Government
Office for Science

Net zero society: Public dialogue

Annex 6

April 2023

Foresight

Introduction

1.1 What are public dialogues?

Our approach in the net zero society foresight report encompasses both a high-level overview of possible societal change (through our reviews and modelling work) and a close-focus investigation on how individuals might experience societal change in the future. For the latter, we chose to hold a public dialogue. These bring members of the public together to deliberate on policy-relevant issues. They are a recognised methodology for understanding public views on science and technology issues; UKRI's Sciencewise programme has existed to support dialogue since 2004.[1]

Greater public engagement in formal decision making processes has been suggested as means to improve the acceptability and success of resulting legislation and policies.[2,3,4,5,6] For example, in its progress report to Parliament on the net zero target, the CCC advocated for greater use of public dialogues in decision making.[7] The Environment and Climate Change Committee's report on behaviour change for climate and environmental goals also suggested that public engagement can improve the effectiveness of interventions for reaching net zero, and calls for a public engagement strategy by April 2023 to fill the gaps in understanding for the changes required to meet net zero, through initiating dialogues with the public to understand which policies can best enable these changes.[8]

1.2 What did we want to discuss through this work?

It is already well-evidenced that the majority of the UK population are concerned about climate change.[9,10,11] However, research has shown that the public's reaction to possible societal changes depends on the perceived impact on their lifestyles, the possible cost implications and the message framing.[10,12] There have been various public dialogues on

issues relating to net zero.[13,14,15,16] Although some of these were tangentially relevant to our work, we wanted to learn about people's reactions to the specific scenarios we had developed. To this end, the public dialogue documented here took a different approach to previous work as it immersed participants in four plausible future scenarios where net zero has been reached to understand their reactions to possible future societal changes. The net zero society project team, with support from the Sciencewise programme, commissioned the research company Ipsos to carry out a public dialogue based on the four scenarios laid out above.

The aim of the public dialogue was to explore:

- **Plausibility and pathways**: These were the aspects of the scenarios that participants felt were least plausible and the changes they believed would be needed between now and 2050 to make the scenario plausible.
- **Cross-cutting themes**: These were the areas that participants felt were important across all scenarios, as follows: technology, equality, health and involvement.
- **Tensions and trade-offs**: Participants were acutely aware of the tensions involved in decision making around net zero and noted that there was no way to wholly resolve all the trade-offs. However, through exploring them, they generally became more receptive to a variety of options.
- **Reactions to the individual scenarios**: These included initial reactions and reflections relating to the specific sectors discussed above.

Please note that the research for this report was carried out up until early 2023 and, therefore, the report only considers trends and policy up until this time point.

Dialogue approach

2.1 Participants

A group of 30 participants from across the UK (Figure 1) took part in the public dialogue. This group was broadly reflective of UK population demographics (including age, income level, geographical location, ethnicity and gender). A range of attitudinal differences were also included in the participant sample, specifically relating to levels of concern about climate change and views on the government's role in shaping economy and society. The approach to recruitment also ensured adequate representation from underrepresented communities that are likely to be disproportionately impacted by the effects of climate change. The groups were: individuals from minority ethnic backgrounds, those with English as an additional language, and people on lower incomes. For a full breakdown of the demographic composition of the participant group, please see Appendix 1.

One participant had to drop out of the dialogue due to unforeseen life circumstances. Another two participants had to miss a single workshop but were able to catch up on the content of the missed workshop and, therefore, this did not affect their engagement in the workshops that they were able to attend.

2.2 Materials

The materials used in the dialogue included the four rich picture illustrations created during the development of the scenarios (Appendix 2). To complement these illustrations, two 'future artefacts' were created for each scenario (Appendix 3). Future artefacts are materials that reflect the culture and daily life of an imagined future. To help participants view the scenarios through the perspectives of different groups, a set of 'personas' were developed (Appendix 4). Personas are characters developed to represent a particular group. The personas were used to help represent groups whose

perspectives and lived experiences have often been underrepresented in social discourse (for example, people with disabilities, individuals from minority ethnic groups, older people, and those with lower incomes).

Figure 1. Locations of participants on a map of the UK. Locations in large cities, such as London, represent more than one participant.

2.3 Structure

The dialogue initially introduced participants to the process and the issues pertinent to the scenarios through a webinar. Following the webinar, participants participated in four three-hour online workshops (workshops 1–4) that each considered an individual scenario. Then they took part in a final three-hour online workshop (workshop 5) where they reflected on all the scenarios. All sessions took place on Monday and Wednesday evenings as this was deemed the most convenient timing to fit with participants' work and caring responsibilities. Participants were paid £40 to attend the webinar and £60 per workshop for their participation in the five online evening workshops.

2.4 Analysis

All workshops were recorded and every breakout room had a trained notetaker who made notes during the sessions. The transcripts of the recordings and the notes were then coded and thematically analysed.

Results

The net zero society report (Chapter 5) includes the following public dialogue results:

- Opinions on the plausibility of the four scenarios and the pathways from current society to a future scenario,
- Thoughts about cross-cutting themes that participants deemed important for all future societies,
- Reactions to the individual scenarios, and,
- Reflections on the tensions between different priorities in future societies.

These sections are reproduced below. However, this annex also provides an additional area of results. It sets out the participants' insights on the changes across the four different sectors covered by scenarios (the built environment, travel and transport, food and land use, and work and industry).

3.1 Plausibility and pathways

Most participants were worried about climate change and the risks it posed to current and future society. There were some participants who were sceptical about the possibility of reaching net zero by 2050, with some pointing out specific technological aspects (such as zero carbon flying) that seemed unrealistic to them. Others expressed strong doubts about the lifestyle changes shown in the scenarios, suggesting that the 'status quo' would not change in the implied timescales.

Although participants were encouraged in workshops 1–4 to accept the premise of the scenarios even where they might find some aspects implausible, there was an opportunity in workshop 5 to discuss plausibility. Participants often referenced the present day when considering plausibility, suggesting that some scenarios showed either too much or little difference between now and 2050.

*"[The **self-preservation society**] does seem like it could happen. […]. But also, [the **slow lane society**] if we're optimistic, we could get to a place like that. Making do with what we have and not buying so much."*

When considering the scenarios overall, participants thought that the **self-preservation society** and the **atomised society** were the most plausible (often suggesting this was the path that UK society was already on). In other words, participants found the scenarios with lower social cohesion and less dramatic societal changes more plausible. Some suggested that the **metropolitan society** and the **slow lane society** were theoretically possible but were more aspirational than realistic.

Where participants expressed that they did not see a pathway from current society to a future scenario, they were asked what they thought would need to change and why they thought that change was unlikely. Below are the changes that they suggested could take place that would move society onto the pathway to some of the scenarios.

Increased investment

Key message for policy makers: Societal change is somewhat contingent on the infrastructure available to support it (such as accessible public transport and active travel infrastructure). Participants expressed the desire to make changes in their lifestyles but were concerned that this was not plausible without investment in the infrastructure to allow them to do so. Framed in reverse, investment in low carbon infrastructure was seen as a key to unlocking acceptable changes to meet net zero.

What the participants said: For all scenarios, except the **self-preservation society**, there was a general sense that for them to occur there would need to be significant investment in future technologies to bridge the gap between where technologies currently are and where they would need to be to realise the scenarios. Participants particularly highlighted that international travel does not have an efficient, low-carbon global transport network, which

"To do so, we need to invest more in public transport in both rural and urban areas. The more we are connected by public transport the better for the whole community."

leaves no viable alternative to flying in some instances. This highlights that meeting net zero in a way that maximised public support would likely require either low carbon flight or viable alternatives. Both would require substantial investment.

Participants also suggested substantially more investment in making UK public transport options more efficient and reliable would be needed if the scenarios with increased reliance on public transport were to come about. Rural participants further highlighted that for any scenarios with reduced access to private vehicles to be workable, there would need to be a far-reaching expansion of public transport networks and access to local amenities (schools, for example) into currently poorly connected areas.

Reskilling

Key message for policy makers: Participants only found scenarios with large societal changes (such as increases in automation or a greater emphasis on the circular economy) plausible if there were supporting efforts to reskill individuals. Clearly changes such as automation are not directly linked to net zero targets but could have an impact on emissions. Without the focus on education and training, supporting the public to navigate big economic shifts, participants believed that such societal changes were unlikely to take place or would be met with resistance.

What the participants said: When discussing scenarios that presented an increased focus on repairing goods rather than replacing them, participants highlighted that there is a large gap in the general public's knowledge of how to repair certain items. They suggested that if these scenarios were to come about then there would need to be more upskilling to facilitate the broader societal change of wasting less and repairing more.

Reskilling was also referenced when participants discussed scenarios with high levels of automation. While most participants were concerned that people may lose their jobs, a few participants argued that scenarios with increased automation might present an opportunity to facilitate upskilling and retraining, but that this needed to be done cautiously and with sensitivity to those unwilling or unable to make those changes.

Some scenarios suggested an increase in individuals or local communities growing their own food. Participants were keen on this concept but again indicated that this was a big change from current society, where people are often separated from agricultural processes. Again, it was suggested that for these scenarios to be realistic, individuals would need to be educated in how to produce their own food.

"There will be the automation of peoples' jobs, but I think government and other organisations would have to help people to reskill and retrain."

Changing food preferences

Key message for policy makers: Participants assumed that the trend for citizens reducing their meat and dairy consumption would continue and many expressed a desire to reduce their own consumption. They were averse to having fewer food options available in the future but were generally supportive of incentivising people to choose less emissions-intensive options. Future policy makers will need to carefully navigate between the expressed dietary preferences of the day, decarbonising food production, and maintaining public support for some of the technical options to achieve this. Ongoing public engagement on this is likely to be necessary.

What the participants said: Most participants acknowledged that reducing meat and dairy consumption would reduce carbon emissions. This was also the case among participants working in agriculture. Although all participants wanted to keep meat and dairy as options for individuals in future societies, some were keen to encourage reduced meat and dairy consumption and incentivise people to choose less emissions-intensive options (for example, by making plant-based alternatives cheaper).

Participants struggled to accept the premise that alternative proteins (such as cultured meat) or novel agricultural techniques (such as vertical farming) would be widely accepted in the future. They often suggested that people would view this as less desirable than food grown or reared traditionally. Most participants believed that food produced using novel technologies (particularly cultured meat) was inherently less healthy than

"We have the responsibility to do the right thing for the planet, but the government need to incentivise that choice as well."

food grown in a traditional way. This affected how plausible they viewed scenarios with increased consumption of cultured meat. A few participants said that if the right checks were conducted to ensure cultured meat was safe for consumption, they would buy it. Others also acknowledged that their reaction may have been driven by a lack of understanding of the technology used in these processes. Reservations around moving towards products that relied on novel technologies affect the **metropolitan** and **atomised** societies to a greater extent. Concerns about the reliance on imports affects the **self-preservation society** most, while concerns about reduced food choice affects the **slow lane society** slightly more than the others.

Incentivising businesses

Key message for policy makers: As noted previously, participants expressed that some societal changes would be less likely to occur without changes in other sectors. For example, participants suggested that establishing a circular economy would require businesses to reduce inbuilt obsolescence, increase repairability and reduce waste associated with manufacturing. Participants suggested that businesses would likely need incentivising to develop these practices because the changes required could come into conflict with their profitability.

"If companies are rewarded for producing things that are better for the planet, that would be a better way of attracting investment into that stream."

What the participants said: A few participants flagged that to facilitate the broader societal change outlined in some of the scenarios (especially those with a greater emphasis on the circular economy), businesses currently producing products with inbuilt obsolescence would need to be incentivised to change their operating model. Suggestions included standards for repairability and using the full lifecycle of products. This was particularly true for scenarios suggesting significant changes to how products

are made, used and disposed of (such as the **slow lane society** or the **metropolitan society**).

3.2 Cross-cutting themes

Throughout discussions, participants explored what they saw as the advantages and challenges in the four scenarios presented to them and how these could impact their lives and those of others. Four main themes emerged in the participants' discussions across the five workshops. These cross-cutting themes (technology, equality, health, and involvement) are outlined below. The themes that emerged during this dialogue also closely match those that have been found in previous public engagement work.[15,16]

Technology

> *"I'm all for technology, but is it going to start controlling everything I do?"*
> **Self-preservation society**

Key message for policy makers: In net zero pathways that rely on a high level of technology adoption, especially technology which is highly visible to citizens (such as novel food technologies or changes to work environments), policy makers may need to work to ensure public support. Participants suggest that promoting equity of access to (and impacts from) technology, preventing job losses, and careful regulation were important to ensuring public support. From stem cells to mitochondrial DNA transfers, successive UK governments have been able to craft policy positions that commanded broad support, in part through public dialogue. The rollout of consumer facing net zero technologies may benefit from similar work.

What the participants said: Many participants expressed wariness of advanced technologies, how they were used and who benefitted from their use. Participants indicated that significant technological innovation was expected by 2050 and were positive

> *"As easy as it is to submerge yourself in this virtual bubble, it can't replace reality and it never should."*
> **Atomised society**

about less visible technological advancement (such as technology to facilitate a circular economy). However, they expressed concern about relying disproportionately on technology to reduce emissions. They were also highly critical of technologies they saw as automating jobs or contributing to social isolation.

> *"You can't trust big tech, it's about their shareholders, not their world."*
> **Metropolitan society**

Participants typically exhibited low levels of trust in the agenda and priorities of large technology companies. This concern also came through in the opinions expressed around the use of advanced technologies in food production, where some participants expressed fear that a few influential companies could end up controlling the means of producing food.

Participants were also concerned about the social and economic implications of technological innovations. They questioned whether technology would be affordable for all and if some technologies could reduce social contact between different groups. However, they also saw some benefits, relating to potential positive health outcomes and convenience, which could arise through the effective use of technologies. This theme was most often raised in relation to the **atomised** and **metropolitan** societies, which involve the highest uptake of novel technologies.

Equality

Key message for policy makers: Perceived fairness was extremely important to participants. If narratives were to emerge around a lack of fairness in how net zero is being delivered, whether by government action or as a result wider changes, it would likely create resistance and hold back progress. Future governments will need to be alert to, and address, concerns expressed by the public around fairness in relation to net zero pathways.

What the participants said: The theme of equality was brought up by participants in every workshop. All participants were deeply concerned by potential inequalities in the

four scenarios. The concerns expressed around inequality can be broadly grouped into three categories:

1. **Income inequality**: Participants were concerned that those who were less well off in the future could be excluded from certain aspects of society. For example, they were concerned that some individuals might not be able to access affordable transport options or might be at greater risk of losing their jobs to automation. There was a pervasive sense that there was a risk that those with less money could be 'left behind'.

2. **Place-based and geographic inequality**: Participants were worried that there could be a widening of inequalities between urban and rural areas in the future. This sentiment was expressed most strongly by those from rural areas. There were two main concerns raised. Firstly, that rural areas would not have access to the amenities and funding enjoyed by urban areas. Secondly, that those currently living in rural areas would need to move into urban areas, resulting in a loss of access to nature or loss of livelihoods for those working in agriculture.

> *"If [food is] grown in a lab, they won't need farmers anymore. Farmers will lose out."*
> **Metropolitan society**

3. **Accessibility**: Participants advocated strongly for increased accessibility in future scenarios and were positive about instances where they saw opportunities for increased accessibility. Participants suggested that that more disparate built environments would not adequately meet the needs of those with different accessibility needs. Typically, private vehicles were seen as being most advantageous for those with limited mobility, although a few participants highlighted the possibility that public transport advances may result in greater independence for those with different accessibility requirements.

The concerns around increased income equality most affects the **atomised society** (which has increased income equality) and to a lesser extent, the **self-preservation** and **metropolitan** societies (where inequality was assumed to stay roughly at today's level). The concern around the widening divide between urban and rural areas mostly affects

the **metropolitan society**, where investment has focused on urban areas for efficiency reasons.

Health

Key message for policy makers: As explored in Annex 5, there are potential co-benefits to policies aimed at reducing emissions, including longer healthy life expectancies and improved air quality. Participants favoured scenarios that gave equal priority to public and planetary health. Given this, emphasising the health co-benefits associated with a net zero transition should benefit citizens and, in so doing, bolster support for the transition itself.

> *"[I like the idea of] the natural fruit and veg, the health benefits and low meat consumption."*
> **Slow lane society**

What the participants said: Participants often explored the impacts that future societal changes may have on human health. Discussions about diet and food centred on the implications for health. In general, participants expressed the view that beneficial climate outcomes should be aligned with beneficial health outcomes.

Participants were particularly concerned with the health implications of the diets that different scenarios put forward, and many participants' perspectives on the health implications of people's diets were contingent on the quality and type of food different people were able to access.

Another key focus was the impact of social isolation on individuals' mental health. There were concerns that reliance on technology would result in greater isolation. Participants highlighted this with the built environment too, noting that lack of access to greenery or nature can have negative impacts on mental and physical health. Concerns around isolation and loneliness particularly affected responses to the **atomised** and **metropolitan** societies.

> *"I have concerns not just about health but mental health in this scenario."*
> **Atomised society**

Involvement

"It's great if you're doing it voluntarily, but if you're forced into it without any other option, it's not so good."
Self-preservation society

Key message for policy makers: Participants were aware that meeting net zero would likely come from people making changes to their lifestyles and were not averse to doing so. However, they expressed the strong desire to be consulted if policy makers were looking for ways to expedite these changes. They also noted that for policies to work, people had to trust the institutions designing and implementing them. Policy makers will likely find it easier to chart a course to net zero by working with and listening to citizens.

What the participants said: Participants often emphasised the importance for individuals to be involved in the decisions that affected their lives and to be able to make their own, informed choices. Most participants recognised the importance of societal changes to reduce emissions. Some participants expressed positive views about changes in consumer behaviour, such as increased preference for plant-based diets or reducing consumption of goods. In general, there was emphasis on the importance for people and communities to take greater individual and collective responsibility, and for sustainable choices to be encouraged and incentivised. Concerns around low levels of involvement and institutional trust particularly affect the **atomised** and **self-preservation** societies.

3.3. Reactions to the scenarios

In this section there is a short reminder of the modelling outputs for each scenario followed by an overview of what challenges policy makers in this imagined future scenario would face. This is followed by greater detail on participants' reactions to each society as a whole and the sectors within it.

Atomised society

Reminder of what the modelling tells us: As a percentage of GDP, the cost of delivering this energy system in 2050 is roughly the same a baseline scenario where net zero is not met, largely because GDP is higher in this scenario. Because of its high energy demand and low available land space, this scenario relies heavily on direct air capture, carbon capture and storage, and hydrogen produced from fossil fuels. The population imagined in this world has a preference for high levels of consumption. The high energy demand and reliance on unproven technologies place this scenario at a medium risk of missing net zero if the trends do not follow our assumptions.

Key challenges for policy makers in the atomised society: In a future like this, high economic growth and technological innovation affords choice for policy makers and the general public. Although this choice is likely to be desirable for many citizens (who may value having a range of transport options or food variety), there may be discontent among those on lower incomes who may find some options unaffordable. Societal divisions (including physical separation of different social groups) could make this future a difficult environment in which to create and implement policy, especially given that citizens may be more concerned about potential disproportionate impacts of any policy options. Policy making around agriculture and land use may be particularly complex, with citizens possibly being reluctant to accept the large changes to rural landscapes and green spaces needed to balance food production and carbon capture technology.

Society as a whole

Participants' overall reactions: Participants' initial reactions centred on concerns around income inequality. While some did note technology could be used to achieve positive outcomes (for example, to make healthcare more effective and efficient), many participants expressed concerns about the frequent use of virtual reality and other immersive technologies in contributing to the isolation. Even participants who

"[People] will be more disconnected and impersonal in their dealings, like detached robots. I find that really sad."
Atomised society

welcomed the use of technologies for the reduction of emissions and greater convenience expressed concerns about technology being used to displace human interaction and communities.

Sector-specific reactions

The built environment

Reminder of the built environment in the atomised society: People are increasingly living in self-contained 'bubbles' in suburban and rural areas, with more people living alone. New homes in dispersed locations have improved affordability. However, there are fewer local amenities.

Participants' reflections: Participants shared a dislike for the perceived insularity of this society, expressing discomfort with the dispersed population and the high number of people living alone. They were also worried that those on higher incomes would move into gated communities or in some other way physically separate themselves from those on lower incomes, increasing segregation and reducing the sense of community.

Travel and transport

Reminder of travel and transport in the atomised society: In this world, long distance public transport is efficient and convenient. However, the cost of using it is relatively high. There is a strong uptake of CAVs by those with higher incomes. International flights for holidays and leisure remain popular.

"It looks like the poorer are excluded from all types of transports."
Atomised society

Participants' reflections: Participants noted that there were many transport options for the highest earners in this society (for example, CAVs and public transport) but limited options for those on the lowest incomes. There were concerns that this could effectively exclude some people from various activities outside of the home.

Work and industry

Reminder of work and industry in the atomised society: High consumption and increased technological obsolescence have created a throwaway culture. However, there are also better recycling solutions for some products. Cryptocurrency is increasingly used to purchase services in both the physical and virtual world.

> *"I understand the worries of how some jobs are being taken over by technology, but I think with tech, that can generate more job opportunities for people so they can develop more skillsets."*
> **Atomised society**

Participants' reflections: There was concern from participants about inbuilt obsolescence in this society. Challenges around inequalities were also raised, especially concerns about whether there was equal access to digital infrastructure. Some participants were concerned about the jobs available in this society, noting that high levels of automation could result in some people losing their jobs. Other participants disagreed, suggesting that innovation would generate jobs and create opportunities to reskill.

Food and land use

Reminder of food and land use in the atomised society: There is an increase in the availability and affordability of cultured meat. Urban agriculture and vertical farming offer local produce for those with higher incomes. Genome-edited crops and robotic pollinators allow the UK to achieve self-sufficiency. However, environmental degradation has reduced biodiversity.

Participants' reflections: Participants expressed reticence around increased agricultural technology in this society, particularly for genome-edited food, cultured meat and vertical farming (there were fewer concerns expressed about robotic pollinators). There were also concerns that rural landscapes and green spaces might not exist in this society, which was seen as undesirable.

Metropolitan society

Reminder of what the modelling tells us: The cost of delivering the energy system in 2050 is 2% of GDP lower than a baseline scenario where net zero is not met. In other words, this scenario is more affordable than not meeting net zero. Energy demand and economic growth have been decoupled most significantly in this scenario. This scenario uses unproven technologies to reach net zero, although it also uses nature-based removals. Demand for energy and goods is moderately high, driven in part by higher economic growth, but offset by resource efficiency. The energy demands in this scenario mean a relatively large area is needed to build the required energy infrastructure. The risk to missing net zero in this scenario is relatively low, as there is scope to push technology change or demand reduction further if needed.

Key challenges for policy makers in the metropolitan society: In this future, high economic growth, alongside high social cohesion and institutional trust, have created a relatively benign environment for rolling out new technologies and implementing new policies. However, there is likely to be continued reticence towards technologies seen to be infringing on people's personal lives and policy makers would likely need to continue reassuring the public on the safety of new technologies in order not to lose support. Particular resistance may be apparent in food production, where the public may be least comfortable with technologies playing a major role without careful research and regulation. Rural populations may express dissatisfaction with policies seen to favour urban areas or to create divisions between urban and rural areas. In general, citizens' need for green spaces and rural landscapes may come into conflict with increasing urbanisation and land being used for food production and/or nature-based carbon removal.

Society as a whole

Participants' overall reactions to the metropolitan society: Participants' initial thoughts on this scenario often revolved around the high use of technology in 2050. Some participants felt the scenario presented futuristic and exciting innovations, but

others expressed some discomfort around increased use of some technologies (specifically AI and agricultural technology). Many participants were concerned that heavy reliance on technology might exclude some groups, especially older people and those in rural areas. They also expressed general concern about the rural and urban divide. Participants from rural areas were worried about being 'left behind', with limited access to the improvements in public transport efficiencies available in urban areas and with the perceived side-lining of their lifestyles and livelihoods (for example, through food production becoming divorced from rural areas).

> *"I think people who don't have an urban lifestyle have been forgotten about."*
> **Metropolitan society**

Sector-specific reactions

The built environment

Reminder of the built environment in the metropolitan society: Many people live in cities and fewer reside in rural areas. Funding is channelled to urban areas. There is compact living in small households and a push for essential services close to home.

Participants' reflections: Participants were positive about the possibility of green cities and high economic growth in this society. However, they raised some concerns about potential isolation, with small or single-person households often being viewed negatively. They were also concerned about physical separation and a lack of interaction between different groups (especially between those on higher incomes and those on lower incomes and between those in urban and those in rural areas).

Travel and transport

Reminder of travel and transport in the metropolitan society: There has been greater investment in low-cost urban public transport and train travel is cheaper and easier between cities. CAVs are available as on-demand shared travel. There are zero carbon international flights available but less domestic flying.

Participants' reflections: Participants welcomed the benefits that active travel and public transport could have on reducing pollution and improving air quality. However, some were concerned with what an increase in public transport (and to a certain extent, increased use of CAVs) would mean for transport infrastructure. In particular, they were concerned about the investment that would be required and whether new inter-city infrastructure would impinge on green spaces.

Work and industry

Reminder of work and industry in the metropolitan society: There is a thriving market for goods and services alongside a growing circular economy. An increased focus on sustainability supported with technology assists people in making sustainable choices.

> *"I quite like the way that it's attempting to eliminate consumerism and the throwaway culture we have, such as fast fashion."*
> **Metropolitan society**

Participants' reflections: The circular economy was seen as a positive aspect of this society. However, some participants were concerned that there would be an increase in automation in the workforce, which could result in people's jobs changing or being lost. Others noted that it was possible for people to reskill to work in the new jobs that technological innovation might offer.

Food and land use

Reminder of food and land use in the metropolitan society: There has been an increase in plant-based diets and cultured meat. Organically farmed meat is a rare luxury. Genome editing and robotics have reduced land and pesticide use.

> *"In agriculture, we currently use a lot of pesticides and chemicals, so reducing those could be positive for the natural world and biodiversity."*
> **Metropolitan society**

Participants' reflections: Participants were generally averse to the use of novel technologies in food production in this society, particularly cultured meats and, to a lesser extent, genome-

edited food. However, others saw potential positives in reducing pesticide use and lowering emissions.

Self-preservation society

Reminder of what the modelling tells us: The cost of delivering this energy system in 2050 is the highest percentage of GDP of all the scenarios and is 5% of GDP higher than a baseline scenario where net zero is not met. More land will be needed to accommodate demand-led infrastructure as well as for increased livestock and agriculture. The level of carbon removal required necessitates both technological and nature-based approaches. There is also a relatively high reliance on unproven net zero technologies, combined with a society less amenable to change; these challenges are unlikely to be resolved and the risk of failure in meeting net zero is high.

Key challenges for policy makers in the self-preservation society: In this future, low growth and technological progress have left fewer options for policy makers to reach net zero. This has meant relying on relatively high-cost unproven technologies to reduce emissions. Lower growth also presents wider challenges to income and public services. Policy makers may find a population frustrated by a lack of innovation, opportunities, and sense of community. However, the relatively low use of visible technology may mean that policy makers need to make fewer decisions on regulation. The preservation of 'traditional' jobs and lifestyles may also mean policy makers need to tackle fewer issues around reskilling the population. Lower growth has resulted in relatively little new infrastructure or housing. Policy makers may find, therefore, that the major issues they face are around housing supply and reliable transport options. Although new building projects have not affected the rural landscape, policy makers may face discontent in rural areas where unviable agricultural land has been used for technological and nature-based carbon removal.

Society as a whole

Participants' overall reactions: There was a strong feeling held by most participants that this society was 'going backwards' and showed no progress between the current day and 2050. Some expressed disappointment in the lack of the net zero technologies that they believed were important to reduce emissions. Participants were concerned about the income equality in this society and were worried that some aspects of daily living would be unaffordable for those on lower incomes. A few participants suggested that this society would be the least jarring for older people or for those who were strongly averse to change as it felt the most similar to the current day.

Sector-specific reactions

The built environment

> *"I come from an already segregated society and gated communities will do nothing to integrate people from diverse backgrounds."*
> **Self-preservation society**

Reminder of the built environment in the self-preservation society: Less investment in cities has driven people out to the suburbs and rural areas. Housing demand outstrips supply and there is more multigenerational living as a result. There is also a focus on 'self-sufficient' living.

Participants' reflections: Participants were worried that the combination of a lack of a sense of community and what they perceived as low living standards would lead to increased crime. They suggested this could result in those with the highest incomes moving into gated communities, exacerbating the social divisions they already felt were prevalent in this society. Some participants were fairly positive about the increase in multi-generational living, suggesting that this would reduce feelings of isolation. However, others expressed concern that this trend would be driven by economic circumstances rather than an increased desire to bring families closer together.

Travel and transport

Reminder of travel and transport in the self-preservation society: Public transport is available but is fragmented outside of cities and has received little investment. There has been moderate investment in active travel infrastructure. CAVs are not widespread but are available for the rich. Flying is increasingly expensive.

> *"I live in a small hamlet. The nearest big shop is over an hour's drive away. It wouldn't be possible for me to get around everywhere on a bike with young children."*
> **Self-preservation society**

Participants' reflections: Participants were concerned about how people who did not own a private vehicle would travel in this society, noting that an unreliable and fragmented public transport system would make life very difficult. There were also concerns that expensive flights would mean that foreign holidays would only be possible for the highest earners and that most people could not afford to visit family or friends they might have abroad.

Work and industry

Reminder of work and industry in the self-preservation society: Many goods are still designed with inbuilt obsolescence. 'Greenwashing' by companies is common. In general, there is a throwaway culture. However, those living 'off grid' have a 'make do and mend' attitude. There are also service exchange or mutual goods exchange systems.

Participants' reflections: Participants disliked the throwaway culture in this society and expressed concern for how the waste would be managed. There were positive reactions towards groups who repaired their goods and towards mutual goods exchange systems. Participants also suggested that this society had the potential for the greatest number of 'traditional' and face-to-face jobs, which they expressed support for.

Food and land use

Reminder of food and land use in the self-preservation society: Meat is readily available through intensive farming. Organic options are available but are unaffordable

"I like to be self-sufficient in what we grow […] If you don't produce your own reserves, you're held captive by outside forces."
Self-preservation society

for most people. Some UK farmland has become unviable, meaning there is an increased reliance on imported food. Some former farmland has been rewilded. There is little advanced agricultural technology available.

Participants' reflections on food and land use in the self-preservation society: Participants were negative about the increased reliance on imports, noting a desire for self-sufficiency and food security. Many also advocated for ensuring that there was equal access to healthy foods for all groups in the future. They were concerned that quality produce would only be affordable for those on higher incomes and that those on lower incomes could end up having lower quality food and less choice in what they consumed. Although participants were generally positive towards rewilding, some were concerned that it could be detrimental to 'traditional' rural lifestyles.

Slow lane society

Reminder of what the modelling tells us: The cost of delivering this energy system in 2050 is 1% of GDP higher than a baseline scenario where net zero is not met. It uses significantly less new energy infrastructure than other scenarios to meet the demand, and significant societal shifts have lowered energy demand and reduced the need for unproven net zero technologies. This includes a shift to a circular economy and nature-based carbon removal. However, the lack of technology availability means that there is a relatively high risk of not reaching net zero if demand reductions are short-lived. The society is amenable to making significant changes, and this is likely to be the main mitigation in case of risks.

Key challenges for policy makers in the slow lane society: In this future, low economic growth has meant fewer technology options are available for policy makers to reach net zero. Lower growth also presents wider challenges to income and public services. However, shifts in consumption have kept costs for meeting emissions targets low.

Although there is high societal cohesion, policy makers may face a population that is at risk of becoming dissatisfied with a lack of progress in living standards, a lack of convenience, and limited choices (for example, in what to eat or how to travel). Challenges for policy makers in this society are likely to be about ensuring that public services can continue to meet demand in a future with relatively restricted public finances. However, they may face fewer challenges around perceived inequalities and land use, with this future having high social cohesion and protection of rural areas (including for traditional agriculture and preservation of natural landscapes).

Society as a whole

Participants' overall reactions: Most participants highlighted that the focus on communities in this society was very positive. The availability of locally grown food was also popular, as was the extensive use of public transport, the shrinking income inequality, and the 'repair and mend' culture. Some participants were worried about a slow-down in production and new products being less frequently available. Most concerns centred on reduced convenience and perceived lower living standards.

> *"I love the idea of getting us onto a more level playing field."*
> **Slow lane society**

Sector-specific reactions

The built environment

Reminder of the built environment in the slow lane society: Population is spread across urban and rural areas. There has been low investment in new homes. People are living more localised and compact lifestyles and relying on increased local amenities.

Participants' reflections: Participants had positive reactions to the increased sense of community in this society. The move towards local amenities and close-knit communities spread across urban and rural areas was also seen positively. However, some feared the

countryside would be fundamentally changed by the new infrastructure and housing that would be needed to facilitate population dispersal from towns and cities.

Travel and transport

> *"If everyone is taking the same mode of transport, you need to create more railway lines, trains and routes. They need to be more reliable."*
> **Slow lane society**

Reminder of travel and transport in the slow lane society: Walking and cycling are common, and people can access an efficient and well-maintained public transport system. Private car ownership is less frequent and there are few CAVs in use. Flying domestically or internationally is less common with more options for slower and less emissions-intensive options (such as high-speed trains or boats).

Participants' reflections: Participants were fairly positive about the high use of active travel and public transport in this society, noting this would be beneficial for public health and the environment. They also suggested that having sufficient infrastructure for active travel would create more flexibility in travel than either private or public transport. Some participants were unconvinced by alternatives to aviation for long-distance travel, suggesting it would be inconvenient and impractical for those working in jobs with limited leave. There were concerns that both private and public transport might not be affordable for those on low salaries.

Work and industry

Reminder of work and industry in the slow lane society: Small businesses are thriving and benefiting from localisation. Big businesses are promoting positive societal values to attract customers. There is an increased in shared goods and services. The cost of goods is high and there is an increase in repairing rather than replacing items.

Participants' reflections: Most participants were very positive towards the concepts of a circular economy and sharing goods in a community (such as through a 'library of things'). Some participants also argued that this shift would create jobs and lead to new skills to

be developed. A small number of participants expressed concern that there would be limited opportunities to buy new goods in this society and suggested that this would reduce the convenience that they experience currently.

Food and land use

Reminder of food and land use in the slow lane society: There is an increase in plant-based diets and lower meat consumption. Little agricultural technology is available. More food is grown in the UK for domestic consumption. There are protected nature zones and restored national parks.

> *"I do eat meat, but I do like a plant-based diet. To me, it seems pretty good. I'm happy not to have the same choice as at the minute. I would survive."*
> **Slow lane society**

Participants' reflections: Participants were positive about locally grown food, consuming seasonal produce and reducing reliance on imports. However, some expressed that this would make the UK less resilient if there were extreme weather events that affected domestic production. Participants also highlighted that there would likely be regional differences in the ability to grow food, meaning some regions would be reliant on food from other areas or on more expensive imports. Some participants also noted that convenience food would be missing from this society, which was seen as negative for those who currently rely on it (such as working parents).

3.4 Tensions and trade-offs

Key message for policy makers: Participants were acutely aware of the tensions involved in decision making around net zero. When exploring inherent trade-offs, they noted that there was no way to resolve them fully. However, through exploring them, they generally became more receptive to a variety of options. In future, as governments articulate the next stages in our path to net zero, citizens may be most receptive to changes where they feel the tensions or trade-offs have been considered and not

disguised. Involving citizens early may provide sustainable routes through any thorny trade-offs that future governments might face.

What the participants said: Participants often raised the tensions they saw within the different scenarios they were discussing. Some key themes emerged that participants suggested that decision makers working on net zero would need to consider when thinking about future society.

1. **Infrastructure and cost**: Participants identified a tension around the investment needed in societies with large infrastructure changes and where the funding would come from. Participants generally agreed that higher costs would be tolerable if it would mean meeting climate targets, reducing inequalities, and maintaining a sense of community. For some, there was concern that infrastructure development would focus on urban areas because the cost of the same developments in rural areas would be deemed too high.

> *"We have to put the building blocks into it, which might mean paying more. But in the long run, it would mean a cleaner, greener country."*

2. **Sustainability and choice**: Participants recognised the need for individuals to make sustainable choices to reduce emissions by 2050. However, they noted that sustainable and less wasteful choices sometimes came with trade-offs (such as being less convenient or affordable). Participants in general wanted options for people in the future so that they could choose what worked for them. Some suggested that those with greater wealth who have the highest emissions needed to be incentivised to take responsibility too. Other participants suggested there was a role for incentivising and educating people to make more sustainable choices. Participants were willing to accept substantial and widespread changes so long as this did not occur at the expense of individual freedoms and result in individuals being mandated to live their lives in a certain way.

> *"Incentivise people, rather than force and push people […] Education might be a key factor in terms of people's decision making."*

3. **Innovation and tradition**: Participants were generally hesitant around societies with increased use of technology in ways that seemed to threaten what they deemed as 'traditional' ways of life. Some participants were accepting of the use of advanced technology provided there were the right checks and balances in place. These participants tended to be those who self-identified as earlier adopters of new technology. However, there were tensions identified around increased use of technology and jobs. For example, some participants were worried that if technology undermines traditional farming, it could mean the end of 'traditional' rural lifestyles.

3.5 Sectoral themes

This section outlines the key themes that participants identified in individual sectors (the built environment, travel and transport, work and industry, and food and land use). Below is a table summarising the key themes in each of the sectors.

The built environment:
1. The built environment can foster a strong sense of community, which participants liked, and there were concerns that this could be lost or undermined through virtual technology. 2. The built environment has an impact on people's quality of life and participants favoured future infrastructure developments that fully consider accessibility and health. 3. Infrastructure decisions can create or reduce regional inequality, particularly between urban and rural areas.
Travel and transport:
1. Participants were positive about the reduced emissions and possible health benefits associated with active and public transport

2. Reliability and flexibility were the biggest factors in determining which transport options were preferred by participants
Work and industry:
1. The circular economy, reducing consumption and repairing goods were seen as positive changes that could reduce what participants saw as unhealthy modern consumerism 2. Advanced technology was most acceptable to participants when tightly regulated and tested and least acceptable where it might increase inequalities
Food and land use:
1. Participants recognised the potential beneficial climate implications of consuming fewer animal products and were positive about dietary changes as long as choice was maintained 2. Novel food technology was viewed with initial scepticism and participants suggested that they would need more information and reassurances before it became widely accepted 3. Self-sufficiency was viewed positively, and participants associated it with health benefits and a greater sense of community

The built environment

Key theme 1: The built environment can foster a strong sense of community, which participants liked, and there were concerns that this could be lost or undermined through virtual technology.

Participants generally preferred built environments in which they saw a strong sense of community and frequent interpersonal interactions. Strong communities were perceived as a central pillar of social support to individuals. Participants generally shared a dislike for societies they perceived as being more insular, with this often being identified in the built environment (through dispersed housing or people living alone).

Participants tended to favour scenarios with a higher reliance on community, even when this came at the expense of infrastructural and technological development; they were

unphased by a slow-down of technological advancement to maintain in-person social interaction. This was felt particularly strongly when the **atomised society** was discussed. In this scenario, and in the **metropolitan society** to a lesser extent, individuals living alone and staying connected with friends and family through technology, was often viewed very negatively.

Key theme 2: The built environment has an impact on people's quality of life and participants favoured future infrastructure developments that fully consider accessibility and health.

Participants questioned the practicality and quality of life in some societies, especially those with densely populated cities. They were particularly concerned about privacy, space, and access to nature. However, densely populated areas were often seen as a benefit for those with physical disabilities as they provided easy access to amenities and, in high technology societies, advancements could facilitate independent living. Some participants were also fairly positive about the integration of more multi-generational living, to facilitate stronger familial ties.

> *"I come from an already segregated society and gated communities will do nothing to integrate people from diverse backgrounds."*
> **Self-preservation society**

However, participants were worried about the emergence of gated communities in the **atomised** and **self-preservation** societies, inferring that this meant higher crime rates outside those 'safe' areas. Participants were also concerned that dispersed housing could increase social isolation.

Key theme 3: Infrastructure decisions can create or reduce regional inequality, particularly between urban and rural areas.

Participants had conflicting views about future infrastructure development. Some were concerned that high investment in the transport and technology in urban areas (as seen in the **metropolitan society**) would mean that people living in rural areas would have fewer opportunities and choices and feel 'left behind'. They expressed further concerns

> *"I think people who don't have an urban lifestyle have been forgotten about."*
>
> **Metropolitan society**

that this would require people living in the countryside to move to towns or cities for work, even if they would have preferred not to. However, others raised concerns about the opposite issue; they were anxious that investment and development in rural areas would change the countryside. They suggested that any new housing developments or large infrastructure projects (such as for transport or digital infrastructure) to facilitate population dispersal from towns and cities would fundamentally change rural areas. In general, participants wanted investment to be shared fairly between rural and urban areas while ensuring that the distinction between the types of areas was not lost.

Travel and transport

Key theme 1: Participants were positive about the reduced emissions and possible health benefits associated with active and public transport

Participants tended to be fairly positive when considering scenarios with active travel options, particularly when they were perceived to be beneficial for their health and the environment. Having sufficient infrastructure for active travel was highlighted as having greater flexibility and reliability than other forms of transport (such as road or rail, which could be affected by issues such as engineering works, road works and congestion).

> *"I like the fact that people are walking and travelling more. That can only be a good thing. It's good for health, mind, and carbon footprint."*
>
> **Self-preservation society**

Participants also noted the positive benefits that active and public transport could have on reducing overall emissions, reducing pollution and improving air quality. However, some participants were concerned about the impacts of increased transport infrastructure (whether private or public), especially if new routes were to go through green spaces or rural areas.

Key theme 2: Reliability and flexibility were the biggest factors in determining which transport options were preferred by participants

Despite being open to, and mostly positive about, public and active transport, participants highlighted several concerns around the feasibility of switching from private transport options (such as cars). Some noted that if trains or other means of public transport were unreliable and there were no viable private alternatives, it would be difficult for people to get around.

> *"If everyone is taking the same mode of transport, you need to create more railway lines, trains and routes. They need to be more reliable […]. You'd have hoped they'd have sorted it out by 2050."*
> **Slow lane society**

Many participants were unconvinced that public transport could be made reliable and flexible enough by 2050 to allow people to choose it consistently over private transport. In particular, those living in rural areas suggested it would require an unfeasible amount of investment in new transport infrastructure to allow people in the countryside to choose public transport over using cars. Participants noted that some groups (such as those with young children, those who carry work equipment or those with physical disabilities and/or mobility issues) currently find it difficult to use public transport and this issue would need to be addressed to make it a viable choice for these groups in the future. Other participants were concerned that public transport might be less affordable and less convenient than private alternatives in the future.

Work and industry

Key theme 1: The circular economy, reducing consumption and repairing goods were seen as positive changes that could reduce what participants saw as unhealthy modern consumerism

"I cannot stand waste […] so if AI […] drives resource efficiency and usage, then I'm all for that."
Slow lane society

Many participants felt that repairing and sharing goods (such as through a 'Library of Things') were positive aspects of the **slow lane** and **self-preservation** societies. Some participants argued that a shift to a repair model would create jobs and lead to new skills to be developed. Participants disliked scenarios with a 'throwaway culture' and expressed concern for the waste that might exist in these futures. Participants were supportive of advanced technologies that could be used in industry to help manage resource use and efficiencies in the background.

Key theme 2: Advanced technology was most acceptable to participants when tightly regulated and tested and least acceptable where it might increase inequalities

There was general wariness around advanced technologies that were highly visible to consumers. Some participants disliked scenarios where greater levels of technology were being used in what was seen as an intrusive way in people's everyday lives. Participants generally disliked the perceived power that using advanced technology could give to 'big tech' companies.

Participants generally agreed that some professions would be impacted more than others by increases in technology. While for most this was a potential challenge, fearing automation may make people redundant, other people liked the idea that technology could be used to perform tasks to a higher standard than might be possible by humans. Some participants also felt that technology might make things cheaper or safer where it might be able to complete jobs that currently carry health and safety risks for people. Not everyone thought the increase in technology was negative for jobs, and some felt people developing themselves and learning new skills in line with societal shifts was positive. It was felt that people would be able to retrain, and that apprenticeships, for example, could be beneficial.

Challenges around inequalities regarding technology were also raised. There was a sense that as society became more digitalised, there would be an increasing number of people being 'left behind'. Participants felt that some groups would struggle with technological advancement, such as older people or those in rural areas if the digital infrastructure was unequal across the UK.

> *"I understand the worries of how some jobs are being taken over by technology, but I think with tech, that can generate more job opportunities for people so they can develop more skill sets... I see this as a positive thing as you constantly upgrade yourself to better suit society's needs."*
>
> **Atomised society**

Technological advancements were seen as being potentially positive, especially those that did not affect individuals' daily lives. However, participants suggested that to be acceptable to the majority of people, technologies would need to be proven to be safe and be tightly regulated.

Food and land use

Key theme 1: Participants recognised the potential beneficial climate implications of consuming fewer animal products and were positive about dietary changes as long as choice was maintained

> *"I agree that reducing the amount of meat and meat production we have is going to be a benefit. Maybe not fully, but switching to organic, sustainable farming would be a better thing."*
>
> **Metropolitan society**

Most participants acknowledged that reducing consumption of meat and dairy was a likely and acceptable societal change that would have beneficial climate impacts. A few participants said they would be very reluctant to make changes in their own diets. There was a general sense that changes to diets in the future would be acceptable and plausible, with it just requiring people adapting their eating habits over time. Some participants felt they would be happy with less choice than they had now. However, most participants emphasised that having a wider variety of food choices (including meat, dairy and plant-based alternatives) was important to them.

Key theme 2: Novel food technology was viewed with initial scepticism and participants suggested that they would need more information and reassurances before it became widely accepted

The use of vertical farms and an increase in the consumption of synthetic meat in some scenarios was questioned by some participants. Participants suggested that for these technologies to be embedded by 2050, there would have needed to be significant testing and regulation to reassure consumers of the safety and quality of products in this way. There was a more positive reaction to technology that could help address labour shortages and reduce pesticides use, with participants noting this would have advantages for nature and biodiversity. A few participants also highlighted the need to maintain the culture and identity of farming, with concerns that new methods may result in automation and loss of traditional farming techniques.

> *"In agriculture, we currently use a lot of pesticides and chemicals, so reducing those could be positive for the natural world and biodiversity."*
> **Metropolitan society**

Key theme 3: Self-sufficiency was viewed positively, and participants associated it with health benefits and a greater sense of community

> *"I like to be self-sufficient in what we grow, and a lot of the food currently does come from overseas […] If you don't produce your own reserves, you're held captive by outside forces."*
> **Self-preservation society**

Participants often noted the positives of growing foods in local communities and consuming seasonal produce, as shown in the **slow lane** and **self-preservation** societies. Most were positive about the possibility for there to be more education for children around growing and cooking food, as well as where food comes from. Some participants also felt that the notion of people growing their own food could help balance income inequalities. They noted that those on lower incomes who grew their own food would have access to cheap and likely organic produce.

Participants were concerned about the reliance on imports in some scenarios, such as the **atomised society**, noting a desire for self-sufficiency and food security. This was achieved in some scenarios through urban food production. While some liked this idea, others had concerns. Some highlighted challenges around air quality in urban environments, and a lack of land for growing food. Some participants posited that having plants packed densely in vertical or urban farms may result in spreading disease or a lack of biodiversity due to the lack of natural plants.

Some participants noted that it would not be possible for the UK to rely entirely on home-grown, seasonal food in the future, especially if there were increased instances of extreme weather events. Participants also highlighted that there would likely be regional differences in the ability to grow food, resulting in some areas struggling to do so.

Key messages

After immersing themselves in the four future net zero scenarios, the key messages that could be drawn from the discussions of the public dialogue participants are:

1. **Participants recognised that societal change is somewhat contingent on the infrastructure available to support it** (such as accessible public transport and active travel infrastructure). Citizens may want to make changes in their lives but need the infrastructure to allow them to do so.
2. Participants believed that **some of the large societal changes** (such as increases in automation or a greater emphasis on the circular economy) **could only happen if there are supporting efforts to reskill individuals**.
3. Having fewer food options available in the future would be unwelcome. **Participants favoured incentivising people to choose less emissions-intensive options**. There is likely an ongoing need to engage the public in balancing dietary preferences, decarbonising food production, and developing public support for potential technical solutions for this.
4. **Citizens are likely to be attentive to the perceived fairness of pathways to net zero**. Future governments are likely to need to be alert to, and address, narratives around fairness. Participants favoured scenarios that gave equal priority to public and planetary health. Therefore, emphasising the health co-benefits associated with a net zero transition should benefit citizens and, in so doing, bolster support for the transition itself.
5. **Individuals are aware that people making changes to their lifestyles can help reduce emissions and are not averse to doing so**. However, participants expressed the need to be consulted about the lifestyle changes they would favour and not to have changes imposed on them.
6. **Citizens may be more receptive to policies where they feel the tensions or trade-offs have been considered and not disguised**.

Acknowledgements

The Ipsos team, who delivered the net zero society dialogue and produced the analysis that forms the basis of this annex, includes Ioanna Fotiadis, Kate Mesher, Reema Patel and Sophie Pizzol. The work was supported by Diane Beddoes (Sciencewise), Philippa Lang (UKRI) and Suzannah Lansdell (Sciencewise). The dialogue was overseen by an expert advisory group, including Jacob Ainscough (Lancaster University), Mette High (University of St Andrews), Justin Macmullan (Which?), Jonathan Marshall (Resolution Foundation), Theresa Marteau (University of Cambridge), Stuart McKinnon (Energy Systems Catapult), Doug Parr (Greenpeace UK), Jonatan Pinkse (University of Manchester), Nem Vaughan (University of East Anglia), Lorraine Whitmarsh (University of Bath) and Rebecca Willis (Lancaster University).

Appendix 1: Participant demographics

Demographic	Target quotas (minimum number for each category)[1]
Gender	Male: 13 Female: 16
Age	16-24: 4 25-44: 10 45-64: 8 65+: 4
Household income	<£29,999: 14 £30,000-£59,999: 14 £60,000+: 5
Urban/rural and nation of the UK:	Rural/Market town: 15 Urban: 18
Opinions on climate change	Very/fairly concerned: 28 Not very/not at all concerned: 5
Attitude towards technology adoption	Innovators / Early adopters / Mostly early: 23[2] Late adopters: 13
Attitude towards government actively shaping society/economy [3]	Strongly/mostly in favour: 29 Strongly/mostly against: 1 Neither: 3

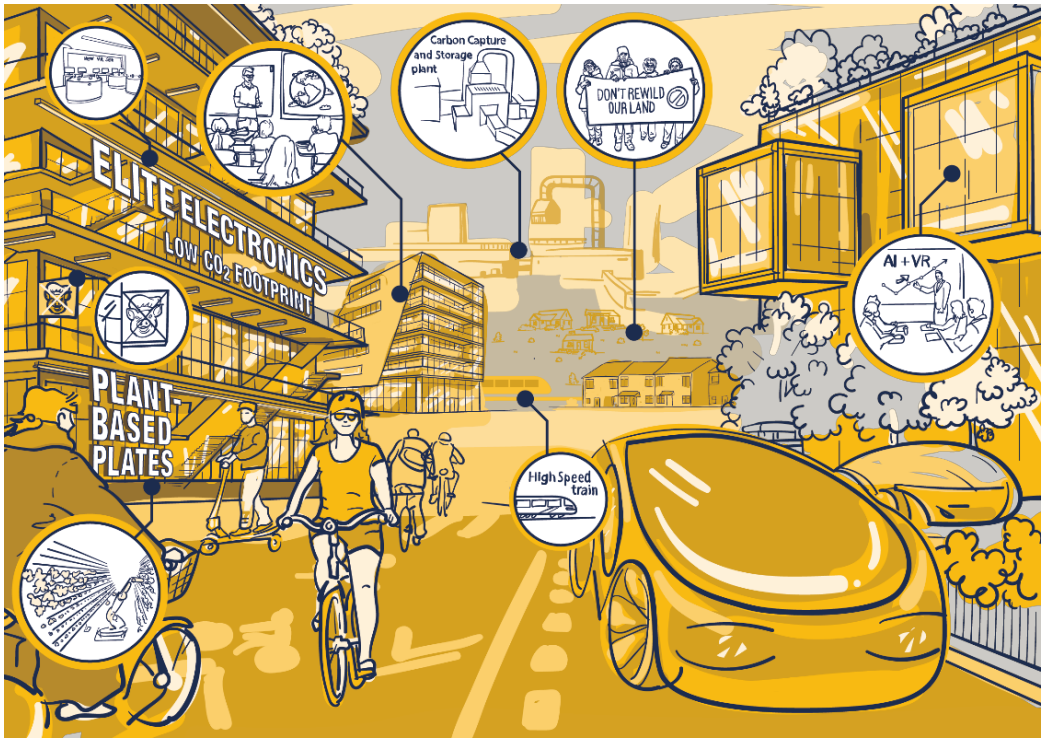
[1] In order to reduce difficulties while recruiting due to the small total sample size (30 participants, plus 5 standbys), quota ranges were used to ensure each group was adequately represented, but also to allow some flexibility when sampling.
[2] These are discrete categories in the technology adoption lifecycle. They have been combined here for two reasons. Firstly, individuals in each category tend to have similar characteristics (tending to be wealthier, younger, less risk-averse and tend to be 'opinion leaders' than other categories). Secondly, to help simplify quotas for this small sample.
[3] Based on responses to: "To what extent do you agree with the following statement: '*The government should play an active role in shaping our economy and our society*.'" Ranging from 'strongly agree' to 'strongly disagree'.

Appendix 1: Participant demographics

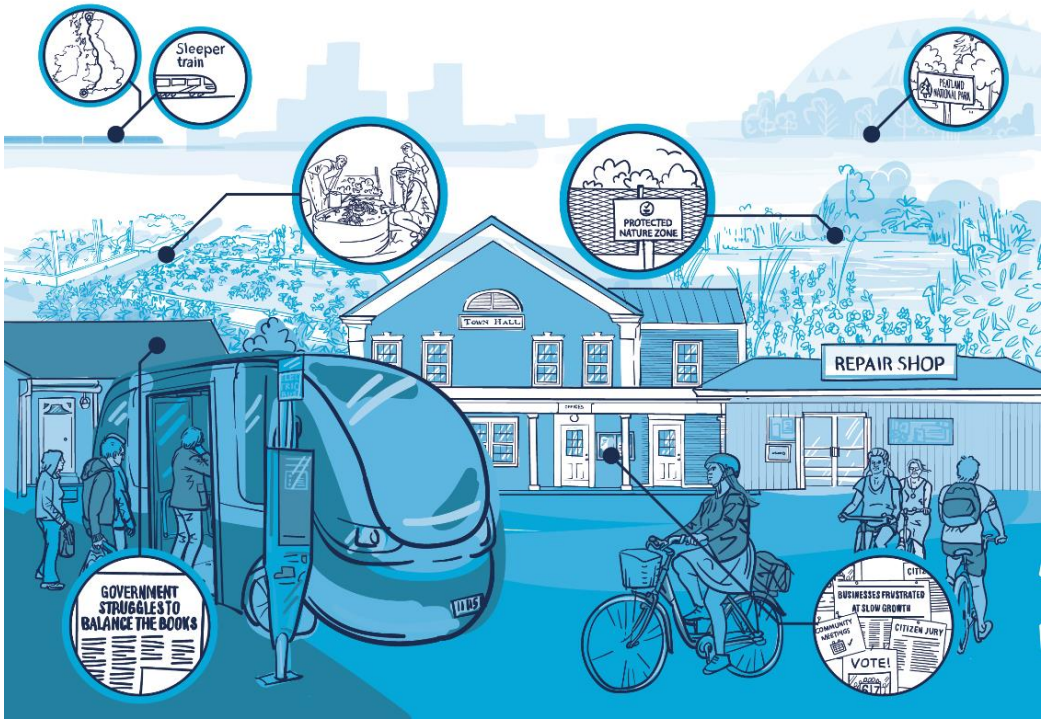
Table 1. Breakdown of final sample by demographic

Gender		Age		Location		Housing		Concern about climate change		
Male	**Female**	**Average**	**Range**	**Rural**	**Urban**	**Own**	**Rent**	**High**	**Mid**	**Low**
44%	56%	43	18–71	47%	53%	52%	48%	44%	41%	15%

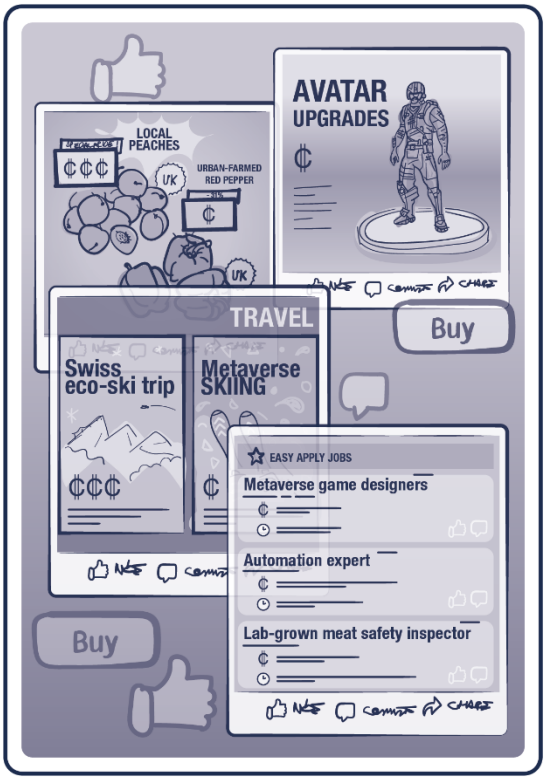
Appendix 2: Scenario ‘rich picture’ illustrations

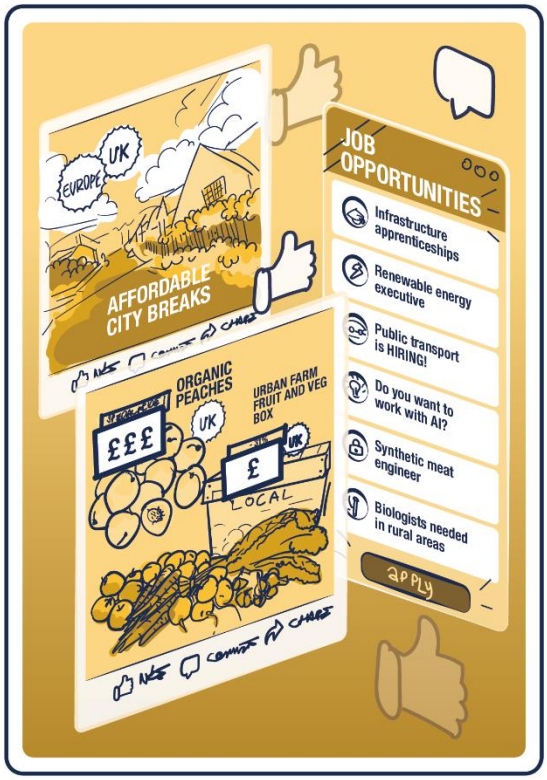


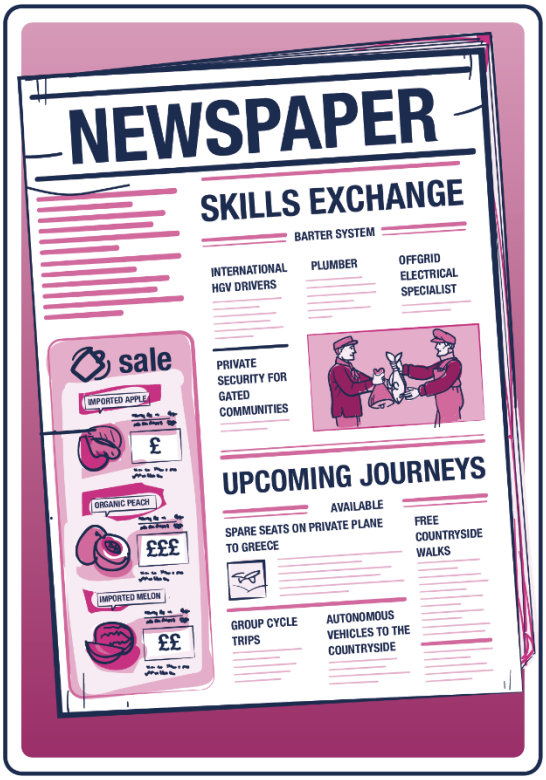
Appendix 2: Scenario 'rich picture' illustrations



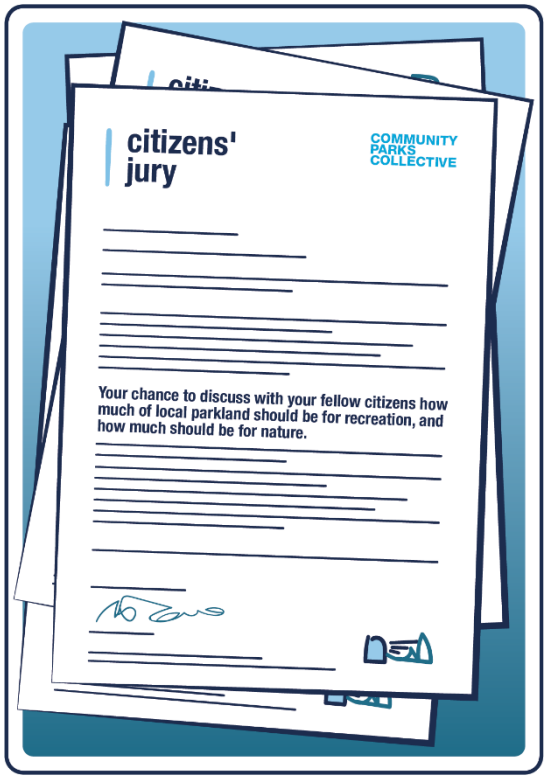
Appendix 3: Future artefacts







Appendix 3: Future artefacts



Appendix 4: Personas

OBAFEMI AND LISA

OBAFEMI (Black African) and **LISA** (White British) are a couple in their 20s with a six-month old son called Tunde. Obafemi works in retail and Lisa works in transport. They both suffer from asthma.

JACK

JACK (White British) is a retired builder in his 70s. He has limited mobility that affects him on a daily basis.

TOM & PRISHA

TOM (White British) and **PRISHA** (Asian British) are a married couple in their 60s. Tom is a lawyer, Prisha is a doctor and together they have two adult children.

CHLOE & EMILY

CHLOE and **EMILY** (White British) are a couple in their 50s. They're both trained in skilled trades, Chloe as an electrician and Emily as a plumber.

ANANYA

ANANYA (Asian British) is a retired doctor in her 90s. She lives with Alzheimer's disease and receives substantial social care.

ASH

ASH (Mixed Asian/White British) is a single man in his 30s. When he was 17 he was diagnosed with ADHD and he is currently unemployed.

References

[1] Sciencewise (2022). Welcome to Sciencewise. *Sciencewise*.
[2] King, M., Padmanabhan, C. & Rose, K. (2021). Engaging the public on climate change: a literature review. *Centre for Public Impact*.
[3] Demski, C. (2021). Net zero public engagement and participation. *Department for Business, Energy and Industrial Strategy*.
[4] Willis, R., Curato, N. & Smith, G. (2022). Deliberative democracy and the climate crisis. *Wiley Interdisciplinary Reviews on Climate Change*,13(2), e759.
[5] Wells, R., Howarth, C. & Brand-Correa (2021). Are citizen juries and assemblies on climate change driving democratic climate policymaking? An exploration of two case studies in the UK. *Climatic Change*, 168(1–2), 5.
[6] University of Lancaster (2022). The role of deliberative public engagement in climate policy development: a report for the Climate Change Committee. *University of Lancaster*.
[7] CCC. (2022). Progress in reducing emissions: 2022 report to Parliament. *Climate Change Committee*.
[8] House of Lords Environment and Climate Change Committee (2022). In our hands: behaviour change for climate and environmental goals. *UK Parliament*.
[9] ONS (2021). Three-quarters of adults in Great Britain worry about climate change. *Office for National Statistics*.
[10] Brisley, R. & Thompson, S. (2022). Net zero living. *Ipsos*.
[11] Flynn, C., Yamasumi, E., Fisher, S., Snow, D., Grant, Z., Kirby, M., Browning, P., Rommerskirchen, M. & Russell, I. (2021). People's climate vote. *United Nations Development Programme*.
[12] Climate Outreach (2022). Net zero, fairness and climate politics. *Climate Outreach*.
[13] Mellier-Wilson, C. & March, S. (2020). UK climate change citizens' assemblies & citizens' juries. *Involve*.
[14] Shared Future (2021). What a citizen-led low carbon vision looks like. *Shared Future*.
[15] Climate Assembly UK (2020). The path to net zero: climate assembly UK report. *UK Parliament*.
[16] Deloitte (2021). Futures we want. *UN Climate Change Conference UK 2021*.

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