Witness 4 of 26, Climate Change
PCAA/W04/5 –Supplementary Proof of Evidence

Expansion of Bristol Airport to 12mppa

PINS Ref APP/D0121/W/20/3259234
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Second Supplementary Proof of Evidence Carbon and Climate Change
for PCAA

Tim Johnson

Second supplementary proof of evidence of Tim Johnson on behalf of the Parish Councils Airport Association (PCAA): carbon and GHG impacts

November 2021

1. Introduction

1.1 My name is Tim Johnson, witness acting for the PCAA on carbon and greenhouse gas impacts relating to the expansion of Bristol Airport to 12mppa. This second supplementary evidence covers the recent publication of the Government's Net Zero Strategy. My comments are additional to the arguments previously set out in my main proof of evidence (PCAA/W04/1), the summary of that document (PCAA/W04/2), the rebuttal evidence (PCAA/W04/3) and my supplementary evidence (PCAA/W04/4).

2. The Net Zero Strategy

2.1 On 19th October 2021, the Government published its *Net Zero Strategy: Build Back Greener*[1] (NZS) setting out the policies and proposals for decarbonising all sectors of the economy to meet the 2050 net zero target.

2.2 The majority of references made to aviation and airports in the NZS relate to commitments or proposals set out previously by Government in the Transport Decarbonisation Plan, the Jet Zero Consultation, the Hydrogen Strategy and the Ten Point Plan. My opinion on the limitations of these proposals to provide effective mitigation for UK aviation emissions between now and 2050 is set out in my first supplementary proof (PCAA/W04/04) to the inquiry.

[1] https://www.gov.uk/government/publications/net-zero-strategy

2.3 In the Foreword to the NZS, the Prime Minister states confidently that "*In 2050, we will still be driving cars, flying planes and heating our homes, but our cars will be electric gliding silently around our cities, our planes will be zero emission allowing us to fly guilt-free, and our homes will be heated by cheap reliable power drawn from the winds of the North Sea."* The Government has not produced any evidence that demonstrates how this will be delivered. While zero emissions technologies should be encouraged, it is dangerous to assume that we will be able to rely on them, and in so doing, overlook the policy actions that are needed today to reduce the sector's climate impact (as recommended by the Climate Change Committee, including a limit on the growth in passengers and no net increase in airport expansion).

2.4 The Government recently undertook a consultation on a mandate for the uptake of sustainable aviation fuels (SAF), and a second consultation is expected in 2022 before a mandate level is set. The NZS states "*Our ambition is to enable delivery of 10% SAF by 2030 and will be supporting UK industry with £180 million funding for the development of SAF plants.*" Having a level of ambition should not be confused with having the policy tools to deliver it, and the SAF mandate level is yet to be defined. As noted in PCAA/W04/4 paragraph 6.4, the SAF mandate consultation set a more cautious note on the UK's approach to SAF compared to the Jet Zero consultation, and there is no indication that the Government intends to take a different approach when it proposes the mandate level.

2.5 The High Ambition net zero pathway set out in the Jet Zero consultation showed UK aviation emissions in 2035 to be around the same level as they were in 2019. In the NZS, however, the Government notes "We anticipate that international aviation and shipping emissions could need to fall by up to 12% by 2035, relative to 2019 levels (see figure 22)". This would push the level of required emissions reductions beyond the High Ambition scenario, requiring further 'breakthroughs' in zero carbon technology and SAF.

2.6 The Government published a range of supporting documents alongside the NZS including *Net Zero: principles for successful behaviour change initiatives.* This

publication was later withdrawn with a note to say it was published in error. This BEIS paper argued that a "technological and behavioural lens" is needed to tackle aviation emissions. The paper recommended reducing the demand from frequent business flyers, the promotion of domestic tourism, and enabling people to choose more efficient airlines. It further argued that "*Success here may ultimately be marked by a shift in social norms, from international in-person meetings being a sign of importance to being an immoral indulgence or embarrassment*" and that " 'Frequent flyer' should not be a badge of pride". The paper also stated that for the Government to approve airport expansions without any conditionality for decarbonisation sends a "hugely impactful signal".

7. Conclusion

7.1 While the NZS provides economy-wide pathways to reach net zero, it does not provide any new proposed measures for aviation beyond those discussed in the Jet Zero consultation (although it does commit to some limited additional funding for SAF infrastructure). It does not therefore reduce the significant policy uncertainties associated with aviation being able to achieve net zero emissions by 2050, especially in the context of expansion at Bristol Airport and elsewhere, as identified previously in PCAA/W04/4.

TMJ, November 2021

Department for
Business, Energy
& Industrial Strategy

Net Zero: principles for successful behaviour change initiatives

Key principles from past government-led behaviour change and public engagement initiatives

BEIS Research Paper Number 2021/063

October 2021

THE BEHAVIOURAL INSIGHTS TEAM

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All are equal first authors.

About the Behavioural Insights Team

The Behavioural Insights Team, also known as the Nudge Unit, is a social-purpose company. Originally set up at the heart of the UK government, we are now a global company with offices around the world.

Our mission is to improve people's lives by applying behavioural insights – evidence on how people make decisions and behave – to improve public policies and public services.

Acknowledgements

Professor David Halpern (CEO BIT), Professor Stephen Reicher (University of St Andrews), Professor Nick Chater (Warwick Business School), Dr Richard Carmichael (Imperial College London), Associate Professor Michelle Shipworth (UCL Energy Institute), Professor Tim Jackson (University of Surrey), Professor Matthew Watson (University of Sheffield), Dr Jo Hale (UCL Centre for Behaviour Change), David Hall (CEO Behaviour Change), Matthew Lipson (ESC) and Elisabeth Costa (BIT) provided expert advice on the behavioural principles for government-led behaviour change for Net Zero.

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Executive summary

1. Introduction

The Behavioural Insights Team (BIT) was commissioned by the Department for Business, Energy and Industrial Strategy (BEIS) to undertake a rapid review and synthesis of successful (and to a lesser extent, unsuccessful) government-led behaviour change initiatives. Drawing lessons from the past 70 years, in the UK and OECD, we have distilled 9 principles that can be applied to encourage societal-level behaviour change on a scale necessary to achieve Net Zero.

2. Methodology

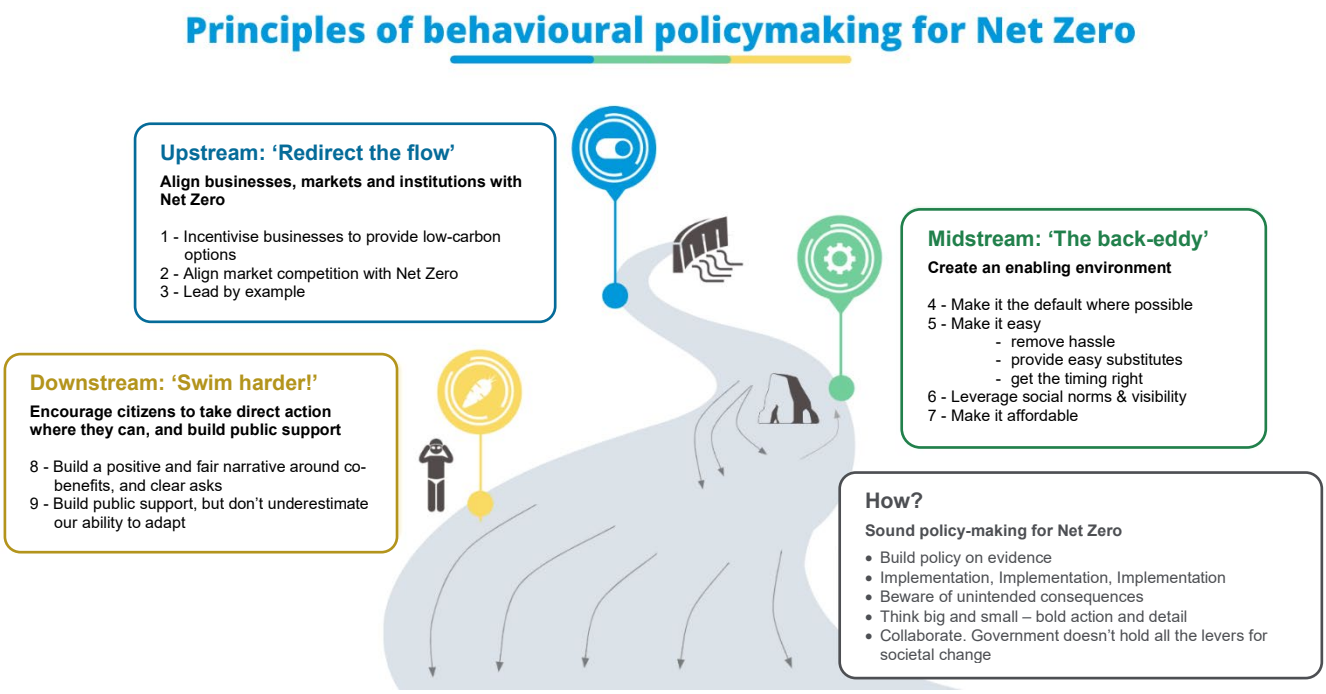
We conducted a rapid evidence review of relevant literature to identify the most applicable examples of public policy and behavioural science successes and failures. We compiled a total of 87 policy case studies from OECD countries. Each had some degree of evidence, and described policies or interventions attempting large-scale shifts in human behaviour. Reviewing these historical examples through the lens of the latest behavioural science, we developed a list of 9 key principles and recommendations. This list was then refined based on consultations with 10 experts from a range of behavioural and social sciences, including behavioural economics and public policy, social psychology, and social practice theory.

3. Behaviour change principles for Net Zero

Achieving Net Zero requires significant behavioural change, including rapid and widespread adoption of new technologies, and a significant reduction in demand for some high-carbon activities such as flying and eating ruminant meat and dairy.[1] To achieve such a transformation government will need to utilise all available policy levers and intervene at multiple levels. We present some of the key principles through an ***upstream-downstream*** **model of behaviour change**, illustrated below in Figure 1.

[1] Committee on Climate Change (2019). Net Zero. The UK's contribution to stopping global warming.

Figure 1. The 'Upstream-Downstream' Model of Behaviour Change



Downstream

Downstream interventions focus on individuals – their attitudes, choices, and actions. Most simply, a government campaign might ask or implore citizens to behave differently. A well-known example would be the UK's *'hands, face, space'* campaign during the COVID-19 pandemic, as well as decades of public health campaigns encouraging us to eat more healthily (e.g., *5-a-day*) or exercise more. Such campaigns can be delivered effectively, or not. There is also a large body of evidence on effective communications generally[2] (e.g. simplify the message; make the action clear; choose the right messenger[3] etc.), which we do not cover in depth in this report.

The weight of evidence shows that information alone is often inadequate to significantly change population behaviour. There will be some exceptions, where sustainable behaviours are relatively easy and acceptable to the public, and therefore we do argue for **[principle 8] the importance of building a narrative which is fair, highlights the many co-benefits of Net Zero actions, and is positive** (which research shows outperforms admonishment, anxiety, or guilt framings). Though rarely sufficient on its own, such an approach is necessary to 'bring the public along', address critical knowledge gaps, and encourage individual efforts where adoption is easy through **clear asks of the public**.

We do not intend to totally diminish the value of government-led behaviour change communications – rather, to emphasise their limited ability to drive *transformational* behaviour change. However they can also serve another critical purpose: **[principle 9] building public support for policy.** Research shows that effectively communicating a policy's benefits, fairness, rationale, and effectiveness can all improve acceptability. Deliberative fora and citizen

[2] Behavioural Insights Team & TRAFFIC (2019) Designing Effective Messages.
[3] Behavioural Insights Team & TRAFFIC (2019) Choosing the Right Messenger

assemblies can also be used to build a strong mandate, and recent examples around the world have often revealed surprisingly strong support for bold action on climate. Policymakers should therefore feel a license to be ambitious, even more so given evidence that we tend to bias towards negativity *before* a policy is implemented, but quickly adapt, showing more positive views once we've experienced the benefits (seen with congestion charges and plastic bag levies, for example). And the transition to Net Zero truly can be one of benefits – to our health, communities, and economy.

These downstream interventions are important, but we must recognise that by putting the onus for change on individual choice, and relying on personal agency, we are often asking people to '*swim against the current'* if prevailing norms, infrastructure, pricing, and hassle continue to make low-carbon choices hard. We need to make the right behaviours easier, or simply *the* obvious choice.

Mid-stream

Mid-stream interventions therefore move away from individual agency, and instead seek to edit the context – or *'choice environment'*. This reflects decades of research revealing the primacy of environmental factors (over attitudinal or knowledge factors) in shaping and constraining our behaviour.[4,5] There are many dimensions to this choice environment (financial, physical, social, digital, etc), - in other words, which behaviours are cheap, convenient, socially normative, accessible, etc. Good policy examples are varied: auto-enrolment into pensions; banning of fast-food advertisements near schools; provision of cycling infrastructure; and road pricing, to name a few. In all cases, within our analogy, these are equivalent to modifying the features of the river: a back-eddy or side channel which makes it easier or more likely that citizens will swim in the desired (low-carbon) direction.

In particular we highlight four approaches to editing the choice environment. First **[principle 4], make the desired outcome the default where possible**, which removes the need for active choice whilst maintaining freedom to choose otherwise. Defaults have been used with enormous success in promoting uptake on pensions in the UK, but also to drive low-carbon behaviours such as green tariff choices.[6]

Second **[principle 5]**, **make the low-carbon choice easier**. This involves removing all ***hassle*** from adoption, with many past examples of poor implementation highlighting how small points of friction can thwart otherwise good policy (e.g. with respect to grants for adoption of energy efficiency retrofits). We can also make it easier to be green by ensuring ***easy substitutes*** are available for ingrained high-carbon consumption habits. For instance, just as e-cigarettes help people quit traditional cigarettes, increased availability of plant-based or lab-grown substitutes can reduce demand for ruminant products – by *increasing* choice, not restricting it![7] ***Timing***

[4] Behavioural Insights Team (2014). EAST. *Four Simple Ways to Apply Behavioural Insights*.
[5] Cadario, R., & Chandon, P. (2018). Which Healthy Eating Nudges Work Best? A Meta-Analysis of Field Experiments. Marketing Science.
[6] Liebe, U., Gewinner, J., & Diekmann, A. (2021). Large and persistent effects of green energy defaults in the household and business sectors. *Nature Human Behaviour*, 1-10.
[7] Garnett, E. E., Balmford, A., Sandbrook, C., Pilling, M. A., & Marteau, T. M. (2019). Impact of increasing vegetarian availability on meal selection and sales in cafeterias. *Proceedings of the National Academy of Sciences*, *116*(42), 20923-20929.

also matters, since habit change is often easier at moments of disruption, such as starting to cycle to work when moving house.[8]

Third, the social dimension of our behaviour is paramount, and so we highlight **[principle 6]** the opportunity to **leveraging social norms, promote green identities, and create transparency** – allowing sustainable behaviours to spread, and unsustainable ones to be exposed.

Finally, concern for the environment is high, but willingness to pay is not. The sustainable choice should therefore *not* be the most expensive one. **[Principle 7]** is to tackle this barrier head-on by using **incentives and disincentives**, whether for one-off adoption behaviours or ongoing routines, to make them affordable or even the cheapest option.

Upstream

Upstream interventions also seek to create an enabling choice environment, but indirectly, and at scale. To act furthest upstream is to alter the very flow of the economic and social system, carrying everyone in the right direction with little or no individual effort. We focus on the role of businesses, the functioning of competitive markets, and the importance of institutional leadership. One reason we've focussed on these is because they are often characterised by positive feedback loops – the engine of rapid, transformational change.

Business practices impact citizen behaviours profoundly: do their business models and products promote sustainability, or waste-and-replace? What's available, cheap, convenient, and marketed as aspirational? And so **[principle 1] is to incentivise businesses to provide low-carbon options.** One recognised example of this is the UK's sugar levy which successfully incentivised widespread reformulation of drinks, helping all consumers (even the least engaged) consume less sugar without actually changing the purchase choices.

[Principle 2] takes a softer but no less profound approach to incentivising businesses: **by de-shrouding markets to tilt competitive forces towards environmental performance.** To give one example, the introduction of the NCAP vehicle safety rating allowed consumers to make more informed choices about which cars were safter (a good thing in itself). But the real power is that this marginal shift in consumer preference incentivised technological advancement in vehicle safety, meaning everyone drives safer cars. Translating this to the Net Zero challenge, by letting consumers know which supermarket, or pension fund, or flight operator is the greenest, marginal shifts among savvy customers have the potential to drive deeper changes across industry which help everyone consume more sustainably without even thinking about it. This is 'behaviour change' that no longer feels or looks like 'behaviour change' because the work is being done by upstream actors and consumers are simply going with the flow.

Finally **[principle 3]** highlights the importance of **leading by example**. Instilling new social norms is not easy, though the individual actions of leaders, policy and procurement decisions,

[8] Kirkman, E. (2019). Free riding or discounted riding? How the framing of a bike share offer impacts offer-redemption. *Journal of Behavioral Public Administration*, *2*(2).

and the norms of institutions all send a strong signal about the importance, legitimacy and moral imperative of combatting climate change.

4. Application of behavioural principles to Net Zero

In Section 4, we explore the application of the above principles to four key Net Zero behaviours.

4.1 Diet change

Food consumption is a largely automatic, habit-based behaviour, strongly driven by cues in our physical, social and price environment. Evidence shows that altering this choice environment is more effective than prompting or imploring people to adopt sustainable diet choices.[9] This suggests effective diet-related policy will lie at the intersection of our *upstream* and *midstream* principles, with a lesser role for *downstream* intervention (though awareness-raising may not be wasted, given evidence that public understanding of the climate impacts of food is poor). Without restricting choice, the most promising interventions would include making sustainable options more prominent and available within canteens, restaurant menus and supermarkets. Where governments can't directly mandate this, acting *upstream* can nonetheless incentivise it: for instance directly incentivising producers to reformulate high-carbon products (e.g. a carbon equivalent of the successful UK sugar levy); driving competition between retailers by creating environmental ratings for supermarkets; or indeed leading by example within public canteens in hospitals, schools, courts, and government buildings (the UK government spends £2.4bn per year on food).

4.2 Home energy

Decarbonising home energy use will largely be achieved through encouraging costly one-off switches to more efficient technologies or retrofits (e.g. solar panels, insulation or heat pumps). Upfront costs are therefore a major barrier, and while R&D and industry investment might ultimately bring costs down, significant consumer incentives will be necessary to drive early adoption. Research also shows that energy-efficiency adoption behaviours are often rife with small frictions and cognitive barriers (such as risk aversion, procrastination, uncertainty over supplier legitimacy, and hassle of installation) which should be addressed. In contrast to adoption behaviours, smaller habit changes (such as turning down the thermostat) bring risks of unintended consequences, and are also shown by the evidence as being difficult to achieve. Looking at our downstream interventions, the 'hearts and minds' battle would therefore be better directed towards building public acceptance for bold policy, such as a future ban on fossil fuel boiler replacements, rather than focusing too much on relatively inconsequential habit changes.

[9] Behavioural Insights Team (2020) A Menu for Change: Using behavioural science to promote sustainable diets around the world

4.3 Aviation

For the most part, individuals' flying behaviour is likely to be quite inelastic - expecting the British public to forego holidays abroad would be an enormous political challenge. The CCC's recommended reductions in demand are therefore likely to come from three sources: first, disincentives (e.g., higher tax) may be most effective for frequent business flyers, particularly now that many businesses are accustomed to using teleworking facilities, so an easy substitute option already exists. Second, big infrastructure investment to provide better substitutes for holidays (i.e., long-distance train travel) could also prove effective. Third, for some holidaymakers, promoting domestic tourism may offer a more palatable route to reduced aviation demand. However, the route to Net Zero aviation may not all be about reduced demand, but offsetting and efficiency improvements, particularly over the medium term. Behavioural dimensions to this could include i) encouraging offsetting (for example using defaults), and ii) de-shrouding the aviation market, by displaying environmental impacts on comparison and booking websites. This has the potential to discourage operators from over-fuelling, under-seating, mechanical upgrades, as well as driving R&D in biofuels and other advances.

4.4 Electric vehicles

Individuals rely on private vehicles to meet a variety of wants and needs, including commuting to work, tourism and completing domestic or parenting duties. Decarbonising mobility will require a blend of increased shared (e.g. public) and active travel, reduced travel, and electrification of the vehicle fleet. We've focussed on EV adoption as one element of this, which does itself adhere to one of our key principles – provide an easy substitute (to combustion vehicle use). However, barriers to rapid EV adoption remain. Ultimately, electric vehicles will need to be as convenient and affordable as combustion vehicles, if not better, including for the larger second-hand market. Some upstream interventions have already been put in place, including a market mechanism to penalise combustion vehicle sales vs. EV sales. This will incentivise manufacturers' R&D and marketing efforts towards EVs, meaning they increasingly feel like the obvious choice to consumers. The government can also create an enabling environment, including provision of subsidies until EVs are closer to price parity, and supporting higher density of charging infrastructure. This will be particularly important for some demographics, including those without off-street parking.

5. Case studies relevant for Net Zero

In Appendix 1, we explore three of the most pertinent policy case studies in greater detail to showcase the complexity and difficulties involved in large scale government-led behaviour change initiatives, as well as the lessons which can be learnt. From the plethora of examples identified, three stand out as having the most valid lessons for Net Zero policy: tackling obesity, improving road safety, and supporting adoption of telecommunications.

Starting with **obesity**, the lack of progress over the last 30 years despite multiple policy efforts can be largely ascribed to overly focusing on encouraging *downstream* behaviour change

reliant on individual agency and choice (e.g. via weight-management or physical exercise) rather than tackling the obesogenic environments around us. A wealth of academic research shows the relative success of *midstream* interventions to edit the food environment (such as portion size, relative availability on menus, positioning in shops), and more recently, the Sugar Levy showcases the success of moving *upstream*, incentivising businesses to reformulate so that consumers drink healthier beverages, without requiring individuals to change their purchasing behaviours.

Since the advent of motor vehicles, improving **road safety** has been a success story with road deaths falling, even as vehicle use grew and speed increased. This is thanks to the government prioritising the (*midstream*) enabling physical and social environment through a range of interventions - from laying down the infrastructure, traffic signage systems, all the way to regulations on seat belts and effectively de-normalising drink driving. In tandem, technological and engineering improvements by manufacturers have been in large part driven by the incentives to do so: the NCAP safety rating provides a perfect example of leveraging marginal behavioural shifts, by de-shrouding the market, to drive market competition towards good consumer outcomes for all.

The deployment of **telecommunications** showcases the government working closely with technological leaders to enable and encourage mass adoption of growth-inducing technology. Huge investment in infrastructure (from cables to providing 4G network coverage) as well as heavy collaboration between government, industry and research actors were needed to hasten the roll-out of new telecommunications technologies, such as the electric telegraph, narrowband to broadband circuit switch technologies, transistors and semiconductors. Obvious parallels can be drawn to the uptake of electric vehicles, low-carbon heating systems, or alternatives to flying. (*Downstream*) consumer acceptance of a product or service is just one part of the puzzle – though an important one, with misinformation or negative narratives always being a threat, as seen recently with 5G and smart meters. However adoption is only possible and palatable within an ecosystem of supporting infrastructure that makes it easy and affordable (*midstream*) and commercial incentives so the heavy lifting is done *upstream*.

Conclusion

When we view ‘behaviour change’ narrowly as an exercise in asking citizens to make different choices, the scale of change required to reach Net Zero is daunting, and an enormous political challenge. Moreover, the evidence from past case studies and decades of behavioural science research shows that awareness-raising and calls to action will not get us there. Though everyone has a degree of agency in changing their behaviour, and well-crafted messages from government can certainly be influential, behaviour is simply too profoundly driven by factors in the environment rather than in hearts and minds. As it stands, low-carbon behaviours are often more costly, less convenient, less available, less enjoyable, and rarely the default choice.

But this is ultimately an opportunity, because the more politically feasible approach is also the far more effective approach – to move further upstream and change these contextual factors. By focusing less on individual *behaviour*, towards bold policy targeting choice environments, institutions, businesses, and markets, it becomes an exercise in ‘world building’ more than ‘behaviour change’ per se.

Some readers may understandably think ‘this isn’t even behaviour change any more!’ – though in some ways this is exactly the point. We propose that different consumption routines and practices (i.e. ‘behaviours’) are the objective, but acting upstream allows us to tackle this objective indirectly, without needing to target consumer *choice* in an explicitly ‘finger-wagging’ manner. The public health sector, which has the biggest pedigree in behaviour-change, variously calls this ‘health by stealth’, or ‘addressing the obesogenic environment’, rather than imploring people to eat less and exercise more. A similar (but even more ambitious) approach is needed.

This is not to say communications and judicious asks of the public are not extremely important. There are various degrees to which public engagement will be necessary, from more passive to more active (acceptance of policy or infrastructural changes; willing adoption of new technologies; or direct individual action). Building a compelling and positive narrative, with clear asks, can help to do this effectively, despite communications on their own tending to have a very modest impact on behaviour change.

In achieving all of this, there is much to be learnt from past government-led initiatives.

However, we do not have all the answers and evidence on ‘what works’ is continuing to grow. It will be more critical than ever to maintain an agenda of evidence-generating policy, as well as evidence-based policy: testing as we go and trialling new approaches. Behavioural science is far from exhausted, with many original ideas waiting to explored. Government behaviour change must therefore be innovative and adaptive to establish what works in the context of this local, national and global challenge.

If we can impart one lesson, the first law of behaviour change would be this: reduce the burden of action for the greatest number.

1. Introduction

Climate change needs behaviour change – according to the Committee on Climate Change (CCC), 62% of future emissions reductions depend on it.[10] The bulk of this (53%) relates to technology adoption, including low-carbon heating systems and electric vehicles. The other 9% relates to reduced demand for high-carbon activities including aviation, ruminant meat and dairy, wasted food, and car travel.

Societies and norms shift all the time. For instance, the CCC propose a 35% reduction in ruminant meat consumption over the next 30 years. In an optimistic light, this could look quite modest compared to the dramatic shifts in diet observed over the past 30 years through technological development, the explosion of international trade, and evolving tastes and trends. Give or take a few decades, and the same could be said for how we travel, heat our homes, and consume material resources, which have also changed radically. So, this scale of change shouldn't necessarily daunt us. However, that does not make it easy to do by design, orchestrated by a democratic government, and in the direction of less rather than more.

We therefore turn to the lessons of history and the latest in behavioural science research to see what works and what does not. There is no shortage of material - virtually all that governments do is about influencing human behaviour. In this sense, human behaviour is our target and our lens, but the levers available for influencing it are varied: not just information campaigns, incentives and mandates, but also a multitude of nudges, the provision of infrastructure and the manipulation of the 'enabling environment'. Some of the most powerful techniques are wholly oblique to citizen 'behaviour' per se, for instance tilting the functioning of markets to encourage businesses to change their products which bring consumer 'behaviours' along in their wake.

We therefore hope **the framework detailed in this report shows that there is a route to success - one which is both politically feasible and minimises the burden on citizens**.

The remainder of this report outlines our methodology [2], our upstream-downstream framework and key principles distilled from the evidence [3], examples for how they could be applied to four Net Zero behaviours [4], and a deeper dive into three of the most valuable case studies [Appendix 1].

[10] CCC (2019). Net Zero The UK's contribution to stopping global warming.

2. Methodology

2.1 Evidence gathering

We conducted a rapid review of relevant academic literature, grey literature and policy publications using relevant search terms to identify the most applicable examples of public policy and government-led behavioural science successes and failures. The policy areas covered included health, the environment, social welfare, crime, transport, education, technology, work health and safety and urban design. We prioritised case studies which satisfied the following criteria:

- Some degree of evidence (i.e. empirical, historical) to support an assessment of the policy or intervention's impact, be it positive or negative.
- Policies or interventions which had clearly identifiable behavioural levers, including both single lever interventions (e.g. a tax on carbon) and multi-lever interventions (e.g. the European Common Agricultural Policy).
- Case studies which exemplified transformational shifts in human behaviour analogous to those required to meet Net Zero emissions.
- Policies or interventions from nations within the Organisation for Economic Co-operation and Development Countries (OECD).

After collating 87 case studies across the last 70 years, assessed through the lens of the latest behavioural science theory and evidence, we sought to distil and synthesise a longlist of key principles for Net Zero. This list went through several stages of refinement informed by consultation with experts (see below).

Complicating this research was the fact that *to govern is to regulate behaviour*, so nearly everything that modern governments do involves some degree of influence in the actions and practices of citizens and businesses. This means that the scope of research on government behaviour change initiatives is very large indeed, as it in fact overlaps with the question of good government (and would not always be explicitly designated as 'behaviour change' by policymakers or academics). **A key tenet of this work is that a narrow definition of 'behaviour change' – i.e. asking citizens to make different choices, is *not* broad enough for our purposes.**

2.2 Insights from the experts

We consulted with 10 experts from a range of behavioural and social sciences, including behavioural economics and public policy, social psychology, and social practice theory. The majority of these experts work on environmental behaviour/practice, while some were deliberately selected from other applications (e.g. public health, COVID-19). Six of our experts

were interviewed during a 2-hour roundtable, and the others through 1-to-1 interviews.[11] Several of these experts also provided written comments on our drafts.

Prior to speaking with the experts, we produced a draft list of key principles, based on our evidence review to date, and our own institutional expertise and perspectives having been at the forefront of government-led behaviour-change over the past decade. The experts broadly agreed with our suggested principles, elaborating in particular on the importance of systemic change alongside individual behaviour, the role of fairness, positive narratives, and sound policy-making that involves social scientists from an early stage. Above and beyond our original thinking, experts highlighted a number of principles and examples that we have included in our review, along with qualifications and edits to our earlier thinking. We are grateful for all this valuable input, though stress the final output reflects BIT's views.

[11] Including: Professor David Halpern (CEO BIT), Professor Stephen Reicher (University of St Andrews), Professor Nick Chater (Warwick Business School), Dr Richard Carmichael (Imperial College London), Associate Professor Michelle Shipworth (UCL Energy Institute), Professor Tim Jackson (University of Surrey), Professor Matthew Watson (University of Sheffield), Dr Jo Hale (UCL Centre for Behaviour Change), David Hall (CEO Behaviour Change), Matthew Lipson (ESC).

3. Key behavioural principles for Net Zero

3.1 How does behaviour 'happen'?

On the one hand we have agency, free to make choices within the world we occupy – free to turn our heating up, or down. Free to choose a beef burger, or a bean burger. Free to fly on holiday, or take the train. Clearly our knowledge, capabilities, and attitudes matter when making these choices.

On the other hand, our choices are constrained and influenced by our context. This is true in a simple sense - which option is cheap, available, and most convenient? But it is doubly true considering cognitive and social psychology research which reveals much of our decision-making to be non-conscious and rooted in automatic responses to cues in our social and physical environment. Be it the layout of a supermarket; the structure of pension investment defaults; the design of infrastructure for cars vs bicycles; the cost of airline vs train tickets; the norms of those you identify with – these social, material and financial dimensions of our 'choice environment' really matter. In fact, they reliably matter *more* than our knowledge or attitudes.

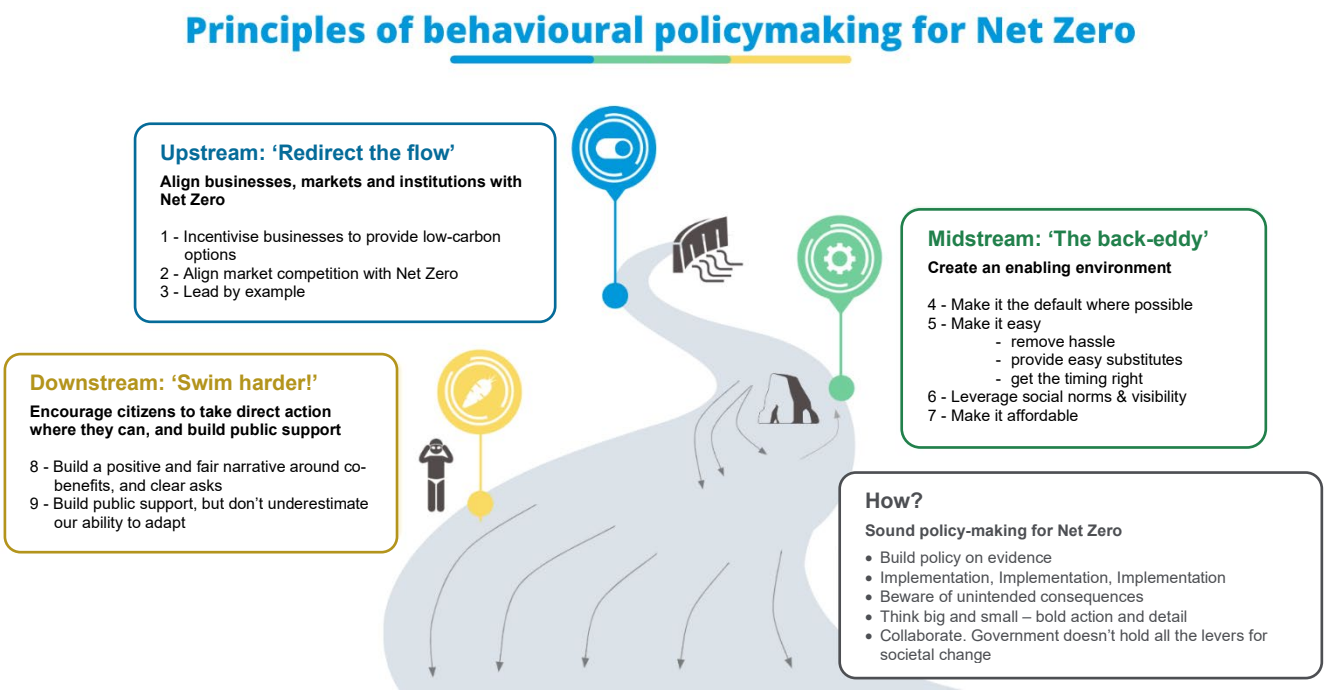
But who designs the choice environment? Normally, the actions of institutions (government and non-government) and businesses play the biggest role. And businesses are themselves generally following the norms and commercial incentives woven throughout the economy.

And so the question of '*who has the leverage to really change things?'* is complex, but through the lens of behavioural science there is a hierarchy. We plot this along a metaphorical river, from upstream (systemic factors), to midstream (the choice environment) to downstream (individual agency). Attacking the issue at each of these 'loci of change', governments can:

- Intervene to encourage individuals **to make different choices (downstream),**
- Intervene to change the **choice environment (midstream),** which enables different choices downstream,
- Intervene to change the functioning of the **socio-economic system (upstream),** which begets a different choice environment (midstream), which enables different choices downstream.

Based on our research, we identified 9 key principles of successful behaviour-change across these three levels (Figure 1).

Figure 2. The 'Upstream-Downstream' Model of Behaviour Change



3.2 The upstream-downstream model, explained

It is possible to encourage individuals downstream to take direct action ('Swim harder! No, in this direction!'). Governments may use social marketing techniques to inform or implore citizens, and this can be done more, or less, effectively. This report is not exhaustive in its coverage of good communications approaches, but within principle 8 we highlight the importance of building a positive and fair narrative, which emphasises the co-benefits of climate action, and offers clear and simple asks of the public.

This is important for governments to get right. However, we must recognise that we are often asking people to 'swim against the current' if the cheap, readily available, enjoyable, convenient, normal and default option is the unsustainable one. This is often the case: it's hard to avoid plastic packaging when the shops are full of it; hard to drive an EV if you don't have off-street parking to install a charge-point; hard to take the train when the plane is cheaper and quicker; hard to give up red meat when our shops, restaurants and cultural norms are brimming with it.

It is therefore often more effective to move upstream a bit, and change aspects of the 'choice environment' – make the sustainable option the default, or at least easier and more available; encourage pro-environmental social norms; and use fiscal interventions to ensure to good choice is not the expensive one. By our analogy this equates to modifying features of the river (midstream) – a side channel or back-eddy in which it is easier to swim in the right direction. A wide body of evidence across multiple policy domains has shown that changing the choice environment tends to be more effective than (trying to) change knowledge and attitudes.

Moving further upstream still, we seek to alter commercial incentives, market functioning and institutional leadership. These are among the most important primary conditions which can have big trickle-down impacts – in other words, they create the conditions in which businesses and other actors will be motivated to create an enabling environment (midstream) for consumers to more easily make green choices (downstream). In essence, we want to focus on the simplest and most foundational changes that allow most people to just 'go with the flow'.

> *"The first law of effective behaviour change: minimise the burden of action for the greatest number of people. Acting further upstream does this."*

Box 1: Interpreting and using the framework

What is the key distinction between upstream, midstream, and downstream?

The distinction is the level at which an intervention is trying to trigger change. It is in essence a distinction between macro (systemic), meso (contextual) and micro (individual). Individual choices occur within a context and within a complex social and economic system. We can neither claim that societal outcomes are merely a result of individual choices, nor that individuals are merely puppets of systemic factors. Causality flows in both directions between the micro and the macro. As such, it is possible to intervene at different levels to create change: If we want everyone to move in a particular direction, we can target the swimmers, or the features of the river, or the direction of the current.

At which level should you intervene for greatest impact?

All 9 principles are important, and available for policymakers to select or combine. Behavioural policymaking should also be based on an assessment of the specific barriers to adoption for the behaviour in question. However as a general rule, acting further upstream will tend to be more effective. There is ample evidence of the primacy of contextual factors in shaping our behaviour. Most of this research sits at the 'midstream' level, e.g. altering the defaults, incentives, or perceived norms within a particular choice environment. Acting upstream achieves similar outcomes but allows greater scale by addressing the underlying incentives or norms which created the unhelpful choice environment to begin with, rather than tackling one specific choice environment at a time. Furthermore, keep in mind that truly transformational change will tend to be achieved only by triggering positive feedback loops. Market competition, supply-demand relationships, and social norms signalled by institutions (all upstream factors) are all characterised by the potential for positive feedback loops.

How literally should the analogy be read?

Fairly literally. The framework aims to represent a highly simplified but defensible account of 'how behaviour happens' across society. That is, individuals have some agency, and varied preferences and attitudes, but are contextually constrained, and are enmeshed in a system characterised by commercial incentives and norms which are more readily changed by institutions and businesses than by individuals (though this is not impossible). Large-scale

change *can* therefore be individual-led, but this is (in a metaphorically but accurate sense) like trying to swim against the current if contextual and systemic factors don't align.

Do the three levels map onto different policy tools?

Many readers will be familiar with the 'ladder of interventions' framework for government-led behaviour change, which maps out different policy tools according to the extent to which they restrict choice. Information provision is at the bottom of the ladder, and bans at the top, with the middle rungs occupied by various shades of nudges and incentives. Our upstream-downstream framework is a conceptual framework and does *not* map neatly onto different policy tools. For example, information provision may be used as a downstream tool to change individual choice, but could also be used upstream to de-shroud markets – in fact, they are two sides of the same coin. However, it is *loosely* the case that downstream interventions will tend to be more information-based, while midstream interventions utilise a range of incentives and nudges (though a consumer nudge might require a business regulation to implement), and upstream interventions may include more substantial taxes or regulations.

Does this replace other behaviour-change frameworks?

This tool can be used in addition to, rather than instead of, other well-established behavioural frameworks such as EAST, MINDSPACE, COM-B or the Behaviour Change Wheel. Although there is some overlap, our framework identifies key *principles* for change (not highly specific tools), and provides a conceptual account of behaviour within society. Among well-known existing frameworks, ours is closest to 'ISM' (Individual, Social, Material), albeit we put both the 'social' and 'material' environment into the *midstream* 'enabling environment', adding *upstream* as a yet higher locus of change.

Do different principles apply to different categories of behaviour (e.g. routine vs one-off)?

We have deliberately chosen not to tie these principles to categories of behaviours (e.g. routine vs one-off, or conscious vs automatic). Though we explored this endeavour, such an approach proved problematic for two reasons. First, any typology of behaviours involves many overlaps (e.g. a behaviour can be one-off and conscious) that complicates generating recommendations. Second, we find that specific context plays a dominant role for every behaviour which means pre-specifying when and how these principles should be applied is flawed. We have therefore found it more useful to share examples for how these principles might apply to *specific* Net Zero behaviours (in Section 4).

3.3 Acting Upstream: 'Redirect the flow' - Align businesses, markets, and institutions with Net Zero.

If we could turn one tap upstream to help, encourage or default everyone downstream into more sustainable behaviours, what would that tap be? Two likely candidates would be i) changing the functioning of markets or business incentives to align commercial interests with low-carbon outcomes, and ii) instilling pro-environmental norms and values across society. These are really the 'economic' and 'social' aspects of the so-called socio-economic system.

Changing the functioning of markets or instilling new norms is far from easy, even for a national government. But there are things that can be done, and indeed have been done, to good effect. Businesses *can* be incentivised; markets *can* be regulated in smart ways; and government institutions *can* shape prevailing norms by leading by example.

The power of these interventions often comes from understanding the *dynamics* of the system. Specifically, transformational change over a short timescale often requires the triggering of positive feedback loops, through which desirable change produces more change.

For instance, social norms are contagious - if more people like us are doing something, we're more inclined to follow suit. Similarly, the relationship between business supply and consumer demand can be mutually reinforcing (increased demand begets greater supply which reduces prices, increases availability, and normalises the new product. This further increases demand, and so on). The same is true of competitive markets where a zero-sum fight for finite business leads to a ratcheting of ongoing improvements, constantly spurred on by a competitors' advances.

These dynamics are all useful to us, but only if the contagious norms are pro-environmental ones; the rising demand is for low-carbon products; and the metric on which markets are competing is aligned with Net Zero. This is not a given – but principles 1 to 3 consider how we can catalyse these virtuous cycles.

Principle 1. Incentivise businesses to provide low-carbon options

Simple upstream changes targeted at businesses can have far-reaching impacts. Much of the improvement in wellbeing in the 20th century came from the introduction of just a few key regulations imposed on firms, such as *the introduction of pensions*[12] or *minimum wages.*[13] The Actions of businesses trickle down into our day-to-day lifestyles because businesses so profoundly shape our choice environment: their commercial models (e.g. circular or waste-and-replace?), their marketing efforts, their R&D, their supply chains and investment decisions all dictate what options are available, cheap, normal, desirable, and convenient for the consumer.

Influencing business practices is therefore an effective route to behaviour change because it can reduce the burden of action on individuals, who might struggle to make low-carbon choices

[12] Esser, I., & Palme, J. (2010). Do public pensions matter for health and wellbeing among retired persons? Basic and income security pensions across 13 Western European countries. *International Journal of Social Welfare*, *19*, S103-S120.
[13] Flavin, P., & Shufeldt, G. (2016). *Minimum Wage Increases and Workers' Well-Being*. Working Paper, Baylor University, Waco, TX.

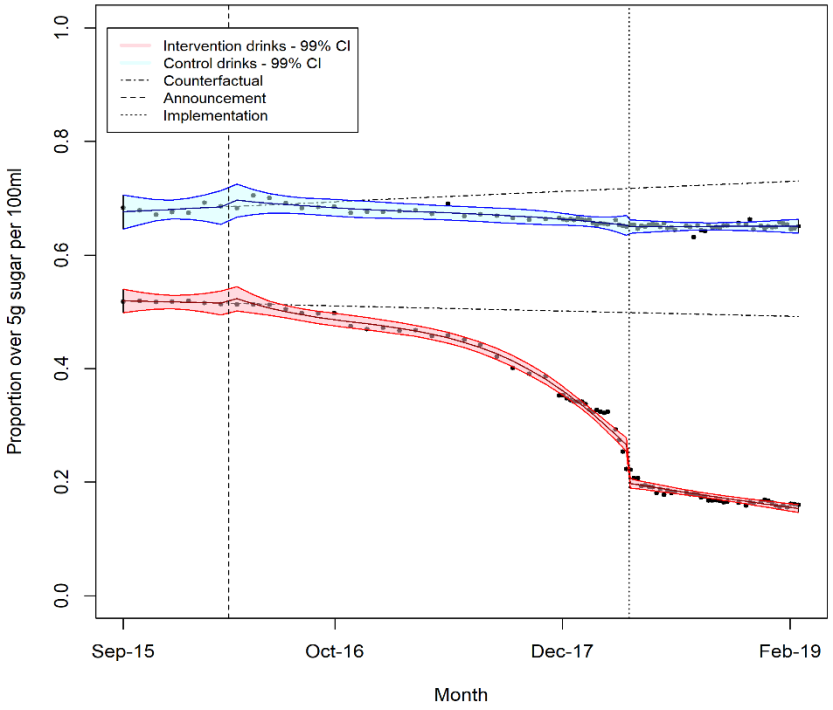
within a high-carbon choice environment. For instance, most of us did not actively *choose* to drive a combustion vehicle, or heat our home with a fossil-fuel boiler, or buy our spaghetti wrapped in plastic. It is simply how the world works. The act of driving electric or installing a heat pump should equally be 'just how the world works', but building this world requires big changes within industry. That requires the commercial incentives to be aligned.

Incentives can be more targeted or more broad brush. For instance, carbon taxes are an effective instrument for steering whole sectors or economies towards better outcomes. A recent study comparing emissions reductions in 142 countries found that, on average, countries with a carbon tax reduced their emissions by 2% per year between 2007-2017, while emissions increased by 3% per year in all others.[14]

Anti-obesity policies[15] also expose the fallacy of targeting individual choices rather than the businesses responsible for creating the choice environment. 30 years of citizen-facing campaigns encouraging healthy eating and exercise have had almost no positive impacts. In stark comparison, *the Soft Drinks Industry Levy on Sugar Content (2018)* led to dramatic reductions in sugar consumption because it targeted change upstream, nudging businesses to reformulate what everyone drinks without changing what most consumers purchase. Total volumes of sales of 'high sugar' soft drinks fell by 50% and the volume of sugar sold from soft drinks dropped 30% in 4 years from 2015-2018.[16] Studies emphasise that this is a result of industry adaptation, as the proportion of soft drinks that were eligible for the levy (over 5g sugar/100ml) fell from 52% - 15% by 2019 (Figure 3).[17]

[14] Best, R., Burke, P. J., & Jotzo, F. (2020). Carbon pricing efficacy: Cross-country evidence. *Environmental and Resource Economics*, *77*(1), 69-94.
[15] Theis, D., & White, M. (2020). Is obesity policy in England fit for purpose? Analysis of government strategies and policies, 1992-2020.
[16] Bandy, L. K., Scarborough, P., Harrington, R. A., Rayner, M., & Jebb, S. A. (2020). Reductions in sugar sales from soft drinks in the UK from 2015 to 2018. *BMC medicine*, *18*(1), 1-10.
[17] Scarborough, P., Adhikari, V., Harrington, R. A., Elhussein, A., Briggs, A., Rayner, M., ... & White, M. (2020). Impact of the announcement and implementation of the UK Soft Drinks Industry Levy on sugar content, price, product size and number of available soft drinks in the UK, 2015-19: A controlled interrupted time series analysis. *PLoS medicine*, *17*(2), e1003025.

Figure 3. Soft Drinks Industry Levy effect on Sugar Content of Drinks[18]



This figure shows the reduction of sugar in drinks targeted by the announcement of the Levy (2015) and by the actual Levy in 2017 (red line) compared to control drinks that were not targeted by the Levy (blue line).

How might this apply to Net Zero?

Stronger carbon taxes are an obvious solution. Beyond this, a range of more targeted incentives could be adopted. For instance, replicating the sugar levy based on emissions-per-portion for high carbon foods could incentivise product reformulation, diversification and production efficiencies up the supply chain. Strong progress is already being made in other sectors – for example, the recent introduction of penalties for vehicle manufacturers who fail to achieve sales targets for EVs vs combustion vehicles. The strength of these outcome-based penalties is that they do not impose a particular solution: they simply put capitalism to work in the right direction, with firms free to focus on technical innovation, commercial innovation, marketing, or any other means to sell more electric vehicles. The consumer literally goes along for the ride.

[18] Scarborough, P., Adhikari, V., Harrington, R. A., Elhussein, A., Briggs, A., Rayner, M., ... & White, M. (2020). Impact of the announcement and implementation of the UK Soft Drinks Industry Levy on sugar content, price, product size and number of available soft drinks in the UK, 2015-19: A controlled interrupted time series analysis. *PLoS medicine*, *17*(2), e1003025.

Principle 2. Align market competition with Net Zero

Markets do not always lead to optimal outcomes, particularly where consumers have imperfect information, or where behavioural factors (such as the stickiness of habits, hassle, or procrastination) leave consumers with their second, third or tenth-best option, even on their own terms.

It is common for markets to be 'shrouded' on environmental performance. For example, UK consumers have no easy way of reliably knowing which pension pot is greenest; which hotel chain is doing the most to reduce their emission; which airline is most climate-friendly; or which supermarket is best helping their customers to eat sustainably.

Governments can de-shroud these markets by providing transparency mechanisms such as comparison tools, kitemarks and rating systems. This not only helps consumers make more informed choices (a good thing in itself), but powerfully catalyses competition between firms to outperform each other on environmental performance. This is critical, and distinguishes this strategy from mere 'education through labelling': if designed through a sophisticated understanding of market dynamics, we only require a minority of consumers to make different choices to incentivise greener practices among competing firms, which in turn defaults all consumers (even the least engaged) into greener products and services.

For example, when consumers are provided information on the rate at which different mobile handsets are stolen, this enables better purchasing choices and prompts manufacturers to develop more secure handsets, meaning theft goes down for all.[19] Food hygiene ratings provide another example. Several US cities have introduced policies mandating health inspection scores to be displayed in restaurant windows. As consumer demand shifted towards cleaner restaurants, all restaurants began to adopt more hygienic practices to keep up with the competition. Foodborne illness hospitalizations decreased as a result.[20] [21] The NCAP vehicle safety rating operates through a similar process: the simple safety rating creates marginal shifts in consumer purchasing patterns which incentivises manufacturers to improve their vehicle safety, which over time leads to all consumers driving safer cars.

None of this is guaranteed – the intervention must shift enough consumers to create the commercial incentives for upstream changes. This means measures which i) maximise the consumer response (e.g. making the information more salient or motivating) and ii) which target points in the value chain where competition is sharpest (e.g. ratings between supermarkets rather than between food producers?), and iii) which help suppliers/retailers respond (e.g. R&D support, grants, knowledge-sharing) will help trigger the desired effect.

How might this apply to Net Zero?

There are many markets which should be de-shrouded to help consumers express their preferences for sustainable options, and thus create accountability and the right incentive for

[19] https://quarterly.blog.gov.uk/2014/10/15/stop-thief-how-data-can-help-prevent-mobile-phone-theft/
[20] Jin, G. Z., & Leslie, P. (2003). The effect of information on product quality: Evidence from restaurant hygiene grade cards. *The Quarterly Journal of Economics*, *118*(2), 409-451.
[21] Firestone, M. J., & Hedberg, C. W. (2018). Restaurant Inspection Letter Grades and Salmonella Infections, New York, New York, USA. *Emerging infectious diseases*, *24*(12), 2164–2168. https://doi.org/10.3201/eid2412.180544

businesses. This could include: pension funds, airlines, property lettings, hotel bookings, restaurants, supermarkets and more. In each case, a credible brand (for example, *Which?)* or industry body would likely manage the rating system.

Principle 3. Lead by example

Governments leading by example and following their own narrative brings multiple benefits.

First, actions can speak louder than words, and so the decisions of government and members of government signals the importance, validity, credibility, and moral authority of the net-zero message. Perceived hypocrisy can do a lot to undermine efforts to build public engagement and support. This was observed during the COVID-19 pandemic when prominent authority figures broke guidelines, leading to measurable reductions in public compliance as well as shifting attitudes.

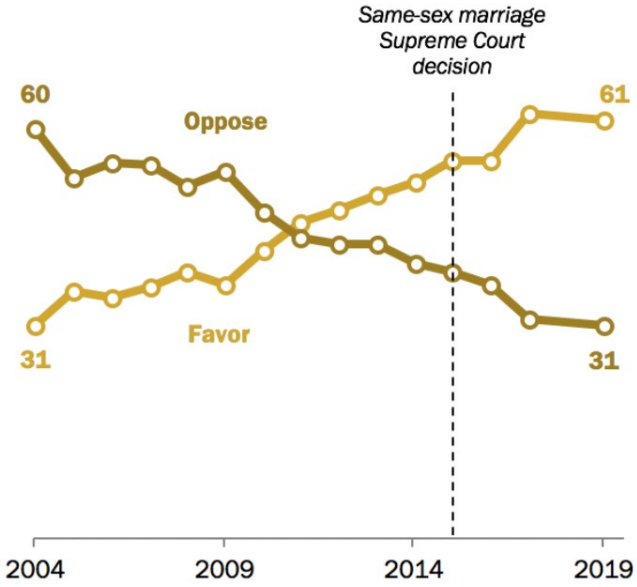
Second, though establishing widespread pro-environmental social norms and values is not easy, governments can play a role. Government statements, actions and laws powerfully shape perceptions of normative and acceptable behaviour. For instance, even with public criticism being high, many still perceived government approval as *the* yardstick for safe behaviour during COVID-19 '*we're allowed to do this now [so must be safe]…*'. This reveals, for many, a deep set reverence for legitimate government authority, regardless of one's personal political views. Being an early and visible adopter may help deliver this message. For instance, national leaders publicly receiving their COVID-19 vaccination on national television sends a strong signal to citizens to trust in the safety of the vaccinations.

Third, public procurement is a powerful lever. For example, requirements that bidders for large government contracts have credible Net Zero strategies are key – impacting not just the £ 'x' billion of services procured each year, but the many-times 'x' represented by the total bidding pool. Procurement can both reinforce perceptions that certain choices are normal, important and legitimate. For instance, many UK councils have electrified their vehicle fleets[22], and hospitals, school canteens and other public eateries are shifting towards offering more plant-based meals.[23]

Fourth, laws also matter, and can powerfully cement emerging shifts in normative values. This has been exemplified by a string of nations legalising same-sex marriage in recent times following years of increasing public support for legislative change (see US case of this in Figure 4 below). Importantly, this isn't merely reactive to existing norms within society – it sends an enormous signal of credibility and official approval to the emerging norms, further strengthening them, pushing them into the mainstream, and even making the counter-values (e.g. anti-gay-marriage) socially *un*acceptable by de-aligning them with law.

[22] www.intelligentcarleasing.com/blog/new-study-compares-every-uk-council-electric-vehicles/
[23] www.theguardian.com/environment/2020/apr/16/school-and-hospital-caterers-vow-to-cut-meat-served-by-20

Figure 4. US public support for same-sex marriage before and after legislative change[24]



In 2005 the Japanese government created a multi-levered strategy to reduce the environmental impact of heating and cooling office buildings.[25] Government buildings would not be heated or cooled beyond 20-28°C. A social marketing campaign 'cool biz' targeted strongly held male office worker identity and etiquette around wearing formal dress-code to work. The prime minister, members of Cabinet and successful business leaders were shown wearing loose-fitting short-sleeved outfits in formal settings to legitimise new norms around appropriate office attire. The 'Cool Biz' successfully changed Japanese conventions of how men dress at work and resulted in an estimated 1.4 million tonnes-reduction in CO^2 emissions.[26]

Education also plays a key role in establishing new norms. Indeed, schools have often been a vector for building national identity.[27] [28] Children can then in turn have profound impacts on their parents, or through other means by making new behaviours observable.

How might this apply to Net Zero?

Government institutions and high-profile individuals should lead by example and display committed and visible consistency with their own Net Zero narrative. For instance, conferences should be zero-carbon; government vehicle fleets (police, Highways England, local buses, etc.) should all be electric; government buildings should be zero carbon (with large scope for improvement within the NHS estate, for example); and public canteens in schools, hospitals,

[24] www.pewresearch.org/politics/2019/05/14/majority-of-public-favors-same-sex-marriage-but-divisions-persist/pp_2019-05-14_same-sex-marriage_0-01/
[25] Shove, E. (2014). Putting practice into policy: reconfiguring questions of consumption and climate change. *Contemporary Social Science*, *9*(4), 415-429.
[26] Tan, C. K., Ogawa, A., & Matsumura, T. (2008). Innovative climate change communication: team minus 6%. *Global Environment Information Centre (GEIC), United Nations University (UNU)*, 53-70.
[27] Telhaug, A. O., Mediås, O. A., & Aasen, P. (2004). From collectivism to individualism? Education as nation building in a Scandinavian perspective. *Scandinavian Journal of Educational Research*, *48*(2), 141-158.
[28] Tormey, R. (2006). The construction of national identity through primary school history: the Irish case. *British journal of sociology of education*, *27*(3), 311-324.

prisons, court buildings and government facilities should provide low-carbon food (the UK government spends £2.4bn per year on food).

3.4 Acting Midstream: 'the back-eddy' - Create an enabling environment

We've discussed up-stream strategies for creating low-carbon incentives and norms within markets, firms and institutions. These have a trickle-down influence on our daily actions by setting the norms, options and defaults that we face day-to-day. If effective, they can truly steer the flow of the river and bring everyone along with it.

Moving downstream, but only slightly, we turn our attention to actions government can take to more *directly* edit the 'choice environment' around articular behaviours, which will make them easy and likely, or difficult and rare. By our analogy, this is more akin to editing the local features of the river, for instance creating a side-channel or back-eddy where it is easier to swim in the low-carbon direction.

There are many dimensions to our choice environment, including financial (how affordable are electric vehicles compared to combustion vehicles?), physical (what is the provision of cycling vs driving infrastructure?), social (what food choices are perceived as normal, or socially desirable?), and digital (how easy is it to find the green pension options on your online dashboard?) Examples of successful intervention are equally broad, including infrastructure (e.g. speed bumps,[29] printed 'footsteps' on tube escalators,[30] and bike lanes[31]), visual (e.g. nutritional labelling[32]) and price signals (e.g. tobacco tax,[33]) or editing choice (e.g. increasing the relative availability or prominence of sustainable options.[34]) Changes to the social environment can include giving access to social support (e.g. Sure Start and Troubled Families campaigns),[35] or highlighting the prevalent (desirable) norm to leverage social proof (e.g. comparing households energy consumption to more efficient neighbours.[36])

Often, transformative change might require multiple interventions to address multiple barriers across these dimensions of the choice environment (e.g. reducing cost, removing hassle, making good options more available and safe). A good example is the mass adoption of cycling as a mode of transport in the Netherlands. 36% of Dutch people list the bicycle as their most frequent way of travelling on a typical day.[37] This high rate of bicycle travel has been

[29] Antić, B., Pešić, D., Vujanić, M., & Lipovac, K. (2013). The influence of speed bumps heights to the decrease of the vehicle speed–Belgrade experience. *Safety Science*, *57*, 303-312.
[30] www.nytimes.com/2016/06/13/world/europe/a-london-subway-experiment-please-dont-walk-up-the-escalator.html
[31] Kraus, S., & Koch, N. (2021). Provisional COVID-19 infrastructure induces large, rapid increases in cycling. *Proceedings of the National Academy of Sciences*, *118*(15).
[32] Croker, H., Packer, J., Russell, S. J., Stansfield, C., & Viner, R. M. (2020). Front of pack nutritional labelling schemes: a systematic review and meta-analysis of recent evidence relating to objectively measured consumption and purchasing. *Journal of Human Nutrition and Dietetics*, *33*(4), 518-537.
[33] Wilson, N., & Thomson, G. (2005). Tobacco tax as a health protecting policy: a brief review of the New Zealand evidence. NZ Med J, 118(1213), U1403.
[34] Garnett, E. E., Balmford, A., Sandbrook, C., Pilling, M. A., & Marteau, T. M. (2019). Impact of increasing vegetarian availability on meal selection and sales in cafeterias. *Proceedings of the National Academy of Sciences*, *116*(42), 20923-20929.
[35] www.gov.uk/government/publications/national-evaluation-of-the-troubled-families-programme-2015-to-2020-findings
[36] Allcott, H. (2011). Social norms and energy conservation. Journal of public Economics, 95(9-10), 1082-1095.
[37] European Commission. (2014). *Quality of Transport report*.

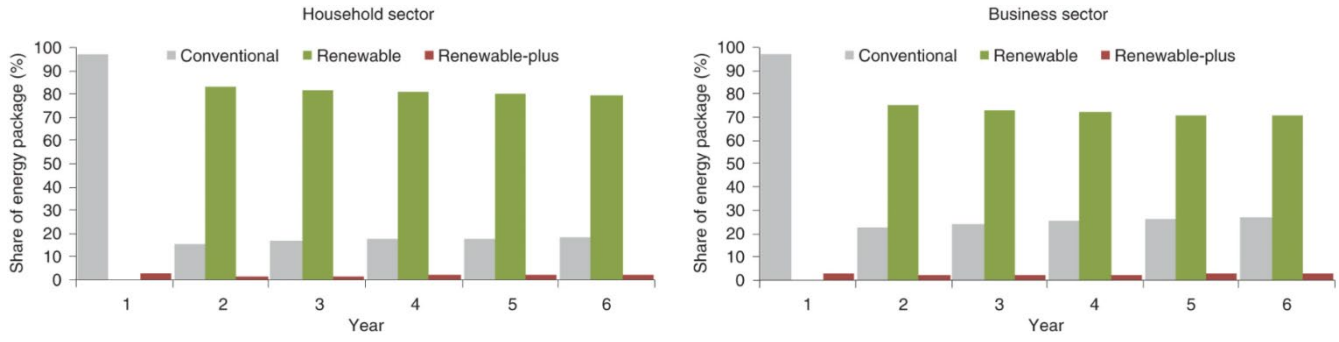
achieved through a combination of government interventions: urban pedestrianisation, car free Sundays, provision of separated bicycle pathways,[38] modified traffic laws to protect young cyclists (defaulting the responsibility for an accident onto the car driver),[39] and mass provision of bicycle storage at train stations and workplaces.[40] The combined effect of these interventions far exceeds any evidence from efforts to simply inform or implore people to cycle more.

Principle 4. Make it the default, where possible

People have a strong tendency to stick with the current status quo, or to forgo an active decision. Accepting the default outcome is not only the low-effort option, but can also be perceived as an implicit recommendation, norm, or safe choice. A commonly used and effective intervention is therefore to set the default option so that the desirable behaviour is realised if no action is taken. This retains individual agency to choose differently. The canonical example in the UK is automatic pension enrolment which boosted the number of employees enrolled up to 78% by 2020 (compared to less than 50% in 2012 before the policy was introduced) [41] resulting in more than 10 million additional savers. [42]

Defaults have also been used to nudge consumers into climate friendly choices. A trial in Switzerland defaulted over 200,000 households and 8000 enterprises into green energy plans and found that over 80% chose to stick (Fig. 5).[43] Importantly, the effects were largely stable over a time span of at least four years indicating that consumers were likely satisfied with their decision.

Figure 5. The shares of conventional and renewable packages per year for households (left) and enterprises (right) are shown before and after they were defaulted into the green option in year 2. Note renewable uptake jumps from close to 0% to 70-80%.



[38] Pucher, J., & Buehler, R. (2007). At the frontiers of cycling. Policy innovations in the Netherlands, Denmark, and Germany.
[39] Slimmen, M., & Van Boom, W. H. (2017). Road traffic liability in the Netherlands. *Available at SSRN 2975796*.
[40] www.centreforpublicimpact.org/case-study/focusing-bicycles-transport-urban-netherlands
[41] www.ons.gov.uk/employmentandlabourmarket/peopleinwork/workplacepensions/bulletins/annualsurveyofhoursandearningspensiontables/2020provisionaland2019finalresults
[42] Cribb, J., & Emmerson, C. (2016). *What happens when employers are obliged to nudge? Automatic enrolment and pension saving in the UK* (No. W16/19). IFS Working Papers.
[43] Liebe, U., Gewinner, J., & Diekmann, A. (2021). Large and persistent effects of green energy defaults in the household and business sectors. *Nature Human Behaviour*, 1-10.

How might this apply to Net Zero?

Net Zero policy should consider where it is appropriate to default individuals or organisations into climate friendly behaviours. For instance, individuals can be defaulted into climate friendly ethical investment pension plans, default energy tariffs can be mandated to have a high blend of renewables, airline customers can be defaulted into carbon offsets, and plant-based food can be the default choice in school or government public canteens and events.

Principle 5. Make it easy: remove hassles, provide easy substitutes, and get the timing right

According to Nobel Laureate Richard Thaler, author of 'Nudge', the first rule of behaviour change is to 'make it easy'. A large body of research confirms that convenience matters a great deal, and seemingly trivial frictions and points of hassle are often disproportionately disruptive. This has been observed with past government interventions including the UK's Green Deal and Green Homes grants, where otherwise good and generous policy is dampened by hassle in uptake.

For widespread voluntary adoption: cycling needs to be as easy as driving; buying plant-based food needs to be as easy as buying meat; travelling by long-distance train needs to be as easy as flying; repairing needs to be as easy as replacing; and buying a heat pump needs to be as easy as buying a replacement boiler. Currently, this is rarely the case, by a significant margin.

We have identified three key strategies which can be applied in a variety of contexts:

First, **reduce the hassle factors**. This will require a behavioural analysis of a particular target behaviour to identify 'frictions' in adoption. For example, heat pump adoption can be complicated by certain planning requirements, difficulty finding surveyors, difficulty understanding noise requirements, longer lead-times compared to a boiler, poor familiarity with the technology, additional hassle of upgrading property energy efficiency, and so on – each of these barriers may require attention. An assessment of electric vehicle adoption, or active travel, or diet change, will similarly reveal a range of frictions to remove. These may require big changes (e.g. infrastructure improvement) or a focus on the smallest details. For example research shows that even removing a single 'mouse click' from an online application can significantly increase compliance and completion.[44]

Second, Provide easy substitutes for undesirable behaviours. Many behaviours, such as our dietary and mobility choices, are habitual and ingrained. We are also more sensitive to the losses associated with giving up an entrenched behaviour than the benefits. It is often easier in these cases to substitute one behaviour for another which satisfies the same routines, habits, and preferences. Good substitutes should require minimal learning, effort or abstinence (e.g. *'it's just as tasty, and a little healthier'*). **Having a good substitute in place should also be a precursor for a future ban,** for instance the UK ban on petrol and diesel vehicles will rely on the widespread availability of electric vehicles and supporting infrastructure, including for those least able to pay or with least access to infrastructure, to ensure fairness for all.

[44] Behavioural Insights Team (2014). EAST. *Four Simple Ways to Apply Behavioural Insights*.

A good example of effective substitution is the allowance of e-cigarettes and vaping to aid people to quit smoking. Widespread adoption has provided a radically easier route to giving up tobacco, leading to higher rates of smoking abstinence.[45] The availability of e-cigarettes resulted in an additional 22,000-57,000 quitters in 2016 alone,[46] and effects remain 5-years later across 2021 studies, [47] meta-analyses,[48] and reviews.[49] Indeed, up to 4.2 million ex-smokers self-reported using vapes during quit attempts by 2019. [50]

Third, get the timing right. It is important to consider a.) when an intervention might be most relevant or close to the moment of decision-making, and b.) at what point a behaviour or habit might be easiest or most open to change, often because a 'decision moment' has been forced or because barriers to action are temporarily removed through circumstance. For example, commuting habits are much more easily disrupted when someone has just moved house or job. This was demonstrated in a BIT trial encouraging adoption of a cycle share scheme in Portland, USA. Promotional leaflets were distributed, and though uptake was low across the board (highlighting that information provision is often a weak intervention), uptake was nearly 4 times higher among those who had just moved home to the area (Figure 6).

Figure 6. Success of Cycling Promotion Campaign when timed to target new movers



How might this apply to Net Zero?

Many low-carbon behaviours are currently too difficult, and it is critical that governments build an enabling environment that makes the right behaviour the easy option. To promote EV adoption, this will include higher density of charge points, quicker charging, and viable solutions for those without off-street parking. Timely prompts, for example among those who

[45] Hajek, P., Phillips-Waller, A., Przulj, D., Pesola, F., Myers Smith, K., Bisal, N., ... & Ross, L. (2019). A randomized trial of e-cigarettes versus nicotine-replacement therapy. New England Journal of Medicine, 380(7), 629-637.
[46] Public Health England (2018). Evidence review of e-cigarettes and heated tobacco products 2018. Retrieved from: www.gov.uk/government/publications/e-cigarettes-and-heated-tobacco-products-evidence-review
[47] McDermott, M. S., East, K. A., Brose, L. S., McNeill, A., Hitchman, S. C., & Partos, T. R. (2021). The effectiveness of using e-cigarettes for quitting smoking compared to other cessation methods among adults in the United Kingdom. *Addiction*.
[48] Wang, R. J., Bhadriraju, S., & Glantz, S. A. (2020). E-Cigarette Use and Adult Cigarette Smoking Cessation: A Meta-Analysis. *American Journal of Public Health*, (0), e1-e17.
[49] www.cochrane.org/CD010216/TOBACCO_can-electronic-cigarettes-help-people-stop-smoking-and-do-they-have-any-unwanted-effects-when-used
[50] https://ash.org.uk/media-and-news/press-releases-media-and-news/in-2019-around-half-as-many-britons-now-vape-as-smoke-and-the-majority-are-ex-smokers/

are making a total-loss claim on their vehicle or who are learning to drive, may also be helpful. For heat pump adoption and energy efficiency upgrades, a radical simplification of the customer journey is required, while simultaneously removing frictions for other actors critical to uptake, such as installers and surveyors. The timeliest moments to intervene may be when moving house, or aligning with the far bigger 'home improvement' sector to encourage energy efficiency upgrades when building an extension, new kitchen or simply redecorating. A shift towards mains hydrogen heating, though facing technical challenges, may provide a more compelling behavioural substitute requiring less individual effort. To encourage sustainable diets, options must be made more available in restaurants and supermarkets, and small frictions like lack of knowledge and skills (among consumers but also professional chefs) can be addressed with tips, recipes, and training. Supporting the food sector to develop low-carbon options such as meat-veg blended products, or new plant-based alternatives, reduces the hassle for consumers by providing an easy and appealing substitution. Timely moments for diet shift will include targeting those learning to shop and cook for the first time, such as students.

Principle 6. Leverage social norms and visibility

Humans are deeply social creatures, and we have a powerful tendency to conform. This trait exists partly for reasons of social cohesion (cooperation, social acceptance, conflict avoidance and identity expression) and partly for informational reasons (the behaviour of others indicates what is appropriate, safe, rewarding – for example, would you infer that a busy restaurant or an empty restaurant serves the better food?) Integral to this trait is an obligation to reciprocate. If others are doing their bit, we're more inclined to do likewise. This is highly relevant to climate behaviours where individual action may require personal cost but benefits are distributed, with little personal reward. Without observing that others are also acting there is a risk of helplessness ('I'm a drop in the ocean'), and without a degree of social pressure to also chip in, a risk of freeloading (a tragedy of the commons).

Conventional economic solutions to these collective action problems include regulation of harmful behaviours, or Pigouvian taxes (e.g. strong 'polluter pays' principles). These are often effective solutions, but cannot easily be imposed on every aspect of citizen life. Governments should therefore consider how we can leverage social accountability as a softer solution to encouraging pro-environmental behaviour.

We touched on this under principle 3, suggesting governments can lead by example. We consider that an upstream strategy since it is broad (non-targeted) and seeks to align the normative values of our institutions with sustainability. But governments can also target specific behaviours, seeking to make sustainable actions normative and socially desirable, and unsustainable actions counter-normative, or even socially unacceptable. Recent experience encouraging citizens to maintain social distance or wear face masks provides an illustrative example: initially counter-normative for many societies, but ultimately normal, and even socially unacceptable to contravene.

One widely proven strategy is to communicate the desirable social norm, or draw a useful social comparison which implies one. For example, telling people that most people recycle,[51] or use less energy,[52] leads to more people doing the same. Where behaviours are not yet the norm, communicating the 'dynamic norm' (i.e. highlighting that more and more people are starting to do something) has also been shown to be effective, for example in promoting sustainable food choices.[53]

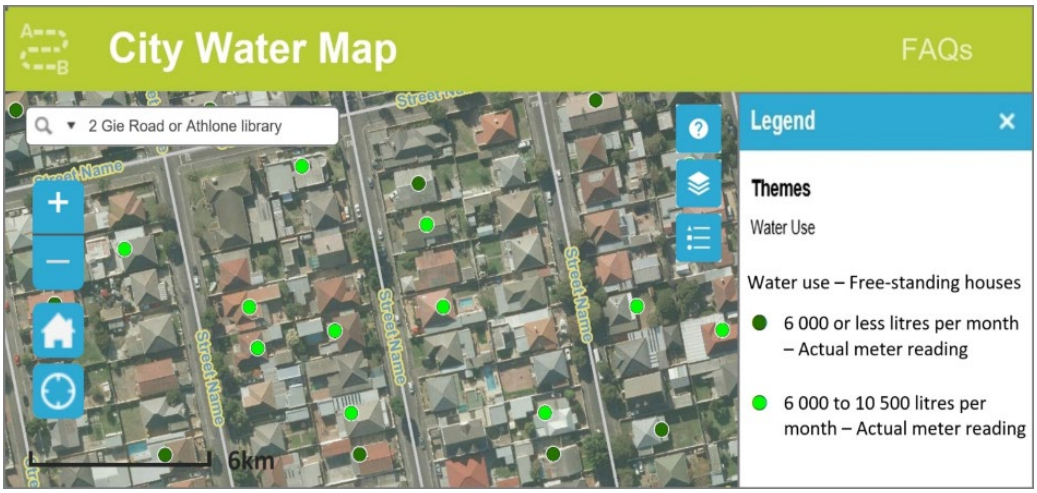
It is also possible to make desirable behaviours more visible to normalise them. For instance, research shows that solar panels are contagious, and more so when installed visibly, e.g. front of house.[54] This is also the logic of the UK's recently introduced green number plates for electric vehicles which are increasingly prevalent on UK roads.[55]

Making behaviours visible can not only help normalise good behaviours, but can also increase the 'social cost' of behaviours which are disapproved (counter-normative) – in other words, 'naming and shaming'. Clearly not a tactic to be used carelessly, but a compelling example comes from Cape Town's 'day zero' drought prevention campaign. During the 2018 drought, after punitive and restrictive measures to promote household water-use reduction were deemed unsuccessful, the government introduced a social comparisons map of the city[56] that displayed household water-use (Figure 7). This intervention, alongside a suite of others, contributed to Cape Town successfully avoiding 'Day Zero', and the taps were not turned off.[57]

The same can be true for organisations: when the UK government published a league table of departments' energy use, it dropped by an average of 13.8%. Another example can be found in *the introduction of Gender Pay Gap reporting* (with changes to the Equality Act in 2017[58]). This has reduced the pay gap by shedding light on existing inequalities, and leveraging soft pressure for firms to live up to the normative values of society.[59] Indeed, simply letting people or organisations know their actions are observed can have an impact. For example a study in which pilots' fuel use was measured found that mere observation led to fuel savings.

[51] Cialdini, R. B. (2003). Crafting normative messages to protect the environment. *Current directions in psychological science*, *12*(4), 105-109.
[52] Allcott, H. (2011). Social norms and energy conservation. *Journal of public Economics*, *95*(9-10), 1082-1095.
[53] Sparkman, G., & Walton, G. M. (2017). Dynamic norms promote sustainable behavior, even if it is counternormative. *Psychological science*, *28*(11), 1663-1674.
[54] Graziano, M., & Gillingham, K. (2015). Spatial patterns of solar photovoltaic system adoption: the influence of neighbors and the built environment. *Journal of Economic Geography*, *15*(4), 815-839.
[55] www.gov.uk/government/news/road-to-zero-in-sight-as-green-number-plates-introduced-on-uk-roads
[56] https://citymaps.capetown.gov.za/waterviewer/
[57] https://behavioralscientist.org/how-cape-town-used-behavioral-science-to-beat-its-water-crisis/ www.bloomberg.com/news/articles/2019-04-12/looking-back-on-cape-town-s-drought-and-day-zero
[58] www.legislation.gov.uk/ukdsi/2017/9780111152010
[59] Blundell, J. (2020). Wage responses to gender pay gap reporting requirements. *Available at SSRN 3584259*.

Figure 7. Cape Town's Water Environmental Economics Policy Research Unit (EPRU) Water Map



How could this apply to Net Zero?

This is a strategy which has been commonly applied to environmental behaviours, as the examples cited above reveal, and there is scope to use it liberally. To give a few examples: make it more visible when homes are retrofitted (e.g. estate-agent-style signs outside); normalise plant-based food by integrating it through menus and shops rather than in 'special' aisles; and mandate large or publicly traded firms to publish their environmental impacts similar to the gender pay reporting. There are also other aspects of an enabling social environment which governments can foster, which we do not cover in detail above, but may include helping create *social opportunities* for low-carbon behaviours (for instance promoting food-waste sharing communities), or providing the *resources necessary for collective and socialised action* (e.g. funding for repair cafes, or subsidies for group cycling safety lessons).

Principle 7. Financial incentives

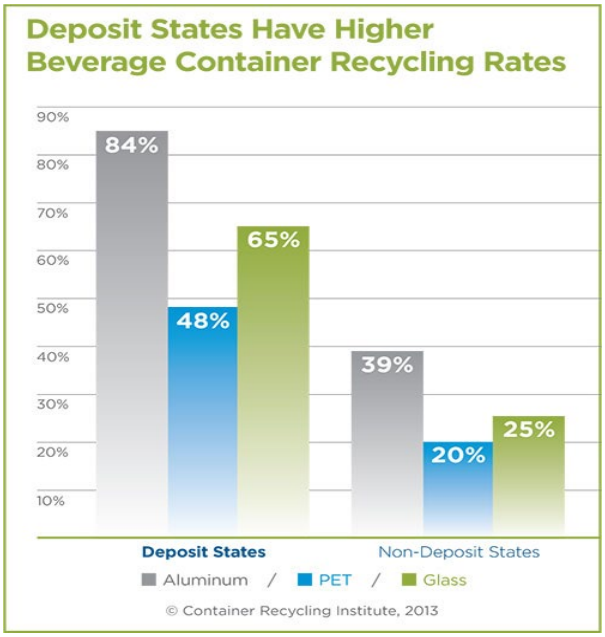
Though concern for the environment is high, and survey data often shows high willingness to adopt behaviours in principle, our willingness to pay or accept penalties (e.g. raised fuel duty) is often low.[60] Cost is also frequently cited as one of the main barriers to adoption, for example for heat pumps,[61] electric cars,[62] [63] or more energy-efficient or sustainable consumer goods.[64]

These cost barriers can be addressed head-on through the use of financial incentives (subsidies, grants, prize-draws), and disincentives (levies, taxes, fines). For example, in UK surveys recycling is often the most cited behaviour that people are willing to adopt, and report doing for the environment – indeed support for recycling is very high. However, the recycling rate was only 44% by 2020.[65] In contrast, Norway, like many countries, has a deposit return

[60] Ipsos MORI (2019) Is climate change important to consumers?
[61] Mahapatra, K., & Gustavsson, L. (2008). An adopter-centric approach to analyze the diffusion patterns of innovative residential heating systems in Sweden. *Energy Policy*, *36*(2), 577-590.
[62] Behavioural Insights Team, for Department of transport (2020) Driving and Accelerating Uptake of Electric Vehicles.
[63] Haustein, S., & Jensen, A. F. (2018). Factors of electric vehicle adoption: A comparison of conventional and electric car users based on an extended theory of planned behavior. *International Journal of Sustainable Transportation*, *12*(7), 484-496.
[64] Weisstein, F. L., Asgari, M., & Siew, S. W. (2014). Price presentation effects on green purchase intentions. *Journal of Product & Brand Management*.
[65] https://wrap.org.uk/taking-action/collections-recycling

scheme incentivising recycling, and see 97% compliance with recycling of bottles.[66] Indeed, deposit return schemes around the world show success (Fig 8).

Figure 8. The effectiveness of DRS compared to non-DRS



There is a substantial body of research on incentives, which we do not cover here because this expertise is well established within the UK government. However, several behavioural factors are worth highlighting:

- Incentives carry psychological value as well as economic value. For example, the UK's plastic bag levy is merely symbolic in monetary value, but led to an 86% drop in bag use,[67] largely because it created a new default (principle 4 - *you must now ask for one*), acted as a timely prompt (principle 5 – *timeliness*) and highlights the social norm (principle 6 – *it became less socially acceptable to use one*).
- There is some evidence that financial incentives and disincentives can sometimes backfire, because they licence the behaviour being discouraged *('I'm paying for it')*[68] or signal undesirability and crowd out intrinsic motivations ('*why else would government pay for it?'*). However, these seem to be the exception rather than the rule, and for the most part incentives are effective.
- Incentives can sometimes be made more effective by integrating behavioural insights. For instance, lotteries and prize draws can be more effective than small, fixed rewards, £-for-£, due to our tendency to focus on the size of the prize and overweight small probabilities. For example, where small fixed-price incentives for CAVOID-19 vaccinations have had mixed effects (including deterring some), eye-catching prize draws have proven effective in some US states.[69]
- The framing of incentives matters a great deal, particularly with respect to losses vs gains. For instance our own research suggests a relative raise in VAT for combustion

[66] www.bbc.co.uk/news/science-environment-42953038
[67] www.gov.uk/government/news/plastic-bag-sales-in-big-seven-supermarkets-down-86-since-5p-charge
[68] Gneezy, U., & Rustichini, A. (2000). A fine is a price. *The Journal of Legal Studies*, *29*(1), 1-17.
[69] https://fortune.com/2021/05/28/covid-vaccine-lottery-psychology-government-incentives-cash-payout/

vehicles would be less publicly acceptable than a relative reduction in VAT for electric vehicles.[70] This aligns with foundational behavioural science research highlighting the importance of reference points,[71] and of fairness (i.e. rewarding new good behaviour vs. punishing the incumbent norm).

- Fairness is crucial when designing incentives, both to address the biggest cost barriers among those least able to pay, and to maintain broad public support for policy (see principles 8 and 9). However, there may be cases where financial support (or disincentives) need to be targeted at larger businesses who sometimes face *dis*economies of scale. For example, installing 300 EV charge-points can cost significantly more than 300x the cost of one charge-point, due to necessary upgrades to transmission infrastructure. It is imperative that businesses do take these steps, in part because commercial fleet adoption of EVs is the quickest route to EVs entering the second-hand market. However, most businesses will not do this unless the commercial incentives are aligned.

How might this apply to Net Zero?

There are many low-carbon behaviours where cost is a limiting factor, and many others where incentives or disincentives would accelerate adoption. These include the continuation of subsidies on electric vehicles until they are closer to cost parity; generous subsidies for early adoption of heat pumps while costs are high; energy efficiency retrofits; and penalties for frequent flyers (principally businesses, rather than penalising holiday-makers). Other recurring incentives which are small in monetary value but loom large in consumers' minds may also help, for example free parking for EVs.

[70] Behavioural Insights Team, for Department of transport (2020) Driving and Accelerating Uptake of Electric Vehicles.
[71] Kahneman, D., & Tversky, A. (2013). Prospect theory: An analysis of decision under risk. In *Handbook of the fundamentals of financial decision making: Part I* (pp. 99-127).

3.5 Acting Downstream – 'Swim Harder!' Motivate citizens to take actions where they can, and build support for policy

A common thread through this report is that it is *generally* preferable to act upstream or midstream to make low-carbon behaviours easier, reducing the burden of action on citizens, than it is to ask them to make different choices within the existing high-carbon choice environment. Further, the weight of evidence shows that information provision alone is a weak driver of behaviour.[72]

However, citizens do still have agency, and often an appetite, to change their behaviour. And indeed, acting upstream is not always feasible, and so there may still be a need to ask citizens to take the right steps where they can to drive both individual and collective action. The evidence shows there are more and less effective ways of doing this.

It is also important to note that downstream behaviour *can* have upstream impacts. For example, if enough people choose to start eating plant-based food, this creates the commercial incentives to expand product ranges and dedicate more shelf space. These are significant changes to the choice environment, encouraging and enabling more consumers to try it, and so on. In other words, downstream action can sometimes be the starting point for triggering virtuous cycles of change – particularly if feedback loops can be triggered within dynamic markets (see principle 2).

There is therefore still value in targeting citizens to take direct action where they can, though such asks should generally be judicious, recognising that individual effort, attention and willpower are all precious resources.

Further, acting downstream is not all about behaviour change – effective messaging and 'winning hearts and minds' is also critical to garnering public support for bold climate policy, and therefore supports the implementation of policy both up and downstream.

Principle 8. Build a positive and fair narrative around co-benefits and clear asks

People are storytellers, viewing the world in terms of characters and motives, journeys and challenges, heroes and villains, victories and losses – more so than in terms of data or abstractions. It is therefore important that the story of Net Zero is a compelling one, which provides the public with a clear, fully justified vision that aligns with a community's values. Governments play an important role in convening and shaping the language of public discourse, as in the case of the Brexit debate for example. Great societal mobilisations during the war and post-war years were also built on compelling narratives (e.g. Churchill's casting the UK as the last bastion of humanity no less, Roosevelt's 'fear of fear itself', Kennedy's 'choice to conquer the Moon', or Thatcher and Reagan's extolling of virtues of neoliberalism set against the background of a fight with the 'Empire of Evil').

[72] Snyder, L. B., Hamilton, M. A., Mitchell, E. W., Kiwanuka-Tondo, J., Fleming-Milici, F., & Proctor, D. (2004). A meta-analysis of the effect of mediated health communication campaigns on behavior change in the United States. *Journal of health communication*, *9*(S1), 71-96.

Our research and engagement with experts identified several key elements to a successful narrative for Net Zero:

- **Positive tends to out-perform negative**. Though environmental campaigns have often drawn on negative messaging (based on guilt, eco-anxiety, or admonishment), research shows that positive messaging (e.g. based on pride and future-optimism) increase engagement and adherence to pro-environmental messages.[73]
- **Attaching narratives to clear asks is important to mitigate helplessness or inertia.** Making pro-environmental choices is often extremely complex with many trade-offs to make, and encouraging people to care, without a clear understanding of what they can do about it, can risk wasting public will.
- **The co-benefits are plentiful, so should be emphasised.** Research suggests that although concern for the environment is high, it is often a 'nice to have' and does not overrule self-interested motives for enjoyment, affordability, convenience, and health. Research shows people are generally more willing to be nudged for their own benefit (pro-self, e.g. pro-health) than for others' benefit (pro-social, e.g. pro-environmental).[74] The Net Zero narrative can therefore be framed not only around the importance of the environment, but around economic or public health benefits. Research on these specific framings is mixed, with different frames tending to resonate with different groups depending upon their values[75] – but overall, health framings, [76] and positive messaging, [77] [78] regularly perform well.
- **Be aware of counter narratives, which are inevitable.** Examples range from health-scares over new technologies, to anti-vax narratives leading to new measles outbreaks in locations the disease was previously considered eliminated.[79]
- **Fairness is vital.** The benefits of the Net Zero transition must be felt by all not only as a moral imperative, but also to maintain strong public support, and willing individual action. A recent French diesel tax proposed by Emmanuel Macron, leading to protests over disproportionate impacts on low-income groups (despite broad support for the underlying environmental objectives), shows how lack of fairness can undermine policy success. Policies can often generate winners and losers, particularly when a major economic and industrial transition means whole sectors (fossil fuel extraction, combustion vehicle mechanics, livestock farming etc.) may feel threatened by the public narrative, or need to pivot their skillsets to new industries. Here lessons can be learnt from past economic transitions, such as closure of mines under Thatcher without

[73] Schneider, C. R., Zaval, L., Weber, E. U., & Markowitz, E. M. (2017). The influence of anticipated pride and guilt on pro-environmental decision making. PloS one, 12(11), e0188781
[74] Hagman, W., Andersson, D., Västfjäll, D., & Tinghög, G. (2015). Public views on policies involving nudges. Review of Philosophy and Psychology, 6(3), 439-453.
[75] Sapiains, R., Beeton, R. J., & Walker, I. A. (2016). Individual responses to climate change: Framing effects on pro-environmental behaviors. *Journal of Applied Social Psychology*, *46*(8), 483-493.
[76] Myers, T. A., Nisbet, M. C., Maibach, E. W., & Leiserowitz, A. A. (2012). A public health frame arouses hopeful emotions about climate change. *Climatic change*, *113*(3), 1105-1112.
[77] Jacobson, S. K., Morales, N. A., Chen, B., Soodeen, R., Moulton, M. P., & Jain, E. (2019). Love or Loss: Effective message framing to promote environmental conservation. Applied Environmental Education & Communication, 18(3), 252-265.
[78] Stecula, D. A., & Merkley, E. (2019). Framing climate change: economics, ideology, and uncertainty in American news media content from 1988 to 2014. *Frontiers in Communication*, *4*, 6.
[79] Hussain, A., Ali, S., Ahmed, M., & Hussain, S. (2018). The anti-vaccination movement: a regression in modern medicine. *Cureus*, *10*(7).

adequate compensation or re-training.[80] A similar spirit to that under COVID-19, of '*nobody should be penalised for doing the right thing'*, should be maintained. There is a large body of literature on achieving a just transition to a low carbon economy, which we do not cover in this report – though we emphasise that this is absolutely paramount.

Principle 9. Build a strong public mandate, but don't underestimate our ability to adapt

Public support doesn't always align with the best policy. Citizens may simultaneously express strong support for climate action (broadly speaking), but prefer policies that are less restrictive, costly or intrusive, even when they are less effective.[81] The most effective policy will therefore be the one that maximises impact within the bounds of public acceptability. A valid application of behavioural science is therefore to better understand the factors that influence acceptability of policy.

A modest body of research on this topic suggests public support for policy can be improved by clearly communicating the rationale; highlighting the benefits of the policy; highlighting the policy's effectiveness[82] [83]; ensuring fairness; and framing behaviour-change asks as pro-self rather than pro-other.[84]

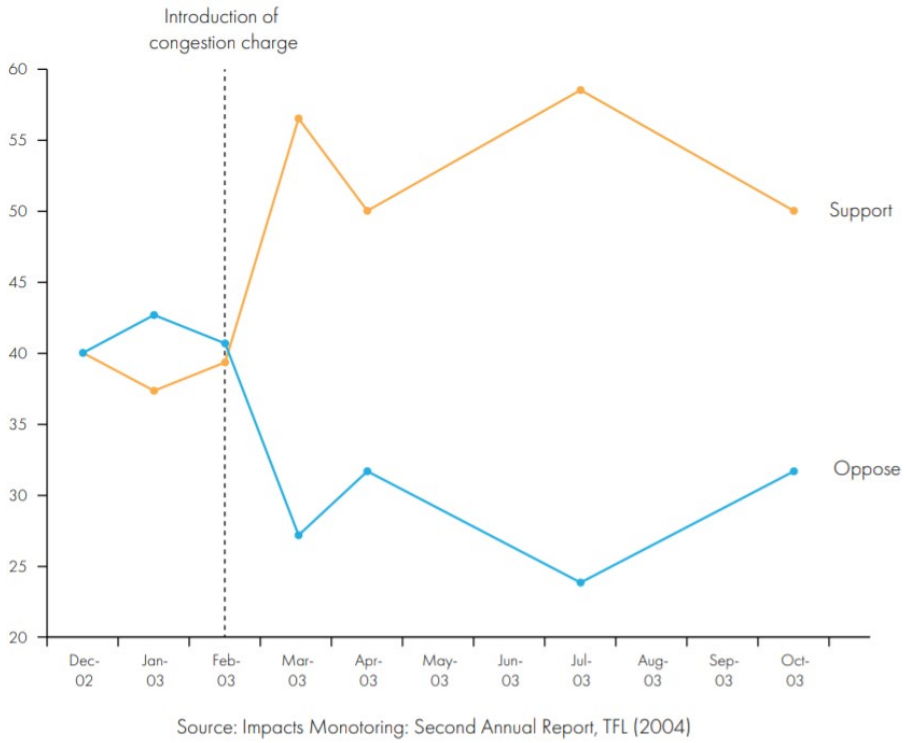
The use of public consultations, citizen assemblies and deliberative fora have also been shown to unblock difficult policy decisions time and again, from climate assemblies, to juries on gay marriage and abortion laws. Recent climate assemblies in particular have revealed that public support often exists for bold action, if the public are given the information and time to consider the issue deeply. Not only can these approaches shed light on a strong mandate for action, but can also result in a greater breadth of creative solutions that represent a wider spectrum of perspectives, and with sufficient fanfare around the events, can be an opportune moment to engage the wider public in an important issue.

All of this said, policymakers may also underestimate the public's readiness to change, and the degree to which we readily adapt to policy. Public support frequently shifts towards the positive after a policy is introduced, since we perceive anticipated losses more strongly than unexperienced gains (loss aversion, and status-quo bias). For example, public support for the London congestion charge increased and opposition decreased almost immediately after it was introduced (see Figure 9 below). A similar shift in attitudes was observed during the

[80] Fieldhouse, E., & Hollywood, E. (1999). Life after mining: hidden unemployment and changing patterns of economic activity amongst miners in England and Wales, 1981-1991. *Work, employment and society*, *13*(3), 483-502.
[81] Diepeveen, S., Ling, T., Suhrcke, M., Roland, M., & Marteau, T. M. (2013). Public acceptability of government intervention to change health-related behaviours: A systematic review and narrative synthesis. *BMC Public Health*, *13*(1).
[82] de Boer, J., de Witt, A. & Aiking, H. (2016). Help the climate, change your diet: A cross-sectional study on how to involve consumers in a transition to a low-carbon society. Appetite. 98, pp19-27
[83] Marteau, T. M. (2017). Towards environmentally sustainable human behaviour: targeting non-conscious and conscious processes for effective and acceptable policies. Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences, 375(2095)
[84] Hagman, W., Andersson, D., Västfjäll, D., & Tinghög, G. (2015). Public views on policies involving nudges. Review of Philosophy and Psychology, 6(3), 439-453

introduction of the UK's plastic bag levy in 2015 – it was both effective,[85] and significantly more popular 1 month later than before it was rolled out.[86]

Figure 9. Public support for the London congestion charge before and after implementation[87]



Source: Impacts Monotoring: Second Annual Report, TFL (2004)

[85] UK, G. (2019). Plastic bag sales in "big seven" supermarkets down 86% since 5p charge. *GOV. UK*, *27*.
[86] Poortinga, W. Sautkina, E. Thomas, G.O, and Wolstenholme, E. (2016). The English Plastic Bag Charge: Changes in Attitudes and Behaviour. Cardiff: Welsh School of Architecture/School of Psychology, Cardiff University.
[87] www.bi.team/wp-content/uploads/2020/03/BIT_Report_A-Menu-for-Change_Webversion_2020.pdf.pdf

3.6 Principles of sound policy making

Whatever mission the government sets to achieve, to succeed it will be crucial to use sound policy-making methods throughout design, implementation and evaluation. We emphasise five points below of relevance to Net Zero policy, which, while likely to seem self-evident to experienced policymakers, bear repeating as they can 'make or break' a policy, and include issues which still commonly arise.

A. Build policy on evidence

'Evidence-based policy-making' has been on the rise in the UK for the past two decades, and COVID-19 has shone a particularly bright light on the connection between scientific research and policy. However, **use of evidence is still far from being mainstream**. For instance, still only 1 in 10 major government projects have had any evaluation component, as of last year.[88] Many high-profile policies have failed due the lack of reliance on evidence, as examples such as the UK obesity policy[89] or the US' 'War on drugs'[90] demonstrate. The latter punitive approach to drugs - as compared to more humanitarian approaches[91] - remains the mainstay today, despite the evidence showing it has enormous human and financial costs, and only a small impact on drug consumption.[92]

The journey to Net Zero should be framed as strongly around 'following the science' as our COVID-19 response, even where that creates a need to work harder to bring the public along. In practice, this should include close cooperation with experts (including social and behavioural scientists early in policy development), continuing to explore multiple solutions to a single issue as evidence develops, readiness to test and iterate our approach as we go, and wherever possible draw on and continue to build on evidence on what works to address climate change.

B. Implementation, implementation, implementation

Without meticulous planning and attention to detail, particularly of 'last mile' issues on the ground, good policy can fall flat. Recent evidence shows that policymakers and politicians, like all of us, suffer from optimism/overconfidence bias - the more so, the more senior they are – meaning that they tend to overestimate how successful and cost-effective a policy will be.[93] Case in point are large infrastructure projects - a review of 258 public transportation infrastructure projects conducted between 1910 and 1998, mostly in Europe and the US, with a collective cost of $90 billion found that, on average, project costs were 28% higher than expected, and they were underestimated for almost 9 out of 10 projects.[94]

[88] www.gov.uk/government/speeches/the-privilege-of-public-service-given-as-the-ditchley-annual-lecture
[89] Theis, D., & White, M. (2020). Is obesity policy in England fit for purpose? Analysis of government strategies and policies, 1992-2020.
[90] Falco, M. (1996). US drug policy: Addicted to failure. *Foreign Policy*, (102), 120-133.
[91] Mehrolhassani, M. H., Yazdi-Feyzabadi, V., Hajebi, A., & Mirzaei, S. (2019). Cross-country Comparison of Treatment Policies Facing the Drug Abuse in Five Selected Countries. *Addiction & health*, *11*(2), 81.
[92] Falco, M. (1996). US drug policy: Addicted to failure. *Foreign Policy*, (102), 120-133.
[93] Liu, X., Stoutenborough, J., & Vedlitz, A. (2017). Bureaucratic expertise, overconfidence, and policy choice. Governance, 30(4), 705–725
[94] Flyvbjerg, B., Holm, M. S., & Buhl, S. (2002). Underestimating costs in public works projects: Error or lie? Journal of the American Planning Association, 68(3), 279–295.

Some of the most common policy pitfalls are seemingly small 'frictions' in front-line delivery: how seamless is it to apply for a grant? Or find a reliable installer? Or make a surveyor appointment? **It should be de-rigueur to undertake pre-mortems, 'red teaming'** (constructive criticism by adjacent teams)**, and for policy makers to try the policy processes themselves**, before expecting the public (who will typically be less knowledgeable or interested) to do so in large numbers.

C. Beware of unintended consequences

Behaviours rarely occur in isolation. Rather civic behaviours and practices are largely interconnected and related to deeper citizen needs. For instance, we don't need to travel in certain ways, but we do need to earn a living, educate our children, have food in the house and socialise, and these things largely require travel. Intervening on one aspect of this behavioural ecosystem will therefore likely have unexpected impacts on other aspects.

Well intentioned policies can therefore **backfire if they don't consider the wider system of interrelated patterns of behaviours and citizen needs.** For example**,** government interventions to ban the use of single-use carrier bags can be highly effective when evaluated narrowly, but can increase the use of more harmful alternatives.[95] These unintended impacts are crucial for Net Zero policy where success can never be measured in terms of impacts on individual behaviours, but rather on the collective whole. Will large-scale heat-pump adoption exacerbate emissions due to leakage of refrigerant chemicals? Will mass EV-adoption lead to another environmental disaster due to unscrupulous extraction or rare-earth minerals for batteries? Will shifts to more sustainable diets lead to unhealthier ones, or vice versa? Will a fixation on reduced plastic use lead to more carbon-intensive alternatives such as glass? And so on.

D. Big challenges often require big solutions, as well as attention to detail

Big problems often require big solutions and strong action from the government. Though it is a maxim of behavioural policy making to show that small changes can have out-sized impacts, there is also a great risk that small tweaks will fail to achieve the systemic changes required - only iterating towards a localised optimum solution within the current 'way of working'.

There is also some evidence to suggest that a focus on softer interventions (e.g. nudges and information provision) can reduce appetite for taking bolder action. In other words 'doing something' can undermine 'doing what's really needed'.[96] Importantly, softer approaches are generally more popular with voters and policymakers,[97] even when there is less or no evidence for their effectiveness.[98] Looking at past government-led initiatives, significant societal behaviour changes related to, for instance, reductions in harm from *smoking*, increasing

[95] Nielsen, T. D., Holmberg, K., & Stripple, J. (2019). Need a bag? A review of public policies on plastic carrier bags–Where, how and to what effect?. *Waste management*, *87*, 428-440.
[96] Hagmann, D., Ho, E. H., & Loewenstein, G. (2019). Nudging out support for a carbon tax. Nature Climate Change. https://doi.org/10.1038/s41558-019-0474-0
[97] Petrescu, D. C., Hollands, G. J., Couturier, D. L., Ng, Y. L., & Marteau, T. M. (2016). Public acceptability in the UK and USA of nudging to reduce obesity: The example of reducing sugar-sweetened beverages consumption. PLoS ONE.
[98] Diepeveen, S., Ling, T., Suhrcke, M., Roland, M., & Marteau, T. M. (2013). Public acceptability of government intervention to change health-related behaviours: A systematic review and narrative synthesis. BMC Public Health, 13(1).

worker and motor-vehicle safety or *uptake of vaccinations* **have all involved taxes, bans, mandates and other regulatory measures beyond soft persuasion**.[99] These tough policy measures have involved restricting individual freedoms, such as the right to smoke a cigarette indoors, not wear a safety belt, or the right to send your child to school without a vaccination. We do not have time to nudge our way to Net Zero, and so a focus on building sufficient political capital and public support to instigate bolder action will be needed.

E. Collaborate - government doesn't hold all the levers for societal change

We may be embarking on a global first. Though societies are almost guaranteed to see profound changes over a 30-year period, **change of this scale is rarely orchestrated by government.** Other societal forces of evolving culture and social norms, commerce and marketing, technological innovation, and shocks (such as wars, pandemics and natural disasters) are all hugely influential and largely unpredictable.

For example, while governments have attempted to change dietary behaviours to improve public health, far bigger shifts have emerged over history through product innovation (e.g. added sugars, processed ingredients) technological developments (e.g. the invention of the plough or the rise of convenience foods, canning, fridges, and freezers), and cultural and demographic shifts (sharing of cultural cuisines, migration, international trade). Could a government 30 years ago have deliberately moved society to the dietary norms of today? Or to some alternate reality?

In particular, the private and third sector have access to a range of other levers and touch-points to influence sustainable consumption behaviour. These include the ability to make behaviours desirable and status enhancing; contribute and amplify social movements; more directly appeal to emotion and influence our wants and preferences (more explicitly than a democratic government could or should); more sophisticated targeted and tailoring of messaging; and applying a wider range of economic incentives.

But this report is about government-led action. Collaboration with, and smart regulation of, the private and third sectors is therefore critical. This is one reason why we emphasise the need to intervene upstream: so that our leadership, our institutions, and economy-wide incentives are pointing roughly in the right direction. This will help ensure other actors with commercial interests and huge influence on society are motivated to exert that influence towards a similar end.

[99] Centers for Disease Control and Prevention. (1999). Ten great public health achievements in the 20th century. *Morbidity and Mortality Weekly Report, 48*(12), 241–243.

4. Applications to Net Zero Policy

In this section, the principles above are exemplified through a series of Net Zero behaviours.

4.1 Diet changes

Our food systems are responsible for 26% of global greenhouse gas emissions,[100] with livestock (and particularly ruminant products) being a disproportionate driver of emissions, land-use change, freshwater use,[101] and a major source of other pollutants.[102] Shifting dietary habits towards more environmental options (e.g. plant-based, local) and enabling sustainable agriculture is fundamental to achieving Net Zero. Here is an account of a potential behavioural policy approach to this challenge using the principles provided.

Behavioural assessment

It is well evidenced that food consumption is a largely automatic, habit-based behaviour, strongly driven by cues in our environment, with meta-analysis showing that altering the choice environment is more effective than prompting or imploring people to make more sustainable or healthy choices.[103] This suggests that effective diet-related interventions will lie at the intersection of upstream and midstream strategies, with a lesser role for downstream interventions targeting individual hearts and minds. Our case study on obesity policy (later in this report) provides further evidence for this assessment.

Upstream: Align businesses, markets and institutions

- Replicating the success of the Sugar Levy, a producer- or retailer-facing tax could incentivise reformulation and diversification among producers of high carbon foods, helping everyone eat more sustainably without concerted shifts in tastes or purchase behaviours.
- Market competition can be aligned with Net Zero outcomes by de-shrouding the environmental performance of supermarkets. The majority of consumers have a choice of multiple competing brands, but little way of knowing which is doing more for the environment. A rating system would shift a minority of consumers, triggering competition between retailers, reducing the carbon intensity of the average shopping basket for all.
- The UK government spends £2.4bn buying food for public hospitals, schools, prisons, courts, offices, military facilities and more. This is a powerful lever through which the

[100] Poore, J., & Nemecek, T. (2018). Reducing food's environmental impacts through producers and consumers. *Science*, *360*(6392), 987-992.
[101] UNESCO (2012) Facts and Figures: Managing Water under Uncertainty and Risk, from the United Nations World Water Development Report, 4.
[102] Food and Agriculture Organization of the United Nations, Rome (2006). Livestock's Long Shadow – Environmental issues and options.
[103] Behavioural Insights Team (2020) A Menu for Change: Using behavioural science to promote sustainable diets around the world

government can begin to normalise plant-based food, and signal the legitimacy of a healthy and sustainable food system.

Midstream: Create an enabling environment

- Increasing the relative availability of plant-based food within canteens has been shown to have dramatic impacts on consumer choice, noting that the status quo is often biased against the most sustainable options.
- Timely moments to intervene may include targeting university students or first-time renters who may be learning to cook and buy groceries for the first time, or even prompting people to try new recipes when buying cookware.
- Without limiting choice, sustainable defaults could be provided in schools and other public settings.
- Attractive substitutes will be crucial to achieve diet changes, and might include, for instance, blended (e.g. beef & mushroom) products to substitute minced beef products.
- We recognise that the government will not have opportunity to implement such changes directly throughout the retail or service sector – however the right incentives (as described under the upstream category above) are precisely designed to motivate businesses to adopt these innovative changes, as well as efficiencies within production and waste.

Downstream: encourage citizens to take direct action where they can, and build support

- Asking people directly to eat less meat and dairy is a major political challenge, though positive framings and smaller asks may be possible (e.g. learn one new recipe).
- Evidence suggest highlighting health co-benefits can be more appealing than purely environmental messages (which can be more moralistic, and less self-interested).
- Effort to win ‘hearts and minds’ may be better spent building public support for bold policy, such as a producer-facing carbon tax on ruminant products.
- It will be important to maintain a narrative of genuine fairness to maintain public support. For example, an unsophisticated meat tax would be highly regressive. Moreover, narratives must avoid alienation of mainstream dietary choices, or demonisation of the livestock sector, which will ultimately be the solution rather than the problem.

4.2 Home retrofits and energy transitions

UK household energy use (for heat, light and appliances) accounts for **14% of UK greenhouse gas emissions**.[104] Ensuring energy efficiency where possible, and low-carbon energy sources are adopted, is key to the Net Zero strategy.

[104] www.theccc.org.uk/wp-content/uploads/2019/02/UK-housing-Fit-for-the-future-CCC-2019.pdf

Behavioural assessment

Decarbonising home energy use will largely be achieved through encouraging costly one-off switches to more efficient technologies or retrofits (e.g. solar panels, insulation or heat pumps). Upfront costs are therefore a major barrier, requiring long-term strategies to reduce costs, and short-term financial support to drive early uptake. Research also shows that energy-efficiency adoption behaviours are often rife with small frictions and cognitive barriers (such as risk aversion, procrastination, uncertainty over supplier legitimacy, and hassle of installation) which should be addressed by making the process much easier. Downstream intervention to encourage consumers to adopt smaller habit changes (e.g. turning the heating down in empty rooms) can have marginal benefits, but given the difficulty of ingraining such habit changes and the modest impacts, moving towards greater automation is likely to be the better strategy. As such, public engagement is likely to be better used to maintain positive narratives around new technologies, and defeat misinformation where is arises.

Upstream: Align businesses, markets and institutions

- One energy-efficiency equivalent to the UK's Sugar Levy, would be a levy on builders and materials manufacturers to drive 'reformulation', e.g. of concrete, steel, glazing and other high-carbon products. The market is competitive and margins and small, meaning small incentives have the potential to accelerate innovation, meaning new homes are low-carbon by default.
- Government can lead by example by improving efficiency of the inefficient public estate (e.g. NHS buildings) which has very high energy demands.
- Leverage market competition to better outcomes by mandating rental properties are advertised as 'warm rent' (including bills) to close the 'split incentive' between tenants (who pay the bills, but underweight this cost when choosing a property), and landlords (who therefore have no commercial incentive to insulate the property).

Midstream: Create an enabling environment

- Some home retrofits are visible (e.g. photovoltaic solar panels or heat pumps) and there is evidence that this leads to social norming**.** However, other home retrofit behaviours are concealed. Making installation salient to neighbours may help.
- There is a great need to remove the frictions from adoption of energy efficiency or low-carbon heating solutions. Compared to like-for-like boiler replacement (which can take 24-48 hours) voluntary heat pump adoption can take weeks, require additional surveys, planning permission, additional energy efficiency measures for some households, and a great deal of uncertainty, unfamiliarity, and diffuse responsibility for the overall effectiveness of the system once installed.
- Consumers can be defaulted into green energy tariffs, or time-of-use tariffs.
- Early adoption of heat pumps may require significant incentives given the high costs relative to fossil fuel boilers. Even long-established energy efficiency products tend to have very long payback periods, and therefore justify incentives to ensure widespread installation. Incentives or disincentives at timely moments (e.g. those buying or selling a home) may be particularly effective.

Downstream: Encourage citizens to take direct action where they can, and build support

- Information provision alone tends to yield very small behaviour-change impacts in energy consumption or technology adoption, though will be critical in building support for, and awareness in advance of, major future policies. For instance, most consumers don't know what a heat pump is, nor have any awareness of their potential benefits, nor link their heating to climate change.
- Attention may be required to counter negative narratives, and conspiracy/misinformation which is common with new technologies (smart meters being a recent case in point).

4.3 Aviation

The aviation sector currently produces **2.5% of global emissions,**[105] but is a high-impact activity among those who do fly regularly (with the UK population being far above the global average), and the sector is estimated to **grow 700% by 2050**.[106] As such, developing interventions to reduce the environmental impact of aviation is critical, both through a technological and behavioural lens. In the UK, the CCC allow for a modest growth of the aviation sector, but below that expected with no intervention.

Behavioural assessment

For the most part, individuals' flying behaviour is likely to be quite inelastic - expecting the British public to forego holidays abroad would be an enormous political challenge. We believe a more realistic transition to Net Zero is therefore through a combination of reduced demand in some select sectors (mainly frequent business flyers, with some potential to also promote domestic tourism), increased carbon offsetting elsewhere, and leveraging marginal behavioural changes to incentivise upstream improvements among airline operators and manufacturers (including long-term deployment of low/zero-emission technologies).

Upstream: Align businesses, markets and institutions

- Similar to other sectors, de-shrouding the carbon emissions of different airlines and routes (i.e. through environmental impact ratings on operators, or emissions information on booking sites) could leverage marginal shifts in behaviour to drive competition among operators to decarbonise. On the one hand, this mechanism may be somewhat less effective than some other sectors if consumer choices are relatively inelastic (i.e. I want to go to Bangkok, Madrid isn't a viable substitute, and there are limited options with price being the overwhelming decision factor). On the other hand, available data suggest there is often a large difference in emissions between operators on the same route due to operational practices, aircraft type and age, and utilisation rates. In any

[105] https://ourworldindata.org/co2-emissions-from-aviation
[106] www.weforum.org/agenda/2019/07/if-airlines-were-a-country-theyd-be-one-of-the-worlds-top-10-greenhouse-gas-emitters/#:~:text=Producing%20around%202%20percent%20of,300%2D700%25%20by%202050.

case, it will be important to create a market signal (e.g. label) which is as salient and impactful as it can be to achieve the necessary upstream incentives for firms to improve.
- Direct incentives on operators, i.e. much stronger carbon taxes with steeper differentiation between airlines' performance (to reward incremental decarbonisation efforts), may therefore be more effective in incentivising airlines to use more efficient aircraft, not over-fuel,[107] not under-seat, or forego basic mechanical efficiencies. This may also accelerate R&D into alternative fuels.
- The UK government can lead by example, and recognise the hugely impactful signal it sends to, for example, approve airport expansions, or financially support the airline industry with little demands for decarbonisation in return.

Midstream: Create an enabling environment

- Though costly, a major aspect of the transport 'choice environment' is limited infrastructure and limited viable substitutes. Major investment in long-distance, high speed, lower-cost train travel would make low-carbon travel choices easier for holidaymakers.
- Passengers can be defaulted into carbon offsets.
- Disincentives may be effective, though in order maintain fairness, should be targeted at frequent business flights where there is already a viable substitute (teleconferencing) for many if not all business needs. Success here may ultimately be marked by a shift in social norms, from international in-person meetings being a sign of importance, to being an immoral indulgence or embarrassment ('frequent flyer' should not be a badge of pride).

Downstream: Encourage citizens to take direct action where they can, and build support

- There will be limited political space to directly ask the public to fly less in the short-term. One approach may be to promote more domestic tourism – maintaining a positive message around the appeal of doing so, rather than admonishment for flying.

4.4 Electric Vehicles

Cars and vans account for around **20% of UK greenhouse emissions**.[108] There are multiple paths to decarbonising road transport, including active and public transport, reduced travel (e.g. more working from home), and electrification of vehicles. A combination of all three may be required, and some locations may offer good opportunity for dramatic reductions in car use (e.g. urban centres). However for much of the UK the adoption of EVs will likely play a major role partly because they offer the easiest substitute behaviour for citizens. This is true psychologically/habitually, but also is the result of historic infrastructural and geographic 'lock-in' to car-centric environments which are hard to undo.

[107] www.bbc.co.uk/news/science-environment-50365362
[108] www.ons.gov.uk/economy/environmentalaccounts/bulletins/ukenvironmentalaccounts/2020

Behavioural assessment

EVs have become compelling products in recent years, with adoption increasing exponentially. They are in many ways the exemplar of future technology adoption curves we hope to see in other sectors, and though EV purchases are still a minority, the momentum within the sector suggests the battle has to a large extent been won. This is in part due to bold upstream measures already implemented, though some barriers remain, including upfront cost, availability of charging infrastructure, and some concern over range and long-term battery life. These are, to varying extents, real barriers - but cognitive biases such as risk aversion, uncertainty aversion and present bias tend to exacerbate them.

Upstream: Align businesses, markets and institutions

- The proposed ban on new combustion car and van sales from 2030 is a very strong upstream measure that has galvanised manufacturers to accelerate R&D and deliver EVs that meet consumers' high expectations.
- Similarly, a recently introduced 'market mechanism' places strong penalties on manufacturers whose car sales do not meet ambitious average emissions targets. By incentivising manufacturers to sell EVs, they may choose to focus on technological innovation, or commercial innovation, or marketing – but either way, consumers are brought along for the ride as EVs simply become more desirable, affordable, available, and normal.
- There is still a need to accelerate penetration into commercial fleets, given this is the quickest way to get EVs into the second-hand market which accounts for 85% of purchases in the UK. Existing incentives and disincentives targeted at large fleet operators and businesses can be continued or strengthened (for large numbers of charge-points at commercial premises, as well as the vehicles), though low running costs are already attracting some.
- The public sector can lead by example by electrifying all public fleets and commercial fleets under government regulation – police, Highways England, buses, taxis, etc. Given how visible vehicles are, and the direct experience we tend to have with them (e.g. we take a taxi), electrifying public vehicle fleets could have outsize signalling and normalising benefits (compared to say, decarbonising buildings in the public estate).

Midstream: Create an enabling environment

- Policymakers should prioritise the physical enabling environment by supporting the provision of critical density of charging infrastructure, including in rural and tourist destinations to support longer-distance EV trips and ensure fair access. The location of public charging points should further be considered through a behavioural lens, noting that some locations may provide greater assurance to not-yet EV owners. By way of example, petrol stations are ubiquitous, salient, and easily found: knowing 'every petrol station has charging facilities' may be a greater reassurance than an equivalent number

of relatively un-salient charge-points elsewhere.[109] Even subtle differences, such as placing them near the entrance to carparks rather than the back, make them more salient and help to normalise EV ownership. For similar reasons, standardised and salient signage for all charge-points is a low-cost idea. Critically, those without off-street parking also need to be provided with a convenient charging solution, in the (as yet) absence of very long-range and very high-speed public charging.

- Recently introduced green number plates leverage 'social proof' to normalise EV ownership
- Costs of EVs are rapidly dropping, though grants could be maintained until upfront cost is closer to price parity, and/or total costs of ownership are unequivocally more attractive for the majority of owners.

Downstream 3: Encourage citizens to take direct action where they can, and build support

- Research suggests experience driving an EV increases positive attitudes. Encouraging people to opt for the EV when hiring a car, or to book a test drive, may therefore hep to raise interest.
- Note that it is the *perceived* financial, social and physical choice environment which influences our decisions, and this isn't always aligned with reality. Unhelpful misperceptions and cognitive biases should therefore be addressed with effective communications (and note the upstream interventions such as the market mechanism' will incentive manufacturers to also do their bit in addressing negative perceptions and making EVs more appealing). For example, EVs are significantly cheaper to run, but we tend to discount future costs relative to those in the present. Beyond conventional communications campaigns, it may therefore help to mandate pricing standards to include estimated lifetime costs, for example.

[109] To note, we are not suggesting a charging network biased towards public, en-route charging is necessarily better than a network of residential charging. The point is instead to illustrate that where public chargepoints are provided, different locations may differ in their psychological value to drivers.

5. Conclusion

When we view ‘behaviour change’ narrowly as an exercise in asking citizens to make different choices, the scale of change required to reach Net Zero is daunting, and an enormous political challenge. Moreover, the evidence from past case studies and decades of behavioural science research shows that awareness-raising and calls to action will not get us there. Though everyone has a degree of agency in changing their behaviour, and well-crafted messages from government can certainly be influential, behaviour is simply too profoundly driven by factors in the environment rather than in hearts and minds. As it stands, low-carbon behaviours are often more costly, less convenient, less available, less enjoyable, and rarely the default choice.

But this is ultimately an opportunity, because the more politically feasible approach is also the far more effective approach – to move further upstream and change these contextual factors. By focusing less on individual *behaviour*, towards bold policy targeting choice environments, institutions, businesses, and markets, it becomes an exercise in ‘world building’ more than ‘behaviour change’ per se.

Some readers may understandably think ‘this isn’t even behaviour change any more!’ – though in some ways this is exactly the point. We propose that different consumption routines and practices (i.e. ‘behaviours’) are the objective, but acting upstream allows us to tackle this objective indirectly, without needing to target consumer *choice* in an explicitly ‘finger-wagging’ manner. The public health sector, which has the biggest pedigree in behaviour-change, variously calls this ‘health by stealth’, or ‘addressing the obesogenic environment’, rather than nagging people to eat less and exercise more. A similar (but even more ambitious and innovative) approach is needed.

This is not to say communications and judicious asks of the public are not extremely important. There are various degrees to which public engagement will be necessary (acceptance of policy or infrastructural changes; willing adoption of new technologies; or direct individual action). Building a compelling and positive narrative, with clear asks, can help to do this effectively, even though communications on their own tend to have a very modest impact on behaviour change.

In doing all of this, there is much to be learnt from past government-led initiatives.

However, we do not have all the answers and evidence on ‘what works’ is continuing to grow. It will be more critical than ever to maintain an agenda of evidence-generating policy, as well as evidence-based policy: testing as we go and trialling new approaches. Behavioural science is far from exhausted, with many original ideas waiting to explored. Government behaviour change must therefore be innovative and adaptive to establish what works in the context of this local, national and global challenge.

If we can impart one lesson, the first law of behaviour change would be this: reduce the burden of action for the greatest number.

Appendix 1: Case studies

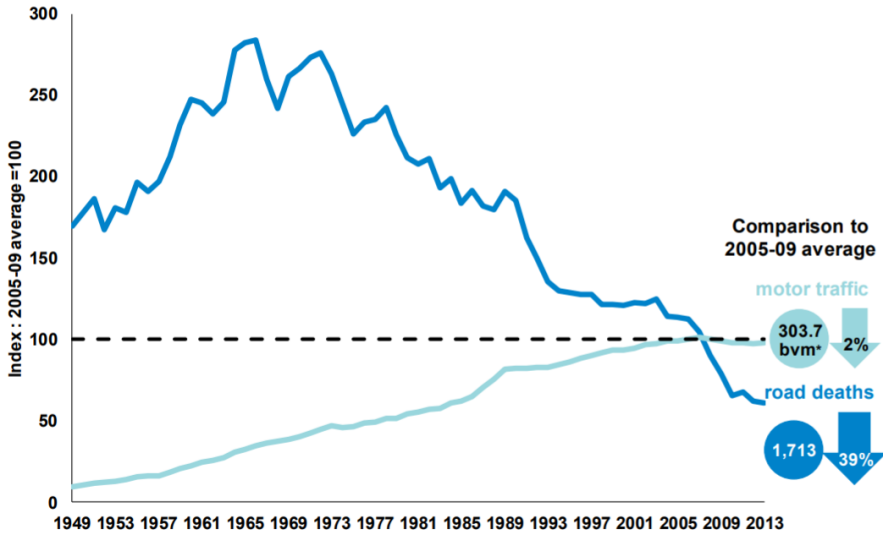
We identified 87 case studies of substantive, government-led behaviour change, which alongside academic research in the behavioural and social sciences, formed the basis of the Upstream-downstream framework and our 9 principles. In this section we explore three case studies in further in detail: road safety, obesity and telecommunications.

5.1 Case study 1: Road safety

Context

Public policy since the post-war period has enabled the mass adoption of private vehicles. Urban planning favoured the development of sprawling car dependent suburbs, while investment in roads and motorways steadily increased as investment in public transport declined. Driving has historically been a relatively dangerous activity. Riskiness depends on a range of behavioural and environmental factors, including risky driver behaviour (e.g. speeding and drink driving), road conditions and weather, standards and availability of medical intervention, and vehicle design and technology. However since 1949, the relative risk of road deaths has fallen substantially (see Figure 10.), despite rapidly increasing vehicle mileage and speeds.[110] For instance, between 2003-2013 road fatalities per billion vehicle miles nearly halved from 10.6 to 5.6 in the UK [111] and have plateaued since then.[112]

Figure 10. Reported road fatalities and motor traffic in the UK from 1949 to 2013[113]



[110] Note that road deaths have largely plateaued since 2010, in the UK and other high-income countries. Reasons for this are not well understood, but likely to include the ageing population continuing to travelling more, and technological advancements slowing (perhaps with a step-change on the horizon with autonomous vehicles).
[111] UK Department for transport. (2015). *Facts on Road Fatalities*
[112] www.gov.uk/government/statistics/reported-road-casualties-great-britain-annual-report-2019
[113] UK Department for transport. (2015). *Facts on Road Fatalities*

There was no silver bullet policy responsible for this steady decline in road deaths. Rather, the UK government introduced a range of policies and interventions over the years to change the behaviour of road users, car manufacturers and town planners. Working with diverse stakeholders, the governments pursued two parallel strategies:

- making roads and vehicles safer (i.e. targeting the choice environment);
- making humans better drivers (i.e. targeting individuals)

Making roads and vehicles safer

Tough regulations, guidelines and standards ensured that car manufacturers stuck to stringent vehicle safety standards,[114] and roads and motorways continuously improved. These policies led to technological and engineering improvements in road design (e.g. shoulder, median and lane width), infrastructure (e.g. guard rails, crash cushions, road lighting) and traffic control (traffic lights and speed bumps), all of which make it easier for drivers to avoid risks on the road without consciously changing their behaviour.

Similarly, vehicle and engineering and design improvements such as crumple zones, safety belts, anti-lock braking systems and airbags have reduced the consequences when crashes when they do occur. For instance, improvements in child safety seat standards have resulted in a 90% reduction in child fatalities on the road since 1979. Many of these improvements were driven by a combination of regulation, and manufacturer innovation incentivised by consumer behaviour. Critical to this was the introduction of the NCAP vehicle safety rating which is a perfect example of principle 2 – a simple rating allowing consumers to make more informed choices aligns market competition with vehicle safety, resulting in safer cars for all.

Making humans better drivers

The government has targeted risky driving behaviours through various means, including education programs, driver's license requirements, implementing and enforcing touch penalties for negligent behaviour (e.g. fines and prison for drink driving or speeding), increasing accountability (MOT's, registration plates) and monitoring driver behaviour (speed cameras, alcohol breath tests). In this way, the government has shown a willingness to impose and mandate tough restrictions on individual liberties to reduce road deaths, but also used softer measures to good effect. Additionally, improved education and training is likely to have produced better and safer drivers, with more demanding theory, hazard perception and driver's tests being imposed over time.[115] Public awareness and educational campaigns have also helped shape new societal norms around drink driving, safety belts and compliance with road signs (principle 6), and a degree of targeting has been adopted to good effect (e.g. DfT THINK! Campaigns targeting the highest risk group of young male drivers).

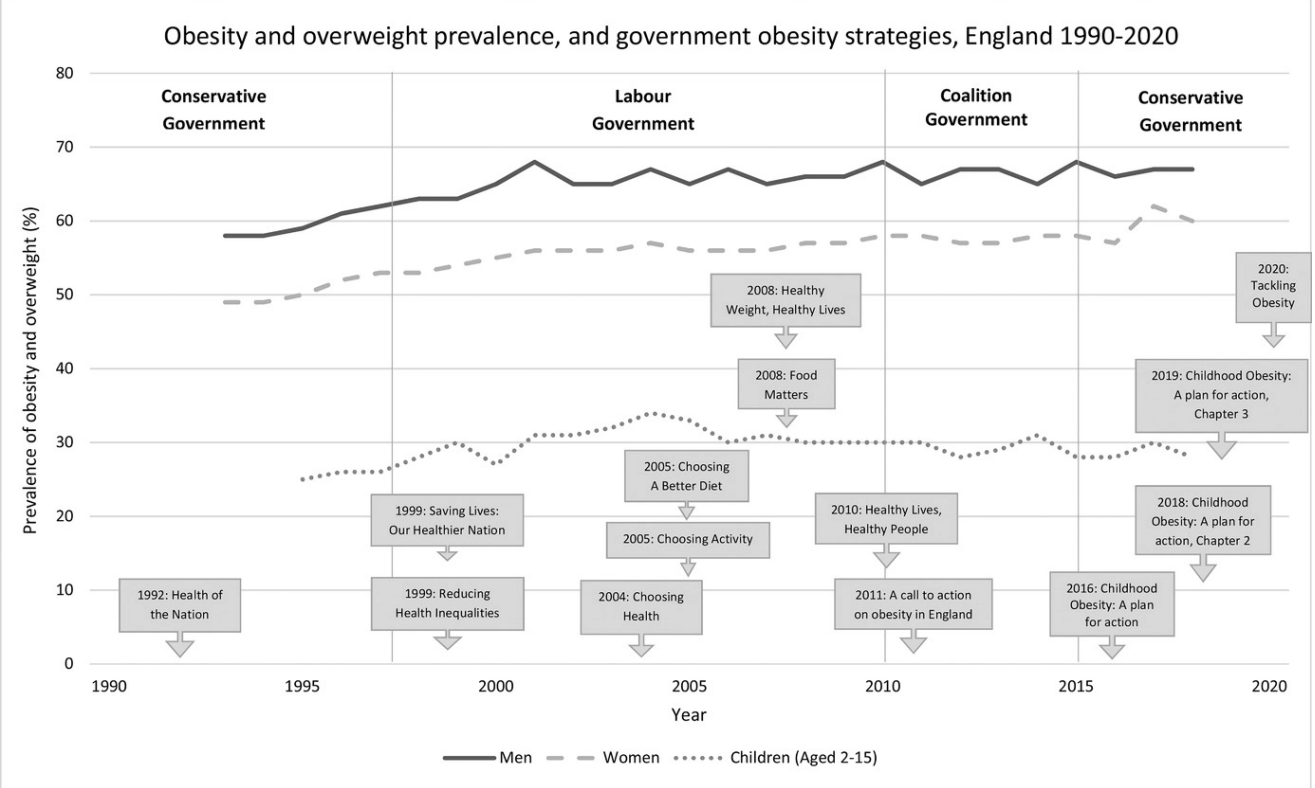
[114] www.gov.uk/government/collections/vehicle-safety-standards-information-sheets
[115] www.gov.uk/government/publications/history-of-road-safety-and-the-driving-test/history-of-road-safety-the-highway-code-and-the-driving-test

5.2 Case study 2: Obesity

Context

Over 60% of the UK population are obese or overweight, which can be associated with potentially life-threatening conditions (e.g. Type 2 Diabetes, coronary heart disease, some cancers) and psychological conditions (e.g. depression). The NHS spends around £6 - 7 billion/year treating obese and overweight individuals.[116] Despite multiple policy interventions on obesity, over the past 30 years the prevalence of obesity has not reduced (Figure 11). The UK government could have been more successful in instigating change if they had considered certain principles highlighted below.

Figure 11. Obesity strategies over the last 30 years



Obesity interventions that focussed on individual agency

The UK government's obesity interventions have tended to place high demands on individual agency (43% of policies) - either asking people to monitor and reduce calorie intake or to summon the effort to exercise more. Ultimately such policies have had only modest effects: For example, the UK's 5-a-day campaign was launched in 2003 with the aim of promoting nation-wide consumption of fruit and vegetables by raising awareness of the WHO diet recommendations.[117] This information campaign showed some positive results by increasing

[116] www.gov.uk/government/publications/health-matters-obesity-and-the-food-environment/health-matters-obesity-and-the-food-environment--2#:~:text=The%20overall%20cost%20of%20obesity,%C2%A349.9%20billion%20per%20year.
[117] Capacci, S., & Mazzocchi, M. (2011). Five-a-day, a price to pay: an evaluation of the UK program impact accounting for market forces. Journal of Health Economics, 30(1), 87-98.

fruit and vegetable consumption by 0.3 portions/day average for the first 5-years.[118] However, with an average increase of just 4g/day for fruit and vegetable between 1995-2015,[119] the percentage of adults who eat 5-a-day did not significantly change.[120] Similarly, giving consumers information about the nutritional content of their food (introduced as front-of-pack traffic light system in the UK in 2014 [121]) also has minuscule effects on healthy purchasing behaviour (average consumption fell by just 2 kcals, 0.4 g of sugar, and 0.15 g of fat per 100 g of food);[122] as had cigarette on-pack labelling on already addicted groups.[123] Targeting people's knowledge about sustainability alone will not be very effective for achieving Net Zero.

In contrast, when UK policymakers have targeted upstream factors in the obesogenic environment, impacts have been greater: such as advertisement bas around schools or children's programming, and most notable the sugar levy which prompted industry drink reformulation to reduce sugar to below 5g/100ml in 69% of eligible drinks. Priori efforts to encourage voluntary reformation on unhealthy products were largely unsuccessful. Expecting too much from citizens' individual agency, despite being bombarded by an obesogenic environment, can largely explain UK obesity policy failure.

Lack of evaluation or thorough implementation of obesity policy

UK obesity policy also was lacking because it was not set up to be readily implemented in different contexts or evaluated. Using the WHO's International Framework, only 8% of policies fulfilled all 7 criteria for implementation viability (with 29% not even fulfilling 1), only 24% included any monitoring or evaluation, and just 19% cited any scientific rationale for the policy.[124]

5.3 Case study 3: Telecommunications

Context

Since the invention of the telegraph in 1845, public policy and its adaptive collaboration with both research institutions and industry has shaped the way we all communicate today. The everyday benefits of a modern telecommunications system are huge and obvious in hindsight, but achieving widespread adoption of telecoms technologies was not easy. This transition required huge investment in infrastructure (from cables to providing 4G network coverage) and system-wide collaboration (between industry, research institutions, and government), often to

[118] www.gov.uk/government/uploads/system/uploads/attachment_data/file/597712/familyfood-2015-webtables-09mar17.ods
[119] Castiglione, C., & Mazzocchi, M. (2019). Ten years of five-a-day policy in the UK: Nutritional outcomes and environmental effects. Ecological Economics, 157, 185-194.
[120] http://healthsurvey.hscic.gov.uk/data-visualisation/data-visualisation/explore-the-trends/fruit-vegetables.aspx
[121] www.gov.uk/government/publications/front-of-pack-nutrition-labelling-guidance
[122] Croker, H., Packer, J., Russell, S. J., Stansfield, C., & Viner, R. M. (2020). Front of pack nutritional labelling schemes: a systematic review and meta-analysis of recent evidence relating to objectively measured consumption and purchasing. Journal of Human Nutrition and Dietetics, 33(4), 518-537.
[123] Varotto, A., & Spagnolli, A. (2017). Psychological strategies to promote household recycling. A systematic review with meta-analysis of validated field interventions. *Journal of Environmental Psychology*, *51*, 168-188.
[124] Theis, D., & White, M. (2020). Is obesity policy in England fit for purpose? Analysis of government strategies and policies, 1992-2020.

promote a technology that was only useful if everybody adopted it, meaning relatively little individual incentives.

Providing telecommunications infrastructure

The government played a key role in changing the physical and technological environment that supported widespread uptake of telecoms technology, from initially contributing to the laying of telegraph cables in the 1800s to providing telephone services when the system was nationalised under the Postmaster General in the 1900s. This process took tremendous effort, but was fundamental to catalysing the transition to a tele-connected society by providing citizens with the opportunity to engage in a behaviour that was otherwise impossible to conceive of individually. Though this is an extreme example, the principle applies to Net Zero behaviours such as EV adoption which absolutely depend on a network of infrastructure to enable individual adoption. Further examples of the provision of telecoms infrastructure can be found in the implementation of free-standing red telephone boxes in the 1920s, building of the (now named) BT Tower by the Post Office in 1964 for telecoms traffic, investing £150 million in 2011 to improve mobile coverage in areas where signal is poor or non-existent, and £5bn infrastructure investment to deliver broadband to 1 million hard-to-reach households.

The UK government also played a fundamental role in shaping the social environment to promote telecoms diffusion whilst holding key players accountable – for example, by ensuring standardization across systems (e.g. Morse Code telegraph system in 1865), controlling telephone licenses, and seizing control of the telephone system under the General Post Office, a state monopoly. At face value this is all about technology, not ‘behaviour’ – yet it is often the case that shaping both the physical and social world can create an environment for behaviours to change, without necessarily having support for the behaviour in advance.

Collaboration with emerging telecoms industry and other players:

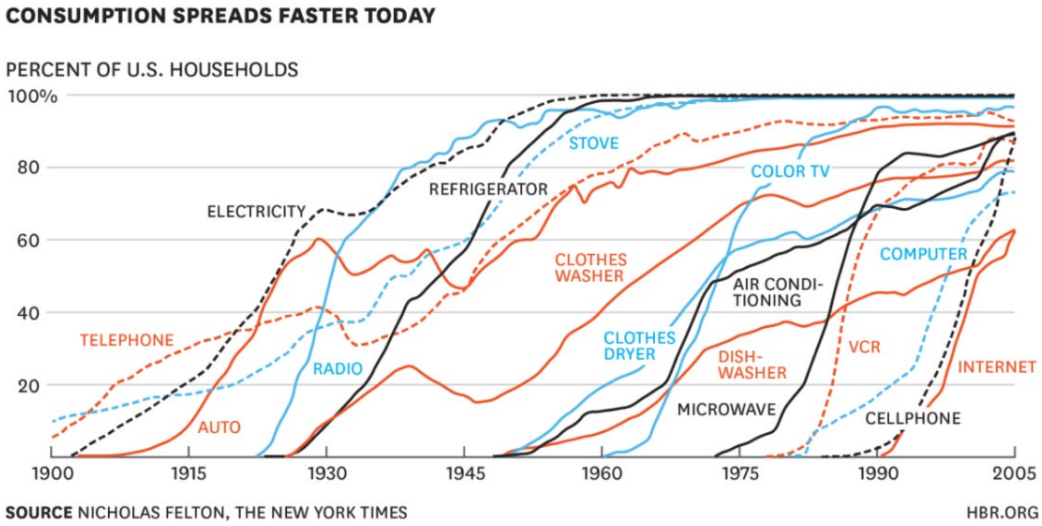
Successful transitions to a tele-connected society relied on heavy collaboration between government and industry and research actors. Interacting closely with research institutions enabled the government to roll out increasingly efficient technologies (e.g. the electric telegraph, narrowband to broadband circuit switch technologies, transistors, and semiconductors) that were necessary for a successful telecommunications system. Equally, collaboration with companies (e.g. National Telephone Company) eased the sociotechnical transition. Landline services were initially provided by both private companies and local city councils, and even as late as 1992 British Rail Telecommunications made up the largest private network in Britain.

The consumer and telephones

As shown in Figure 12, even though telephones were an intuitive technology that required no training to use, uptake was slower compared to alternative technologies (e.g. 70 years to reach 90% of the population compared to 30 years for refrigerators, 20 years for colour TVs, and 10 years for microwaves). Two barriers caused this slower adoption: citizen distrust of the relevant

new technologies (e.g. perceptions that telephones contributed to an invasion of privacy)[125] and perceptions that telephones were not useful unless mass-adoption was guaranteed (a similar challenge may emerge, for example, with adoption of hydrogen-ready gas appliances for a possible, but not inevitable, switch to mains hydrogen). The government made efforts to normalize telephone technology - from permitting Queen Elizabeth II to make the UKs first long-distance phone call, to publicly installing red telephone boxes across the nation. Moreover, as prices decreased, telephones became normalised, and adoption eventually reached almost 100% of the population.

Figure 12. Adoption rate of different technologies in the 1900s - Telephone is one of the slowest[126]



[125] www.theatlantic.com/notes/2015/09/when-the-telephone-was-dangerous/403609/
[126] https://hbr.org/2013/11/the-pace-of-technology-adoption-is-speeding-up

This publication is available from: www.gov.uk/government/publications/net-zero-principles-for-successful-behaviour-change-initiatives

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