6 Bridging the gap – the role of equitable low-carbon lifestyles

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6.1 The consumption problem and why lifestyles are critical to tackling climate change

Minimizing the impacts of climate change requires rapid transitions in people's lifestyles and how we organize our societies, institutions and infrastructure. This is underscored by the fact that household consumption accounts for around two-thirds of global greenhouse gas (GHG) emissions; Ivanova *et al.* (2016) estimate lifestyle and consumption emissions at 65 per cent of the global total, while Hertwich and Peters (2009) suggest the proportion to be around 72 per cent of total emissions.[1] On an aggregate level, compliance with the 1.5°C goal of the Paris Agreement will require reducing consumption emissions to a per capita lifestyle carbon footprint of around 2 to 2.5 tons of CO_2e by 2030, and an even smaller 0.7 tons by 2050 (Intergovernmental Panel on Climate Change [IPCC] 2018; Institute for Global Environment Strategies [IGES] *et al.* 2019; Ivanova *et al.* 2020). Most climate mitigation pathways that seek to keep temperature rise to within 1.5°C envisage a major role for lifestyle change (IPCC 2018). The International Energy Agency (IEA 2020) has likewise concluded that behaviour change is an integral part of emissions reduction strategies that accomplish net-zero emissions by 2050, emphasizing in particular the need for changes to domestic energy use, as well as reductions in car use and passenger aviation (see chapter 5).

Understanding the distribution of lifestyle emissions among populations and by activities is important for equitable targeting of mitigation measures, in order to encourage reductions from households with high consumption emissions and to avoid regressive impacts associated with imposing burdens on the poor (Rao *et al.* 2017; Roberts *et al.* 2020; Wiedman *et al.* 2020). Average consumption emissions vary substantially between countries. For example, current per capita consumption emissions in the United States of America are approximately 17.6 tons CO_2e per capita, around 10 times that of India at 1.7 tons per capita. By contrast, the European Union and the United Kingdom together have an average footprint of approximately 7.9 tons per capita (see chapter 2).

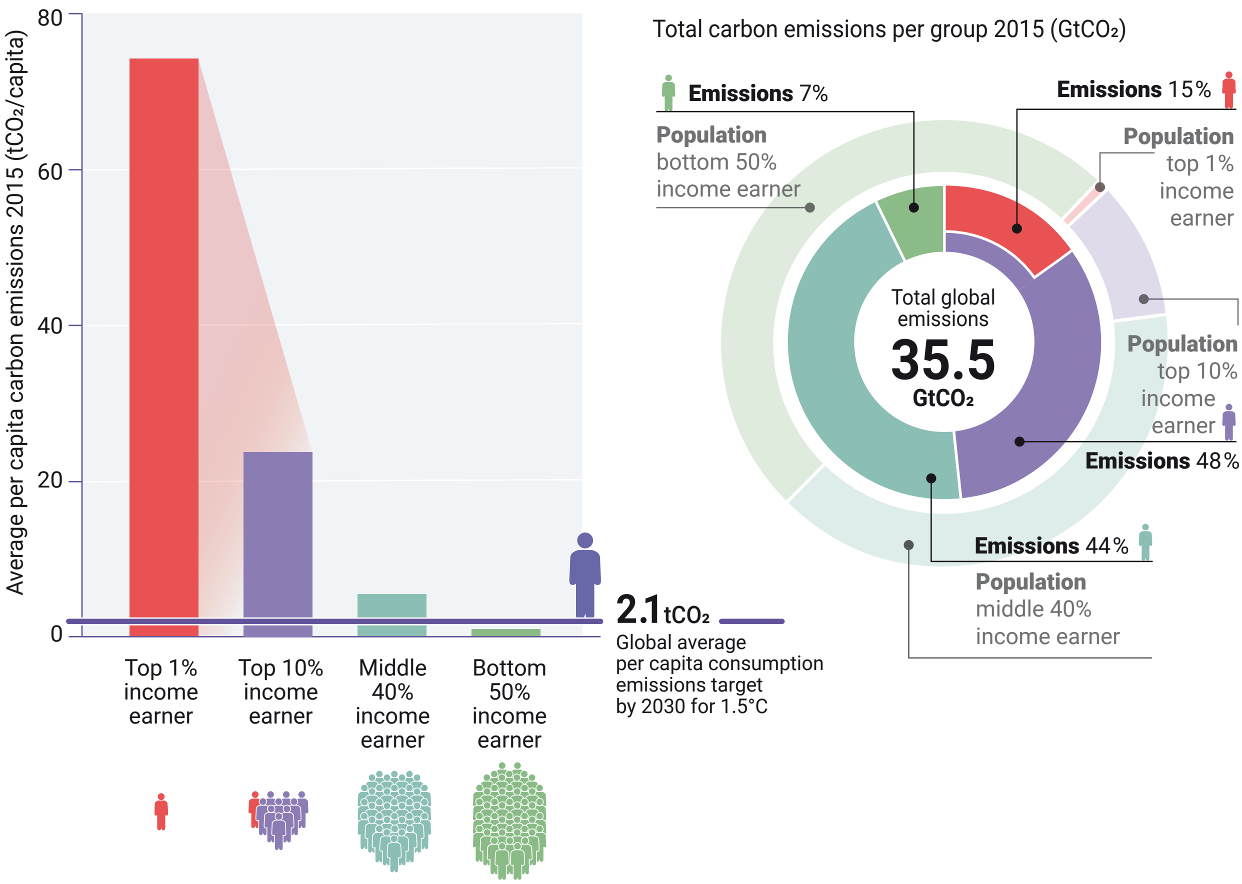
A range of estimates point to a strong correlation between income and emissions, with a highly unequal global distribution of consumption emissions. Such studies estimate that the emissions share of the top 10 per cent of income earners is around 36–49 per cent of the global total, whereas the lowest 50 per cent of income earners account for around 7–15 per cent of all emissions (Chakravarty *et al.* 2009; Chancel and Piketty 2015; Oxfam 2015; Hubacek *et al.* 2017; Dorband *et al.* 2019; Oxfam and Stockholm Environment Institute [SEI] 2020). This disparity is particularly stark where studies have estimated footprints among the very highest-income, highest emitters: the combined emissions share of the top 1 per cent of income earners has been found to very likely be larger than – and perhaps double – that of the bottom 50 per cent (Chancel and Piketty 2015; Oxfam and SEI 2020). Around half the consumption emissions of the global top 10 per cent and 1 per cent are associated with citizens of high-income countries, and most

1 Calculated using consumption-based accounting, encompassing GHG emissions associated with the production and use of products and services used by households.

of the other half with citizens in middle-income countries (Chancel and Piketty 2015; Oxfam and SEI 2020). One study estimates that the 'super-rich' top 0.1 per cent of earners have per capita emissions of around 217 tCO_2 – several hundred times greater than the average of the poorest half of the global population (Oxfam and SEI 2020).

Estimates of the per capita CO_2 consumption emissions of different global income groups are shown in figure 6.1, based on Oxfam and SEI (2020). This analysis estimates per capita CO_2 emissions rather than CO_2-equivalent, and allocates all consumption emissions to individuals rather than just those associated with household consumption. To indicate the relative scale of lifestyle emission changes required, a target for global average per capita consumption emissions of 2.1 tCO_2 per capita in 2030 is also shown, as implied by 1.5°C-consistent pathways estimated by Oxfam (2020). Estimates in figure 6.1 show that per capita consumption emissions of those in the global top 10 per cent of income earners would need to be reduced to about one-tenth of their current level by 2030 and those of the top 1 per cent by at least a factor of 30, while those of the poorest 50 per cent could increase by around three times their current level.

Figure 6.1. Per capita and absolute CO_2 consumption emissions by four global income groups in 2015



Note: Per capita CO_2 consumption emissions, and absolute CO_2 consumption emissions by four global income groups in 2015, compared with emissions reduction targets for 2030 for limiting warming to 1.5°C. Income thresholds in 2015 are according to US$ purchasing power parity in 2011: 1 per cent > US$109,000; 10 per cent > US$38,000; middle 40 per cent > US$6,000; poorest 50 per cent < US$6,000.

Other estimates also affirm wide disparities in emissions by income bracket. Oswald *et al.* (2020) estimate that households of the global top 10 per cent of income earners use around 45 per cent of all energy for land transport and around 75 per cent of all energy for aviation, compared with 10 per cent and 5 per cent respectively for the poorest 50 per cent of households. Similarly, Ivanova and Wood (2020) find that a large share of the emissions of the top-emitting European Union households are transport-related.

To design equitable low-carbon lifestyle approaches, it is important to consider these consumption inequities and identify populations with very high and very low carbon footprints. Central to addressing consumption inequities is reframing the meaning of 'progress' and 'affluence' away from the accumulation of income or energy-intensive resources to the achievement of well-being and quality of life. Studies show that a comprehensive idea of well-being that includes basic needs for all people can be attained with

a much-reduced level of energy consumption (Rao *et al.* 2019; Millward-Hopkins *et al.* 2020).

6.2 Achieving lifestyle emissions reduction by sector

To help understand the options available to reduce lifestyle emissions, the Avoid-Shift-Improve (ASI) framework (Creutzig *et al.* 2018; van den Berg *et al.* 2019) provides a useful conceptual categorization. This framework does not articulate how lifestyle change occurs, but provides distinctions around the types of possible emissions reduction. In this chapter, we emphasize emissions reduction from mobility, residential energy use and food, as these constitute key sectors through which lifestyle change can enable climate mitigation, comprising approximately 17 per cent, 19 per cent and 20 per cent of lifestyle emissions respectively (Hertwich and Peters 2009).

The Avoid category refers to the reduction in energy or carbon demand by foregoing some aspect of consumption (for example, reduced travel, fewer appliances). The Shift category includes shifts in behaviour to less carbon-intensive modes of consumption (for example, opting for walking, cycling or public transport instead of private vehicles; plant-based diets). The Improve category refers to reducing GHG emissions through improving efficiency or replacing technologies with lower-carbon ones, without changing the underlying consumption activity; this category includes increased vehicle efficiency and switching to battery electric vehicles (BEVs), efficient domestic appliances, household renewable energy and consumption of organically grown food.

Figure 6.2 shows boxplots for options of varying carbon mitigation potential, aggregated by different sectors and ASI categories, based on a meta-review of 53 lifecycle assessment studies by Ivanova *et al.* (2020).[2] These studies included the supply chain impacts that may occur elsewhere than the country of consumption. Also shown in figure 6.2 are illustrative examples of impactful changes across sectors, based on median emissions reduction potential across studies.

2 For more detail on the results included in this chapter, please see Annex III. For more detail on the searches, procedure and inclusion criteria, please see Ivanova *et al.* 2020.

Figure 6.2. Carbon mitigation potential of Avoid, Shift and Improve consumption options within domains

Note: Aggregated consumption options per sector and per ASI category. The error bars represent the minimum and maximum values of estimates (excluding outliers, which are classed as greater than 1.5x the interquartile range), the boxes represent the interquartile range, and the middle line represents the median values of the consumption options. Examples for each ASI category per sector are given. For a detailed breakdown of consumption options included, see Annex III and Ivanova *et al.* 2020.

Building on the types of changes identified in figure 6.2, tables 6.1 to 6.3 offer examples from different countries on approaches to encourage low-carbon lifestyles for mobility, residential energy use and food, covering both hypothetical and implemented cases, as well as a range of mechanisms (for example, city-based projects, national policies and citizen-led initiatives). We discuss in more detail the range of mechanisms by which lifestyle change can be accomplished in section 6.3.

In terms of mobility (table 6.1), there is substantial mitigation potential to reduce emissions by avoiding and curtailing travel. Reducing long-haul flights has strong potential to reduce emissions in an equitable manner: air travel accounts for around 41 per cent of the carbon footprint of the highest-emitting 1 per cent of households in the European Union, but less than 1 per cent of the emissions of the poorest 50 per cent of households. Although this mitigation option is available only to primarily wealthier people who fly, it has the potential for substantial emissions reduction, at around 1.9 tCO_2e per avoided long-haul return flight (see chapter 5 for a more detailed discussion of technology-centric options to reduce aviation-sector emissions).

Emissions from mobility can also be reduced through more active travel such as cycling and walking, and greater use of public transport. Further options to improve mobility emissions include greater vehicle efficiency or the adoption of BEVs. Overall, consumption options in the mobility sector show high mitigation potential and high income-elasticity of demand (i.e. there is a strong link between income and mobility emissions; Ivanova and Wood 2020; Oswald *et al.* 2020). This suggests that emissions reduction measures across this sector can be relatively impactful and equitable, as they concern limiting luxury consumption by higher-income households.

Table 6.1. High energy intensity (energy footprint/money spent by consumer), high income-elasticity of demand (luxury consumption)

Most impactful changes	Annual GHG emissions reduction potential Mean (min/max) tCO_2e/cap	Mechanisms for lifestyle change	Practical examples
Reducing use of long-haul flights/ medium-haul flights	One less long-haul return flight: **1.9** (0.7/4.5) One less medium-haul return flight: **0.6** (0.2/1.5)	**Economic policies:** end kerosene tax exemptions; implement frequent flyer levy; incentivize domestic tourism **Legal frameworks:** restrict airline and flight advertising; legal challenges to airport expansion **Transport infrastructure:** end further airport expansion in high-income countries; improve surface transport alternatives to aviation **Social norms and social movements:** changing desirability of air travel **Social conventions:** growing professional use of virtual meetings	Airport expansion plans in the UK legally rejected in their current form on climate grounds (Mitchell 2020) Domestic Austrian flights replaced with intercity rail between Vienna and Salzburg (Railway Gazette 2020) Tax exemptions for domestic tourism in India encourage land-based travel (Kumar 2016) Frequent flyer levy could reduce flying among the wealthy (Fouquet and O'Garra 2020) Changing norms around flying: 'flight shame' (Gössling *et al.* 2020) Rapid uptake and normalization of online work practices in response to COVID-19 (Carroll and Conboy 2020)
Reduced car use, increased public transport and active travel (bicycle, walking)	Living car-free: **2.1** (0.6/3.6) Reducing car usage: **0.8** (0.1/1.6) Car-pooling: **0.3** (0.0 /1.0) Shift to active transport: **0.8** (0.01/2.8)	**Economic policies:** subsidized public transport; incentives for cycling and cycle purchases; road toll and congestion charges; vehicle quota policies **Legal framework:** ban on petrol and diesel vehicle sales; parking and zoning restrictions; green public procurement **Transport infrastructure:** tackle peak demand e.g. through car-pool lanes; expand cycle networks; open dedicated cycle lanes; introduce car-free residential zones; expand public transport provision **Interpersonal influence:** personal action contributes to visibility and mainstreaming of active travel **Habit disruption:** targeted interventions when people move house	Integrated policies and infrastructure to enable cycling in Colombia, the Netherlands, Germany and Denmark (Cervero *et al.* 2009; Pucher and Buehler 2008) Car-free settlements in Austria (Ornetzeder *et al.* 2008) USA car-sharing facilitates large reductions in household emissions (Martin and Shaheen 2011) Global provision of public bike-sharing programmes (Meddin *et al.* 2020; United Nations Environment Programme [UNEP] 2016) Workplace provision of e-bikes (Page and Nilsson 2017) Increased cycling through 'pop-up' bike lanes across Europe in response to COVID-19 (Kraus and Koch 2020)

Reduced car use, increased public transport and active travel (bicycle, walking)	Shift to public transport: **1.0** (0.2/2.2)	**Attitude and awareness:** cycle safety and promotion campaigns; carbon labelling at point of sale for vehicle fuel **Social norms:** increase convenience and attractiveness of active travel and car-pooling options e.g. via car clubs or shared neighbourhood vehicles	Incentives for bicycle purchase and repair – tax cuts for cycling in the EU (Fleming 2019) and UK (Swift *et al.* 2016) Citizen activism in India pushed for prioritizing non-motorized vehicles (Roy 2015) and advocacy groups accelerate uptake of cycling in Colombia and Denmark (Rosas-Satizábal and Rodriguez-Valencia 2019; Carstensen *et al.* 2015)
Smaller, more- efficient vehicles	**0.4** (0.0/1.1)	**Economic policies:** differentiated vehicle tax based on emissions **Legal framework and attitude change:** ban advertising of large, high-carbon private vehicles **Social norms and social movements:** change desirability of large and high-emission vehicles **Attitude and awareness:** carbon/eco-labelling at point of sale for vehicle fuel	Differentiated tax in Norway reduced high-emission car purchases but also led to more diesel cars (Ciccone 2018) Campaign to ban advertising of sports utility vehicles (SUVs) and high-emission vehicles (Beevor *et al.* 2020) Emissions standards to encourage smaller vehicles in Italy (Shindell *et al.* 2011) Health warnings and eco-labels for fossil fuel purchases (e.g. at petrol pumps) to prompt behaviour change (Gill *et al.* 2020)
Battery electric vehicle (BEV), fuel cell vehicle (FCV), hybrid vehicles	BEV: **2.0** (-1.9/5.4) (varies with electricity mix) FCV: **0.0** (-3.4/5.8) Hybrid: **0.7** (-0.2/3.1)	**Transport infrastructure:** network of charging stations; priority parking and bus lane access for electric vehicles; public transport e-mobility options such as electrobuses **Economic policies:** tax and fee exemptions for electric vehicle usage; grants and incentives for electric vehicle purchase **Interpersonal influence:** household uptake and conversations contribute to diffusion of electric vehicles **Attitude change:** social marketing of electric vehicles that highlights vehicle performance and addresses range anxiety **To optimize impact from these mechanisms, it is also important to decarbonize the electricity mix.* ***Supply side:*** *moratoriums, bans on fossil fuel exploration and extraction*	Bus lane access and reduction of, and exemptions from, fees and taxes led to BEV uptake in Norway (Aasness and Odeck 2015); consolidated by social influence between citizens (Figenbaum 2017) Restrictions on petrol cars, plus financial incentives, led to BEV uptake in China (Li *et al.* 2019) Oil exploration moratoriums in Costa Rica, Belize, Mexico (Tudela 2019), New Zealand (2019) and France (2017)

Note: Emissions reduction calculations for all tables based on a meta-review by Ivanova *et al.* (2020). See the meta-review for emission reduction ranges and more details. The absolute minimum and maximum emissions mitigation ranges are included in parentheses.

For the residential sector (table 6.2), there is substantial mitigation potential to reduce emissions through measures such as low-carbon heating and renewable energy use by households, as well as energy-efficient construction and renovations. Further options include reducing emissions through smaller living spaces and adjustments to room temperature. Overall, residential consumption options show relatively high mitigation potential, although much lower income-elasticity of demand (involving basic or essential consumption), with these highly context-dependent by socioeconomic group and region (Oswald 2020).

Table 6.2. Residential High energy intensity, low income-elasticity of demand (basic or essential consumption)

Most impactful changes	Annual GHG emissions reduction potential Mean (min/max) tCO_2e/cap	Mechanisms for lifestyle change	Practical examples
Better energy efficiency of appliances and heat pumps; better insulation and construction	Refurbishment/ renovation: **0.9** (0.0/1.9) Heat pumps: **0.9** (0.0/1.8)	**Economic policies:** retrofitting recovery packages; incentives to increase benefits of retrofitting for landlords and homeowners; incentives to purchase new energy-efficient appliances **Physical infrastructure:** energy-efficient construction and stricter building standards; wood-based construction **Behaviour change:** reduce barriers to action for retrofitting; make it easier for households to invest in energy efficiency **Information-based policies:** standards and labels for energy-efficient products	Improved residential energy efficiency in USA; retrofitting public housing after economic downturn (Climate Action Tracker 2020) India's residential light-emitting diode (LED) purchase scheme (Kamat *et al.* 2020) Legislation improving environmental performance of products; eco-design and energy labelling in the EU (Casamayor and Su 2020; European Commission 2020a) Energy-efficiency standards for energy-intensive products in Japan (Asia Energy Efficiency and Conservation Collaboration Center 2020)
Household use of grid-based and on-site renewable electricity; heat pumps; district heating and cooling; combined heat and power	Renewable electricity use in homes: **1.5** (0.3/2.5)	**Physical infrastructure:** provide renewable electricity and related infrastructure for household renewable energy production **Economic policies:** incentives to invest in and consume renewable electricity **Legal framework:** restrictions on fossil-fuel-based provision of home energy **Social influence:** harness social diffusion of solar panels via aggregate/community pricing options; emphasize presence of renewables through visible signposts; launch community engagement initiatives	Renewable energy defaults led to higher uptake of green home energy tariffs (Schonau, Germany; several states in USA; Kaiser *et al.* 2020; Kennedy and Rosen 2020)

Technology to encourage shifts towards lower energy use	Lower room temperature: **0.1** (0.0/0.4)	**Economic policies:** incentivize lower usage and energy-efficient heating and cooling devices; loans for passive homes and net-zero buildings	Smart meters reduced gas consumption by 22.0 per cent overall and by 27.2 per cent in high consumers in the UK (Mogles *et al.* 2017)
Technology to encourage shifts towards lower energy use *(continued)*	Smart metering: **0.2** (0.0/1.1)	**Infrastructure:** provide smart meters; use shading; insulate walls and windows; use high reflecting surfaces on areas such as roofs and walls; increase ventilation; install occupancy sensors **Behaviour change:** green energy tariffs by default to encourage uptake; reduce energy use through information and feedback	Normative feedback reduces energy consumption in some circumstances (Schultz *et al.* 2007; Jain *et al.* 2013)

Note: Emissions reduction calculations for all tables based on a meta-review by Ivanova *et al.* (2020). See the meta-review for emission reduction ranges and more details. The absolute minimum and maximum emissions mitigation ranges are included in parentheses.

For food (table 6.3), a shift towards vegetarian or vegan diets offers substantial potential for carbon mitigation. Further options for emissions reductions include consumption of locally grown and organic food and use of improved cooking equipment.[3] While the avoidance of excess consumption and food waste reduction show substantial mitigation potential, these options are mostly applicable to higher-income households.

Table 6.3. Food Low energy intensity, low income-elasticity (basic or essential consumption)

Most impactful changes	Annual GHG emissions reduction potential Mean (min/max) tCO_2e/cap	Mechanisms for lifestyle change	Practical examples
Vegan/ vegetarian diet	Vegan: **0.9** (0.4/2.1) Vegetarian: **0.5** (0.0/1.5)	**Legal framework:** restrict advertising of high-carbon food items; stronger protection of forest land to withstand pressure from cattle ranches; trade policy that ensures sustainable supply chains **Economic policies:** end incentives for unsustainable food industries and offer support for alternatives **Supply chains:** influence provision systems e.g. better availability of sustainable products (e.g. plant-based alternatives) in supermarkets and retail outlets	Finnish policies to reduce dairy consumption using behaviour campaigns, school meals and training for health care workers (Pietinen *et al.* 1988) Growth of veganism in Austria through social diffusion (Ploll *et al.* 2020) European 'farm to fork' initiative aims to ensure sustainable diets are affordable and accessible; proposed legislation to address food linked to deforestation (European Commission 2020b)

3 Improved cooking equipment is allocated to the food category in accordance with the original meta-review (Ivanova *et al.* 2020).

		Social influence: cultural and societal changes via media	Provision of meat-free meals in schools in UK (Leeds City Council 2020) and 'Meatless Monday' in Norwegian armed forces (Milford *et al.* 2019)
Sufficiency (eating only what is needed) and food waste reduction	**0.3** (0.0/1.3)	**Economic policies:** penalties on food waste in supermarkets, dis-incentivize buffets and package deals **Infrastructure:** schemes encouraging reuse/charitable donation of leftover food in restaurants **Attitudes:** campaigns against food waste and unnecessary stockpiling	France implemented national policies against food waste in supermarkets (Mourad 2016); Italy implemented a law to reduce food waste and encourage donation of leftover food to charity (Gazetta Uficiale della Republica Italiana 2016)
Local, organic foods	Organic food: **0.5** (0.0/0.9) Regional/local food: **0.4** (0.01/1.1)	**Legal framework:** policy support for organic production; stronger standards for the use of pesticides **Economic policies:** incentivize local, organic options to ensure affordability **Social influence:** work with communities, public kitchens and schools to diffuse change **Information sharing:** knowledge transfer of resource-efficient agricultural practices between developed and developing countries	Danish Organic Action Plan led to increased provision of organic food in state-linked outlets (Sørensen *et al.* 2016) Urban household vegetable gardens have potential to reduce GHG emissions (Cleveland *et al.* 2017) Food-growing households in Czech Republic reduce household emissions (Vávra *et al.* 2018) Legal exceptions granted for agricultural zones in Quezon City, Philippines, to ensure more self-reliant food production (C40 Cities Network 2020)

Note: Emissions reduction calculations for all tables based on a meta-review by Ivanova *et al.* (2020). See the meta-review for emission reduction ranges and more details. The absolute minimum and maximum emissions mitigation ranges are included in parentheses.

While the estimates considered here are drawn from a range of geographical regions, evidence of mitigation from lifestyle change from developing countries are typically lacking in the literature relative to European and North American studies. Approaches to promote low-carbon lifestyle measures in developing countries are critical, however, with structural transitions offering opportunities to align development and climate objectives (McCauley and Heffron 2018). Many developing countries' economies are growing quickly, and infrastructure and policy decisions taken now have the potential to lock in high- or low-carbon lifestyles (the latter with multiple benefits) for the long-term. For instance, an estimated 3 billion people worldwide currently rely on highly polluting and unhealthy traditional solid fuels for household cooking and heating (Yadama 2013). Shifting these energy sources to electricity and clean fuels could heavily influence residential emissions reductions and provide multiple development outcomes (Creutzig *et al.* 2016; Mulugetta *et al.* 2019).

6.3 Realizing lifestyle change: which mechanisms encourage low-carbon lifestyles?

The evidence presented so far shows that rising emissions are underpinned by contemporary lifestyles. Major reductions in emissions require substantial changes to these patterns of consumption and behaviours – especially among the global rich (Davis and Caldeira 2010; Liobikienė and Dagiliūtė 2016; Oswald *et al.* 2020; Oxfam and SEI 2020).

A person's choices operate within broader contexts that enable or constrain action (Akenji and Bengtsson 2014; Walker 2014) – including physical environments, cultural conventions, social norms and financial and policy frameworks – and are inseparable from income levels and access to resources. Even so, individuals can exercise environmental citizenship to bring about societal change through the various roles they occupy: including as consumers, members of organizations and communities, citizens participating in social movements and deliberative processes, or as owners of assets and investments (Stern 2000). These types of personal action can influence not only the underlying social conditions that shape lifestyles, but also the actions of governments and businesses (Otto *et al.* 2020a; Nielsen *et al.* 2020; Amel *et al.* 2017). The interaction between structural conditions and how people live is dynamic: personal choices have consequences for the contexts within which they are made, which in turn reinforce or challenge the contribution of lifestyles to climate change (see figure 6.3).

Figure 6.3. Mechanisms to change lifestyles

Note: Personal, social and contextual, and structural factors affecting lifestyle consumption options.

6.3.1 Incentives, information and choice provision

Approaches that encourage voluntary behaviour change (for example, information provision, economic incentives) have been a dominant means by which policy has attempted to influence lifestyles (Pykett *et al.* 2011). Economic policies such as renewable energy incentives have stimulated uptake of solar voltaic panels (Briguglio and Formosa 2017; Mundaca and Samahita 2020) and changed the competitiveness of renewable energy compared with fossil fuels. Market-oriented policies can also increase the behavioural plasticity (i.e. how responsive behaviours are to changes in external conditions) of actions for carbon emissions reduction (Dietz *et al.* 2009), which can be crucial in increasing access to low-carbon lifestyle options.

Targeted information (energy efficiency information, carbon labelling) can also shift consumer decision-making towards more efficient and low-carbon products (Langley *et al.* 2012; Kunreuther and Weber 2014; Khosla *et al.* 2019; Whittle *et al.* 2019) and often has broad public support (Carbon Trust 2020). Adjustments to the contexts under which decisions are made can also be influential, by offering low-carbon products and services as the default option (Kaiser *et al.* 2020).

While information and incentives can be useful, there are limits to approaches that seek to 'nudge' behavioural change, as they rely on individual responsibility to bring about change. Such approaches risk 'scapegoating' citizens (Akenji 2012) and may not be enough to overcome inertia (Kaiser *et al.* 2020). Historically, sustainable transitions have not been strongly driven by voluntary consumer choices (Organisation for Economic Co-operation and Development [OECD] 2003), but by factors such as social norms and by changing the options available to consumers (Sustainable Consumption Roundtable 2006).

While there have been calls for integrated policy that combines more assertive and restrictive policies with voluntary ones (Moberg *et al.* 2018), public acceptability is key for both approaches, with the risk that policies that unfairly burden households will receive backlash (Sovacool *et al.* 2017; Moberg *et al.* 2018).

6.3.2 Infrastructure and conventions of everyday life

Patterns of everyday life – the way we eat, travel and occupy our homes – are shaped and directed by the built environment, how services are provided, and expectations of normal conduct (Breadsell *et al.* 2019). In many developed nations, the dominance of the car has been enabled through urban infrastructure that is car-dependent, spatial planning that has led people to live far from workplaces and essential services, and a 'car culture' that favours this mode of transport (Mattioli *et al.* 2020). Likewise, high-carbon diets have become established through supply chains and market liberalization that has promoted convenience foods, bulk-buying and meat-based meals (Hoolohan *et al.* 2016; Xiong *et al.* 2020).

Attempts to reduce lifestyles emissions are more likely to be effective if they address the infrastructures on which high-carbon lifestyles depend and enable knock-on effects to other carbon-intensive practices. For example, high-speed rail networks may lower demand for domestic aviation (Clewlow *et al.* 2014). Conversely, infrastructural changes that do not anticipate how decisions might influence wider patterns of daily life may result in failure or unintended increases in emissions.

6.3.3 Social influence

Where lifestyle change is accomplished – by one person, household or community – this can act as a catalyst to promote wider change, spreading behaviours through peer influence and reconfiguring what is typical or expected (Shwom and Lorenzen 2012; Guilbeault *et al.* 2018; Wolske *et al.* 2020).

Social influence has contributed to wider uptake of rooftop solar panels (Bollinger and Gillingham 2012; Richter 2013; Graziano and Gillingham 2015), transport modal shift (Feygin and Pozdnoukhov 2018), transitioning to plant-based diets (Cherry 2006) and purchase of energy-efficient products (Wolske *et al.* 2020).

At the interpersonal level, people follow the example of others who are similar to themselves (Welsch and Kühling 2009; Abrahamse and Steg 2013; Amel *et al.* 2017). At a larger scale, the actions of a committed minority of people can comprise a 'critical mass' that is able to prompt broader change in patterns of behaviour, leading to a tipping point whereby social conventions change rapidly towards a new normal (Centola *et al.* 2018; Otto *et al.* 2020a). Actions taken by key individuals can lead to greater uptake of similar choices by others. The social influence of high-emitting groups, especially those in prestigious or influential positions, may be particularly important in shaping what is desirable and affect people's willingness to cooperate on shared problems (Anderson 2011; Henrich *et al.* 2015). Additionally, climate communicators, advocates and researchers are seen as more convincing – and their advice more likely to be acted upon – if they themselves pursue low-carbon lifestyles (Attari *et al.* 2016; Attari *et al.* 2019; Sparkman and Attari 2020).

6.3.4 Citizen participation

Social movements can give individually disempowered people a strong voice if they act collectively (Kashwan 2016; Otto *et al.* 2020b). The example of the Fridays for Future youth climate protests has demonstrated collective agency among individuals – many of whom do not even have voting rights – with the movement becoming widely established across Europe, Africa, South America and Asia (Marquardt 2020).

The involvement of people in bringing about change is enshrined in article 6 of the UNFCCC Doha Convention and article 12 of the Paris Agreement. Citizen participation can range from formal processes to shape policy, to participation in social movements. Where processes exist that enable individuals to directly shape policy – including citizens' juries and assemblies – they have led to the proposal of measures that have confronted the structural determinants of high-carbon lifestyles (Kythreotis *et al.* 2019; Devaney *et al.* 2020). For example, Ireland's citizens' assembly advocated higher taxes across carbon-intensive activities (Torney and O'Gorman 2019; Muradova *et al.* 2020) whereas in France, participants proposed a change to the country's Constitution and a new law of 'ecocide' as ways to hold policymakers and other actors to account (Convention Citoyenne pour le Climat 2020). The 2015 World Wide Views deliberation across 76 countries likewise found that most citizens supported strong action on climate change (Dryzek and Niemeyer 2019).

Advocacy of inclusive solutions has often been driven by poorer communities able to demonstrate best practice in climate mitigation (Roy 2015). For example, Project 90 in South Africa advocates for a 90 per cent reduction in emissions by 2030 through youth leadership programmes and community engagement (Kyle 2020), while Bold Nebraska brought together farmers, Native Americans and other concerned citizens to build community action that successfully opposed the construction of the Keystone XL pipeline (Ordner 2017).

6.3.5 Disrupting habits

Much of our behaviour is habitual – unconscious routines triggered by contextual cues (such as time of day), rather than a conscious intention to act (Kurz *et al.* 2015). Habits are a substantial barrier to lifestyle change, as they lock in individual behaviour and maintain its automatic repetition over time (Maréchal and Lazaric 2011). However, since habits develop in, and are cued by, stable contexts (Wood *et al.* 2005), changes in context can in turn provide opportunities to disrupt well-established routines (Verplanken *et al.* 2008; Kurz *et al.* 2015).

'Moments of change' – defined as occasions when an individual's circumstances change considerably within a short time frame (Thompson *et al.* 2011) – have been identified as an important lever for lifestyle change (Capstick *et al.* 2014). Research shows that disruptions – whether concerning a person's life-course (such as moving house) or structural changes (such as economic growth or downturn) – can provide opportunities to recraft lifestyles in new directions (Birkmann *et al.* 2010; Verplanken *et al.* 2018), such as shifting from commuting by car to home-working (Marsden *et al.* 2020) or investing in energy-efficient housing and the use of LEDs in the home (Khosla *et al.* 2019; Kamat *et al.* 2020).

6.3.6 Lessons from COVID-19: opportunity to lock in positive changes

COVID-19 has impacted everyday life around the world, disrupting many established patterns of behaviour. As noted in chapter 2 of this report, an unintended side effect of lockdown policies was a sharp, unprecedented drop in carbon emissions (Le Quéré *et al.* 2020), representing the largest relative reduction globally since WWII. However, policies to contain COVID-19 differ from those needed to curb carbon emissions in important ways, and there are risks in drawing simplistic parallels between these very different issues. Lockdown policies were enacted quickly and designed to be temporary disruptions to the status quo. By contrast, lifestyle changes to address climate change entail carefully managed and long-term transitions away from the status quo towards more sustainable and equitable practices (Howarth *et al.* 2020). Nonetheless, COVID-19 has shown that rapid, extensive and profound changes in lifestyles are possible with the coordination of governments and civil society. The lessons for climate mitigation from COVID-19 are less about the magnitude or longevity of the drop in emissions observed, and more about the insights gained into how rapid lifestyle changes can happen.

First, governments must lead the way and create conditions under which lifestyle changes are possible (for example, economic measures that enable workers to remain at home). Second, positive social norms and a sense of collective agency are important for behavioural change. Finally, infrastructure to lock in behaviour changes is critical – for example in the case of cities that, in response to COVID-19, took action to promote walking and cycling and encourage local food production (C40 Cities Network 2020). New habits take around two to three months to form (Lally *et al.* 2010), meaning the lockdown period in many countries may be long enough to establish new, enduring routines, if these are supported by longer-term measures.

In planning the recovery from COVID-19, governments have an opportunity to catalyse low-carbon lifestyle changes by disrupting entrenched practices, rethinking infrastructure and protecting environmental standards (Büchs *et al.* 2020, see also chapter 4).

6.4 Integrated policies in each sector

Drawing on the mechanisms described above, the following sections outline integrated approaches to lifestyle change across the mobility, residential and food sectors, providing practical examples of measures that have been implemented, as well as potentially effective approaches.

6.4.1 Towards low-carbon mobility

Approaches to enable lifestyle change for the mobility sector include assertive policies that prioritize active travel, incentivize shifts to low-carbon modes of transport and discourage non-essential travel, particularly among high-consuming groups.

Around the world, changes to mobility options and practices have been made as a direct response to the COVID-19 pandemic. The C40 group of around 100 large cities has called for a green and just recovery from the economic impacts of COVID-19 (C40 Cities Network 2020), including a worldwide initiative to pursue urban planning that enables most residents to access everyday needs within a 15-minute journey by walking or cycling.

Social influence is important when shaping mobility lifestyle decisions. For example, near-exponential growth in electric vehicle ownership in Norway that has strongly aligned with climate policy conferring price advantages has been consolidated by peer-to-peer communication (Figenbaum 2017), as well as neighbourhood effects (for example, visibility in residential areas) and perceptions of what is expected and desirable (Pettifor *et al.* 2017). Similarly, there is a role for social influence in shaping norms around the desirability of flying ('flight shaming'; Gössling *et al.* 2020), potentially in conjunction with policies such as frequent flyer levies (Fouquet and O'Garra 2020).

Citizen participation can also mobilize support for low-carbon mobility policy. For example, in Leeds, United Kingdom, the city's citizens' jury recommended halting local airport expansion (Place-based Climate Action Network [PCAN] 2019); the French Convention Citoyenne proposed the prohibition of both new airports and the extension of existing airports, as well as ceasing most domestic flights by 2025 (Convention Citoyenne pour le Climat 2020) and the Switch ON organization in India has mobilized concerned citizens to push back against planned restrictions on bicycles and non-motorized transport (Roy 2015).

Assertive policies around the world have challenged the social status of the car. For instance, in Bogotá the reallocation of street space, construction of off-street bike paths and car-free days has encouraged a shift towards cycling and walking (Rosas-Satizábala and Rodriguez-Valencia 2019). Such measures can be achieved equitably: in the Netherlands, Germany and Denmark, cycling is distributed evenly across income, gender and age groups (Pucher and Buehler 2008). In China, BEV uptake has been encouraged using a combination of mandatory restrictions on petrol cars (limiting their purchase and use) and market-oriented policies (government subsidies, tax exemptions, and dedicated licence plates that afford parking benefits, as well as having symbolic value; Li *et al.* 2019). Health practitioners have also argued for warning labels at point of sale for fossil fuels (for example, at petrol stations) and in the context of high-carbon services (for example, on airline tickets; Gill *et al.* 2020).

In developing nations, there are opportunities to leapfrog the car-dependent, carbon-intensive infrastructure that dominates many developed nations. High-density, mixed-use urban forms that emphasize access by modes of transport other than cars are beneficial from an emissions perspective, and also enable more equitable participation in employment, cultural and entertainment activities (Kenworthy 2006). Such modal shifts also reduce local air pollution, thereby emphasizing the multiple benefits of more active, less carbon-intensive mobility options.

6.4.2 Towards a low-carbon residential sector

Policies that enable residential lifestyle change – particularly low-carbon technologies operating at the individual or household level (for example, energy-efficient building envelopes, heat pumps, electric vehicle charging points, household solar) – have been shown to lead to more rapid diffusion of technology and more widespread social returns (such as job creation) than in the case of larger-scale energy investments (Wilson *et al.* 2020).

Incentives, information and changes to how choices are presented (behavioural 'nudges') have met with some success, especially in terms of enabling equitable access to low-carbon options. Green defaults (whereby new customers are automatically assigned green energy tariffs) have been shown to dramatically increase their uptake (Ebeling and Lotz 2015; Kaiser *et al.* 2020). In 2017, around 5 million customers in California, United States of America, were able to access greater renewable energy at lower cost through the green default provided by the state-enabled Community Choice Aggregation programmes (O'Shaughnessy *et al.* 2019).

More broadly, successful residential lifestyle changes require anticipating how policies will impact daily life. Financial incentives to encourage uptake of efficient and improved cookstoves in developing countries show that policies also need to account for ongoing costs of use and maintenance (Pattanayak *et al.* 2019), the role of female empowerment, as well as attachment to traditional cooking techniques (Lewis and Pattanayak 2012).

The residential sector offers significant mitigation opportunities and risks as it is one of the longest-lived components of the economy. In many developing countries, rapid urbanization and population growth are outpacing the provision of adequate, affordable housing (United Nations 2017). Studies estimate that ongoing upgrade and construction of infrastructure to connect communities and enable urban development could result in additional emissions of 226 $GtCO_2$ by 2050 (Müller *et al.* 2013; Bai *et al.* 2018). Analogously, the predicted growth in ownership of air-conditioning technologies (equivalent to 10 new air conditioners being purchased every second for the next 30 years), especially in China, India and Indonesia, affirms the need for low-energy and low-carbon cooling options (IEA 2019). Infrastructural changes can moderate this growth: for instance, in Viet Nam and India, successful examples of vernacular architecture (buildings designed using local knowledge and materials for local needs) require much lower energy inputs (Creutzig *et al.* 2016).

In the past, recovery measures during economic downturn have been used to incentivize sustainable changes to households (for example, enabling retrofitting, solar panels and insulation; Climate Action Tracker 2020). Such policies bring multiple benefits by hastening the energy transition, enabling low-income households greater access to low-carbon living, stimulating the economy and reducing income burdens from high energy costs.

6.4.3 Towards low-carbon diets

In comparison to current average diets, full or partial vegetarianism has the potential to reduce emissions from food consumption by around 31 per cent, with a pescatarian diet leading to an approximately 27 per cent reduction (Aleksandrowicz *et al.* 2016). However, attempts to encourage more sustainable diets have tended to be limited to information and awareness campaigns, which typically have marginal effects (Traill *et al.* 2014; Schanes *et al.* 2016; Bianchi *et al.* 2018). Recent modelling shows that for the best outcome for emissions, global well-being, land-use and other factors, food policies should provide food to the undernourished while simultaneously reducing overconsumption and food waste in high-consumption regions (Hasegawa *et al.* 2019).

Placing costs on emissions-intensive foods such as beef and lamb, in conjunction with financial support to encourage healthy fruit and vegetable consumption, can shift demand and reduce food-related emissions by nearly 10 per cent globally (Springmann *et al.* 2017). Low-carbon diets also tend to be those that are healthier, thus providing opportunities for health and climate policy to be aligned (Aleksandrowicz *et al.* 2016; Willett *et al.* 2019). In Latin America, North America, Europe and many parts of Asia, consumption of red meat is at much higher levels than is recommended for a healthy, low-carbon diet (Willett *et al.* 2019). While it is not easy to shift notions of normal and culturally acceptable ways of eating (Bailey *et al.* 2014; Mozaffarian *et al.* 2018), recent history shows that this can occur rapidly and that diets in many parts of the world are in flux (Vermeulen *et al.* 2019).

Comparable measures have been effective in influencing purchasing choices, such as taxes on unhealthy foods (Colchero *et al.* 2016) and subsidies for fruit and vegetables (for example, through food assistance programmes in the United States of America; Olsho *et al.* 2016). Complementary measures such as restricting advertising of high-carbon foods (Hyseni *et al.* 2017), while improving access to low-carbon foods, such as by increasing vegetarian meals in cafeterias and other food outlets, has the potential to enable dietary change (Garnett *et al.* 2019). Globally, close to one-third of global food sales are from just 10 supermarket chains (IPES-Food 2017): major retailers have the ability to influence consumer practices, for example by encouraging alternatives to meat protein through ensuring their availability and prominence in stores (Gravely and Fraser 2018).

Policies against food waste offer benefits such as saving consumers money without reducing the quantity consumed (Hasegawa *et al.* 2019). Food waste bans and other policies can also allow providers of fresh fruit and vegetables to better address the needs of underserved or deprived communities (Pearson and Wilson 2013). Where authorities have direct control over food provision, including in the public sector, its carbon footprint can be cut: for example, the city of Leeds in the United Kingdom introduced meat-free and vegan catering into 182 primary schools for climate mitigation (Leeds City Council 2020). In Quezon City, Philippines, legislation is being developed for urban agricultural zones, with a scheme termed Fresh Market on Wheels delivering fresh produce from local farms to vulnerable communities around the city (C40 Cities Network 2020). However, as large segments of the global population still lack sufficient food (Willett *et al.* 2019), acknowledging divisions in terms of income and access are important if food sector emissions are to be reduced while meeting basic human needs.

6.5 Looking forward

6.5.1 Communicating lifestyle change

Popular debate has often pitted 'behaviour change' and 'system change' against each other, presented as a trade-off between two choices. As this chapter illustrates, however, system change and behaviour change are two sides of the same coin. When communicating about lifestyle change, it is important to recognize the constant interplay between the lifestyles of individuals and the social, cultural, political and economic systems in which they live and which they help shape.

There is a central role for communication and public engagement to change the way sustainable lifestyles are discussed in public forums and to emphasize the dynamic and complex relationship between systems and behaviour. Recognizing the role of interpersonal influence can also help emphasize the social and collective nature of lifestyle change, and is potentially more empowering than a view of personal actions that occur in isolation or that are negligible compared to the need for large-scale climate mitigation (Maniates 2001; Capstick 2013; Kubit 2020). Communicating where actions would be most impactful, and that changes to lifestyles are a necessary component to meeting global emissions reduction targets, is a powerful tool that can be wielded by a diverse range of actors.

6.5.2 Overcoming barriers and accomplishing long-lasting change

In seeking to shift focus from economic growth towards equity and well-being within ecological limits, a move towards sustainable lifestyles is likely to challenge powerful vested interests. For example, the focus of the global economy on paid employment – and the devaluation of unpaid care work that sustains it – is an overlooked barrier to low-carbon lifestyles. Higher income tends to be correlated with higher emissions; by contrast, an alternative economic system that places caring responsibilities and well-being at the centre of community and economic life (for example, through a shorter working week and fairer distribution of care work) has the potential to reduce emissions. With enabling policies in place, such an approach could reduce emissions and gender and income inequality, while improving standards of living (Coote *et al.* 2010; Biesecker *et al.* 2014; Gottschlich and Bellina 2017; Wiedenhofer *et al.* 2018; Fremstad and Underwood 2019). On the other hand, an approach of this kind is poorly aligned with the current economic and political system in many parts of the world, in which large corporations are increasingly determining how private and social needs are met and shaping the conditions of everyday life (Dauvergne and Lister 2013).

Changes to underlying social and cultural norms are more difficult to accomplish than transitory behavioural changes, but once established they are likely to be more durable and to support a wider range of low-carbon lifestyles (De Young 2011). By contrast, the process of changing laws and written codes of behaviour and conduct can occur in only a few years (Williamson 1998), and large infrastructural projects can enable and disable choices of citizens for decades or longer (Seto *et al.* 2016; Otto *et al.* 2020b).

One example that seeks to redress the balance of power towards long-term sustainable societies is an ombudsman for future generations (Beckman 2016) who intervenes in public policy design and investments that present structural barriers to a low-carbon transition. Such an approach has already been implemented in Wales, United Kingdom (Davidson 2020) and in Hungary (Vincent 2012). From a cross-European study of demand-side options in line with 1.5°C pathways, Moberg *et al.* (2018) conclude that while current policies are insufficient to achieve emissions reduction in line with this, households are keen to see stronger government intervention, with high public acceptability of 'command-and-control' measures across mitigation options.

Ultimately, the accomplishment of low-carbon lifestyles will require deep-rooted changes to socioeconomic systems and cultural conventions. The participation of actors and groups across civil society, as well as government, is needed to ensure this happens in a way that preserves people's well-being while achieving substantial and rapid cuts in GHG emissions.