

Enabling green choices for net zero



Overview

- Reaching net zero targets will require the enabling and encouraging of low-carbon actions by individuals, businesses, and the public sector, also called 'green choices'.
- Addressing the sectors with the highest emissions (transport, built environment, and consumption of products, services and goods) first would likely provide the greatest greenhouse gas reductions. Engagement in green choices may spill over from these into other sectors.
- Governments, businesses, and organisations can minimise the effort or cost to individuals of taking green choices by adapting physical and regulatory environments.
- Stakeholders and researchers have identified several approaches that may encourage green choices by the public, including:
 - clear and consistent policy direction from governments
 - the use of trusted voices to communicate messages
 - using different forms of public engagement with different groups of citizens
 - having long-term and tailored strategies
 - making green choices more accessible, affordable, attractive, and easy

Background

The UK has a legally binding 2050 Net Zero commitment under the Climate Change Act.^{1,a} To track the UK's decarbonisation, the Climate Change Committee (CCC)^b set six carbon budgets.^{4,c} However, CCC projections suggest that current and planned policies will be insufficient to meet the sixth carbon budget covering the period 2033-2037.⁷

Reductions in greenhouse gas (GHG) emissions have thus far predominantly been achieved through technological innovation and some information provision to encourage individual action.⁸⁻¹⁰ However, to achieve the 60% reduction in consumer emissions that the CCC has stated is needed to meet net zero targets,¹¹ research studies suggest a systems-wide approach is required.^{10,12-30}

This would involve the public and private sector providing the environment and infrastructure that enables individuals to make low-carbon choices – referred to as 'green choices' by the UK Government^d – more easily, whilst ensuring they have the relevant information to make their decisions. Both the CCC and the House of Lords have recommended that government strategies should incorporate greater societal- and behavioural-change policies and guidance.^{6,8}

In March 2023, the UK Government published the Powering Up Britain: Net Zero Growth Plan, which responded to the expert recommendations made in the Independent Review of Net Zero report and the CCC 2022 Progress Report to Parliament, as well as providing a Carbon Budget Delivery Update. The plan contained six principles^e to support "empowering" the public to make green choices.³²

^a The target requires the UK to reduce greenhouse gas (GHG) emissions by 100% from 1990 levels by 2050 compared to the previous target of an 80% reduction. Net zero would mean the amount of GHG emissions produced by the UK would be equal to or less than the emissions removed by the UK from the environment.²

^b The CCC is an independent statutory body established under the Climate Change Act 2008. Its purpose is to advise the UK and devolved governments on emissions targets and to report to Parliament on progress made in reducing GHG emissions and preparing for, and adapting to, the impacts of climate change.³

^c These budgets are represented as a cap on total GHGs emitted across five years and as a percentage reduction of GHG emissions compared to 1990 levels.⁵ The UK met its first and second carbon budgets, and registered a 46% drop in GHG emissions compared to 1990 levels in 2022.⁶ This has been achieved through actions such as decarbonising the electricity sector, above-expected sales of electric vehicles, expanding the boiler upgrade scheme, and launching the Great British Insulation Scheme.⁷

^d In the UK Government's Powering Up Britain: Net Zero Growth Plan, green choices are referred to as the public and businesses choosing green products, services and goods.³¹

^e The UK Government's Powering Up Britain: Net Zero Growth Plan sets out six principles in the 'Empowering the Public and Business to Make Green Choices' section: 1. minimise the 'ask' from the public by 'sending clear regulatory signals', 2. make the green choice the easiest and 3. most affordable, 4. empower people and businesses to make their own choice, 5. motivate and build public acceptability for major changes, and 6. present a clear vision of how we will get to net zero and what the role of people and business will be.³²

Achieving net zero targets requires adaptations across all aspects of society. Recent surveys have shown public willingness for stronger net zero policies.^{33,f} Sectors contributing the most to GHG emissions in the UK include transport, the built environment, and consumption of goods and services.

These could be addressed through system-level perspectives, which involves action from government, businesses and organisations, as well as individual citizens. Changing physical and regulatory environments raises specific considerations relevant to the UK context.

Methods to enable green choices

The Intergovernmental Panel on Climate Change (IPCC) has stated that achieving climate change targets will require action across multiple sectors,⁹ involving action by governments, public and private sector bodies, and individuals.

Studies suggest that interventions in settings outside of the home (such as workplaces) can lead to changes in other settings such as the home, as choices developed in these locations can 'spill-over'.³⁷⁻³⁹ For example, interventions in educational settings can encourage green choices outside of school (Box 1). Evidence for spill-over is mixed, and dependent on context.⁴⁰⁻⁴²

Commentators debate the extent to which individuals should be responsible for making green choices as opposed to the regulatory or physical environment not letting them.^{12-20,22,34,38,43-46,46-48,h}

Commentators suggest the need for different actions based on the context.^{13,19,38,43,45,51} Several frameworks are available to categorise different green choice approaches (for example, as shown in Table 1).

Strategies need to consider context and the different ways individuals act as consumers, citizens, and within organisations and groups.^{13,14,18,19,38,43,45,51} Health, time, comfort and status can strongly influence individuals' decisions, while finance and regulation are typically stronger motivations for organisations.^{38,52}

^f In one UK survey, 90% of adults stated an intention to make environmentally sustainable choices but wanted more government and business leadership.³⁴ Another study suggests citizens' knowledge of their impact on the climate is low.³⁵

⁹ The term 'systemic transformation' is used in the IPCC AR6 Working Group 3 report to signify that changes are required across multiple sectors.³⁶

^h An example of a regulatory environment restricting green choice is the ban on the private use of powered transporters, such as e-scooters.^{49,50} An example of physical environmental barriers is insufficient cycle lanes that may deter individuals from choosing to cycle.

Box 1: Green choice 'spill-over' from educational settings

Studies show that schools provide an opportunity for positive spill-over.⁵³⁻⁵⁵ These have highlighted that young people have fewer ingrained carbon-intensive habits,^{56,57} education can minimise climate change misconceptions in 13-year-olds, and those aged 16-24 offer a 'moment of change' as they form their individual identities.⁵⁸⁻⁶⁰ Spill-over can be encouraged through, for example:

- improving knowledge on what actions are most effective to reduce GHG emissions⁶¹⁻⁶⁴
- involving children in energy-saving initiatives, such as reducing car use and serving and teaching young people how to make low-carbon meal options^{65,66}
- disseminating green careers information and helping young people to identify misinformation in media⁶⁷
- embedding climate change in the curriculum and including interactive activities^{66,68-71}

While spill-over from educational settings will depend on the home environment,³⁸ research has shown that climate education may support life-long green choices and young people influencing parents.^{55,67-79}

Table 1: Examples of frameworks to enable green choices

Frameworks provide a clear indication of where action can be taken and how. Commentators agree that no single framework is suitable for all contexts, and that they can be used in combination to develop effective policy.

<p>Behaviour change wheel (BCW)</p>	<p>The BCW is a long-standing model used to categorise interventions designed to change individual behaviour.^{15,37,80} At the centre of the wheel is the COM-B model, made up of three essential conditions - capability, opportunity, and motivation – to allow a change in behaviour. Surrounding this are nine intervention functions (education, persuasion, incentivisation, coercion, training, enablement, modelling, environmental restructuring, and restrictions), followed by a further seven policy categories (environmental and social planning, communication and marketing, legislation, service provision, regulation, fiscal measures, and guidelines).</p> <p>As a long-standing model this has been widely used in scientific research.</p>
<p>Upstream-downstream</p>	<p>In 2021, the Behavioural Insights Team produced the Upstream-downstream model of behaviour change, commissioned by the Department for Business, Energy and Industrial Strategy.³⁴ This was based on earlier models, including EAST – easy, accessible, social, timely. It illustrates the need for policy levers at three levels:</p> <ul style="list-style-type: none"> • upstream - structural change by government • midstream - sustainable options made available and attractive by businesses and local authorities • downstream - informational measures to support individuals' decision-making
<p>Avoid, shift, improve</p>	<p>The 'avoid, shift, improve' framework, developed by a German consultancy in 1994, has been used to evaluate how actions should be adapted for net zero.⁸¹ This is based on a hierarchy of approaches, whereby priority should be given to avoid measures, then shift, then improve.</p> <ul style="list-style-type: none"> • avoid: for example, eating a vegetarian rather than a meat-based diet • shift: for example, travelling by public transport instead of by car • improve: for example, installing heat pumps to replace gas boilers <p>If these three adaptations are not available, emissions associated with actions can be offset (PN 713).</p>

High emission sectors for action

Commentators agree that enabling green choices in three high emission sectors would provide progress towards net zero targets.^{12–18,20,22,37,43,43–45,82,i} These are:

- transport
- buildings
- consumption

This section outlines where green choices may contribute to future emission reductions.

Transport

The CCC has stated that a 90% reduction in surface transport emissions by 2050 is needed to meet net zero targets.⁸³ In 2022, surface transport was recorded as the highest emitting sector at 21%, a level that has remained relatively static since 1990.^{84–88} 61% of these emissions were from cars, while HGVs and vans contributed 17% each.^{84,j} A further 8% of total UK emissions were from domestic and international aviation ([PN 615](#)).³⁴

Possible green choices that may reduce emissions include:³⁴

- adopting electric vehicles
- offering safe, accessible infrastructure for walking, cycling and public transport
- managing aviation demand

Electric vehicle adoption

Electric vehicle (EV) sales have increased and accounted for approximately 20% of total UK new car sales in August 2023.^{6,89} Plug-in electric vehicles accounted for approximately 2.5% of all licensed road vehicles in the UK in September 2022.⁹⁰ Some commentators attribute this to the Government's commitment to phasing out the sale of petrol and diesel vehicles by 2030, and their use of market mechanisms^k to favour EVs.^{6,34} In September 2023, the Government postponed the phase out until 2035.⁹¹

ⁱ Other domains also contribute to GHG emissions. For instance, heating and cooling of water in homes contributes 6% of UK GHG emissions and DEFRA's Plan for Water sets a legally binding target to reduce water demand.

^j The remaining emissions are shared between buses (3%), rail (2%) and other surface vehicles (1%).⁸⁴

^k The Zero Emission Vehicle (ZEV) Mandate, introduced in September 2023, is an example of a market mechanism. The mandate requires 80% of new cars and 70% of new vans sold by vehicle manufacturers to be electric in 2030, with a stated policy objective of increasing this to 100% in 2035.⁹¹

Despite increasing EV sales, research suggests that many households will not be able to afford an EV, particularly with limited second-hand options.³⁴ EV uptake is also influenced by consumer knowledge, awareness and attitudes, such as running cost perceptions, vehicle comfort and performance.³⁴ Barriers may include:

- limitations in, and people's perceptions of, charging infrastructure
- long charging times and ownership of chargers ([PN 715](#))
- mistrust in vehicle range^l

Public transport, walking, and cycling

Convenience plays a key role in which form of transport people decide to use; the hassle associated with the 'first mile'^m dictates how people travel for the whole journey.⁹³ The CCC estimates that a 9% and 17% reduction in car miles will be necessary by 2035 and 2050 respectively to meet net zero targets.⁸⁴ Barriers to choices to reduce vehicle use include:

- poor perceptions of public transport desirability, and the habitual nature of travel^{34,94,95}
- a lack of infrastructure reducing accessibility and functionality of low-carbon travel options, such as in rural areas⁹⁶⁻¹⁰⁰
- poor perceptions of public transport value. Subsidising public transport alone may not reduce car use, as shown in Germany's trial of monthly unlimited national train travel for €49,^{101,102} but other research has shown congestion charges can be effective¹⁰³

Aviation

The CCC stated that aviation emissions ([PN 615](#)) need to be managed to meet the UK's Sixth Carbon Budget.¹⁰⁴ Studies suggest barriers may include:

- consumer aspirations for overseas holidays^{34,52}
- consumer awareness about the carbon impacts of flying^{34,52}
- a lack of regulation or incentives for more efficient airline flights^{34,52}
- flights often costing less and taking less time than other transport modes^{n,107-109}

^l Commonly referred to as 'range anxiety'.

^m The 'first mile' problem refers to the distance between the residence and public transport. If this distance is further than an individual is willing to walk (or cycle), then they are more likely to take a private car for their whole journey.⁹²

ⁿ Route choice and time of booking can alter the price of travel tickets. However, taking the train on 10 of the most popular UK routes was 50% more expensive than making the same journey by plane in 2021.^{105,106}

Methods to support net zero transport

In many European countries, government approaches to reducing transport emissions has been through incentivising EV adoption by individuals rather than measures to reduce car use. Given geographical factors influencing transport choice, local government bodies may be better placed to take such measures, rather than central governments.^{16,37,38,o} Commentators largely agree on applying the “avoid, shift, improve” approach to transport (Table 1).

Avoid

Suggested “avoid” measures for land transport can often fall outside of (land) transport policy.²² These include teleworking and optimising delivery services ([PB 49](#)). The CCC has set out a number of options that could be used for managing aviation demand, such as a frequent flyer levy.^{6,8,12,22,34,38,45,46,52,111,112}

Shift

Mechanisms to “shift” travel from private cars to public and active travel have been widely researched (Table 2), with provision of options - such as cycle lanes - as well as disincentives - such as reducing workplace car parking - both affecting green choices.^{14,34} Research suggests interventions are most effective during ‘moments of change’.^{37,113,p}

Examples of option and disincentive combinations governments have considered include:

- adoption of low-traffic neighbourhoods and low-emission zones whilst improving access to and affordability of public and active transport,^{115,116} although such measures have been controversial ([SN01097](#))
- reallocating road space from cars to other travel options, such as the private car bans proposed in Milan, Stockholm and Paris for 2024¹¹⁷

Improve

Researchers suggest EV adoption can reduce personal transport emissions if electricity generation systems are decarbonised.^{q,13} Compared to fossil-fuelled vehicles, governments have reduced EV cost by providing grants or VAT reductions on new EVs;¹¹⁹ this should also increase the supply of second-hand EVs.^r Commentators have raised concerns about the EV market diversity, especially for second-hand options: very few small, affordable cars exist; larger, more expensive

^o The introduction of the Local EV Infrastructure (LEVI) Fund supports local authorities in England to plan and deliver charging infrastructure for residents without off-street parking.¹¹⁰

^p Moments of change refer to when an individual’s situation shifts within a short time frame, such as when someone retires, moves house or job, or has another life-event that disrupts their travel habits.¹¹⁴

^q There is a range of misinformation surrounding the environmental impact of EVs compared to fossil-fuelled vehicles.¹¹⁸

^r The average duration of owning a car is up to 6 years, therefore increased first-hand purchases in the 2020s will result in an increased second-hand supply by 2030.^{120,121}

Table 2: Summary of evidence on transport shift strategies

Intervention	Quality of evidence	Evidence impacts on behaviour
Information provision		
Campaigns and marketing	Moderate	Mixed
Cycle training and safety	Moderate	Mixed
Events, such as community bike rides	Limited	Mixed
Infrastructure		
Built environment, such as cycle lanes	Moderate	Yes
Improved public transport network	Moderate	Yes
Incentives		
Pricing, such as bus fares, EV subsidies	Strong	Mixed
Alternative incentives, such as rewards and perks	Moderate	Yes
Tools and planning		
Planning tools	Strong	Mixed
Car clubs and organisational practices, such as reduced parking	Moderate	Yes

Source: The Behavioural Insights Team, 2023

sport utility vehicles dominate the market.^{45,122} The House of Lords Environment and Climate Change Committee has recommended that the UK Government should consider schemes to incentivise the purchase of second-hand EVs.¹²³

Buildings

Buildings contributed 17% of UK emissions in 2019. Decarbonisation of the built environment ([PN 650](#)), including both residential houses, public sector buildings and businesses, has primarily occurred through increased renewable power generation.¹²⁴

This growth was driven by the UK Government's energy market interventions ([PN 694](#)), with commitments for 100% renewable electricity generation by 2035.³² These changes have consumer support, with over half of new tariffs advertised as 100% renewable and more than 9 million customers adopting green tariffs.¹²⁵

Other green choices by individuals that may reduce future emissions from residential properties include:

- heat pump adoption ([PN 699](#))
- undertaking energy efficiency retrofits, such as installing double glazing and insulation ([PN 650](#))

- domestic electricity generation, such as solar panels, and storage^{126,127}
- demand reduction, such as turning down thermostat and boiler temperatures¹²⁸⁻¹³⁰

Challenges

A combination of a fully renewable electricity grid and comprehensive electric heat pump installation would decarbonise the sector. However, commentators suggest that increasing demand from electrifying heating and transport would require energy efficiency and demand-side response (DSR) mechanisms ([PN 715](#)),⁵ to manage the extent of grid infrastructure improvements also needed.³⁷

Upfront retrofit costs can pose a common barrier to uptake. Despite upfront costs being partially funded by the UK Government's Boiler Upgrade Scheme and Great British Insulation Scheme, the CCC has highlighted that uptake of heat pumps, energy efficiency measures, and DSR remains below the level it estimates is required to meet net zero targets.^{131,132,t}

Physical barriers include some buildings being unsuitable for heat pumps or being complex to retrofit.^{34,133} However, a report by the Behavioural Insights Team (BIT) found consumers' perceptions of physical barriers are typically worse than reality, affecting uptake.³⁴ The mandatory Future Homes Standard^u from 2025¹³⁴ seeks to reduce physical barriers in new homes, which may increase home-owner acceptance of installing low-carbon technologies.¹⁴

Studies suggest that the impact of heat pump associated noise on owners varies based on household.¹³³ A lack of trained installers can result in long heat pump installation times and low consumer trust in the quality of products and their installation ([PN 699](#)); this uncertainty can result in consumers opting for an easier and faster option, such as a gas boiler.^{34,135}

A lack of understanding and trust may also create challenges. For example, smart meters are freely available, removing a cost barrier to demand reduction,¹³⁶ but studies have indicated that consumers lack trust in smart meter data collection and have not found consistent changes in energy-use habits.¹³⁷⁻¹⁴⁰

Methods for addressing built environment challenges

The main measures that could be used to support domestic uptake of heat pumps, insulation, and DSR devices are cost reductions, regulation, and clear, accessible information.^{133,141,142} Energy UK, a trade association, states that customer flexibility

⁵ DSR mechanisms include use of smart meters and time-of-use tariffs ([PN 655](#) and [587](#))

^t The CCC recommends that 1 million heat pumps should be installed annually by 2030.¹³² Whilst the Government's target is 600,000 installed annually by 2028, only 60,000 heat pumps were installed in 2022.¹³¹

^u The Future Homes Standard will require new-build homes to be future-proofed with low-carbon heating and world-leading levels of energy efficiency.¹³⁴

will also be important but requires uptake of smart technology and flexible tariffs.^{143,144,v}

Studies show information alone does not promote change and may require other measures,^{14,20,38} but several commentators support an English advice service, similar to Home Energy Scotland, NEST in Wales and NISEP in Northern Ireland.^{13,51,146–150,w}

Cost

A BIT report for the Department for Energy Security and Net Zero (DESNZ) has suggested that upfront costs are a large barrier to retrofits¹⁵¹ and are being partially mitigated through government initiatives. It suggested that uptake could be increased amongst:

- landlords,^x by requiring rental property listing prices to include estimated energy bills³⁴
- owner-occupiers, by linking the Stamp Duty Land Tax to the property Energy Performance Certificate (EPC) rating ([PN 650](#))

DESNZ suggests that both these measures increase the prominence of energy efficiency, and other commentators agree that such measures can leverage 'moments of change'.^{37,113} BIT suggests households receiving the Winter Fuel Payment could also be supported to retrofit by permitting and encouraging the payment to go towards energy efficiency improvements.³⁴

Acceptance

Researchers suggest uptake and acceptance of heat pumps may be encouraged by:

- subsidising upfront cost and ensuring running costs are comparable to gas boilers^{34,152}
- minimising the impact of 'distress purchases' when a boiler breaks, by offering short-term boiler leases to cover the installation time of a heat pump^{51,y}

Additionally, BIT suggests the visibility of homes fitted with, or suitable for, a heat pump or solar PV could be increased to promote local uptake, for example, through signage outside the home during installation, and inclusion in property listings.³⁴

^v Energy system flexibility is the ability to adjust supply and demand to achieve an energy balance. Types of flexibility vary according to how much energy providers can deliver, the length of time they can deliver this for and how quickly they can respond, for example, second by second surges in TV use or managing the differences in energy demand and supply between different seasons.¹⁴⁵

^w A nationwide support service could gather building details to provide advice and recommend trusted suppliers, to reduce the challenges for consumers in identifying appropriate measures for their homes.

^x Landlords present a challenging group as they do not directly benefit from low-carbon retrofits. Whilst costs need to be mitigated for low-income owner-occupiers, landlords may be incentivised through impacting property rental values.

^y A 'distress purchase' is defined as a purchase made out of necessity, rather than for pleasure (out of choice).

Research also suggests applying these visibility interventions to public sector and business may increase acceptance.^{13,16,38,153} For example, commentators have identified that citizens are more willing to invest in energy efficiency if they see others (including offices and schools) doing so.¹³

Trusted, skilled suppliers

Commentators suggest the number of skilled and trusted suppliers presents a further barrier to meeting energy efficiency targets ([PN 699](#) and [PN 711](#)).^{13,43,51,144,z} Large energy suppliers such as Octopus Energy, EDF Energy and British Gas are investing in training and apprenticeship programmes focused on low-carbon technologies.¹⁴⁴ BIT also suggests that achieving sufficient training numbers may require governments setting quotas for large suppliers and providing subsidies to smaller or independent suppliers.³⁴

Consumption

Current status and challenges

GHG emissions arise from the production and supply chains for goods and services, such as food, clothes, household goods, and retail.^{52,aa} The consumption of these goods and services in the UK also creates 27 million tonnes of waste annually, which contributed 6% of total UK emissions in 2018.¹⁵⁵

Reducing waste through repair and reuse

Consumers can minimise waste and associated emissions by repairing and reusing products rather than buying new; buying low-carbon products; and recycling ([PN 646](#)).¹⁵⁶ Studies suggest barriers to such choices include:

- knowledge of the impact of consumption and recycling¹⁵⁷
- difficulties identifying lower GHG emission products or those that are recyclable due to either lack of or poor labelling³⁴
- higher costs and time associated with buying sustainably and repairing items¹⁵⁷
- manufacturing processes that prevent repair, low numbers of second-hand or repair shops, the lack of relevant skills and access to recycling infrastructure ([PN 646](#))

Food system emissions: production, demand, waste

Food systems are built from the complex activities, interactions and networks of decision-makers, natural processes, human processes and infrastructure ([PN 702](#)). Additionally, studies show consumer relationships with food include strong emotional,

^z The Green Deal provided financial support for insulation but the lack of trust that consumers had in suppliers contributed to its limited success.^{13,154}

^{aa} Consumption emissions are associated with the manufacturing country rather than the UK's net zero target. However, consumption emissions related to imports account for 46% of the UK's total emissions.

habitual, and cultural links that can restrict willingness to change.^{158,159} In 2019, the food system contributed up to 35% of UK GHG emissions, including domestic agriculture (11%), imported food (15%), and production and distribution (9%).¹⁶⁰

Considering diet alone, the CCC advises a 35% reduction in meat and dairy product consumption by 2050.¹⁶¹ However, studies suggest reducing future food system emissions may require measures to support green choices across the food system including agriculture, retailers, individuals, and waste ([PN 702](#), Figure 1).^{10,22,34,52,160}

Studies estimate that up to 40% of food is wasted across the supply chain via crop damage, inappropriate storage and transportation, and rejection of misshapen produce ([PN 702](#), [PN 707](#)).¹⁶² However, they also suggest that the majority of food waste occurs in households. This may be due to consumers being incentivised to buy excess food, storing it incorrectly, not reusing leftovers and not donating unwanted food ([PB 59](#)).^{34,162}

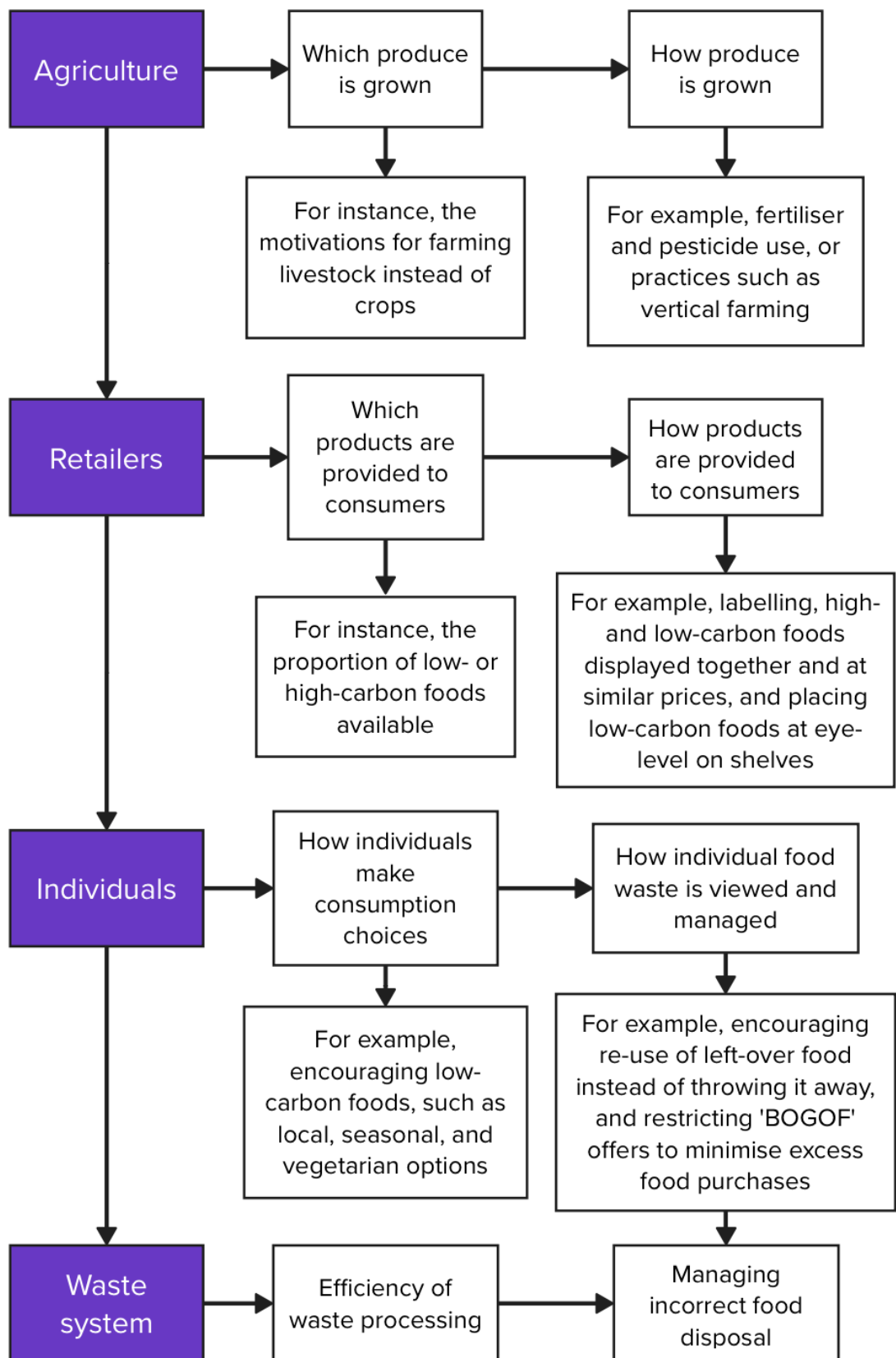
Methods for encouraging net zero compatible consumption

Studies suggest actions by governments can incentivise supplier and consumer choices.^{12,14,16,20,38,43} For example, the carrier bag charge, which fined retailers if they did not charge for single-use bags, reduced customer plastic bag demand by 98%,^{13,37,163,164} and the Soft Drinks Industry Levy incentivised sugar reductions in drinks.^{8,22,34,111,151}

Some commentators have suggested actions that governments could take to enable green food consumption choices ([PN 702](#)).¹² This includes how low-carbon foods are presented by supermarkets, restaurants, and public sector outlets,^{165–169} such as increasing the availability and prominence on supermarket shelves, or on restaurant and canteen menus.¹⁷⁰

Despite recycling having a comparatively low impact on emissions,¹⁷¹ studies suggest consistent waste collections and simplifying standards and labels across the UK could minimise household recycling errors.^{19,172,173} Standardisation would reduce problems when individuals move between areas with different systems.^{19,44} WRAP has an extensive evidence base on effective strategies ([PB 59](#)).¹⁷⁴

Figure 1: Summary of areas within the food system that require green choices to be enabled



The UK Government's 2021 Right to Repair legislation seeks to reduce waste and increase economic circularity.^{bb} Commentators suggest options to further support this green choice include:

- a reparability index, as provided by France in 2021, which enables customers to buy more recyclable products, and encourages manufacturers to provide these^{176,177}
- reducing repair costs through removing VAT or providing vouchers for repairs, similar to the Austrian repair fund¹⁷⁸
- waste has been reduced in Seoul by using automated bins to weigh food waste and charge residents accordingly^{179,cc}

Central government actions can be paired with local-level action, which tends to receive more engagement.^{12,38} For example, studies suggest that local authorities could minimise consumption emissions by encouraging community hubs to promote circular economy initiatives, such as repair shops or skills classes, and local second-hand trading schemes.^{22,34,dd}

BIT suggest businesses can operate similar in-house schemes and promote these behaviours by purchasing repairable products, and providing and facilitating refillable, rental, and take-back schemes to employees.³⁴ Low-carbon options can also be made the default within organisations to make green choices easier for individuals.^{14,52,181-184,ee}

Future UK policy considerations for green choices

Commentators suggest that behavioural evidence is typically not well applied to existing green choice initiatives to support net zero ambitions, especially regarding structural or systematic recommendations.^{14,38,185,ff}

DESNZ noted that barriers to applying this evidence include a mixed understanding and appreciation for behavioural and systems-thinking mechanisms across government departments.³⁷ Some academic stakeholders state that government should curate and use better data for designing policies.^{12,21}

^{bb} A circular economy keeps resources in use as long as possible, extracting maximum value from them, minimising waste and promoting resource efficiency.¹⁷⁵

^{cc} Some inedible parts of food products will result in waste, such as potato peelings.

^{dd} Examples of second-hand schemes include Vinted, which allows individuals to buy and sell second-hand items, and the Library of Things, which provides a borrowing service.¹⁸⁰

^{ee} Low-carbon defaults can include automatic lighting, train travel rather than private car or flying, and doctors prescribing low-carbon asthma inhalers.¹⁴

^{ff} Commentators drew parallels with the COVID-19 pandemic when there was criticism of how the government applied input from the Independent Scientific Pandemic Insights Group on Behaviours, which advised the Scientific Advisory Group for Emergencies.^{17,185}

The role of public engagement

Many commentators stress that the success of green choice approaches depends on public engagement of citizens and businesses.^{16,21,37–39,45,48,186,187} ‘Hard’ policy mechanisms that leave the green choice as the only option (such as infrastructure change or regulation) also require public engagement to ensure consumer awareness of the consequences of decisions to gain acceptance.¹⁹

Tailored engagement

Commentators emphasise that the public is not a single entity.^{14,15,17,19,38} Different social contexts affect behaviour, so engagement strategies need to consider groups in different ways based on their circumstances and how they choose to engage.^{12,13,15–17,43} Commentators stress the need for diverse, tailored and appropriate engagement mechanisms to ensure all groups are represented (Box 2).

Box 2: Characteristics to consider when tailoring engagement strategies

- **Income:** the richest 10% globally contribute 50% of GHG emissions, raising just transition issues ([PN 706](#)).^{18,38,43,45,191,99} Context impacts the efficacy of financial incentives. Some commentators identified cost as a major barrier to green choices.^{18,51,147} Others highlight it is not the only factor, nor always the most impactful, and can cause unintended consequences.^{20,21,37,38,45}
- **Demographics:** age and gender can influence willingness to change and political support respectively.^{16,38} Younger people have shown higher concern about climate change and desire for widespread green choices.^{194–196} Older generations typically have higher support for transport and consumption policies such as carbon taxes and frequent flyer levies, whilst younger groups favour policies encouraging EV uptake and dietary change.²² Women are slightly more supportive of net zero policies than men, and are generally more willing to adopt a plant-based diet.²²
- **Home-ownership:** for example, owner-occupiers or landlords have more control over home energy efficiency than renters.^{16,38}
- **Activities, consumption and routine:** interacting with groups defined by the actions they actually take relies on high quality data.^{12,21}
- **Physical environment:** for example, transport choices for people living in rural vs urban areas are very different.^{13,16,38,43}
- **Profession:** organisations provide the opportunity to engage with large groups to enable green choices.^{38,43}

⁹⁹ The richest 10% globally encompasses all those earning more than £32,000 a year.¹⁹² The median household income in the UK at the end of 2022 was £35,000 before tax and benefits.¹⁹³

For example, research has shown that citizens' assemblies^{hh} may be an effective mechanism for capturing the views of the participants involved, but not of the whole public.^{15–17,44} Repeated public engagement is seen as key to achieve a just transition as different groups will need different support to enable their green choices ([PN 706](#)).

Awareness of the additional benefits of green choices

Highlighting other potential benefits associated with green choices, in addition to net zero, increases public engagement effectiveness.^{13–15,17,37,44–46,51} Other benefits may include:

- reduced air pollution associated with green transport choices, such as walking, cycling, public transport or EVs, may improve overall health^{197–199}
- improved cardiovascular health from a low-carbon diet^{200–202}
- better health from a warmer home in winter due to improved insulation^{203–205}

Individual financial benefits may include:

- reduced energy bills from installing insulation and solar PV^{206–211}
- saving money, for example, by reducing food waste or buying second-hand goods^{212–214}

Studies show that interventions focussed on net zero, decarbonisation, 1.5°C, and similar terms, are poorly understood and less motivating than those focussed on benefits for individuals.²¹⁵ Some research suggests that by making benefits clear or shifting the narrative from climate change to health or financial opportunities, citizens may be more likely to support and encourage government actions.^{15,17,215}

Citizenship

Academic stakeholders highlight the importance of citizen action and its influence on enabling green choices through:^{16,18,38,216}

- voting
- investing in green financial products
- activism
- talking with family, friends, and colleagues
- choosing a career aligned with net zero ([PN 711](#))
- community involvement and volunteering

^{hh} Citizens' Assemblies are a form of tailored engagement, described as a representative group of citizens who are selected at random from the population to learn about, deliberate, and make recommendations in relation to a particular issue or set of issues.¹⁸⁸ An example of this is the Climate Assembly UK in 2020.^{189,190}

Engagement strategies can emphasise the opportunities for citizens to contribute to net zero action and inform government policy effectiveness and acceptability.²²

Some studies suggest that providing outlets for citizen action can reduce individual climate anxietyⁱⁱ and instil hope, especially if individuals are already taking climate action or their personal context limits them from other green choices. When responding to citizen engagement, encouraging citizen buy-in and support requires clear decisions and explanations from government.^{194,217–219}

Misinformation

Stakeholders highlight that climate change misinformation^{jj} is a major barrier to successful public engagement.^{51,222,223} Alongside misinformation, the complexity and volume of information from multiple sources can also prevent consumers from making confident and appropriate green choices.¹⁹

The Energy Saving Trust noted that the Government’s “It all adds up” campaign^{kk} acts as a first step in educating citizens on net zero and dispelling misinformation.¹⁴⁷

Legislation to prevent misinformation has been suggested as a means to reduce confusion and increase trust in government, media, and science.^{44,228}

Policy considerations for enabling system-wide green choices

Based on stakeholders’ views, possible priority areas for green choice policies could include:

- integrating across all levels of society to ensure green choices are appropriately enabled, such as:^{8,12–17,19,20,34,38,43–45,48,52,229,230}
 - through government regulation, guidance, and direction
 - in organisational environments and procurement approaches
 - for individual decision-making and engagement
- designing and implementing long-term and tailored engagement strategies that can guide policy, earn public buy-in, and encourage citizenship^{12,13,15–17,21,37–39,43,45,48,186,231}

ⁱⁱ Climate anxiety stems from worry about negative ongoing and future climate change impacts, and has been linked with low mental wellbeing.^{217,218}

^{jj} Misinformation differs from disinformation. Misinformation refers to incorrect information being spread unintentionally. Disinformation refers to the intentional spreading of wrong information.^{220,221}

^{kk} The ‘It All Adds Up’ energy saving campaign aims to raise public awareness of straightforward actions that people can take to cut their bills by bringing down the amount of energy needed to keep their homes warm and stay safe in winter temperatures.²²⁴ This UK example is less “ambitious” than ‘Sobriété Énergétique’ in France, which aims to mobilise society around a national energy saving target.^{225–227}

- identifying trusted national and impartial advice sources that counter misinformation and promote accurate and positive messaging about the benefits of the green transition^{13-15,17,19,37,44-46,51,222}

References

1. [A legal duty to act](#). *Climate Change Committee*.
2. Brader, C. (2023). [Mission zero: Independent review of net zero](#). House of Lords Library.
3. [About the Climate Change Committee](#). *Climate Change Committee*.
4. Department for Energy Security and Net Zero (2023). [Carbon Budget Delivery Plan](#).
5. [Advice on reducing the UK's emissions](#). *Climate Change Committee*.
6. Climate Change Committee (2023). [Progress in reducing emissions - 2023 Report to Parliament](#).
7. Dooks, T. (2023). [CCC assessment of recent announcements and developments on Net Zero](#). *Climate Change Committee*.
8. House of Lords Environment and Climate Change Committee (2022). [In our hands: behaviour change for climate and environmental goals](#). House of Lords.
9. Department for Energy Security and Net Zero *et al.* (2022). [Net Zero Strategy: Build Back Greener](#).
10. Marteau, T. M. *et al.* (2021). [Changing behaviour for net zero 2050](#). *BMJ*, n2293.
11. Climate Change Committee (2020). [Reducing UK emissions: 2020 Progress Report to Parliament](#).
12. Hoolohan, C. (2023). Personal Communication.
13. Hall, D. (2023). Personal Communication.
14. Royston, S. (2023). Personal Communication.
15. Davan Wetton, J. (2023). Personal Communication.
16. Hampton, S. (2023). Personal Communication.
17. Hargreaves, T. (2023). Personal Communication.
18. Hauser, O. (2023). Personal Communication.
19. Holmes, H. (2023). Personal Communication.
20. Michie, S. (2023). Personal Communication.
21. Oliveira, S. (2023). Personal Communication.
22. Hampton, S. *et al.* (2023). [Choices for climate action: A review of the multiple roles individuals play](#). *One Earth*, Vol 6, 1157–1172.
23. Newell, P. *et al.* (2021). [Scaling behaviour change for a 1.5-degree world: challenges and opportunities](#). *Global Sustainability*, Vol 4, e22. Cambridge University Press.
24. Capstick, S. *et al.* (2014). [Prospects for radical emissions reduction through behavior and lifestyle change](#). *Carbon Management*, Vol 5, 429–445. Taylor & Francis.
25. (2021). [Achieving low-carbon and equitable lifestyle change](#). *CAST Briefing 06*. Centre for Climate Change and Social Transformations.
26. Hale, J. *et al.* (2022). [Decarbonising existing homes in Wales: a participatory behavioural systems mapping approach](#). *UCL Open Environment*, Vol 4, UCL Press.
27. Council for Science and Technology (2023). [Achieving net zero carbon emissions through a whole systems approach](#).
28. [net-zero-a-systems-perspective-on-the-climate-challenge-final-nepc.pdf](#).
29. National Engineering Policy Centre [Video explainers - Getting to net zero: a systems approach](#).
30. Giambona, J. (2021). [A Systems Perspective on Net-Zero Infrastructure](#). *Imperial News*, *Imperial College London*.
31. Department for Energy Security and Net Zero (2023). [Powering Up Britain: Net Zero Growth Plan](#).

32. Department for Energy Security and Net Zero (2023). [Powering Up Britain: Net Zero Growth Plan](#).
33. Department for Business, Energy & Industrial Strategy (2022). [BEIS Public Attitudes Tracker: Spring 2022](#).
34. Park, T. (2023). [How to build a Net Zero society](#). The Behavioural Insights Team.
35. Wynes, S. *et al.* (2020). [How well do people understand the climate impact of individual actions?](#) *Climatic Change*, Vol 162, 1521–1534.
36. Pathak, M. *et al.* (2022). [Technical Summary](#). in *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. (eds. Shukla, P. R. *et al.*) 49–147. Cambridge University Press.
37. DESNZ Green Choices Team (2023). Personal Communication.
38. Whitmarsh, L. (2023). Personal Communication.
39. Anderson, A. Personal Communication.
40. Lanzini, P. *et al.* (2014). [Behavioural spillover in the environmental domain: An intervention study](#). *Journal of Environmental Psychology*, Vol 40, 381–390.
41. Maki, A. *et al.* (2019). [Meta-analysis of pro-environmental behaviour spillover](#). *Nat Sustain*, Vol 2, 307–315. Nature Publishing Group.
42. Nash, N. *et al.* (2017). [Climate-relevant behavioral spillover and the potential contribution of social practice theory](#). *WIREs Climate Change*, Vol 8, e481.
43. Park, T. (2023). Personal Communication.
44. Chater, N. (2023). Personal Communication.
45. Bogelein, S. (2023). Personal Communication.
46. Carmichael, R. (2019). [Behaviour change, public engagement and Net Zero](#). Imperial College London.
47. Owens, S. (2000). [‘Engaging the Public’: Information and Deliberation in Environmental Policy](#). *Environ Plan A*, Vol 32, 1141–1148.
48. Zhao, J. (2023). Personal Communication.
49. Voi Technology (2023). [Most successful e-scooter scheme in UK reaches 10 million journeys milestone](#). *News Powered by Cision*.
50. Department for Transport *et al.* (2020). [Powered transporters](#).
51. Professor Paul Monks. (2023). Personal Communication.
52. Centre for Climate Change and Social Transformations (CAST) (2023). [The Implications of Behavioural Science for Effective Climate Policy Output 1: Literature Review and Background Report](#).
53. Trott, C. D. (2019). [Reshaping our world: Collaborating with children for community-based climate change action](#). *Action Research*, Vol 17,
54. Devine-Wright, P. *et al.* (2004). [Situational influences upon children’s beliefs about global warming and energy](#). *Environmental Education Research*, Vol 10, 493–506. Routledge.
55. Kolenatý, M. *et al.* (2022). [What Triggers Climate Action: The Impact of a Climate Change Education Program on Students’ Climate Literacy and Their Willingness to Act](#). *Sustainability*, Vol 14, 10365. Multidisciplinary Digital Publishing Institute.
56. Rudd, J. A. *et al.* (2020). [You and CO2: a Public Engagement Study to Engage Secondary School Students with the Issue of Climate Change](#). *J Sci Educ Technol*, Vol 29, 230–241.
57. Webb, T. L. *et al.* (2009). [Planning to break unwanted habits: Habit strength moderates implementation intention effects on behaviour](#)

- change. *British Journal of Social Psychology*, Vol 48, 507–523.
58. Drake, E. C. *et al.* (2016). Daily cortisol activity, loneliness, and coping efficacy in late adolescence: A longitudinal study of the transition to college. *Int J Behav Dev*, Vol 40, 334–345.
 59. Kwasny, T. *et al.* (2022). Towards reduced meat consumption: A systematic literature review of intervention effectiveness, 2001–2019. *Appetite*, Vol 168, 105739.
 60. Lee, K. *et al.* (2020). Youth perceptions of climate change: A narrative synthesis. *WIREs Climate Change*, Vol 11, e641.
 61. Frick, J. *et al.* (2004). Environmental knowledge and conservation behavior: exploring prevalence and structure in a representative sample. *Personality and Individual Differences*, Vol 37, 1597–1613.
 62. Pickering, G. J. *et al.* (2021). Lifestyle decisions and climate mitigation: current action and behavioural intent of youth. *Mitig Adapt Strateg Glob Change*, Vol 26, 25.
 63. Baldwin, C. *et al.* (2023). Knowledge and self-efficacy of youth to take action on climate change. *Environmental Education Research*, Vol 29, 1597–1616. Routledge.
 64. Wynes, S. *et al.* (2017). The climate mitigation gap: education and government recommendations miss the most effective individual actions. *Environ. Res. Lett.*, Vol 12, 074024. IOP Publishing.
 65. Roque, L. *et al.* (2022). Plant-based school meals as levers of sustainable food transitions: A narrative review and conceptual framework. *Journal of Agriculture and Food Research*, Vol 10, 100429.
 66. British Science Association (2023). UK secondary school pupils call for more relevant and rigorous climate change education.
 67. Anderson, A. How the education system can help to fight the climate crisis. *Academy of Social Sciences.*
 68. Muccione, V. *et al.* (2023). A scoping review on climate change education. EarthArXiv.
 69. Gatersleben, B. *et al.* (2023). Handbook on Pro-Environmental Behaviour Change. Edward Elgar Publishing.
 70. Corner, A. *et al.* (2015). How do young people engage with climate change? The role of knowledge, values, message framing, and trusted communicators. *Wiley Interdisciplinary Reviews: Climate Change*, Vol 6,
 71. Monroe, M. C. *et al.* (2019). Identifying effective climate change education strategies: a systematic review of the research. *Environmental Education Research*, Vol 25, 791–812.
 72. Lawson, D. F. *et al.* (2019). Children can foster climate change concern among their parents. *Nature Climate Change*, Vol 9, 458–462.
 73. Lawson, D. F. *et al.* (2018). Intergenerational learning: Are children key in spurring climate action? *Global Environmental Change*, Vol 53, 204–208.
 74. Braun, T. *et al.* (2017). Connecting students to nature – how intensity of nature experience and student age influence the success of outdoor education programs. *Environmental Education Research*, Vol 23, 937–949. Routledge.
 75. Lee, K. *et al.* (2022). Adolescents’ Representations of Climate Change: Exploring the Self-other Thema in a Focus Group Study. *Environmental Communication*, Vol 16, 408–423. Routledge.
 76. Corner, A. *et al.* (2015). How do young people engage with climate change? The role of knowledge, values, message framing, and

- trusted communicators. *WIREs Climate Change*, Vol 6, 523–534.
77. Devine-Wright, P. *et al.* (2004). Situational influences upon children’s beliefs about global warming and energy. *Environmental Education Research*, Vol 10, 493–506. Routledge.
 78. Trott, C. D. (2019). Reshaping our world: Collaborating with children for community-based climate change action. *Action Research*, Vol 17, 42–62. SAGE Publications.
 79. Otto, S. *et al.* (2017). Nature-based environmental education of children: Environmental knowledge and connectedness to nature, together, are related to ecological behaviour. *Global Environmental Change*, Vol 47, 88–94.
 80. Michie, S. *et al.* (2011). The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implementation Science*, Vol 6, 42.
 81. ASI TUMI SUTP iNUA No-9 April-2019-Mykme0.pdf.
 82. Wynes, S. *et al.* (2018). Measuring what works: quantifying greenhouse gas emission reductions of behavioural interventions to reduce driving, meat consumption, and household energy use. *Environ. Res. Lett.*, Vol 13, 113002.
 83. Climate Change Committee (2021). Progress in reducing emissions - 2021 Report to Parliament.
 84. Sector-summary-Surface-transport.pdf.
 85. Department for Transport Transport and environment statistics 2022.
 86. Gov. UK. 2022 Provisional emissions statistics report.pdf.
 87. Department for Business, Energy & Industrial Strategy (2021). 2019 UK Greenhouse Gas Emissions, Final Figures.
 88. Climate Change Committee (2023). Progress in reducing emissions - 2023 Report to Parliament.
 89. Electrical Review (2023). Electric car sales soar in August, reaching 20% market share.
 90. Mawhood, B. *et al.* (2024). Electric vehicles and infrastructure. House of Commons Library.
 91. Department for Transport (2023). Government sets out path to zero emission vehicles by 2035. *GOV.UK.*
 92. Kåresdotter, E. *et al.* (2022). First Mile/Last Mile Problems in Smart and Sustainable Cities: A Case Study in Stockholm County. *Journal of Urban Technology*, Vol 29, 115–137. Routledge.
 93. Lu, Y. *et al.* (2023). First and last mile travel mode choice: A systematic review of the empirical literature. *International Journal of Sustainable Transportation*, Vol 0, 1–14. Taylor & Francis.
 94. De Vos, J. (2022). The shifting role of attitudes in travel behaviour research. *Transport Reviews*, Vol 42, 573–579. Routledge.
 95. Bamberg, S. *et al.* (2003). Choice of Travel Mode in the Theory of Planned Behavior: The Roles of Past Behavior, Habit, and Reasoned Action. *Basic and Applied Social Psychology*, Vol 25, 175–187. Routledge.
 96. Padam Mobility (2021). Accessibility – how barrier-free is public transport in the UK? - Demand-Responsive Transport News.
 97. Committee of Public Accounts (2023). Active travel in England. UK Parliament.
 98. Sustrans (2023). Lack of transport choices leaving young people behind. *Sustrans.*
 99. Hamidi, Z. *et al.* (2020). Shaping sustainable travel behaviour: Attitude, skills, and access all matter. *Transportation Research Part D: Transport and Environment*, Vol 88, 102566.

100. Rural Services Network (2023). [Rural areas hardest hit by transport poverty.](#)
101. Euronews Green (2023). [Germany's €49 ticket leads to 25% increase in low-carbon trips.](#) *euronews.*
102. Here360 news (2022). [How did Germany's €9 train scheme affect road traffic?](#) *Here.*
103. Kuss, P. *et al.* (2022). [A dozen effective interventions to reduce car use in European cities: Lessons learned from a meta-analysis and transition management.](#) *Case Studies on Transport Policy*, Vol 10, 1494–1513.
104. [Sector-summary-Aviation.pdf.](#)
105. Which? (2021). [Costing the earth: Environmentally-conscious travellers face paying around 50% more to travel by train than plane.](#)
106. Jackman, J. (2023). [Why Are Train Journeys More Expensive Than Flights?](#) *The Eco Experts.*
107. Nilson, P. (2023). [How low-cost airline subsidies are hampering the great modal shift.](#) *Railway Technology.*
108. Hine, R. *et al.* (2020). [Incentivising low-carbon travel.](#) Grantham Institute – Climate Change and the Environment, Imperial College London.
109. Hansmann, R. *et al.* (2021). [Reducing personal air-travel: Restrictions, options and the role of justifications.](#) *Transportation Research Part D: Transport and Environment*, Vol 96, 102859.
110. Office for Zero Emission Vehicles (2023). [Apply for Local Electric Vehicle Infrastructure \(LEVI\) funding.](#) *GOV.UK.*
111. Centre for Climate Change and Social Transformations (CAST) (2023). [The Implications of Behavioural Science for Effective Climate Policy Output 2: Policy Recommendations.](#)
112. Newell, P. *et al.* (2021). [Changing our Ways? Behaviour change and the climate crisis.](#) Cambridge Sustainability Commissions.
113. [Moments of Change for pro-environmental behaviour shifts \(MOCHA\).](#) *Cardiff University.*
114. [Understanding and leveraging 'moments of change' for pro-environmental behaviour shifts | MOCHA Project | Fact Sheet | H2020.](#) *CORDIS | European Commission.*
115. Smith, L. *et al.* (2023). [Clean Air Zones, Low Emission Zones and the London ULEZ.](#) House of Commons Library.
116. Sustrans (2020). [What is a low traffic neighbourhood?](#) *Sustrans.*
117. Euronews Green (2023). [Milan plans to ban cars from city centre by mid 2024.](#) *euronews.*
118. Evans, S. (2023). [Factcheck: 21 misleading myths about electric vehicles.](#) *Carbon Brief.*
119. [Norwegian EV policy.](#) *Norsk elbilforening.*
120. Boulton, M. (2022). [Almost a third of second-hand car sales to be electric by 2030.](#) *Forecourt Trader.*
121. Mabunga, L. (2023). [How Often Should I Change My Car?](#) *Carmoola.*
122. Bracht, J. (2022). [Consumers are demanding small and affordable EVs – why traditional automakers are supplying the opposite.](#) *SciencesPo.*
123. Environment and Climate Change Committee (2024). [EV strategy: rapid recharge needed.](#) House of Lords.
124. [Sector-summary-Buildings.pdf.](#)
125. Department for Business, Energy & Industrial Strategy (2021). [Government to tighten rules to stop 'greenwashing' of electricity tariffs.](#) *GOV.UK.*
126. Galizzi, B. (2024). [Microgeneration of sustainable energy.](#) *Uswitch.*
127. Woodward, K. (2021). [How can renewable energy help the UK reach net zero?](#) *Energy Saving Trust.*

128. UCL (2022). [Analysis: Energy bills - how much money does turning down the thermostat actually save?](#) *UCL News*.
129. Economist Impact (2022). [What difference can one degree make in the middle of an energy crisis?](#)
130. International Energy Agency [Behavioural Changes - Energy System](#). *IEA*.
131. Sarsentis, D. *et al.* (2023). [How the UK compares to the rest of Europe on heat pump uptake](#). Nesta.
132. Climate Change Committee (2020). [Sixth Carbon Budget](#).
133. Williams, J. *et al.* (2023). [Decarbonising Home Energy Through Behaviour Change: How to Overcome Barriers to Green Purchase Decisions](#). International Public Policy Observatory.
134. Ministry of Housing, Communities & Local Government (2019). [The Future Homes Standard: changes to Part L and Part F of the Building Regulations for new dwellings](#). GOV.UK.
135. Hazlegreaves, S. (2023). [Retrofit skills shortage undermines plan to upgrade 19m homes](#). *Planning, Building & Construction Today*.
136. Department for Energy Security and Net Zero *et al.* (2021). [Smart meters: a guide for households](#). GOV.UK.
137. Buchanan, K. *et al.* (2016). [The British public's perception of the UK smart metering initiative: Threats and opportunities](#). *Energy Policy*, Vol 91, 87–97.
138. Hielscher, S. *et al.* (2018). [Contested smart and low-carbon energy futures: Media discourses of smart meters in the United Kingdom](#). *Journal of Cleaner Production*, Vol 195, 978–990.
139. Fredericks, D. *et al.* (2020). [A Decade On, How Has the Visibility of Energy Changed? Energy Feedback Perceptions from UK Focus Groups](#). *Energies*, Vol 13, 2566. Multidisciplinary Digital Publishing Institute.
140. Keele University (2020). [Smart meters have little impact on people's energy usage habits](#). *Keele University*.
141. Cardoso, C. A. *et al.* (2020). [Making demand side response happen: A review of barriers in commercial and public organisations](#). *Energy Research & Social Science*, Vol 64, 101443.
142. Element Energy (2022). [Home Response: Domestic Demand Side Response Insights Report](#). Greater London Authority.
143. (2023). [Energy UK explains: The Demand Flexibility Service](#). *Energy UK*.
144. Energy UK (2023). Personal Communication.
145. [download.pdf](#).
146. [Home Energy Scotland](#). *Home Energy Scotland*.
147. Energy Saving Trust (2023). Personal Communication.
148. [Home - Nest Wales - nest.gov.wales](#). *Nest*.
149. Energy Saving Trust (2023). [National or local retrofit advice? To cut bills, carbon and improve energy security, we need both](#). Energy Saving Trust.
150. Northern Ireland Sustainable Energy Programme. [Energy Saving Trust](#).
151. Department for Business & Industrial Strategy (2021). [Net Zero: principles for successful behaviour change initiatives](#). Department for Business & Industrial Strategy.
152. Monschauer, Y. *et al.* (2023). [Global heat pump sales continue double-digit growth](#). *International Energy Agency*.
153. Paramonova, S. *et al.* (2016). [Energy-efficiency networks for SMEs: Learning from the Swedish experience](#). *Renewable and Sustainable Energy Reviews*, Vol 65, 295–307.

154. Murray, K. (2014). [Lack of trust in energy suppliers holds back efficiency drive.](#) *The Guardian*.
155. Climate Change Committee (2020). [The Sixth Carbon Budget - Waste.](#)
156. Zhang, L. *et al.* (2022). [Extending the Lifetime of Clothing through Repair and Repurpose: An Investigation of Barriers and Enablers in UK Citizens.](#) *Sustainability*, Vol 14, 10821. Multidisciplinary Digital Publishing Institute.
157. Department For Environment, Food & Rural Affairs [Barriers and enablers to the repair of electrical equipment: Application of the System Effects methodology - EV0285.](#)
158. Reddy, G. *et al.* (2020). [Food, culture, and identity in multicultural societies: Insights from Singapore.](#) *Appetite*, Vol 149, 104633.
159. Monterrosa, E. C. *et al.* (2020). [Sociocultural Influences on Food Choices and Implications for Sustainable Healthy Diets.](#) *Food Nutr Bull*, Vol 41, 59S-73S. SAGE Publications Inc.
160. WRAP (2021). [UK Food System GHG Emissions.](#) WRAP.
161. Climate Change Committee (2022). [Government's Food Strategy 'a missed opportunity' for the climate.](#) *Climate Change Committee*.
162. WRAP (2021). [Food waste trends survey 2021.](#)
163. Department for Environment, Food & Rural Affairs (2023). [Carrier bag charges: retailers' responsibilities.](#) *GOV.UK*.
164. Department for Environment, Food & Rural Affairs (2023). [Plastic bag use falls by more than 98% after charge introduction.](#) *GOV.UK*.
165. Panzone, L. A. *et al.* (2024). [Nudging the Food Basket Green: The Effects of Commitment and Badges on the Carbon Footprint of Food Shopping.](#) *Environ Resource Econ*, Vol 87, 89–133.
166. Panzone, L. A. *et al.* (2021). [Sustainable by Design: Choice Architecture and the Carbon Footprint of Grocery Shopping.](#) *Journal of Public Policy & Marketing*, Vol 40, 463–486. SAGE Publications Inc.
167. Betz, A.-K. *et al.* (2022). [How can carbon labels and climate-friendly default options on restaurant menus contribute to the reduction of greenhouse gas emissions associated with dining?](#) *PLOS Climate*, Vol 1, e0000028. Public Library of Science.
168. Parkin, B. L. *et al.* (2022). [Menu design approaches to promote sustainable vegetarian food choices when dining out.](#) *Journal of Environmental Psychology*, Vol 79, 101721.
169. Filimonau, V. *et al.* (2017). ['Nudging' as an architect of more responsible consumer choice in food service provision: The role of restaurant menu design.](#) *Journal of Cleaner Production*, Vol 144, 161–170.
170. Buratto, A. *et al.* (2024). [Encouraging sustainable food consumption through nudges: An experiment with menu labels.](#) *Ecological Economics*, Vol 216, 108024.
171. Ivanova, D. *et al.* (2020). [Quantifying the potential for climate change mitigation of consumption options.](#) *Environ. Res. Lett.*, Vol 15, 093001. IOP Publishing.
172. Sustainable Materials Innovation Hub [Lack of consistency and standardisation leaves UK recycling system 'not fit for purpose' –report.](#)
173. Department For Environment, Food & Rural Affairs (2023). [Government response on consultation on Consistency in household and business recycling in England.](#) *GOV.UK*.
174. [Resources.](#) *WRAP*.

175. Department For Environment, Food & Rural Affairs *et al.* (2020). [Circular Economy Package policy statement](#). GOV.UK.
176. [Rapport-indice-de-reparabilite.pdf](#).
177. Mikolajczak, C. (2022). [One year on, has the French repair index kept its promises? Right to Repair Europe](#).
178. Markus Piringier *et al.* (2022). [Austria launches a nation-wide repair bonus scheme](#). *Right to Repair Europe*.
179. Kim, M. (2023). [How South Korea's composting system became a model for the world](#). *Los Angeles Times*.
180. Library of Things [Library of Things](#).
181. Kaiser, M. *et al.* (2020). [The power of green defaults: the impact of regional variation of opt-out tariffs on green energy demand in Germany](#). *Ecological Economics*, Vol 174, 106685.
182. Taube, O. *et al.* (2019). [How green defaults promote environmentally friendly decisions: Attitude-conditional default acceptance but attitude-unconditional effects on actual choices](#). *Journal of Applied Social Psychology*, Vol 49, 721–732.
183. Sunstein, C. R. (2021). [Green defaults can combat climate change](#). *Nat Hum Behav*, Vol 5, 548–549. Nature Publishing Group.
184. Meier, J. *et al.* (2022). [Review: Do green defaults reduce meat consumption?](#) *Food Policy*, Vol 110, 102298.
185. Michie, S. *et al.* (2022). [Lessons from the UK's handling of Covid-19 for the future of scientific advice to government: a contribution to the UK Covid-19 Public Inquiry](#). *Contemporary Social Science*, Vol 17, 418–433. Routledge.
186. Centre for Climate Change and Social Transformations (CAST) (2020). [Engaging the public on low-carbon lifestyle change](#).
187. [CAST-the-cente-for-climate-change-and-social-transformations-cast-briefing-20-how-can-politicans-avoid-a-net-zero-backlash-the-role-of-public-engagement-a-briefing-for-policy-makers-and-communicators.pdf](#).
188. Citizens' Assembly. *Electoral Reform Society*.
189. [Climate Assembly UK](#). *Climate Assembly UK*.
190. Climate Assembly UK (2020). [The path to net zero](#).
191. Oxfam International (2023). [Richest 1% emit as much planet-heating pollution as two-thirds of humanity](#). *Oxfam International*.
192. Carrington, D. (2023). [Revealed: the huge climate impact of the middle classes](#). *The Guardian*.
193. Office for National Statistics (2023). [Effects of taxes and benefits on UK household income: financial year ending 2022](#).
194. Whitmarsh, L. *et al.* (2022). [Climate anxiety: What predicts it and how is it related to climate action?](#) *Journal of Environmental Psychology*, Vol 83, 101866.
195. Milfont, T. L. *et al.* (2021). [Ten-year panel data confirm generation gap but climate beliefs increase at similar rates across ages](#). *Nat Commun*, Vol 12, 4038. Nature Publishing Group.
196. Hassim, A. (2021). [Why younger generations are more willing to change in the name of sustainability](#). *GreenBiz*.
197. Buckeridge, D. L. *et al.* (2002). [Effect of motor vehicle emissions on respiratory health in an urban area](#). *Environ Health Perspect*, Vol 110, 293–300.
198. [improving air quality walking cycling.pdf](#).
199. Mayor of London Making the case for social prescribing of active travel: a toolkit to support patients to walk and cycle.
200. Zhang, J. *et al.* (2021). [Association of red and processed meat consumption with cardiovascular](#)

- morbidity and mortality in participants with and without obesity: A prospective cohort study. *Clinical Nutrition*, Vol 40, 3643–3649.
201. Yan, D. *et al.* (2023). Global burden of ischemic heart disease associated with high red and processed meat consumption: an analysis of 204 countries and territories between 1990 and 2019. *BMC Public Health*, Vol 23, 2267.
202. Jakobsen, M. U. *et al.* (2021). Intake of Unprocessed and Processed Meat and the Association with Cardiovascular Disease: An Overview of Systematic Reviews. *Nutrients*, Vol 13, 3303.
203. London School of Hygiene & Tropical Medicine (2023). Insulating homes plays 'central role' in health benefits of net zero policies.
204. Howden-Chapman, P. *et al.* (2007). Effect of insulating existing houses on health inequality: Cluster randomised study in the community. *BMJ (Clinical research ed.)*, Vol 334, 460.
205. Schmidt, C. W. (2008). Bringing Green Homes within Reach: Healthier Housing for More People. *Environ Health Perspect*, Vol 116, A24–A31.
206. Peñasco, C. *et al.* (2023). Assessing the effectiveness of energy efficiency measures in the residential sector gas consumption through dynamic treatment effects: Evidence from England and Wales. *Energy Economics*, Vol 117, 106435.
207. Johnston, S. *et al.* (2022). Analysis of financial and carbon savings of grid-tied home energy systems in conjunction with photo-voltaic solar generation and electric vehicle use. *Procedia CIRP*, Vol 105, 73–79.
208. Adan, H. *et al.* (2016). Do energy efficiency measures really reduce household energy consumption? A difference-in-difference analysis. *Energy Efficiency*, Vol 9, 1207–1219.
209. Paraschiv, S. *et al.* (2021). Increasing the energy efficiency of a building by thermal insulation to reduce the thermal load of the micro-combined cooling, heating and power system. *Energy Reports*, Vol 7, 286–298.
210. University of Cambridge (2023). Insulation only provides short-term reduction in household gas consumption. *University of Cambridge.*
211. García-López, M. *et al.* (2023). Household energy consumption and the financial feasibility of self-consumption through photovoltaic panels in Spain. *Energy Efficiency*, Vol 16, 57.
212. Calvo-Porrall, C. *et al.* (2024). Second-hand online stores: an examination of consumers' purchase behaviour. *The International Review of Retail, Distribution and Consumer Research*, Vol 0, 1–24. Routledge.
213. Conrad, Z. (2020). Daily cost of consumer food wasted, inedible, and consumed in the United States, 2001–2016. *Nutrition Journal*, Vol 19, 35.
214. Taylor, M. *et al.* (2023). Unique and Cheap or Damaged and Dirty? Young Women's Attitudes and Image Perceptions about Purchasing Secondhand Clothing. *Sustainability*, Vol 15, 16470. Multidisciplinary Digital Publishing Institute.
215. Poortinga, W. *et al.* (2023). Factors and framing effects in support for net zero policies in the United Kingdom. *Frontiers in Psychology*, Vol 14,
216. Hauser, O. P. *et al.* (2014). Cooperating with the future. *Nature*, Vol 511, 220–223. Nature Publishing Group.
217. Ogunbode, C. A. *et al.* (2022). Climate anxiety, wellbeing and pro-environmental action: correlates of

- [negative emotional responses to climate change in 32 countries.](#) *Journal of Environmental Psychology*, Vol 84, 101887.
218. Fyke, J. *et al.* (2023). [Reducing personal climate risk to reduce personal climate anxiety.](#) *Nat. Clim. Chang.*, Vol 13, 209–210. Nature Publishing Group.
219. Mortreux, C. *et al.* (2023). [Reducing personal climate anxiety is key to adaptation.](#) *Nat. Clim. Chang.*, Vol 13, 590–590. Nature Publishing Group.
220. Dictionary.com (2022). ["Misinformation" vs. "Disinformation": Get Informed On The Difference.](#) *Dictionary.com*.
221. [Misinformation vs disinformation: What do these types of fake news mean and what's the difference? - Other Side of the Story.](#) *BBC Bitesize*.
222. Government Office for Science (2023). [What impact do climate change misinformation and disinformation have?](#) *GOV.UK*.
223. Gabbatiss, J. *et al.* (2024). [Analysis: Record opposition to climate action by UK's right-leaning newspapers in 2023.](#) *Carbon Brief*.
224. Department for Business, Energy & Industrial Strategy (2022). [Small changes mean energy advice campaign adds up to big savings.](#) *GOV.UK*.
225. [Climate-policy-that-cuts-costs-International-policy-comparisons-Energy-Saving-Trust-and-Green-Alliance.pdf.](#)
226. [What does the Energy Sobriety Plan provide for households?](#)
227. UsersTCP [CampaignXchange Task](#).
228. Full Fact (2022). [Written evidence to the Online Safety Bill Public Bill Committee \(OSB28\).](#) Online Safety Bill Public Bill Committee, UK Parliament.
229. Chater, N. *et al.* (2023). [The i-frame and the s-frame: How focusing on individual-level solutions has led behavioral public policy astray.](#) *Behavioral and Brain Sciences*, Vol 46, e147.
230. Crow, D. *et al.* (2021). [Do we need to change our behaviour to reach net zero by 2050? – Analysis.](#) *International Energy Agency*.
231. Centre for Climate Change and Social Transformations (CAST) (2023). [How can politicians avoid a net-zero backlash? The role of public engagement: a briefing for policy makers and communicators.](#)

Contributors

POST is grateful to Ellie Smallwood for researching this briefing, to EPSRC for funding her parliamentary fellowship, and to all contributors and reviewers. For further information on this subject, please contact the co-authors, Natalie Low and Dr Jonathan Wentworth.

Members of the POST Board*

David Hall, Behaviour Change

Toby Park, Behavioural Insights Team

Dr Sandra Bogelein, Climate Change Committee People and Net Zero Team*

Professor Nick Chater, Warwick Business School

Dr Jo Davan Wetton, University College London Centre for Behaviour Change*

DESNZ Green Choices Team*

Abigail Ward, Energy Saving Trust*

Rebecca Pickavance, Energy Saving Trust

Naomi Baker, Energy UK

Daisy Cross, Energy UK

Louise Shooter, Energy UK

Dr Samuel Hampton, University of Bath*

Dr Tom Hargreaves, University of East Anglia

Professor Oliver Hauser, University of Exeter

Dr Helen Holmes, University of Manchester

Dr Clare Hoolohan, University of Manchester

Professor Susan Michie, University College London

Professor Paul Monks, Chief Scientific Adviser to Department for Energy Security and Net Zero

Professor Sonja Dragojlovic-Oliveira, Strathclyde University

Dr Sarah Royston, Anglia Ruskin University

Professor Lorraine Whitmarsh MBE, University of Bath*

Dr Jill Zhao, University of West of England

* Denotes people who acted as external reviewers of this briefing

The Parliamentary Office of Science and Technology (POST) is an office of both Houses of Parliament. It produces impartial briefings designed to make research evidence accessible to the UK Parliament. Stakeholders contribute to and review POSTnotes. POST is grateful to these contributors.

Our work is published to support Parliament. Individuals should not rely upon it as legal or professional advice, or as a substitute for it. We do not accept any liability whatsoever for any errors, omissions or misstatements contained herein. You should consult a suitably qualified professional if you require specific advice or information. Every effort is made to ensure that the information contained in our briefings is correct at the time of publication. Readers should be aware that briefings are not necessarily updated to reflect subsequent changes. This information is provided subject to the conditions of the Open Parliament Licence.

If you have any comments on our briefings please email post@parliament.uk. Please note that we are not always able to engage in discussions with members of the public who express opinions about the content of our research, although we will carefully consider and correct any factual errors.

If you have general questions about the work of the House of Commons email hcenquiries@parliament.uk or the House of Lords email hlinfo@parliament.uk.

DOI: <https://doi.org/10.58248/PN714>

Image Credit: Image by Annette from Pixabay

POST's published material is available to everyone at post.parliament.uk. Get our latest research delivered straight to your inbox. Subscribe at post.parliament.uk/subscribe.



 post@parliament.uk

 parliament.uk/post

 [@POST_UK](https://twitter.com/POST_UK)