feelings *hadn't* changed, and why

Views that had stayed the same

Some assembly members noted views that had stayed the same despite Covid-19 and the lock down:

"Car/planes aren't the problem – fuel is the problem. And there are solutions available for this and that need to be developed and mass produced – solutions are out there...."

"Still think that we should not just look at [the] impact of passengers flying but also at cargo and find other ways to transport goods ... and if prices go up for passengers [they] should also go up for cargo."

"Still want to travel as much as I can on aeroplanes even if I realise that may take a time to come."

"Due to Covid-19 [the] Government has been providing info every day to the public / organisations etc. Similarly [we] need a knowledge base for this [net zero] agenda that offers information / solutions on how to get to net zero that is shared and developed."

Views not changed, but greater urgency

Some assembly members said they "...just feel it's more urgent to do it now – e.g. car charging points across the country – this is a massive job and will offer job creation." Others commented that "there is an opportunity and urgency to this and to take the lessons from the experience around Covid-19 and apply it to approaches to get to net zero."

Things will return to normal soon

One assembly member said "I think it will return to normal soon." Another commented:

"Through both weekends, a huge preference of improving public transport was revealed. While some members of my group today raised concerns that they don't feel confident about using public transport so soon and think the improvements should be pushed back and focused on [electric cars and] renewable energy production, I feel quite confident that society will return back to before coronavirus soon so I feel like I still agree with the push for improving the public transport infrastructure and electrifying it as well."

"We are seeing today that the Peak District car parks are full – car travel will stay the same and we are selfish and want to be in control."

Additional comments

One assembly member commented that "coronavirus has given us more time to think about things and appreciate what we can't have right now like freedom." Another commented:

> "Using online conferencing (Zoom etc) increases the digital divide. [...] Ease of use for most people, less travel (environmental costs reduced), save time (travel etc). But negative points are difficulties with global time differences, national holiday dates. [It also] [i]ncreases the gap with digital literacy and [the] economic divide (both between people, and countries)."

Some assembly members looking at 'in the home', 'what we buy' and 'what we eat and how we use the land' also made comments about how we travel:

- **Choice of workplace** – some assembly members predicted that "the workforce will be more trusted to work from home or work remotely. We need to think about remote working hubs too, so people can still have company but not travel so far. Some people find working from home hard, mentally." Others commented that "people need more choices and options – more localised offices would be good. Plus the choice to work from home, and incentivise it."
- **Some travel for work is still needed** – some assembly members commented that "the virus and lockdown allows companies and the government to weigh up car use, working from home and evaluate what does and doesn't make sense. 6–8 weeks is very different to the rest of your life. People can have mental health issues. Other industries could be wiped out e.g. office landlords. Building relationships by video conference is hard." Others agreed saying "we will still need to fly / meet people face to face, e.g. to build relationships for roles like sales."
- **Less travel is good** – one assembly member suggested that "spending more time in homes is better for CO_2 – [I] will fly and drive less and use solar and wind power more." Another reported that "seeing very few planes and having less road traffic has made for a more peaceful, healthy environment. You hear the birds better and the wildflowers are thriving."
- **Tackle air travel** – some assembly members said there is "more impetus to cut air travel now", that it's "more possible for businesses to use conference calls and to cut air travel", or that we should "tackle [the] disproportionate number of people taking [the] majority of flights – more important to do this now."
- **Travel on the land** – some assembly members suggested that we are "going backwards and relying on cars, e.g. getting out of [the] village for shopping and to see somewhere new for [the benefit of our] mental health." Others noted that "some people [are] still limited in travel options, e.g. from where they live. For example, they need public transport to get to work but can't with social distancing." Some commented that there is "more talk of promoting cycling now, but the problem is when [the] weather is bad – is cycling going to be feasible?"
- **Cost of oil** – one assembly member commented that "because oil has been so cheap recently, I know of many family / friends who have bought it in the last few weeks when they would not have done previously. I think an immediate change should be to increase the prices again (e.g. through taxation) to encourage more use of renewable resources and use the revenue from the tax to invest in renewables."

B.2.3 In the home

Assembly members who had examined heat and energy use in the home during weekends two and three of the assembly discussed the impact of Covid-19 and lockdown on their thoughts and feelings about the path to net zero for this topic. As reported in Section B.1 above, 35% said that their thoughts and feelings had changed; 39% said they hadn't and 26% didn't know or were unsure.

Ways in which thoughts and feelings *had* changed, and why

Greater awareness

Some assembly members suggested that the more people are at home, "the more people might feel the incentive to change electricity supply e.g. solar panels, or fitting insulation." Others agreed, saying "if you're in the home permanently [you] would be more aware of what energy you're using in the home" or that you "would think a lot more about it." Some said that "insulation and retrofitting is more in focus, as people have worked from home now and will see the usefulness of it more. For new build homes too." One assembly member commented that "spending more time in the home has made me think about how much energy I need to use due to poor insulation. With more people at home remote working it is important to make sure that we have innovative ways to reduce emissions and I'm now more interested in heat pumps as they are less disruptive in this time."

Implications around energy use and costs

Some assembly members said we are "using more electricity than [we] normally do", that "if we stay at home our homes are using more electricity especially if you have kids at home all the time", or that we are "using more energy in the home – spending more too." Some noted "concern that more power is being used in the home and the impact that may have on bills – this may need more government intervention to address fuel poverty." Individual assembly members commented:

> *"My own home is dark and cold. Before my husband started working from home, we didn't put the heating on during the day. Now he's here, we do. His office [i.e. where he works usually] is heated. This has put our costs up. What about an allowance from work to heat our home, or to make it more energy efficient?"*

> *"The experience of lockdown has resulted in a lot more people being at home and working from home. If this trend is to be long-term then having a plan in place to re-fit old homes that aren't energy efficient will be more crucial than ever."*

> *"From [a] purely personal point of view, I should not have put off the home insulation project. The last few weeks at home all day would have been warmer and cheaper! – and less CO_2 emitted from here. Delay costs money and the environment."*

"We are all using more energy in our homes during this crisis, and we are fast approaching summer. I am concerned that if this had been during the winter months, the effects on people's lives would've been much worse. With this in mind, it has highlighted the need for cheap reliable energy, and I do not want to see people's bills rise in order to pay for green initiatives. We already pay more to fund these green initiatives and I feel the subsidies should be removed."

Views on government action

Some assembly members said that changes "will be driven by industry and government – makes change more likely" or that "it hasn't changed my views on how to do it but it has demonstrated that it can be more 'doable' than I feared."

Some assembly members said that they now "feel this should be more of a common endeavour, not just the government doing stuff."

Financial and economic implications

Some assembly members said that "a lot has gone back to the drawing board, a lot of people have been financially very adversely affected" or that it will be "less feasible for home owners to upgrade homes – for next decade possibly – government action is essential." Others said that "people [are now] focused on keeping businesses going and getting debt paid off" or that there is "less money available to improve homes to become more energy efficient. Virus may delay reaching net zero. Worried government may not allocate sufficient funds to support this."

Some assembly members disagreed, commenting that "we have the wealth (using a global comparison) to do this despite current difficulties – and we should."

Changes to views on specific policies or technologies

Some assembly members said we should "maybe look more at home energy efficiency, e.g. [gas boiler] scrappage scheme – but more energy use in [the] home would be balanced by less office space." Others said they "wonder whether heat networks might be a less reliable source of power if lockdown conditions stay as there will be less industrial activity able to feed them."

Feel more strongly

One assembly member commented that it "made me more convinced of what needs doing." Another said "I feel even more strongly that we must make every effort we can to reduce emissions within the home and all the ways of doing this that we discussed and agreed on are even more important."

Shock

Some assembly members said that they were "shocked by the lack of impact [of lockdown] on climate change" or commented that "everyone has been shocked by what's happened with coronavirus."

Having work done while at home

Some assembly members said that "people won't want workmen in [their] home."

Ways in which thoughts and feelings *hadn't* changed, and why

No or very little change

Some assembly members said that Covid-19 and lockdown had made "no difference" to their views, or said that "not much has changed for me." One assembly member wrote that "I cannot see much changing in how we use energy in our homes except the high fixed costs of many methods may be more difficult for individuals to cover as disposable incomes fall during the recession. This would be another area where higher levels of government expenditure may be required to reach the net zero target. It will be interesting to see if this changes if some level of lockdown lasts over the winter months." Other individuals noted that "the 'in the home' topic was never really controversial so the solutions we came up with are relatively unchanged", or that "I still think the changes should be made and paid for and incentivised by government led initiatives."

Specific views unchanged

Some assembly members noted specific views that had stayed the same despite Covid-19 and lockdown. Some said that "homeowners were never going to pick up the bill – scale is massive, needs central funding" or that "government should be incentivising people to improve their homes with grants etc." Others re-emphasised the "benefits of solar panels" or said that "the building that has started again – needs to be energy efficient." Others commented that their "views in favour of hydrogen, regional heating systems etc haven't changed – just more urgency."

Haven't felt impact yet

Some assembly members said "it's been warm so I haven't had to put the heating on" or "we're now in summer, so no hardship being locked down. What will happen come winter, when household bills go up? Highlights the need for cheap energy."

Views haven't changed, but we have noticed changes

Some assembly members said they had noticed "more deliveries, increased use of [the] internet" or that "we are using more electricity." One assembly member commented:

> *"Think the impacts have been more to do with travel and air travel"*

B.2.4 'What we eat and how we use the land' & 'What we buy'

Assembly members who had examined 'what we eat and how we use the land' and 'what we buy' during weekends two and three of the assembly discussed the impact of Covid-19 and lockdown on their thoughts and feelings about these topics. As reported in Section B.1 above, 36% said that their thoughts and feelings had changed; 26% said they hadn't; 37% said they didn't know or were unsure.

Ways in which thoughts and feelings *had* changed, and why

Food security

Some assembly members said that "the UK is not a food secure country. 53% of our food is produced in the UK, 47% comes from elsewhere – imported, mainly from the EU." Some commented that "as countries come out of lockdown in different ways, importing food may be less doable – might grow more of our own." Others felt that the current situation "prompts [the] UK to be more independent with food – it's not sustainable to import to that extent – not just food, what else can we make here? Raises the question more pressingly that was already raised by net zero." Some queried "are we importing less food currently?" or said Covid-19 and lockdown "made [them] feel more strongly that we shouldn't be relying on imports."

Economic implications

Some assembly members expressed "concern that people are more worried about money at the moment." One commented, "I feel sorry for self-employed couples. Use their savings to get by. Wonder what the financial impacts of Covid-19 will be for many people?" Some assembly members predicted that "less disposable income will probably affect what people buy – maybe higher quality too – changing consumeristic attitudes." Some speculated that "meat use might reduce because it's more expensive." Some suggested that "having limited choices during the lockdown is a good example of what we could face with climate change. Good to see that we have been wasting less. We have planned the meals more. Saved money."

Buying locally and local produce

Some assembly members reported that they "have started buying more locally, trying to get things not imported. Altered shopping habits. Enjoyed doing it because [we] felt [we were] supporting local businesses." Other said they had "noticed people are using local produce more, even if it might be a bit more expensive (especially if they deliver). Used to be lots of people going to [the] supermarket. But because of queues etc, that's lessened and more uptake in local buying." Some assembly members disagreed saying the "uptake in local buying isn't the same everywhere – some places still shop at the supermarket because it's the cheapest."

Behaviour change

One assembly member commented that "consumer behaviours that I wouldn't have expected before I now believe are much more likely to happen (e.g. reusing products) so this effects the incentives required to change people's behaviours." Others noted that "people are sharing more – giving stuff to each other, or reduced rates for key workers, doing each others' shopping – will that attitude continue? Could help with emissions – stronger community spirit."

Change will be easier and is more important

One assembly member said "I think it'll be easier as long as we keep the momentum and use what we are learning now from this going forward." Another commented that "if anything they [the recommendations] are more important now than ever and would be even easier accepted. Very very important [that] diary farmers ... get a fair price for milk .... They were being squeezed by the big 4 supermarkets. They deserve a fair price for their products." Other individuals suggested that "just introducing change may be easier as change is already happening" or that "this is a once in a lifetime opportunity to asses what we eat, what we actually need and food supply chain processes. Also transport options can be addressed for future environment targets."

Other comments

Other comments included:

"People feel closer to nature – more appreciative of our land. We've started looking round and found what matters. Rewilding and respecting nature has gone up in priority."

"Getting people back to work and kick-starting a failing economy must be a priority."

Ways in which thoughts and feelings *hadn't* changed, and why

Our recommendations still stand

Some assembly members recorded a "consensus amongst the group that all the points made by assembly members [about food, farming and land use] are still relevant. How do you use the land better? How to use more renewable energy? The whole subject is common sense." Others said they "stand by the principles [previously agreed]: change is still needed" or that "everything that was decided in the Assembly is important. We know it is still important. Covid-19 has made it even more important." Some groups reported that it is "not clear that views have changed in any substantial way."

Our views haven't changed, but we have noticed changes

Some assembly members said differences between pre- and post-lockdown were "more about how things have changed rather than [that] views have changed." Some said that "food costs have gone up (oranges)", that "getting Polish food has become more difficult – miss it", or that "in general consumption patterns haven't changed – just things like not getting a coffee when you're out going for a walk." Some assembly members commented that "we've made big advances towards things that are positive for reaching net zero, and we should keep these things: buying locally and supporting local businesses, buying from local shops." One assembly member commented:

> *"It hasn't made me feel differently. However there have been changes to how people shop – many are shopping more locally, or growing their own – and to how people see land use, appreciating nature and seeing the benefits of re-wilding (when you leave nature alone how it flourishes). This is something we can build on."*

One assembly member noted the complexity of the situation:

> *"The effects of lockdown differ so much from person to person it is impossible to say. I don't know enough about how lockdown has affected farmers. I don't know if it has affected land use at all so I don't feel I can comment on this."*

Conclusions – impact on the assembly's thinking

Assembly members **tended to agree that Covid-19 and the lockdown had made them think or feel differently about the how the UK should get to net zero** in general. 62% 'strongly agreed' or 'agreed' that this was the case; 28% 'strongly disagreed' or 'disagreed'.

Assembly members who reported changed thoughts and feelings talked about areas including:

- There being an **opportunity for change**, including increased willingness to accept it from the general population;
- **Altered perceptions of what is possible**, including what government can do;
- **Lifestyle change that is already happening** – for example, homeworking is proving more doable than some thought; changes to how we travel are taking place;
- **Economic impacts** that, for example, make reaching net zero more difficult.

The impact of Covid-19 and the lockdown on assembly members' thoughts and feelings about topics they had considered before it happened varied.

The **biggest impact was on views about 'how we travel':** 75% of the assembly members who looked at this topic said that Covid-19 and lockdown had changed their thoughts and feelings about how to get to net zero in this area. Key themes in their discussions included:

- **Changes happening to air travel**, with some assembly members suggesting that people may continue to fly less;
- **Homeworking** becoming more acceptable;
- The **impact on public transport**, with some assembly members noting that people are currently less willing to use it and raising questions about whether or not that would last long-term;
- **Increases in cycling and walking**, although some expressed doubts about whether these would hold during the winter.

A minority of assembly members said their thoughts and feelings had changed about the other topics the assembly had considered prior to the pandemic: 'in the home' (35%), and 'what we eat and how we use the land' and 'what we buy' (36%).

Assembly members who reported changed thoughts or feelings about heat and energy use '**in the home**' had changed suggested that **the pandemic may make change more likely**: people are more aware of their energy use if they are at home more. They also noted the **increased energy costs of being at home and suggested a need to address them.** They put forward ideas ranging from an allowance from work, to cheap energy, to getting old homes retrofitted.

Assembly members who said their thoughts or feelings on **'what we eat and how we use the land'** or **'what we buy'** noted points including a feeling the UK should be less reliant on imports for its food. They also highlighted shifts in some areas to buying more local produce or from local businesses. Some assembly members suggested that changes to what we buy may now be easier, for example because of reduced incomes or an increased in community spirit.

Assembly members whose views had not changed suggested, among other comments, that the pandemic had provided evidence for views they already held, or underlined their importance. A minority of assembly members noted that they now saw reaching net zero as less of a priority than economic recovery.

Across all the votes, **assembly members tended to avoid expressing 'strong' views** – i.e. they chose 'agree' or 'disagree' rather than 'strongly agree' or 'strongly disagree'. This may reflect the uncertainties and emerging nature of the current situation. In general, their comments reflected the changed context created by Covid-19 rather rather requests for alterations to specific recommendations made earlier in the assembly. Some assembly members raised new issues, such as a the request to help people with the increased energy costs of being at home.

C. Anything else to add

Assembly members' ballot papers included the opportunity to add any final thoughts on Covid-19, recovery and the path to net zero. Many chose to leave comments. We have grouped them under ten overlapping headings, for ease of navigation.

What's important in life

- "It may [be a] … chance for people to take stock of the important things in life."
- "It was nice to be able to go for a walk and cross a normally very busy road without seeing a single car. It was good to see how many people started cycling too. My daughter is working from home and doesn't miss the commute to work, has saved money on petrol and has enjoyed spending time with her little boy. Perhaps there are bigger priorities for people's well-being than the state of the economy, and working from home will become the 'new normal'."
- "Coronavirus [and] lockdown have made us value a more simple way of living, working from home, being with family."
- "I feel many people will make changes in their own lives – some will, some won't. I feel [the] majority will though, and buy local, work less days a week. More will work from home reducing emissions etc."

Perceptions of what is possible

- "Hopefully [it] made us look around and see clearer skies, less traffic. Made people see it is possible."
- "Coronavirus has now shown us what is possible if people rally together and listen to science to save lives. We need to take this approach and move forward as we rebuild the economy."
- "The lockdown is abnormal hence might not necessarily be a yardstick for climate change net zero aspirations. However, the present situation does prove that given [the] right incentives, humans can adapt."
- "The Covid-19 crisis has brought home the realisation that we can't rely on quick technological fixes for every emergency. We need to start our work to address climate change now."

Information and communication

- "Information and education are key for both how people have responded to the virus and how they should engage on the subject of climate change and the net zero target."
- "It has shown that people can work together when they feel threatened, but also that if people are not fully aware or fully informed of the impending problem they will ignore it."
- "Use observations of environmental changes seen during this time to show people what happened after such a short time of these restrictions."

An opportunity for change

- “This is an opportunity to incorporate net zero into the new reality that will become tomorrow’s new normal.”
- “This is a once in a lifetime opportunity for government to deliver environmental targets as part of our economy recovery.”
- “I think the lockdown has heightened people’s awareness of climate change and what can be achieved. Strike while the iron’s hot.”
- “It will be a grave mistake and missed opportunity if we simply try to helter-skelter back to our previous values and lifestyles.”
- “To the government: don’t miss this chance to help us change the way we live now and for future generations.”

Is meeting the net zero target possible or desirable now?

- “I don’t think that this is now going to be achieved due to the other issues that have been thrust upon us!”
- “Concern that the economic impact may now take the focus off the target, as other priorities may be more to the front.”
- “It’s going to be one hell of an effort to get there since companies and governments need to invest in projects/industries etc that will help achieve the goal of net zero.”
- “I think it has shown that on a personal level, and for our country as a whole, the priority has to be our economic well-being, and that green initiatives are a nice to have, when and if we can afford them.”

The relative threat from climate change

- “Even though Covid-19 is a priority, the climate emergency is even more urgent. Covid-19, if not contained would rip through our societies and millions would die. As with all pandemics some would survive and the human race would carry on. If we allow the planet to continue heating up to an extent where no intervention from us would stop it, we wouldn’t have a world to live on and neither would the diversity of life we depend on.”
- “I believe the climate emergency is a bigger threat than coronavirus to the UK, the rest of the world and human beings in general. Covid-19 has been the biggest short-term threat we have faced in recent times, but the climate emergency is the biggest long term threat we will ever face. We need to continue with our target to achieve net zero and be the generation that’ll be remembered that did everything we could to save our planet and recovered our economy from the coronavirus crisis through investing in carbon zero investments and technologies.”
- “More lives have been saved by reductions in air pollution already than have been lost to Covid-19. This shows the sheer scale of the crisis facing us with climate change. People are dying, forests are burning, towns and cities are flooding and island nations are disappearing below the waves. Now is the time to take action. Lives depend on us.”

Transparency, leadership and the global context

> “Government should not shy away from net zero in the wake of the virus. It should be bold and lead the discussion and efforts to get the public and companies on board.”

> “COP26 is an historic opportunity for the UK to show global leadership, re-establish its place in the world, and help build a global consensus for moving the world towards net zero as it moves out of this crisis.”

> “As no country has escaped Covid-19 and some are now working together to find answers and ways forward, perhaps it will be easier for global decisions to be made on climate issues.”

> “We need good leadership. Urgently.”

> “I think it is likely that the population will come out of this situation with a lower level of trust for the current government. Therefore, I think transparency in how they are reaching net zero, which industries they are investing in and where public money is being spent is vital in how we reach the net zero by 2050 target.”

A green economic recovery

> “I really like the idea of … companies [having] to reach certain net zero targets to benefit from government investment with high levels of enforcement.”

> “I think the most important thing for the government to do is think of ways to pair reaching net zero and recovering the economy. There are so many ways this can be done – e.g. bailing out companies but only if they agree to invest a [percentage of their] … profits into a low carbon technology.”

> “Government should not just bailout companies, there should be a net zero portion to any monies spent ….”

> “With all the job losses after lockdown the government will need to retrain people with new skills. Why not achieve net zero with a green revolution.”

Incentives for individuals and a basic income

> “There is a concern that household investments in electric cars, heat pumps and double glazing will be delayed because of the squeeze on household incomes. The government needs to think of ways to incentivise purchases which support industry and allow individuals to move their habits to lower carbon [ones], as people will be putting off these big purchases for a while to come otherwise.”

> “I don’t think you should be bailing out companies; I think you should be bailing out the people. Money is power! So if you give the money to the people, you’ll be allowing the people to use their money to spend on the companies that are doing things right. People will be able to buy what they think is right rather than what they can afford. The last thing we need now is another recession, along with people being forced to spend money that they haven’t got on making changes they don’t understand. Educate the people to create a cleaner world and give them the funds to choose how they want to do this. [….] I believe now is the time to create a basic minimum income. Wealth creates wealth. Isn’t it time for us to live in times of abundance, where things are done for the benefit of all, including the earth, the environment and the climate.”

Additional comments on topics considered by the assembly

How we travel

> “I feel air travel no longer seems such a potent problem, especially for now, so we should probably focus our energies on cleaner power and cars and reduce movement a bit; then we will have a shot at reaching our target.”

> “I hope we do not go back to using our cars as much as before, or go back to flying as much as before. Just a reduction in both would help.”

> “The pandemic has changed how the decisions we made will work and this needs to be taken into account especially with the issue of how we need to not focus on public transport anymore.”

What we eat and what we buy

> “I think it has highlighted how dependent we are on imports, especially in the food industry. If we can produce more locally it would certainly be beneficial for the economy as well as reducing carbon emissions from importing goods from abroad.”

> “I think there has been a massive impact on what we consume when there is no opportunity to go shopping (not including food shopping) which will have a further impact on how we live after lockdown, especially if disposable incomes fall. I think this is a chance to encourage people to move away from a disposable, fast-paced consumption to more reusable and repairable goods.”

One assembly commented that “I see a lot of positives but many will be in financial difficulties – [the] self-employed, small businesses etc.”

Conclusions

Assembly members' views on Covid-19, recovery and the path to net zero are significant. No other group is at once a representative sample of the UK population and well-acquainted with the steps needed to reach net zero.

A clear view emerged from assembly members' discussions that **the current "tough and sad time" presents an opportunity for change that should be taken.**

A large majority of assembly members (79%) 'strongly agreed' or 'agreed' that, 'steps taken by the government to help the economy recover should be designed to help achieve net zero'. Their most frequently given reasons included requests for the Government to:

- Limit, or put conditions on, investment in high carbon industries;[8]
- Rethink and invest in infrastructure;
- Support low carbon industries;
- Make the most of the economic opportunities presented by the path to net zero;
- Deal with Covid-19 and climate change together where possible.

Assembly members who were unsure or who disagreed with the statement tended to emphasise a need to focus on economic recovery first and foremost.

Another large majority (93%) of assembly members 'strongly agreed' or 'agreed' that, 'as lockdown eases, government, employers and/or others should take steps to encourage lifestyles to change to be more compatible with reaching net zero'. Assembly members backed steps to encourage homeworking and changes to how we travel. They also saw a key role for government in providing leadership and information, alongside roles for business and local areas.

In contrast to the above assembly members **tended to avoid expressing 'strong'[9] views about whether Covid-19 and lockdown had made them think or feel differently about the how the UK should get to net zero**.

Overall they **tended to agree that they now thought or felt differently about how the UK should get to net zero *in general* (62%).** They re-emphasised the idea of there being an opportunity for change, whilst also reporting altered **perceptions of what is possible** (e.g. what government can do) and pointing to lifestyle changes that are already happening. Some highlighted the **economic impacts** of the pandemic, suggesting, for example, that they make reaching net zero more difficult.

8 This was both the most frequently given rationale and the most controversial, with some assembly members disagreeing. Please see pages 488 and 489.

9 They tended to choose 'agree' or 'disagree' in all four relevant votes, rather than 'strongly agree' or 'strongly disagree'.

In terms of topics that the assembly had considered prior to the pandemic, the **biggest impact was on views about 'how we travel':** 73% of the assembly members who looked at this topic said that Covid-19 and lockdown had changed their thoughts and feelings about how to get to net zero in this area. Key themes in their discussions included:

- **Changes happening to air travel**, with some assembly members suggesting that people may continue to fly less;
- **Homeworking** becoming more acceptable;
- **The impact on public transport**, with some assembly members noting that people are currently less willing to use it and raising questions about whether or not that would last long-term;
- **Increases in cycling and walking**, although some expressed doubts about whether these would hold during the winter.

A minority of assembly members said their thoughts and feelings had changed about the other topics the assembly had considered prior to the pandemic: 'in the home' (35%), and 'what we eat and how we use the land' and 'what we buy (36%)'.

Assembly members whose thoughts and feelings had not changed suggested, among other comments, that the pandemic had provided evidence for views they already held, or underlined their importance. A minority noted that they now saw reaching net zero as less of a priority than economic recovery.

In general, assembly members comments reflected the changed context created by Covid-19 rather rather requests for alterations to specific recommendations made earlier in the assembly. Some assembly members raised new issues, such as a a request to help people with the increased energy costs of being at home.

Additional recommendations

Chapter 11

Summary of recommendations

1 On the final assembly weekend, all assembly members discussed whether or not they wanted to add any further recommendations to this report. Assembly members worked together to draft suggested additions. The proposals were then put to a vote of the whole assembly.

2 In total, assembly members voted in favour of thirty-nine additional recommendations. They did not pass two further proposals. The recommendations touch on themes including: transparency, accountability and decision-making; education, communication and engagement; international action and impacts; and incentives, payments, conditions, and taxes.

3 For the full list and wording of each recommendation – some are detailed – please keep reading this chapter. The ten additional recommendations that received most support were:

- The transition to net zero should be a cross-political party issue, and not a partisan one (**96% support**)[1]
- More transparency in the relationship between big energy companies and government (**94% support**)
- Get to net zero without pushing our emissions to elsewhere in the world (**92% support**)
- Incentives to accelerate progress to net zero and conditions attached for organisations seeking government financial support (**91% support**)
- A robust media strategy on the outcomes of the assembly (**90% support**)
- An independent neutral body that monitors and ensures progress to net zero, including citizens assemblies and independent experts (**89% support**)
- Move away from fossil fuels and transition to new energy sources (**89% support**)
- Products and services labelled to include their carbon footprint (**89% support**)
- A follow up on the outcomes of the assembly covering what has been taken into account, what hasn't and why (**88% support**)
- Harness the response to Covid-19 and COP26 to drive international co-ordinated action on climate change (**87% support**)

Proposals not passed by the assembly

The assembly did not pass two proposals. Both focussed on **reaching net zero by an earlier date than 2050.** Slightly more assembly members opposed such a move than supported it, with the balance held by those who were 'unsure' or 'didn't mind'.

1 % of assembly members who 'strongly agreed' or 'agreed' with the recommendation.

Additional recommendations

On the final assembly weekend, all assembly members discussed whether or not they wanted to add any further recommendations to this report.

What did the assembly choose to consider?

Assembly members could suggest recommendations on any aspect of the path to net zero. They started by thinking, as individuals, about the following question:[2]

> *"Is there anything else you would like to tell government and Parliament about how the UK should get to net zero?"*

They then discussed emerging proposals in small groups, with each group able to put forward a maximum of three ideas. The facilitation team turned these ideas into a ballot paper, using assembly members' own wording.[3] There were forty-one suggestions for additional recommendations in total. Assembly members then voted by secret ballot.

Assembly members did not hear any new evidence to inform their votes. Their decisions were based on their own experiences, values, views and knowledge, and the information they had heard throughout the assembly. We made clear to assembly members that they did not have to vote on all the proposals if they did not want to, or that they could choose 'unsure' if they did not feel they had sufficient information to express a view.

2 The facilitators had encouraged assembly members to think about this question at previous assembly weekends and to note down thoughts. We kept a list of their suggestions and presented them back to the assembly at this point so that assembly members could pick the ideas up in their discussions if they wanted to.

3 The only exception is where facilitators combined ideas that were so similar as to be almost identical. Here they retained as much of the original wording as possible, only making small changes as necessary to accommodate variations in language or nuance.

Vote results

In total, a majority of **assembly members backed thirty-nine additional recommendations**. They rejected two.

The results for all the recommendations are included below. We have categorised them under the following headings to make them easier to navigate:

- Transparency, accountability and decision-making;
- Education, communication and engagement;
- Covid-19;
- Generations and equality;
- International action and impacts;
- The net zero target date;
- What we buy;
- Incentives, payments, conditions, and taxes;
- Other specific policy areas;
- Miscellaneous.

We used the same headings to organise the proposals on assembly members' ballot papers.

Transparency, accountability and decision-making

A majority of assembly members 'strongly agreed' or 'agreed' with all the suggested recommendations in this category:

- **Levels of 'strong agreement' were generally high:** A majority of assembly members 'strongly agreed' with nine of the eleven suggested recommendations. Over 70% 'strongly agreed' with four of them (please see below);
- **Levels of 'strong disagreement' and 'disagreement' were low**. No assembly members 'strongly disagreed' or 'disagreed' with two recommendations – making the transition to net zero a cross-party issue and greater transparency about the relationship between government and big energy companies;
- **A proposal** for citizens' assemblies on issues relating to net zero not covered by Climate Assembly UK, potentially including the net zero target date, was the least popular option in this category, with a high number of assembly members (28%) saying they 'didn't mind' or were 'unsure.'

The full wording of each recommendation was as follows. Recommendations are listed in order of popularity:[4]

- "We want the transition to net zero to be a cross-political party issue, and not a partisan issue" (**96% support**)
- "We need much more transparency in the relationship between big energy companies and the government, due to concerns over lobbying and influence" (**94% support**)
- "There should be an independent neutral body that is not political and lasts beyond political cycles that monitors and ensures progress to net zero – including citizens' assemblies (as a neutral and fair option) and independent experts – to guarantee continued progress and policy development" (**89% support**)
- "A follow up on the outcomes of Climate Assembly UK is needed to ensure we know: 1- how Parliament and government have taken the assembly's recommendations on board, 2- what has been taken into account, what hasn't and why. This follow up could be done face-to-face or online, funding should be allocated for doing it, and citizens from Climate Assembly UK should be able to directly ask questions to Parliament or government" (**88% support**)
- "There should be a dedicated department for achieving net zero which holds regular briefings with clear milestones that hold the government to account" (**86% support**)
- "The government should publish the carbon budgets (i.e. the 5 yearly plans showing where the UK should be on its path to net zero) and progress towards them on a quarterly basis" (**86% support**)
- "Government should be better held to account for their action on net zero by an on-going relationship with citizens through mechanisms like regular citizens' assemblies" (**82% support**)
- "There should be regular (at least annual) independent reviews, citizens' assemblies and scrutiny by the six parliamentary committees to ensure progress is being made by government to reach net zero" (**81% support**)
- "The Government should commission a citizens' assembly, or an independent citizens' forum / citizens body, to provide oversight on meeting the net zero target. This could take the form of:
  - On-going citizens' assemblies to ensure that all political parties and all governments are committed to implementing Climate Assembly UK's recommendations; monitor the progress of the implementation of these recommendations; ensure that future assemblies can review what the government does for achieving net zero, based on new evidence (science and technology) coming in, and/or
  - Regular non-partisan committees of the public, based on the same demographic as Climate Assembly UK, to review progress to hold the government to account against a visible time-line" (**80% support**)

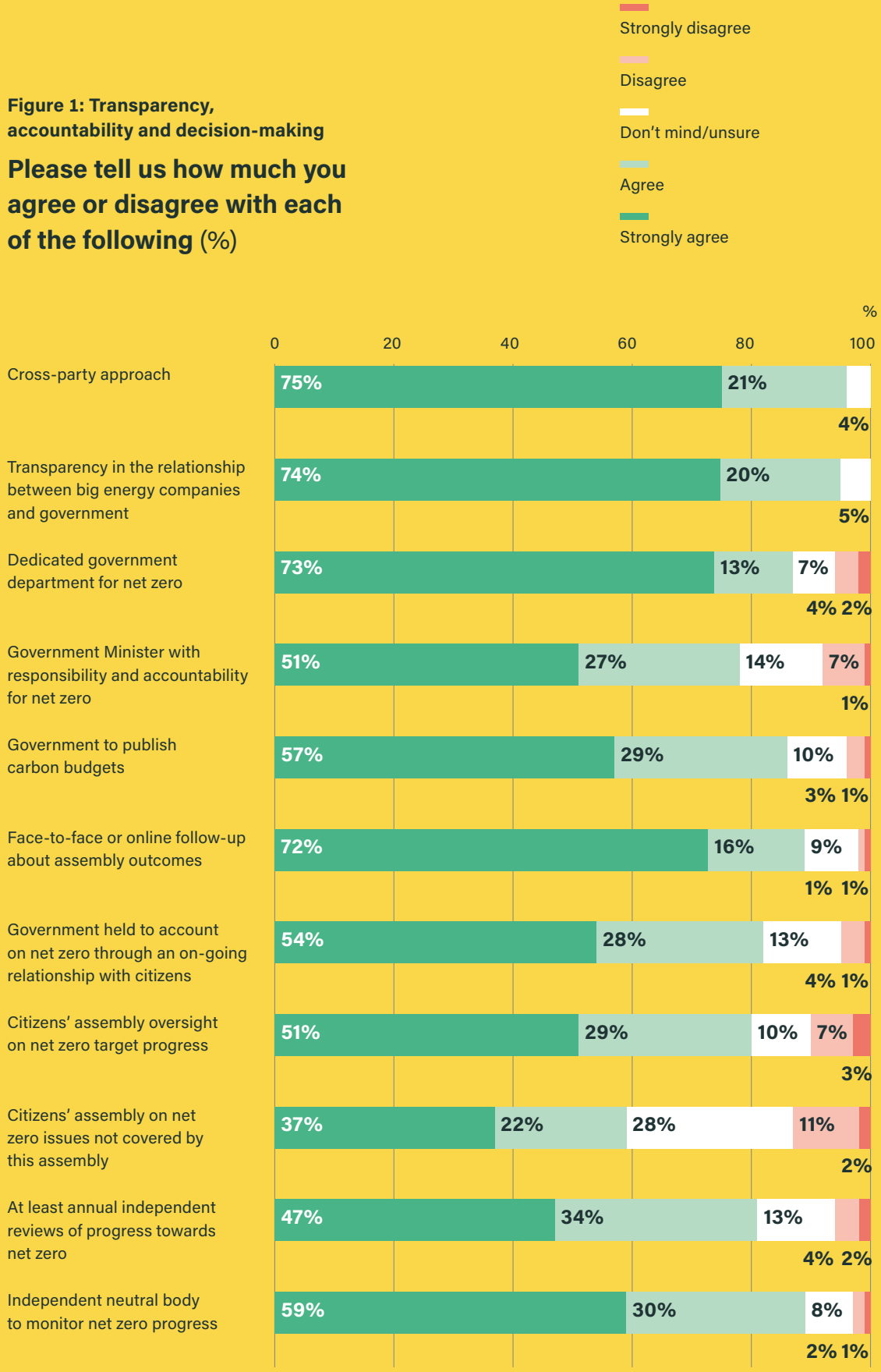
4 % of assembly members who 'strongly agreed' or 'agreed' with the recommendation.

Above: Chris Stark (Committee on Climate Change) and Tony Juniper (Natural England) take questions from assembly members.

- "There should be a Minister with exclusive responsibility and accountability for ensuring net zero targets are met and government departments are co-ordinated in their efforts and achievements to meet their targets" (**78% support**)
- "We need another climate assembly or citizens' assemblies on issues relating to net zero that have not been discussed, to involve citizens and business. This could include looking at whether the 2050 target is too late" (**59% support**)

Figure 1: Transparency, accountability and decision-making

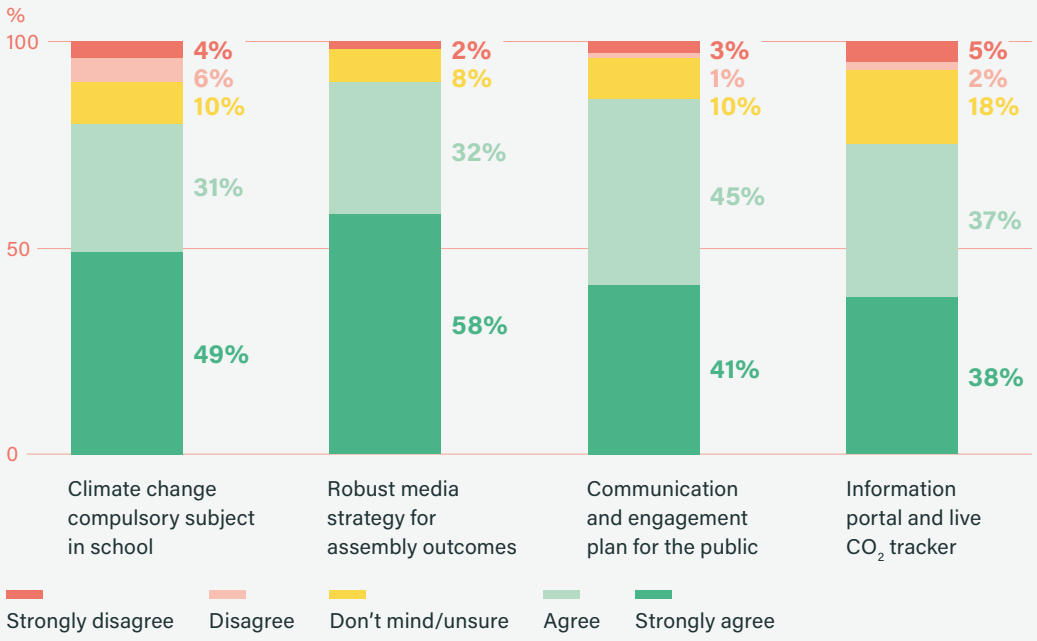
Please tell us how much you agree or disagree with each of the following (%)



Education, communication and engagement

Figure 2: Education, communication and engagement

Please tell us how much you agree or disagree with each of the following (%)



At least 75% of assembly members 'strongly agreed' or 'agreed' with all the recommendations in this category. The percentage of assembly members 'disagreeing' or 'strongly disagreeing' was low throughout, never amounting to more than 10% in total.

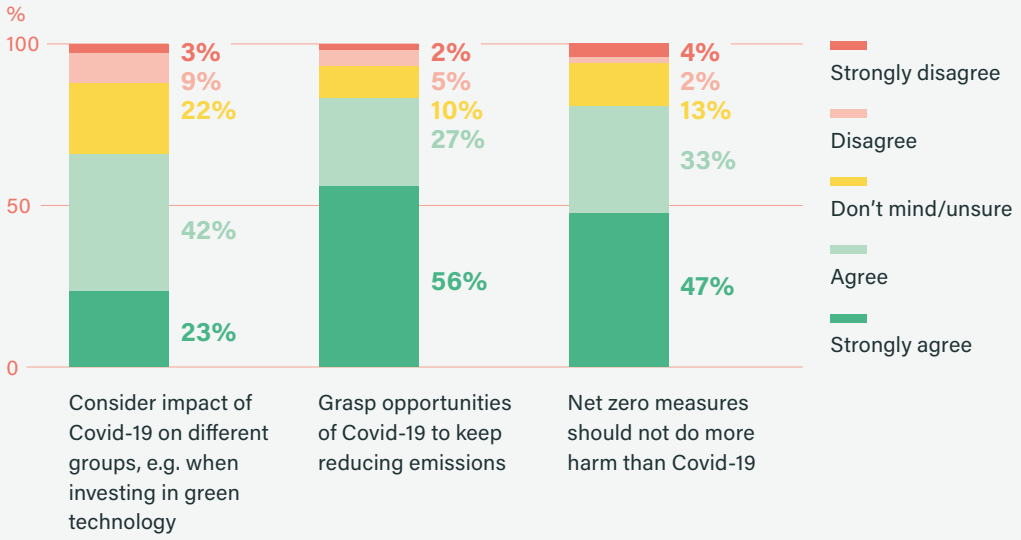
The full wording of each recommendation was as follows. Recommendations are listed in order of popularity:

- "A robust media strategy on the outcomes of Climate Assembly UK should be put in place so that the recommendations of the assembly are widely disseminated because the nation needs to know about it and we have a duty to inform and educate everyone" (**90% support**)
- "There should be a communication and engagement plan to engage the public, with multiple formats, which also ensures there is local level engagement as well as feeding back to central government" (**86% support**)
- "Climate change should be made a compulsory subject in all schools" (**80% support**)
- "In order to support the public to understand climate science, progress towards net zero and relevant technology, the government and Parliament should develop and fund an information portal and live CO_2 tracker" (**75% support**)

Covid-19

Figure 3: Covid-19

Please tell us how much you agree or disagree with each of the following (%)



Over 60% of assembly members 'strongly agreed' or 'agreed' with all the suggested recommendations in this category:

- The two most popular were grasping the opportunities presented by Covid-19 (83%) and ensuring that net zero measures do no more harm than the current situation (80%);
- A higher number of assembly members said they were 'unsure' or 'didn't mind' about considering the impact of Covid-19 on different groups (22%, compared to 10% and 13% for the other proposals). It also received considerably less 'strong' support (23%, compared to 56% and 47%).
- The percentage of assembly members who 'strongly disagreed' or 'disagreed' with any of the recommendations was low (never more than 12% in total).

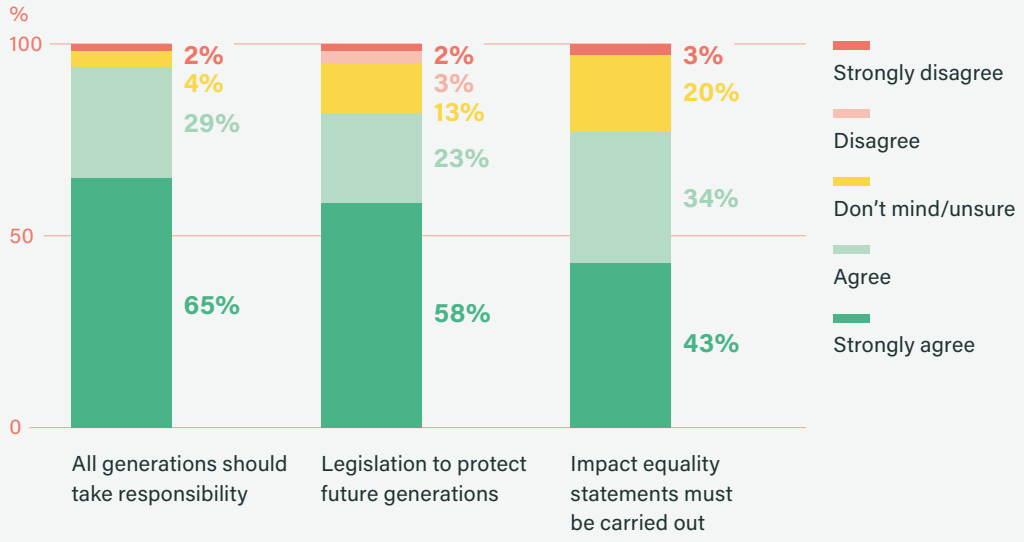
The full wording of each recommendation was as follows. Recommendations are listed in order of popularity:

- "We should grasp the opportunities that have arisen from Covid-19 to maintain the momentum in reducing emissions" (**83% support**)
- "Any measures taken to reach net zero should not do more harm than the current situation" (**80% support**)
- "We must consider the impact of Covid-19 on different regions, age groups and sectors when investing in green technology and job creation" (**65% support**)

Generations and equality

Figure 4: Generations and equality

Please tell us how much you agree or disagree with each of the following (%)



Over 70% of assembly members 'strongly agreed' or 'agreed' with all the recommendations in this category:

- Levels of 'strong disagreement' or 'disagreement' were very low, never reaching more than 5%;
- A relatively high number of assembly members (20%) said they 'didn't mind' or were 'unsure' about impact equality statements.

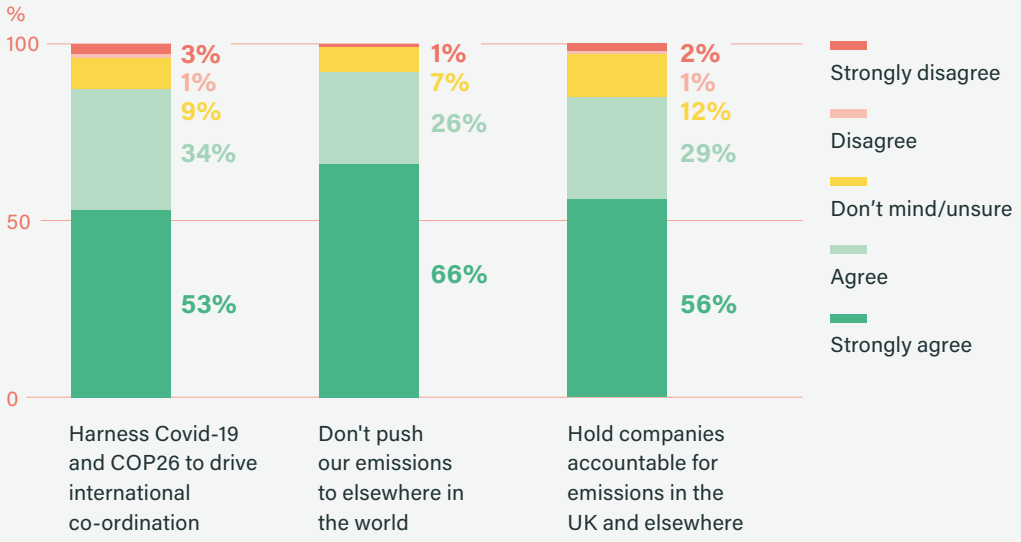
The full wording of each recommendation was as follows. Recommendations are listed in order of popularity:

- "All generations should take responsibility, not just young people" (**94% support**)
- "There should be legislation to protect future generations" (**81% support**)
- "Impact equality statements must be carried out so that we carry the rest of society with us, especially the most vulnerable" (**77% support**)

International action and impacts

Figure 5: International action and impacts

Please tell us how much you agree or disagree with each of the following (%)



Over 80% of assembly members 'strongly agreed' or 'agreed' with all the recommendations in this category, with a majority 'strongly agreeing' in all cases. Levels of 'strong disagreement' or 'disagreement' were very low, never rising to more than 4% in total.

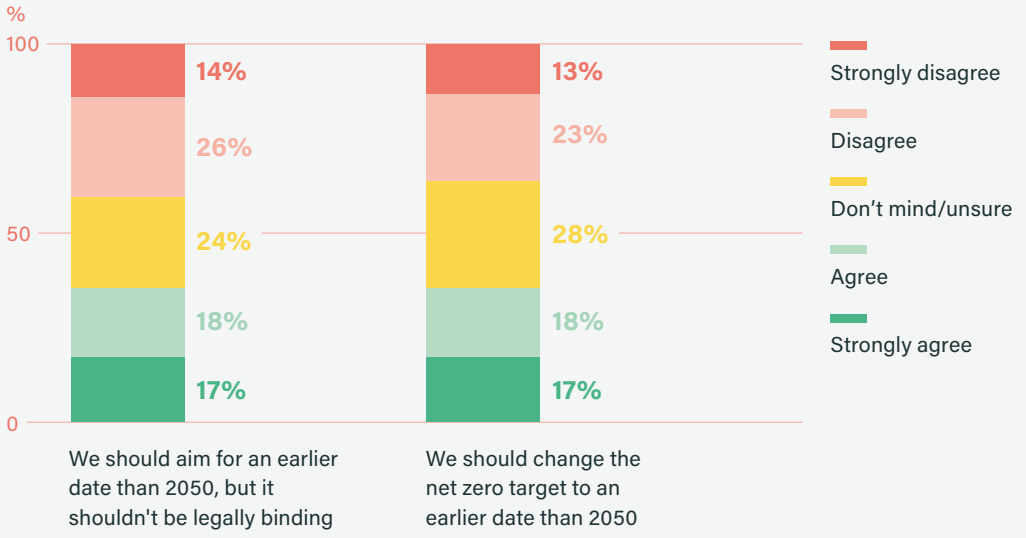
The full wording of each recommendation was as follows. Recommendations are listed in order of popularity:

- "We should get to net zero without pushing our emissions to elsewhere in the world" (**92% support**)
- "We should harness the opportunities afforded by the response to Covid-19 and the upcoming COP26 event to drive a conversation about more international co-ordinated action on climate change" (**87% support**)
- "We should hold companies accountable, including through the UK financial markets, for their emissions in the UK and around the world and stop the shifting of CO_2 elsewhere" (**85% support**)

The net zero target date

Figure 6: The net zero target date

Please tell us how much you agree or disagree with each of the following (%)



The two proposals in this category were the only suggestions for additional recommendations not passed by assembly members.

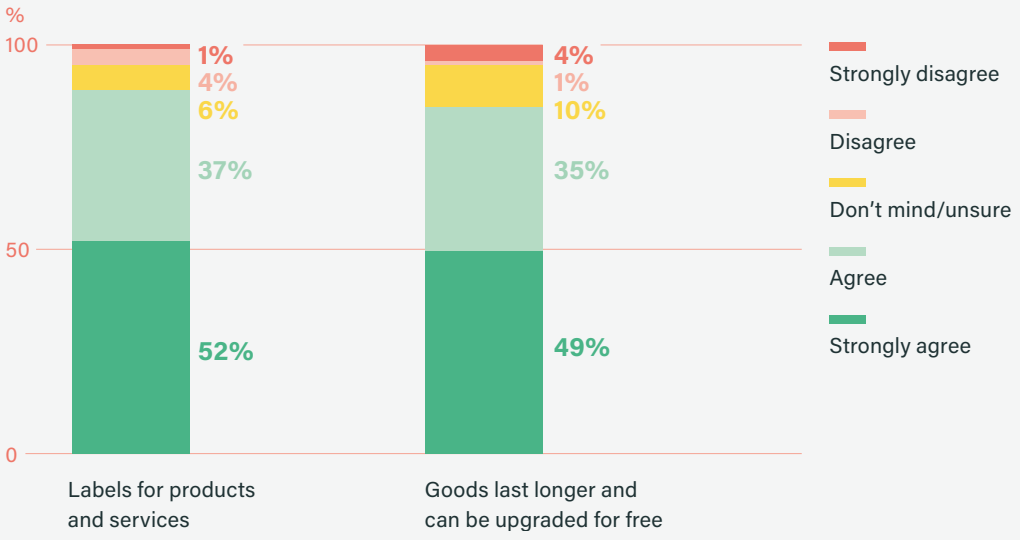
The full wording of each suggested recommendation was as follows.

- "We should change the date for achieving net zero to an earlier date in line with other countries like Finland and Iceland" (**35% support, 28% don't mind/unsure, 36% oppose**)
- "We should be aiming for an earlier target than 2050; it shouldn't be legally binding, but the Government should face consequences if they do not meet this earlier target; for example, there should be a vote of no confidence in the Government" (**35% support, 24% don't mind/unsure, 40% oppose**)

What we buy

Figure 7: What we buy

Please tell us how much you agree or disagree with each of the following (%)



Over 80% of assembly members 'strongly agreed' or 'agreed' with all the suggested recommendations in this category. Levels of 'strong disagreement' or 'disagreement' were very low, never rising above 5% in total.

The full wording of each recommendation was as follows. Recommendations are listed in order of popularity:

- "Products and services should be labelled to include their carbon footprint" (**89% support**)
- "We need a complete overhaul of our 'disposable' consumer culture, so that the goods we buy last much longer and can be upgraded for free" (**84% support**)

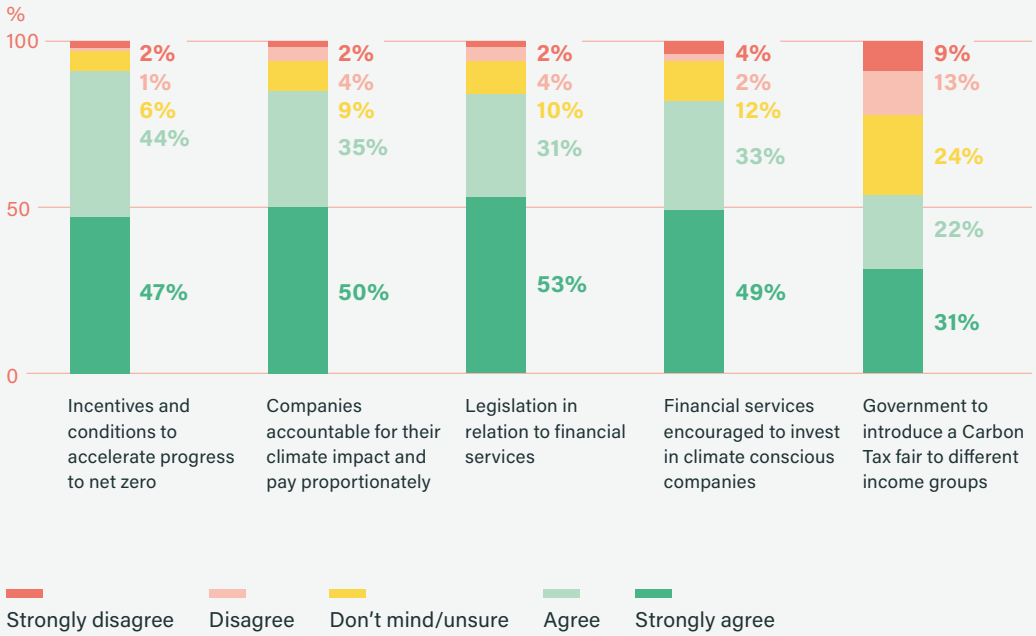
Incentives, payments, conditions, and taxes

Over 80% of assembly members 'strongly agreed' or 'agreed' with four of the suggested recommendations in this category (please see below). Levels of 'strong disagreement' or 'disagreement' with these proposals were very low, never reaching more than 6% in total.

The final suggested recommendation around introducing a carbon tax was more controversial: a slim majority of assembly members (53%) supported it; 24% were 'unsure' or 'didn't mind'; 22% opposed it.

Figure 8: Incentives, payments, conditions and taxes

Please tell us how much you agree or disagree with each of the following (%)



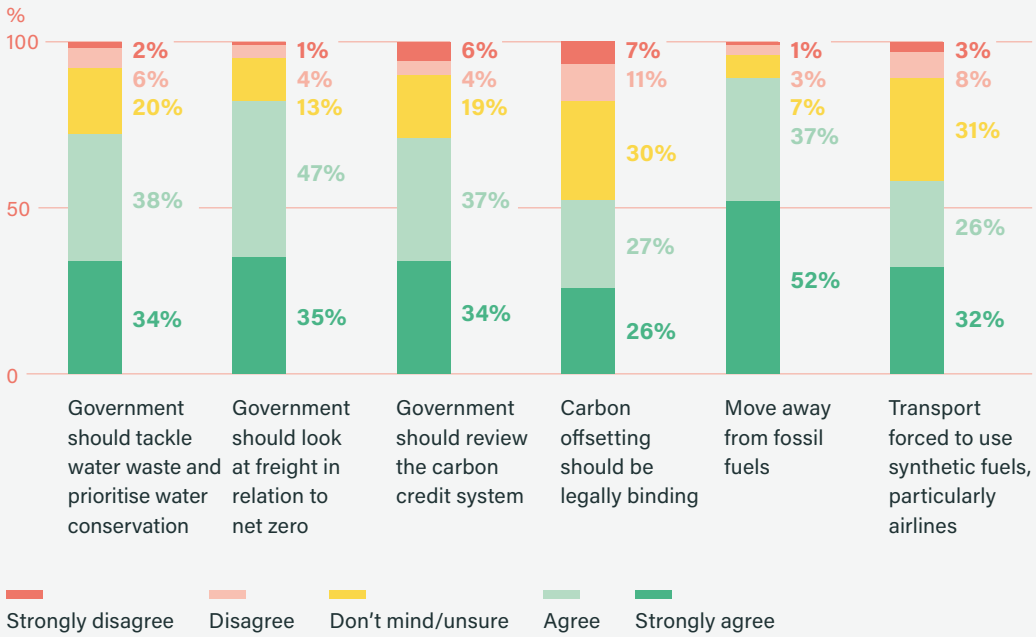
The full wording of each recommendation was as follows. They are listed in order of popularity:

- "There should be incentives for groups, organisations and businesses that accelerate progress to net zero, along with conditions attached to groups, organisations and businesses that are seeking government aid" (**91% support**)
- "All companies should be accountable for their impact on climate change and pay proportionately for their impact through greater regulation and more stringent rules on tax collection" (**85% support**)
- "Legislation [laws] should be used in relation to financial services to ensure investment in renewable energy and to make oil companies pay for the true costs of their activities" (**84% support**)
- "Financial services should be encouraged to invest in climate conscious companies" (**82% support**)
- "The Government should introduce a carbon tax, which is fair for people of different incomes" (**53% support**)

Other specific policy areas

Figure 9: Other specific policy areas

Please tell us how much you agree or disagree with each of the following (%)



Over 70% of assembly members 'strongly agreed' or 'agreed' with five of the suggested recommendations in this category (please see below). Levels of 'strong disagreement' or 'disagreement' with these proposals were low, never rising above 10% in total.

Fewer assembly members (58% and 53%, respectively) supported the other two suggested recommendations, around synthetic fuels and carbon offsetting. Levels of opposition were however low (11% for synthetic fuels) or moderate (18% for carbon offsetting). High numbers of assembly members said they were 'unsure' or 'didn't mind' (31% and 30%, respectively) about these proposals.

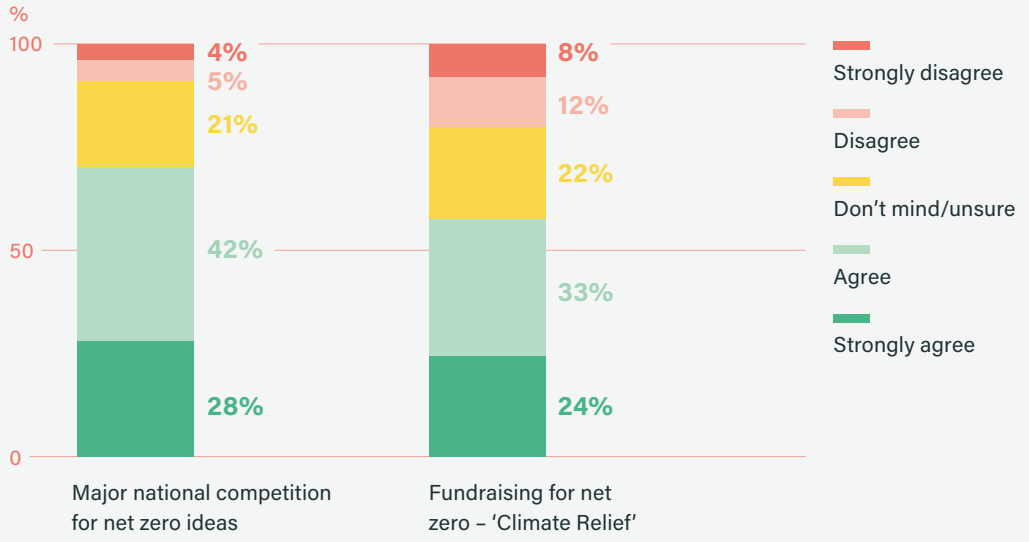
The full wording of each recommendation was as follows. They are listed in order of popularity:

- "To meet our green energy models of production we will need to transition through the various energy technologies available, moving away from fossil fuels" (**89% support**)
- "The Government should look into freight when planning / acting on meeting the net zero target" (**82% support**)
- "The Government should tackle water waste in its efforts to meet the net zero target. Water conservation should be a priority moving forward" (**72% support**)
- "Government and parliament should look at carbon credits and fix / scrap the system if it's not working" (**71% support**)
- "The airline industry in particular, but other transport of all types, must be forced to use synthetic fuels (hydrogen / carbon) to be carbon neutral unless a better technology is developed" (**58% support**)
- "Carbon offsetting should be legally binding and everyone must offset their emissions" (**53% support**)

Miscellaneous

Figure 10: Miscellaneous

Please tell us how much you agree or disagree with each of the following (%)



A majority of assembly members 'strongly agreed' or 'agreed' with both the suggested recommendations in this category – in one case by a relatively large margin (70%) and in one case by a slim one (57%). Relatively high numbers of assembly members (21% and 22%) said they 'didn't mind' or were 'unsure' about both proposals.

The full wording of each recommendation was as follows. They are listed in order of popularity:

- "There should be a major national competition/challenge/prize for the best invention or initiative to address net zero and that the winners are implemented" (**70% support**)
- "We should enable individuals, influencers and charities to contribute to getting to net zero by raising funds through an event – 'climate relief', similar to comic relief but with a climate change focus" (**57% support**)

Conclusions

Assembly members made thirty-nine additional recommendations in total. Many received high levels of backing: at least 80% of assembly members supported twenty-five of the recommendations; at least two-thirds supported thirty-four of them.

The recommendations covered a broad range of areas, and included statements at the level of aims as well as more specific policy proposals:

- Some recommendations picked up or fleshed out themes present since the assembly's very first decision on underpinning principles for the path to net zero – for example, the recommendations around information and education, government leadership and the need for a cross-party approach;
- Some recommendations re-emphasised decisions that had already been made – for example, on labelling for products and services;
- Others raised new points – for example, around water use, and financial services – or allowed assembly members to vote formally on issues that had come up in discussion at earlier weekends.

The assembly did not support two proposals, both around reaching net zero earlier than 2050. Slightly more assembly members opposed such a move than supported it, with the balance held by those who were 'unsure' or 'didn't mind.'

The assembly members' agreement of their additional recommendations brought the assembly process to its close. It marked the completion of Climate Assembly UK's recommended path to net zero.

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Most of all we would like to thank the assembly members for their dedication, hard work, and the thoughtful and considered nature of their recommendations.

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Climate Assembly UK

THE PATH TO NET ZERO

A project by

House of Commons

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