ZERO CARBON BRITAIN

Making it Happen

Centre for Alternative Technology
Canolfan y Dechnoleg Amgen

Zero Carbon Britain: Making it Happen

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Typesetting and design: Annika Faircloth
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Published by CAT Publications, CAT Charity Ltd.
Registered charity no. 265239.

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Acknowledgements

There are a large number of individuals and organisations who contributed to this report and CAT is extremely grateful for their help and support. The report does not necessarily reflect their views and any mistakes are entirely the responsibility of the report research team.

Many thanks to all the following individuals and organisations in alphabetical order by first name.

For their contribution of specific pieces that are included or linked to in the report:

Andrew Simms New Weather Institute
Katharine Knox Joseph Rowntree Foundation
Lucy Neal Theatre maker
Oliver Johnson Environmental Industries Commission
Sarah Woods Playwright
Steve Shelley Hertfordshire Business School
Tom Crompton Common Cause Foundation

For their time to be interviewed for the Stories for Change or the Case Studies:

Agamemnon Otero Repowering London
Anne Meikle WWF Wales
Anna Joyce Flower Pod
Arno Schmickler Energiesprong UK
Chris Blake The Green Valleys CIC and TGV Hydro
Ruben Pastor-Vicedo Robin Hood Energy
Sheridan Piggott York Bike Belles
Simon Dale Nottingham City Council
Veronica Burke Bread Matters

For their time and expertise to review drafts of the report:

Alex Randall Climate Outreach
Alexa Spence University of Nottingham
Andy Rowell Spinwatch
Becky Clissman UK Environmental Law Association
Becky Willis Green Alliance and University of Lancaster
Brenda Boardman Oxford University Centre for the Environment
Catherine Butler University of Exeter and British Sociological Association
Charlie Wilson University of East Anglia
Christopher Blake Renew Wales
Duncan Williamson WWF UK
Emma Bridge Community Energy England
Geoff Tansy Food Systems Academy
George Marshall Climate Outreach
Godfrey Boyle Open University
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Helen Grimshaw URBED
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Mike Childs Friends of the Earth

Naresh Giangrande Transition Network

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Sarah Woods Playwright

Steph Robinson CAT

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Sue Dibb Eating Better

Tamasin Cave Spinwatch

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Tom Crompton Common Cause Foundation

For their help with queries and other information:

Alexandra Runswick Unlock Democracy

Barbara Jones/Clair Walker Straw Works Ltd

David Clasby Sustrans

Eamon Lally Local Government Association

James Greyson Blindspot

Jim Seymour Derbyshire County Council

Lauren Rickards University of Melbourne

Linda Farrow UK Environmental Law Association

Shashi Vandegraaff Political Studies Association

Tamasin Cave Spinwatch

Leo Murray A Free Ride

Thanks to CAT students **Adam Harper** and **Richard Couldrey** for organising an Open Space event, **Nick Nuttgens** for facilitating, and all the participants who contributed. Also thanks to **Sarah Warren** and all the **CAT students** who volunteered their help with the project.

For their permission to use images in the report:

Barilla Centre; **Influence Map**; **ShareAction**; **Cambridge Carbon Footprint**; **Urbed/Carbon Co-op**; **Daniel Schoenen**

We would also like to thank the following staff and friends of CAT for reviewing earlier drafts of the report:

Adam Harper; **Chloe Ward**; **Christina French**; **Deirdre Raffan**; **Frances Hill**; **Jane Fisher**; **Kit Jones**; **Sam Christie**; **Steph Robinson**; **Tammi Dallaston**; **Tom Barker**

Thanks to **Alice Hooker-Stroud**, **Catriona Toms** and **Allan Shepherd** for editing the report, **Hele Oakley** for proofreading, **John Urry** for illustrations, and **Annika Faircloth** for images and layout.

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Sarah is a campaigner and playwright, creating participatory performances, films and events in collaboration with communities, campaigns, specialists and arts organisations. Sarah's plays have been produced by many UK companies including The Soho Theatre, Hampstead Theatre, the RSC, BBC TV and radio, many regional theatres and touring companies. Her campaign work includes The Co-operative Group's Frack Free UK campaign, the Fabian Society's Commission on Food and Poverty, and the Ashden Trust's VISIONING LONDON project. Sarah also teaches at Manchester University and is a Wales Green Hero.

Foreword

Adrian Ramsay

Chief Executive,
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January 2017

Climate change is here. Not only was 2016 another of the hottest years on record, but increasing incidents of extreme weather, instability in farming around the world and erosion of habitat for many species are now being linked to human-induced changes to our climate. We know that to avoid runaway climate change, with its devastating impacts on humanity and the natural world, we need to take urgent action to decarbonise our society.

The UN climate agreement in Paris in December 2015 marked a major step forward as global leaders recognised that rapid reductions in carbon emissions are needed to keep global temperature rises below the crucial 1.5 to 2 degrees above pre-industrial levels. The green movement is now quite rightly focused on how we ensure that this is delivered at all levels.

Back in 2007, CAT's Zero Carbon Britain (ZCB) project was launched as a response to the huge gap between the 'politically thinkable' decarbonisation options on the table and the rate of change that the climate science actually demands of humanity. We could not find any research outlining a fast enough carbon reduction plan, integrating energy, buildings, food and land-use emissions. So we were compelled to develop a scenario to bridge the gap, getting us to zero emissions in around 20 years.

For 10 years now, CAT has been undertaking increasingly detailed research showing that we have the technology needed to rise to the climate challenge. This research remains an important tool for campaigners and policymakers needing to showcase how we can overcome the perceived technical barriers to change.

Following the Paris climate agreement, however, there is increasing acceptance that we can and must move towards a zero carbon future. The challenge is increasingly around how this change is delivered. Rather than an unresolved technical challenge, it is now widely accepted that we face a mix of economic, cultural and psychological barriers. But, once again, we could not find any unified piece of research that worked across different disciplines and at a range of levels to explore how we overcome the various barriers, and to show the co-benefits and synergies of building a zero carbon future.

Zero Carbon Britain: Making it Happen is our response to that gap. It links up emerging findings across a wide range of rapidly developing fields, bringing together academic research with examples of local initiatives that are showcasing new ways forward. We hope it will help open new conversations, forge new connections and encourage others to carry out further research and spread good practice.

Our research uncovered an exciting spectrum of innovative projects and ideas from individuals, communities, organisations and municipal authorities around the country. By showcasing these examples, and by supporting more communities to make a difference, we can create a sense of collective purpose that will be an extremely powerful tool as we work to scale up this good practice and build a zero carbon future.

We have the tools to rise to the climate challenge and create a healthier and happier society. This requires concerted effort across all sectors and involves people working for change at all levels: as individuals, in communities, at workplaces and through local and national government. At CAT, working with the wider green movement, we will provide education and inspiration to help catalyse the change.

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In signing up to the historic Paris climate change agreement, the UK has accepted that it must enshrine in law a goal of reducing its carbon emissions to zero. The UK is also legally committed by its own 2008 Climate Change Act to delivering an 80% cut in emissions by 2050. Yet, even based on emissions within its borders, not counting those associated with imports, the UK is not on track to meet this target, let alone reach zero carbon. There is an urgent need to increase ambition on delivery.

CAT's previous Zero Carbon Britain (ZCB) reports, plus a range of other work, clearly demonstrate that we have all the technologies needed to reach net zero carbon. Rather than an unresolved technical challenge, it is increasingly accepted that we must overcome a mix of political, cultural and psychological barriers. This report investigates how we can overcome them, linking up insights from research with examples and stories from individuals and organisations that are living the changes we need to see.

This report doesn't claim to provide all the answers – there is a clear need for more detailed and better resourced work, further linking research and practice across disciplines, borders, sectors and scales.

Where we are now

Understanding where we are today is a vital step in exploring what needs to change, and how that can be brought about.

The situation today is a long way from where we need to be.

Most of the UK's electricity is generated from fossil fuels and the UK is not on track to meet its target of generating 15% energy from renewables by 2020. The energy system is highly centralised and dominated by a small number of large companies, while community energy schemes supply less than 1% of electricity.

Most people in the UK are eating too much animal protein and processed foods and not enough fruit and vegetables. Obesity levels are on the rise and a huge amount of food is being wasted.

There is growing car dependency, through choice or necessity, while public transport services are being cut back. Electric vehicles are still a small percentage of the overall fleet. There has been a dramatic growth in air travel, due to a relatively small proportion of richer frequent flyers.

The UK has an ageing and poorly insulated building stock, with over 2 million households in fuel poverty.

Inequality in the impacts of climate change

Climate change affects everyone, but some people suffer more than others. It reinforces and exacerbates existing patterns of inequality, particularly in developing countries. In the UK, worsening storms, flooding and heatwaves particularly impact disabled people, children and older people, as well as deprived communities. The UK contributes to global climate change impacts through its domestic emissions plus those associated with imported goods and its high carbon investments overseas.

What needs to change?

There needs to be a significant increase in installed renewable capacity for electricity and heat. We must increase the amount of plant-based food and reduce the amount of meat, especially beef and lamb, as well as dairy in our diets. We must significantly reduce the need to drive or fly by improving public transport, increasing levels of walking and cycling, and providing disincentives to drive or fly. All vehicles need to be run on 100% renewable energy.

New houses need to be built to zero-carbon standard and use low-carbon materials for construction, while existing buildings need to be retrofitted to significantly reduce energy demand. All of these changes can result in significant social, economic and environmental benefits.

The barriers to change

Exploring the wider barriers helps us grasp the multifaceted nature of this challenge.

Worldviews and values: Climate change is not the root problem but a symptom of our materialistic culture and growing disconnection from nature and from each other. The belief that we are separate from, or even somehow 'above' nature, allows continued inaction, even when there is clear evidence that our actions are deeply damaging the habitats of other humans and other species. Our values have a profound effect on our behaviour. As long as values based on image, wealth and status appear to dominate society, people will struggle to act on more helpful values, such as honesty, social justice and equality.

Communications: The prevailing silence on climate change across the media and in public dialogues undermines levels of public awareness and action. There is significant media bias, with views of marginal climate sceptics given inappropriate prominence. There is also undue stress on the uncertainty of climate science, driven through well-funded campaigns by industry. Corporate or political affiliations can lead to media bias, often because of dependence on advertising revenue. Highly concentrated media ownership gives a few individuals a disproportionate influence on public opinion. Commercial advertising

promotes values that are counter to concern and action on climate. People are often unaware of the subliminal effects of advertising, and children – often targeted by advertisers – are especially vulnerable.

Psychology and behaviour: There are numerous psychological barriers preventing people thinking about or acting on climate change, even when they have high levels of concern about the issue. Many people fail to take responsibility because of feelings of powerlessness or scepticism about the efficacy of individual action. In some cases there may be a lack of knowledge or information about what to do. People are heavily influenced by others and observed social norms, so will be reluctant to act if no one else does.

There may also be a lack of urgency because climate change is not seen as a personal threat or because it's not recognised as a moral wrong. Many of the behaviours that need to change are also habitual behaviours that are hard to change. There has been undue focus on uncontroversial individual behaviour change and not enough emphasis on more radical action and tackling barriers at social, industrial and governmental levels.

Carbon lock-in: Industrialised economies have become dependent on fossil fuel systems over many years, developing significant system inertia that is hugely resistant to change. While innovation at the local level can break through this inertia, many local projects face difficulties in scaling up or spreading ideas into the mainstream. Small groups often lack the necessary financial resources, time or skills, making them vulnerable to external shocks and problems of fatigue and burnout.

In many cases there are practical barriers that make alternatives less convenient or attractive, such as the hassle factor of building retrofits. Local councils are responsible for local policy and delivery of planning, housing, transport and waste but have seen budget cuts that undermine action in these key areas. The planning system has been constantly devalued and local planning powers removed.

Economics and finance: The continued belief in the ideology of neo-liberalism, deregulation and free markets undermines society's ability to deal with climate change. The systematic privatisation and contraction of the public sphere favours returns to shareholders over environmental responsibilities, and means the necessary funds are not available for investment in the zero carbon transition. There is an urgent need for a level playing field for low or zero carbon alternatives. Fossil fuels receive billions of pounds in subsidies, far higher than those given to renewables, and the full external costs of fossil fuels are not included in the price, making them appear cheaper.

Higher upfront costs of super-efficient buildings or electric vehicles also impede uptake despite lower

whole-life costs than conventional alternatives. The government has an interest in supporting national fossil fuel production due to the contribution of revenues to government budgets. There is an investment gap for renewables, with traditional methods of financing tending to favour large centralised projects.

There is a pervasive but mistaken assumption in society that perpetual growth within our finite ecosystem is synonymous with improved well-being and is sustainable and desirable. Also the problems with using GDP as a measure of progress and quality of life have long been recognised by economists and others.

Politics and governance: Changing systems like energy or food is a political power struggle with risks including confronting powerful vested interests and implementing policies perceived as unpopular. Just 90 private and state owned companies are responsible for nearly two-thirds of historical cumulative emissions of carbon dioxide. Fossil fuel and other high carbon industries successfully lobby governments to weaken climate legislation and policy, a phenomenon known as regulatory capture. Current lobbying laws fail to meet international principles on transparency and weaken checks on corporate influence.

There is also a problem of 'revolving doors' where politicians and civil servants move backwards and forwards to and from industry. Lack of collective political will for action is a fundamental obstacle, with both commitment and cross-party unity on climate change diminished over recent years. Public spending cuts have undermined green investments, while fossil fuel tax breaks have increased.

Even when politicians are aware that climate change is urgent and important they may still fail to act because of factors including; undue faith in future technical solutions, education in neoclassical economics, 'tendency for group think' and a need to avoid blame. In recent years the government has shifted away from legislation towards self-regulation and voluntary approaches, and has withdrawn or repealed key laws and policy, such as the legislation for zero carbon homes.

Many of the remaining policies have shortcomings. The Climate Change Act has loopholes that prevent emissions from the power sector being included in carbon budgets, and there is a lack of accountability for meeting its targets. It is also difficult for citizens and NGOs to bring legal cases against polluting firms. The changes proposed to Judicial Review, an important check and balance on government action, will make it extremely difficult for charities to seek this legal remedy.

Making it happen

Based on our assessment of the barriers, we offer a synthesis overview of the broad range of current research and practice demonstrating how these can be overcome. There is no single approach that guarantees success,

but a combination of interventions in different ways can leverage change.

Worldviews and values: The importance of feeling connected to nature is a long recognised way of fostering pro-ecological behaviour. Helping people understand that their well-being is interlinked with the protection of the natural world has been shown to foster more sustainable behaviour as well as leading to higher levels of health and well-being. Promoting more compassionate values is important, so that these values become strengthened across society.

Reducing the focus on consumption needs to be recognised as a positive shift that increases well-being. Measures that can help this include reducing the working week as a way to break the cycle of working to spend, and promotion of the sharing economy, which enables products and services to be given or exchanged. On the production side, the circular economy designs out waste in a closed loop system.

The main global religions now show increasing unity around climate change, with many promoting less materialistic lifestyles and engaging on climate both practically and politically. Outside of organised religion, many people now seek spiritual experience that provides meaning in their lives. Some practices, such as meditation and mindfulness, have been shown to foster greater compassion for others and more sustainable behaviour. Spiritual practice is also being successfully combined with both social and political change.

The arts have long been a powerful catalyst in transforming worldviews and sparking cultural change, allowing imaginations to flourish, glimpsing other ways of seeing and feeling. It is from these experiences that different futures can emerge. The arts have the ability to engage people collectively and to challenge the status quo.

Communication: The current concentration of UK media ownership needs to be addressed through regulation with clear thresholds in law. This requires a wide public campaign to build the necessary political support. While media misinformation sticks and is often hard to correct, it can and should be challenged head-on by climate scientists and activists. With limited resources the climate movement can use clever and engaging online communications to counter misinformation and greenwash.

Given the pervasive and detrimental nature of advertising there is a clear need to better regulate the industry, banning advertising in public spaces and restricting advertising to children. Many other countries have introduced such restrictions, and it is likely that there would be public support for this in the UK. The creative power of the marketing industry can also be harnessed in ways that support the zero carbon transition.

The prevailing climate silence can be broken using stories that are more engaging and memorable than information alone, backed by positive images that can have a strong

mobilising effect. Communication that highlights the positive benefits of mitigation is more effective in promoting action than fear driven appeals. The use of low-cost accessible social media can enable rapid communication with a global audience and can be used to mobilise large numbers of people very quickly, as well as driving news traffic.

Psychology and behaviour change: Positive stories of what can be practically achieved can help counter feelings of helplessness, demonstrate that other people care, and show that the actions of both individuals and communities do make a difference. The influence of social norms related to how others behave and what people believe others expect of them can be harnessed to encourage more sustainable behaviour. High profile individuals can also help normalise new behaviours.

The lack of urgency on climate change can be addressed by making the issue more immediate, for example, by emphasising the impacts of severe weather. Care is needed, however, to avoid overwhelming people or inducing guilt. Engagement can also be increased by framing climate change as a moral wrong that needs to be put right, and linking action to positive emotions, such as hope, pride and gratitude.

Behavioural change can be more closely linked to the wider structural changes needed in society, industry and government. Better programme design and targeting can improve outcomes and can be used to influence social action and tackle more damaging behaviours. The challenge of breaking ingrained habitual behaviour can be addressed during transition periods, such as moving house or changing jobs, when habits are disrupted and people are more open to change.

Carbon lock-in: Thousands of community groups across the UK are developing practical, positive examples of the zero carbon transition, ranging from waste food cafés to community energy schemes. While many of these community-scale projects are small, they empower and connect people, help expand the political choices available, give people a sense of agency and help normalise sustainable behaviours. The role of intermediary organisations that connect and support grassroots projects is very important in helping to scale up and replicate ideas. Government support is needed for community action on carbon in the form of a long-term strategy and the provision of necessary resources.

Making zero carbon alternatives more convenient and attractive is essential. For example, by making walking and cycling safer with the provision of off-road, segregated paths and reduced traffic speeds, or combining energy works with general home repairs, maintenance and improvements.

Rethinking planning can help reduce car dependency through measures, such as an increase in car-free developments, higher minimum densities for housing and tighter parking provision. There

is also a need to restore the rights of councils to set higher energy standards for local developments.

Local authorities play a key role in reaching carbon targets. Despite funding pressures, many UK authorities have developed innovative low carbon solutions, and councils can make significant savings from energy efficiency and earn revenue from renewable energy schemes. Cities are in an ideal position to catalyse wider climate action, with higher urban densities enabling innovative approaches. Several world cities plan to be carbon neutral within the next ten years.

Economics and finance: Moving on from the prevailing and demonstrably failed economic model of neo-liberalism with its emphasis on free markets can facilitate a more co-operative, fair, enriching, resilient and sustainable economic system. Backed by a shift from a narrow focus on economic growth and GDP, this could transform how society sets out its goals and evaluates progress towards them.

Removing the massive subsidies currently given to fossil fuels and making all energy choices pay their full societal or environmental costs will help level the playing field for zero carbon alternatives. This could manifest in the form of a carbon tax for fossil fuels, congestion charging, workplace parking schemes, taxes on unhealthy foods and a levy on frequent flyers.

Local and municipal banks and citizen finance can assist in providing investment for zero carbon measures, such as renewable energy generation, retrofitting buildings and sustainable transport infrastructure and services. Low and zero interest 'pay as you save' loans could be provided for energy efficiency measures using successful examples from around the world to remodel the failed Green Deal.

New business and ownership models can prioritise environmental and social benefits as much as economic returns; these include energy co-operatives, social enterprises, new energy supply models, municipally owned companies, community and public ownership.

There is enormous scope for more community and public ownership, particularly in energy supply and distribution. This can be achieved by strengthening policies that encourage community energy projects and through new legislation.

Taking assets like the railways or national grid back into public ownership could ensure that the necessary improvements take place and profits are reinvested for the public good rather than being distributed to shareholders.

Politics and governance: Political action requires increasing the visibility of climate change amongst voters, whilst providing clear evidence that workable solutions already exist gives politicians no place to hide. Powerful vested interests and their undue influence on the regulatory process can be challenged through shareholder action and divestment campaigns, as well as

by increased transparency. The current law on transparency of lobbying can be amended to satisfy international principles of transparency. Rules to prevent the problem of 'revolving doors' must be tightened.

Mass social movements based on coalitions of a broad range of groups will be needed to drive political support as individual issue groups are not strong enough on their own. Forging a sense of collective identity and finding common values is vital. While traditional insider advocacy approaches are valuable, disruptive forms of protest are also needed. Throughout history radical voices have challenged and helped overturn systems of injustice and helped shift the window of political possibility.

Cross-party political support for both policy and action can be built by framing communications appropriately and by the use of trusted communicators. Submissions to Parliamentary Select Committees or direct communication with MPs and local councillors help build support. Political risk can also be reduced by directly linking climate policies with complementary policies, such as health.

New and strengthened legislation and policy frameworks are needed. Despite government preference for deregulation or self-regulation, most voluntary approaches have performed poorly. The Climate Change Act must be amended to deliver the net zero emissions target and to close existing loopholes that exclude emissions from the power sector.

There also needs to be a better system of accountability at all levels. New laws can protect the planet and future generations, such as an international law on ecocide. In Wales, a groundbreaking new law requires public bodies to consider the well-being of future generations in decision-making. Legal access for NGOs and citizens to challenge public policy also needs to be improved.

Conclusions

Getting to zero carbon will require radical system change. All the necessary technologies already exist, improvements are appearing all the time and costs are falling. However, our hesitation to believe that this transition is possible is, in itself, one of the key barriers to achieving that shift.

History shows that radical social and technological changes are possible, and can happen within a few years. This transition should not be seen as burdensome or a return to the past, but as one of the most exciting opportunities in human history. Isolated, stressful, consumer-focused lifestyles can be replaced by a sense of connection with community and nature, delivering benefits in physical health and psychological well-being.

The overarching headline is that we need to do this together. It will take many of us pulling in the same direction to enable change, and each and every one of our actions can contribute to making a zero carbon future happen.

Chapter 1:

Introduction

1. Introduction

Paul Allen

Project Coordinator,
Zero Carbon Britain

1.1 Zero Carbon Britain: Making it Happen – the story of the report

Many robust scenarios from across the globe now clearly demonstrate that the technologies to reach net zero greenhouse gas (GHG) emissions already exist. Yet, changing how millions of people live is a rather special kind of problem – the forces that shape our lives exist on many different levels. Tackling such a complex global challenge requires a new kind of approach which joins up research and practice across disciplines, borders, sectors and scales.

This new report *Zero Carbon Britain: Making it Happen* is CAT's response to this challenge. It is based on a broad literature review of insights into what is stopping us getting to zero carbon from peer-reviewed journals, as well as books, reports, articles and other sources. The research looked at findings from psychology, sociology, geography, political science, economics and other social sciences, as well as faith and spiritual practice, arts and culture. We have developed dialogues with researchers working in these fields to ensure our findings are supported by good evidence. We have also included input from individuals and organisations that have managed to overcome specific barriers in innovative ways.

The research team also explored specific issues affecting the four key sectors of our Zero Carbon Britain (ZCB) research that we know need to be changed: food, transport, buildings and energy. However, many barriers are common to all sectors, or bigger than any single sector, and can only be tackled at societal level. We have therefore presented our findings in terms of cross-cutting barriers and solutions.

Inevitably, the research has drawn on an extremely wide-ranging and often complex body of evidence-based research in an attempt to uncover the most effective solutions. This report is intended as a tool for all those working for a sustainable future and seeks to provide an impetus for others interested in pursuing the research further. Ultimately this important and far-reaching investigation requires a great deal more resources, plus much wider collaboration across all disciplines and at all levels.

1.2 What is the Centre for Alternative Technology?

The Centre for Alternative Technology (CAT) helps people to live well on a finite planet, from individuals changing their habits to politicians making decisions on a larger-scale.

Established over 40 years ago as an experiment in sustainable living, CAT Charity is now known throughout the world as a centre of excellence for environmental education, with a wide range of short courses, postgraduate degrees and a strong educational programme supporting schools and colleges in delivering sustainability education. In-depth information is available on a wide variety of topics, including green building and architecture, renewable energy and sustainable land management. The on-site educational experience is supported through a visitor centre with a range of educational displays, membership department, green accommodation, conferencing, retail and catering.

Zero Carbon Britain is CAT's flagship research programme.

The Centre for Alternative Technology

1.3 What is the Zero Carbon Britain project?

Since its inception in 2007, CAT's Zero Carbon Britain (ZCB) project has set out to offer the hard data and confidence required for visualising a future where we have risen to the demands of climate science; to remove fear and misunderstandings and open new positive, solution-focused conversations.

Following the UN climate agreement in Paris in December 2015 (COP21), there is clear recognition that long industrialised countries such as the UK must now legislate and plan for zero emissions.

The range of ZCB reports produced since 2007 clearly demonstrate that we can reach net zero emissions using only existing technology, and that such a transition offers many positive co-benefits for society, the environment and the economy. Through researching and communicating this work, CAT aims to stimulate economic and political debate around achieving zero emissions, engage the research community and get society thinking in a new way to help build consensus on action.

It is now almost ten years since CAT's first ZCB report was launched in Parliament. Pro-active communication has been as important as undertaking research. For almost a decade, the ZCB team has been engaging with a wide spectrum of society, from faith-groups, local environmental groups, climate activists and community groups to MPs, Welsh Assembly Members, policy organisations, NGOs, think tanks, international networks and the UN COP process itself.

Today zero carbon is becoming a much more commonly accepted goal. CAT's work to date has played an important part not only in raising the profile of 'zero' but also in increasing confidence that it is deliverable.

An Alternative Energy Strategy for the UK (1977)

Sixteen copies of CAT's 'Alternative Energy Strategy for the UK' were delivered to Tony Benn's Ministry of Energy in 1977. This was poles apart from the official UK en gy strategy of the time. Energy planners expected demand to grow year-on-year, as it had done since the Second World War, fuelled by as yet untapped North Sea oil and the promise of nuclear power, which was going to be "so cheap it wouldn't be worth metering." This innovative report showed for the very first time th t an alternative approach could reduce energy demand whilst radically increasing generation from renewable sources.

Zero Carbon Britain: An Alternative Energy Strategy (2007)

By the opening of the 21st century, the importance of taking action to deal with the climate challenge had grown ever more urgent. However, the UK officia target (60% reduction of greenhouse gas emissions by 2050) fell far short of what science was demanding and there were no major scenarios that explored a suffici tly rapid transition. CAT's first CB report offered a scenario outlining a pathway to zero emissions over two decades utilising only proven technologies via a dual process of 'powering down' energy demand, whilst 'powering up' renewable energy supplies.

Zero Carbon Britain 2030: A New Energy Strategy (2010)

The economic meltdown of 2007 made it much harder to make the case for concerted action on climate change. It became clear that the ZCB scenario must also highlight economic and employment benefit . The second report delivered this, whilst also integrating new research in land-use – exploring food, energy and, in particular, carbon capture through changing land use, considered integral to reaching net zero carbon emissions.

Zero Carbon Britain: Rethinking the Future (2013)

CAT's third ZCB report addressed concerns about 'keeping the lights on' under a variable renewable energy supply, using detailed hourly modelling of the UK energy system based on ten years of weather data to simulate energy supply and demand. It also offered much deeper analysis on diets and land-use, modelling low and minimal carbon diets.

Who's Getting Ready for Zero? (2015)

CAT teamed up with Track0 to develop this report and presented it at the UN COP21 negotiations in Paris. It maps over 100 peer-reviewed research projects, plans and practical on-the-ground projects from across the globe that demonstrate paths towards zero greenhouse gas emissions, using only existing technology.

Stories for Change

> *After nourishment, shelter, and companionship, stories are the thing we need most in the world.*
>
> Philip Pullman

We all tell ourselves stories, framing events to make sense of our lives. And we do it as societies as well, to help us better understand the world. Stories offer a hugely effective way to transcend the limits of our worldview and rehearse new ways of being. They can enable us to explore our cultural paradigms and how they define our eality, the way we think, the ways problems are solved, what goals we pursue and what we value. Throughout this report are the stories of six people who are living the sorts of change we need in the world, to make it happen:

Veronica Burke	*Co-creator of Bread Matters*
Sheridan Piggott	*Founder of York Bike Belles*
Arno Schmickler	*Programme Director of Energiesprong UK*
Anna Joyce	*Project Manager of Flower Pod*
Chris Blake	*Founding director of The Green Valleys Community Interest Company (CIC) and TGV Hydro*
Agamemnon Otero	*Chief Executive Officer of Repowering London*

Chapter 2:

Postcards from the future

Being able to envisage positive change is a powerful first s ep in making it happen. Drawn from CAT's Zero Carbon Britain research, these 'postcards' help us visualise what a zero carbon future could look like. Looking back from a future where we have risen to the climate challenge, they explore what changes have occurred in the four key sectors of food, transport, buildings and energy.

Photo by michel bish / CC BY 2.0

2.1 Food

The average diet in the UK is now healthier, more varied and sustainable owing to a mixture of legislation and education. The trend in obesity has been reversed and is no longer a health concern now that the consumption of foods high in fats, salt and sugar has fallen.

Restrictions on advertising, as well as the taxation of junk foods, have helped move the population as a whole to a much more balanced diet. There is a greater understanding of healthy food choices and the benefits of more nutrient-dense foods. This vastly increased awareness of what actually constitutes a diet healthy for both people and planet means people eat significantly less red meat – particularly beef and lamb, but also pork and chicken, and less cheese, milk and eggs. Many people enjoy high quality meat a couple of times a week, and while most still eat a certain amount of dairy produce, plant-based alternatives are everyday fare.

Publicly-funded organisations like schools and hospitals always provide sustainable diets. Restaurants and manufacturers have diversified significantly and the majority of meals on their menus are now non-meat or lower meat choices. Many popular dishes, such as spaghetti Bolognese, are now made by adding a small amount of meat to a plant-based mince. Nobody seems to have noticed the difference.

Farmers grow a wider range of crops, providing more food directly for human consumption, rather than for livestock. The UK grows much more of its own fruit and vegetables. Animal welfare and meat quality is also improved. Pigs and chickens are fed predominantly on food waste, with a small amount of crops still grown to feed livestock, to limit the need for these to be imported from elsewhere. The reduction in livestock farming has reduced water pollution and enabled better protection of the UK's green spaces and land around streams and rivers, helping wildlife and biodiversity.

2.2 Transport

Towns and cities have become more human-centred and vibrant, with attractive public spaces where people can meet, stroll and shop in traffic-free streets. Cars no longer dominate and vast areas of the land that were once used for car parking have been made into green areas, or converted to low-cost and social housing.

Public transport is now quicker, more affordable and more convenient than travelling by car. Combined with safer and more pleasant options for cycling and walking, these have become the norm for all sorts of journeys, including to work and to the shops.

All cars, light vans and buses are electric or hydrogen-fuelled, meaning they're not only cleaner but quieter too. This has been helped by the reduction of traffic speeds in urban areas to 20mph, making residential areas much safer and enabling children to play outdoors in their streets.

In addition to being less stressed by their commute, people use technology to work more flexibly, all of which make for a more productive working day. The school run is a thing of the past as children walk, cycle or catch the bus.

The efficient public transport infrastructure extends to rural areas, where regular bus services connect with rail networks.

Holidaying in the UK is popular again, regenerating the economies of many British seaside resorts and rural areas. Although some people still take occasional flights for family holidays, health or religious reasons, travelling by high-speed train to continental Europe is favoured by many. Rather like the slow food movement, slow travel for leisure has become popular – with the focus as much on the journey as the destination.

People, especially children, are much healthier and less stressed as a result of the cleaner air and from walking and cycling more. This, together with better diets, has averted an obesity epidemic in the UK, saving money on healthcare and increasing overall levels of well-being.

Photo by Bromford / CC BY 2.0

2.3 Buildings

While many of the UK's buildings look the same, their performance has dramatically improved thanks to comprehensive energy efficiency retrofitting. This has come about through a mixture of minimum energy efficiency standards for buildings, incentive schemes managed by local authorities to ensure secure financial returns, and the provision of low-cost finance.

Building regulations require all new buildings to be built to 'Passive House or equivalent' standards, giving everyone – whether they're home-owners or in the social and rented sectors – homes that are warmer and cheaper to run.

Methods and technologies for achieving these super-high efficiency standards have spread throughout the construction industry. With their wider implementation, costs have reduced significantly and further innovations have been developed. The adjustment in land values to cover increased construction costs has been minimal and many wonder why we didn't do it sooner!

Zero carbon heating systems, such as heat pumps and solar thermal systems, have become commonplace and people are more aware of their energy use and much better at controlling it using smart-meters and energy control systems. There is also a much increased range of 'flexible demands', such as freezer and heat pumps, which can pay the best possible price by automatically selecting to operate at the time when the grid tells them energy from renewables is available.

The materials used in building new buildings and in retrofitting existing ones have changed. Knowledge and information about the embodied energy and carbon of construction materials, as well as the health and well-being benefits of 'natural materials', have become widely available and well understood. At long last, as a nation, our housing stock has caught up with that of our European neighbours.

Photo by 10 10 / CC BY 2.0

2.4 Energy

The UK now gets all its energy from renewable sources, from solar panels on roofs and walls, wind turbines on the tops of hills and out at sea, from plantations and energy crops, and agricultural and food waste.

A significant and important percentage of renewables are installed, owned and managed by communities, boosting and stabilising local economies and helping public acceptance. Offshore wind is part-owned privately and part-owned by the public purse, using public sector pension funds. This growth in the renewable energy industry has also created hundreds of thousands of good jobs across the country.

Local authorities return to getting a significant part of their funding from delivering local energy provision, this time sustainably. There is still a national grid, developed to enable a greater proportion of the energy that feeds into it to come from decentralised and community owned sources – for which there is widespread public and political support.

The carbon dividend, an equal per-person refund of revenue raised by a carbon tax, means that although the unit cost of energy has increased, household energy bills are lower as a result of much improved insulation and efficiency. People are still better off than they were, and certainly in a better position than they would have been if dangerous had not been averted.

The renewable energy industry in the UK has also grown strongly, and many see the benefits of the energy transition, particularly the creation of hundreds of thousands of good jobs across the country.

The human and monetary cost of illnesses caused by air pollution has fallen significantly.

Chapter 3:

Where we are now: our changing climate

3. Where we are now: our changing climate

Photo by Christopher Michael / CC BY 2.0

3.1 Why we need zero carbon

When we burn fossil fuels to heat our homes and drive our cars, when we use chemical processes in industry, or when we change how we use land and how we produce our food, greenhouse gases, such as carbon dioxide, methane and nitrous oxide, are emitted. However, the burning of fossil fuels contributes most to UK greenhouse gas (GHG) emissions (Baumert et al., 2005).

Even though plants and oceans absorb much of the carbon dioxide that we emit (about 55%), the rest builds up in the atmosphere (Ballantyne et al., 2012). As a result, greenhouse gas levels in the atmosphere today are higher than they have been for at least the last 800,000 years (NRC, 2010), and are rising at a rate ten times faster than the last deglaciation (Shakun et al., 2012).

3.1.1 Providing an international consensus on climate science

Reaching agreement between nations to act on climate is not an easy task and so requires a process for reaching clear international consensus on the science. Founded in 1988 by the World Meteorological Organization and United Nations Environment Programme, the Intergovernmental Panel on Climate

Change (IPCC) is the international body for assessing climate science. It provides policymakers with regular rigorous and balanced 'Assessment Reports' of impacts and future risks, plus options for both adaptation and mitigation. It provides a unique service to decision-makers because of its intergovernmental scientific approach. Key findings from the most recent assessment report (AR5) are in the box below.

3.1.2 The international process for deciding how to act on climate change

IPCC assessments present projections of future climate change based on different scenarios and the risks that climate change poses. They discuss the implications of response options, but they do not tell policymakers what actions to take. Actions are delivered through a process called the United Nations Framework

Key findings from the IPCC Assessment Report 5

Climate Change 2014 Synthesis Report Summary for Policymakers

Observed changes in the climate system

Warming of the climate system is unequivocal, and since the 1950s many of the observed changes are unprecedented over millennia. The atmosphere and oceans have warmed, the amounts of snow and ice have diminished, and sea level has risen. Each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850. The period from 1983 to 2012 was likely the warmest 30-year period of the last 1400 years in the Northern Hemisphere. The globally averaged temperature shows a warming of 0.85°C over the period 1880 to 2012.

Causes of climate change

Anthropogenic greenhouse gas emissions have increased since the pre-industrial era, driven largely by economic and population growth, and are now higher than ever. This has led to atmospheric concentrations of carbon dioxide, methane and nitrous oxide that are unprecedented in at least the last 800,000 years. Their effects, together with those of other anthropogenic drivers, have been detected throughout the climate system and are extremely likely to have been the dominant cause of the observed warming since the mid-20th century.

Future climate changes, risks and impacts

Continued emission of greenhouse gases will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems. Limiting climate change would require substantial and sustained reductions in greenhouse gas emissions which, together with adaptation, can limit climate change risks. Risks are unevenly distributed and are generally greater for disadvantaged people and communities in countries at all levels of development.

Convention on Climate Change. The Conference of the Parties (COP) is the supreme decision-making body of the Convention. All nations that are Parties to the Convention review the implementation of current policies and aim to take decisions necessary to meet the demands of the science, drawn from the IPCC and others. At the Paris COP21 Climate Summit in December 2015, 195 countries agreed that they will collaborate – this is known as the 'Paris Agreement'.

3.1.3 Reaching a meaningful global agreement

The Paris Agreement calls for the total global emissions to reach net zero by the second half of this century. The COP process involved all countries putting forward their own voluntary emissions reduction targets called 'National Determined Contributions' (NDCs). These are either devised by individual governments or are the result of negotiations between regions, trade partners or other alliances. Core to building the ambition needed to meet the agreed target is the need for recognition of the different historic responsibilities between developed and developing countries. Carbon Brief has developed an interactive map of the world to help us understand historical emissions. (https://www.carbonbrief.org). While long industrialised areas such as the US and EU contribute far more greenhouse gases to the atmosphere, newly industrialising countries such as China are catching up. India's contribution is also rising, yet it will remain a comparably small contributor – particularly on a per-capita basis. (https://www.carbonbrief.org)

The Paris Agreement – key decisions

Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognising that this would significa tly reduce the risks and impacts of climate change.
In order to achieve the long-term temperature goal set out above, Parties aim to reach global peaking of greenhouse gas emissions as soon as possible, recognising that peaking will take longer for developing country Parties. Thereafter, Parties aim to make rapid reductions in accordance with best available science, so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century, on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty. (http://unfccc.int)

3.1.4 Increasing ambition

Yet, despite having agreed a target of 2°C, or ideally 1.5°C, the actions agreed at COP21 will not, on their own, achieve it. Climate Action Tracker calculate the sum of each nation's commitment

agreed in Paris will, at very best, limit global temperature rise to around 2.7°C to 3.5°C. Although that's a clear improvement of 0.4°C since the 2014 climate summit in Lima, it's still not enough (http://climateactiontracker.org). So there is an urgent need to increase ambition. The next review of COP commitments is planned for 2018. Long industrialised countries need to get to zero as quickly as possible to set an example and to allow the developing countries their fair share of the final, residual carbon we can safely burn to put in to place the basic human infrastructure we have enjoyed for many decades. Hence the Zero Carbon Britain scenario was developed to explore how we can reach zero in 20 years.

3.2 UK progress towards zero carbon

The UK is legally bound by the 2008 Climate Change Act (CCA) to reduce emissions by 80% by 2050 (see box below). In March 2016, the Government confirmed that the UK will enshrine in law a long-term goal of reducing its net carbon emissions to zero, as called for in the Paris Agreement (Hansard, 2016).

However, the CCA targets only address part of the greenhouse gas emissions that the UK is responsible for. For example, emissions from aeroplanes, not included in the current target, have increased since 1990. The targets cover the UK's domestic, or 'production' emissions of greenhouse gases – those emitted by activity within the UK. While these have fallen in recent years, if emissions associated with imported goods and services (known as 'consumption' emissions) are included, the picture is less clear-cut – see figure 3.2.

> *Avoiding severe global catastrophe is a moral and legal imperative. To the extent that human activity endangers the biosphere, particularly through the effects of human activity on the global climate, all States and enterprises have an immediate moral and legal duty to prevent the deleterious effects of climate change.*
>
> Oslo Principles on Global Climate Obligations, March 2015

Estimates vary because of the different ways of calculating these consumption emissions, though figures show they are significant, possibly 50-80% higher than production emissions (Committee on Climate Change, 2013; DECC, 2015a). While the environmental impacts of these mainly imported goods may be invisible in the UK, and do not appear on the UK's

climate change budget sheet, they are a significant part of the UK's carbon footprint and contribute to global levels of greenhouse gas emissions. For example, it is estimated that half of the growth in China's greenhouse gas emissions between 2002 and 2005 was due to production of goods for export, mainly to western countries (Guan et al., 2009). The UK's consumption habits drive emissions up around the world, to the detriment of our happiness as well as the future of the planet.

> *We are concerned that the UK could be meeting its domestic carbon budgets at the expense of the global carbon budget...The UK's consumption cannot rise indefinitely.*
>
> House of Commons Select Committee on Energy and Climate Change

The Climate Change Act (CCA)

The CCA was the world's first long- erm legally binding framework to tackle climate change. The Act set a legally binding target for the UK to reduce its greenhouse gas emissions by at least 80% from 1990 levels by 2050, consistent with a 50% chance of limiting global temperature rise to as little as possible above 2°C.

To ensure that regular progress is made towards this target, the Act also established a system of fi e-yearly carbon budgets. These are set in law and act as stepping-stones towards the 2050 target. The UK is currently in the second carbon budget period (2013-17). Meeting the third (2018-2022), fourth (2023-2027) and fi th (2028-2032) carbon budgets will require that emissions be reduced by 35% by 2020, 50% by 2025 and 57% by 2030 respectively compared to 1990 levels. The carbon budgets exclude international aviation and shipping.

The Committee on Climate Change (CCC), an independent expert body established by the Act, recommends the levels of budget and submits annual reports to Parliament on the UK's progress towards targets, to which the Government must respond. Under the Act the Committee are required to identify the contributions to meeting the carbon budget by 'traded' and 'non-traded' sectors. The 'traded' sector refers to those sectors of the economy covered by the EU Emissions Trading System (EU ETS), primarily electricity generation and energy intensive industry. The 'non-traded' sector covers all emissions outside the EU ETS, including transport, heating in buildings, agriculture, waste and some industry. Under the accounting rules of the CCA the contribution of the traded sector is determined by the emissions allowances allocated to the UK in the EU ETS (Committee on Climate Change website).

Consumption emissions appear to have peaked in 2007 (DECC, 2015a), though some analysts have suggested that the government figures underestimate the true picture as they assume that production practices and efficiencies around the world are the same as the UK (Owen, 2016).

Yet, even based on production emissions alone, the UK is not on track to meet the 80% target (Committee on Climate Change, 2015). The Government has not only ignored recommendations to strengthen action, it has actually done the reverse; for example, cutting kick-start incentives for solar and onshore wind instead of extending them (Le Page, 2015). The fifth carbon budget has been criticised for not being ambitious enough in the light of the Paris agreement (Scott and Sakai, 2016). Clearly the UK still has a long way to go to meet even the current 80% reduction targets by 2050, let alone reach zero carbon.

3.3 The impacts of climate change and inequalities

Climate change affects everybody, but some people suffer more than others. Whilst not creating new forms of discrimination, the impacts of increasing global temperatures can reinforce and exacerbate existing patterns of inequality. Groups of people at risk of discrimination are susceptible to increased levels of systemic or individual inequality as a result of climate change, whether directly or indirectly (WHO, 2011; Neumayer and Plümper, 2007). Fundamental freedoms may become harder to uphold, and

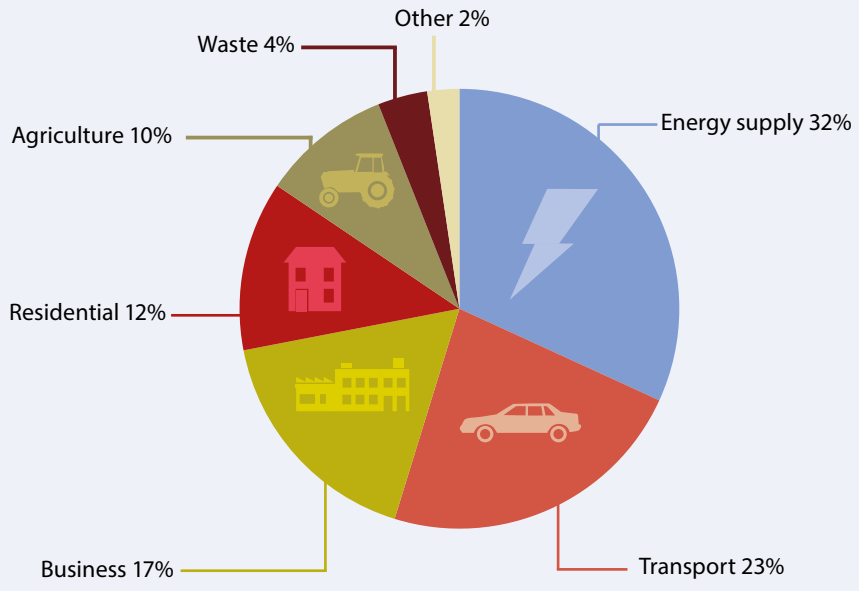

Figure 3.2a

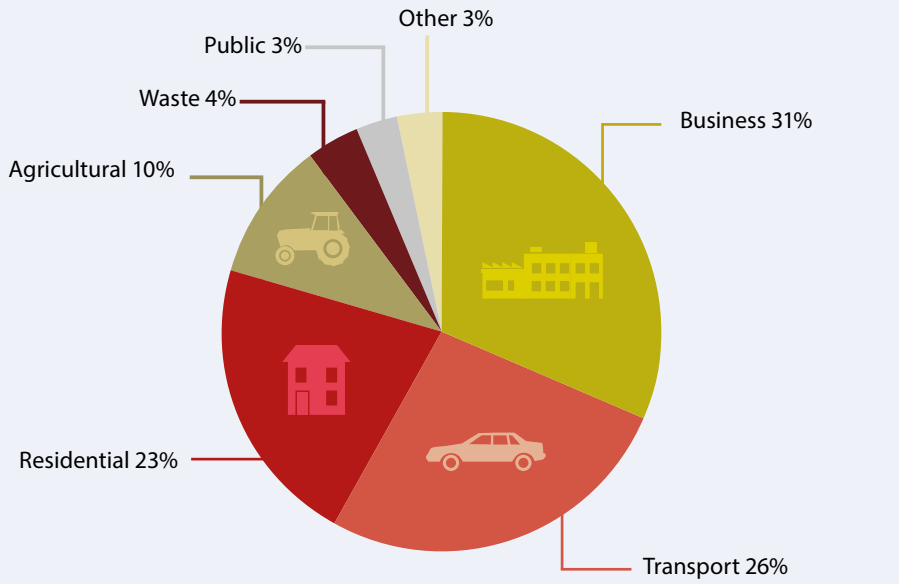

Figure 3.2b

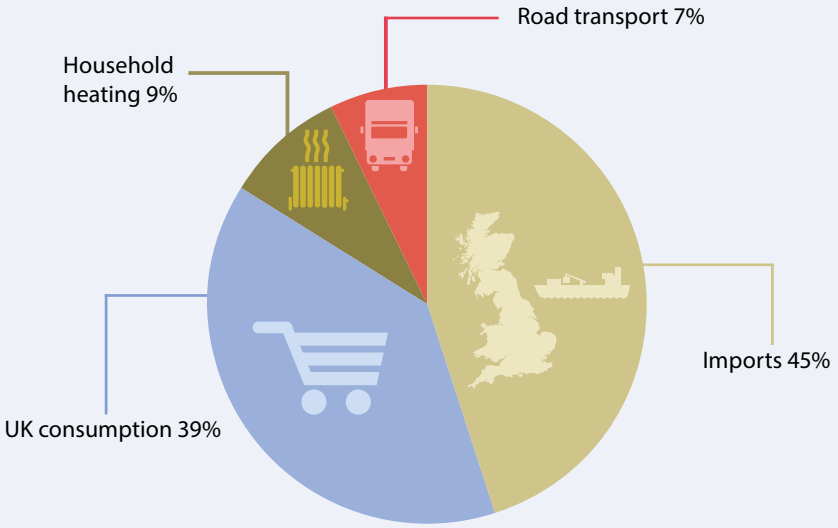

Figure 3.2c

Fig. 3.1 a, b and c *– Breakdown of greenhouse gas emissions generated in the UK by a) source b) user (in 2014) (DECC, 2016a) and c) consumption (in 2012 – latest figures available) (DEFRA, 2016). Also see notes below* [(1)].

(1) Please note in a) Total emissions in 2014 were 514 million tonnes of CO_2eq (not including emissions from international aviation and shipping of 41 million tonnes CO_2eq). b) Same total as before but emissions from electricity generation at power stations are attributed to where the electricity is used, such as homes and businesses. c) Including the carbon embedded in the goods and services that we import to the UK (and excluding those exported) the total consumption emissions are 863 million tonnes CO_2eq, much higher than that for production emissions alone.

the most vulnerable people are at risk of becoming even more vulnerable (Waldinger and Fankhauser, 2015; IPCC, 2014). Issues of social justice must, therefore, be central to action on climate change.

Globally, many of the regions that have been prone to natural disasters in the past are now experiencing increasingly frequent and dangerous extreme weather events (Foresight, 2011). When rapid displacement occurs due to the sudden onset of flooding, wildfire or landslides, for example, immediate survival is placed under threat. If affected people are unable to answer the immediate needs of their families by providing shelter, fuel and sustenance, they are more likely to take risks, potentially increasing their susceptibility to conflict, violence or exploitation (Detraz and Windsor, 2013).

If displacement is gradual as a result of incremental environmental degradation (such as deforestation, desertification, rising sea levels or freshwater salination), vulnerability at home can increase: male relatives may relocate in search of urban jobs (Curran and Meijer-Irons, 2014; Ezra and Kiros, 2001), whilst typically women and girls remain as primary carers, often having to travel further afield to find basic resources (Abebe, 2014; Haigh and Vallely, 2010).

In developing countries, women and girls are more likely to die than men and boys in extreme weather events due to a combination of gender-specific risk factors (Abdein et al., 2013; Ikeda, 1995). For example, girls are less likely to know how to swim or climb trees because of gender constructs within family life (Oxfam, 2005), and more likely to be confined to their household or local area for cultural or religious reasons (Ahmad et al., 2014; Yavinsky, 2012).

Women and girls, particularly in rural areas of developing countries, are at risk of increased sexual violence as a result of climate change. In Sudan, for example, desertification in the north has fostered conflict with the mineral-rich south, leading to rapid escalation of sexual violence against women and girls (Institute of Development Studies, 2008). In Ethiopia, droughts contributing to water scarcity and deforestation have led to increased levels of rape, sexual assault and abduction of girls sent further from home to collect fuel and water (Swarup, 2010). In the Pacific region, following Cyclone Zena in 2009, one relief centre recorded a 300% increase in intimate partner violence (Vanuatu Women's Centre, 2011).

People with restricted mobility may be entirely reliant upon the help of others to escape a sudden extreme weather event. The perception of disability as a special needs issue requiring segregation or rarified expertise – rather than normalisation through mainstream integration – serves to further deter an inclusive approach. In 2009, the Global Partnership for Disability and Development stated that, "stigma remains one of the most intractable barriers towards the inclusion of disability issues in disaster response"

(Global Partnership for Disability & Development, 2009).

In the UK, direct experience of climate change in recent years has been limited to worsening storms, flooding and heatwaves. Six of the seven wettest years on record occurred after 2000, as did all of the eight warmest years on record (Centre for Ecology and Hydrology, 2014). Such conditions contribute to significant increased risk of injury, illness and death for disabled people, as well as for babies, children and older people, all of whom may be reliant on others to implement protective measures, such as evacuation or sun protection (Benzie et al., 2011). Existing vulnerabilities associated with older people, such as chronic illness, susceptibility to infection, and reliance upon medication or assistive devices, such as walking frames, hearing aids, and glasses may be exacerbated in emergency situations.

3.3.1 Heatwaves

In Europe in 2003 an estimated 80,000 people died as a result of heatwaves, including 10,000 in France and 2,000 in the UK (Robine et al., 2008), followed by over 50,000 in Russia in 2010 (Revich, 2011). Along with flooding, heatwaves pose a growing major health and safety risk in the UK (Wolf and McGregor, 2013). Some research has identified a link between mortality and room temperature which starts as low as 19°C (Hajat, et al., 2013).

In response to the 2003 European heatwaves, various bodies have researched and developed heatwave action plans, indices and mapping, which consider the susceptibility of communities and individuals (UNISDR, 2004). As with all forms of climate changing weather, the people in the most vulnerable position before a heatwave are the most vulnerable during and after the event. These heat risk factors disproportionately affect the very young, very old, and the impaired, from restricted mobility to mental health issues, and are compounded by limited access to resources and inadequate interventions (Ogg, 2005). Research has tended to focus on socio-economic demographics, rather than vulnerability and resilience within communities.

One recent study projected that heat-related deaths would increase by two-thirds in the 2020s in the absence of mitigation and adaptation efforts (Hajat, 2013). Another study found that a mere 2°C increase in average UK summer temperatures correlates with an extra 1,550 deaths. More than half these victims are predicted to be over-85s and two-thirds women (Bennett et al., 2014). Disabled people, especially those with underlying health conditions, are generally more vulnerable to the impacts of climate change, such as extreme temperatures, and to other impacts of burning fossil fuels, such as air pollution. In Britain, there are over 11 million – one in six people – living with disability (DWP, 2015). Those based in large cities face

the greatest risk owing to an incubatory 'urban island' effect (South and Grimmond, 2006).

3.3.2 Flooding

In the last decade, severe flooding has affected every region in the UK and provided stark evidence of inequality. December 2015 was the wettest month on record (as measured since 1910), and in June 2016 flash floods in South London measured up to two metres deep. Flooding in the UK has not traditionally been framed as a matter of environmental justice, however there is a limited but growing body of evidence which considers the distributional social impact and issues of vulnerability. In particular, the sudden onset of flash flooding has been found to aggravate existing inequalities. Over 12% of the British population live in areas at risk of flooding, but people in sea flood zones are 122% more likely to be in the two lowest deprivation categories (Walker, 2011). In other words, either the poorest 20%, or poorest 40% of the population.

In 2006, a report by the UK government's Environment Agency recognised the importance of understanding and addressing inequalities in order to provide effective flood risk management across the UK. The research found that the social impact of flooding in the UK is wide-ranging, affecting people's physical and psychological health, material goods, assets, households and communities. Levels of flood risk awareness are lower in deprived communities which are less likely to be prepared to cope with flood events and consequences. Deprived communities are more likely to be characterised by poor health, which in turn increases their vulnerability to cope with flooding. The health impact of flooding is significant, with over two-thirds (67%) of those affected by floods in 2007 reporting mental health issues, and 39% suffering physical injury (Pitt, 2008). Additionally, pre-existing conditions and age are major factors in vulnerability to the negative health effects of flooding (Few et al., 2004).

Photo by John Robinson / CC BY 2.0

York floods 2008

In Britain, the impact of severe flooding has been shown to substantially increase the burden of care for women (Fordham, 1998). Mobility issues in flooding are a particular concern, which disproportionately affect the very young, very old, and disabled people. The British Red Cross have identified climate change as the key factor likely to increase vulnerability globally and highlighted the importance of community

relations (McNulty and Rennick, 2013). Diversity and inclusion of minority and marginalised groups is repeatedly cited across UK and global literature on climate change as a primary requirement to improve mitigation and adaptation strategies (Hamza, 2015; Fordham and Gupta, 2011; Brosius, 1998). Fundamentally, this involves including more and different types of people at every level of decision-making, governance and implementation. This offers an important and inspiring opportunity to embrace diversity as a vector for positive solutions.

3.3.3 UK investments and global justice

While this report focuses on the UK it is important to remember that as well as the need to reduce emissions associated with both production and consumption, including imported goods, the UK has other global responsibilities. As the box below shows it is also indirectly responsible for global emissions via its investment in fossil fuels and industries that contribute directly to climate change, and political support for regimes that promote this.

UK global responsibilities – the case of West Papua

The British government supports the Indonesian occupation of West Papua (known by its occupied name of Irian Jaya) along with mining, logging and drilling activities in West Papua (British Embassy Jakarta, 2013; Capriati et al, 2016).

British company BP operates liquefied natural gas (LNG) projects in West Papua and is expanding interests there (McKenna, 2015; Hickman and Barber, 2011). Another British company, RTZ – the second largest mining company in the world with a market value of $77.1 billion (March 2015) – is partner to US company, Freeport-McMoRan, Indonesia's largest taxpayer at $1.5 billion in 2014.

The overall motivation for the occupation and accompanying scale of destruction in West Papua is to control and release the immense natural reserves of oil, gas, copper, gold, timber and palm oil (Pilger, 2006; Capriati et al, 2016).

With Indonesian occupation came a "slow-motion genocide" (Elmslie and Webb-Gannon, 2013) aiming to destroy the traditional, low carbon Papuan way of life of the indigenous Melanesian tribes (Monbiot, 2003). Figures disputed by the Indonesian authorities – but extensively reported by other sources (for example, by Yale and Sydney Universities, IPWP and the US National Security Archive) – put the estimated number of murders committed by the Indonesian Special Command Kopassus over half a century at 500,000 (Barnett, 2005). Many of those who survived have been forced from their ancestral homes in the jungle to coastal regions where they are exceptionally vulnerable, in the immediate pathway of cyclones and tsunamis, which are increasingly frequent in the region (Samuelson, 2013).

Expert View

Poverty and climate change – finding solutions

Katharine Knox

Policy and Research Manager at the Joseph Rowntree Foundation

The Joseph Rowntree Foundation (JRF) has long pioneered research on issues of poverty and disadvantage in the UK, seeking out the 'causes of social evil' as tasked in our memorandum. In recent years we have developed a work programme to examine the social impacts of climate change and the social justice implications in the UK. This came out of concerns that while social justice was increasingly being considered internationally (though arguably not enough), there had been little consideration given to the implications in the UK itself.

What are the key climate change and social justice issues in the UK?

Our research to date has highlighted a range of injustices in how climate change will affect society closer to home. Low-income households who contribute least to emissions are likely to be among those worst affected by the impacts of climate change. They are also likely to pay proportionately more and benefit less from certain policy responses, while often having least voice in decisions (Banks et al., 2014).

In particular, we know that the highest income households in the UK are on average responsible for three times as many emissions as those on the lowest incomes for direct emissions associated with housing and transport (Preston et al., 2013). These differences in emissions related to income are amplified if other forms of consumption are taken into account.

At the same time, low-income households will be most adversely affected due to the increase in the costs of living we can expect as a result of climate change – particularly if food prices rise due to impacts of climate change overseas – although they may also benefit from reduced energy costs if rising temperatures reduce demand for home energy heating (Watkiss, 2016).

However, a warming climate will also mean increasing need to consider overheating risks and low-income households are more likely to suffer the health consequences of inadequate housing than be able to afford to install air conditioning (which of course may not be the best solution in any case in light of the carbon consequences). The condition of people's homes and wider environment will be an important context in which people experience climate change – and whether this helps to act as a buffer or serves to exacerbate risks will affect social outcomes.

This is most starkly brought home in relation to flooding. Deprived communities are disproportionately exposed to coastal flooding compared to less deprived communities and over 1 million people living in deprived areas are at risk of some form of flooding (Sayers and Partners, 2016). The most recent floods in 2015/16 led to average claims of £50,000 on household flood insurance. However, as many as 40% of low-income households don't have flood insurance; even in areas at higher risk, take-up rates are only marginally higher (Watkiss, 2016). Low-income households in at-risk areas thus face the prospect of a lack of a safety net to deal with the impacts of flooding and a higher impact on their household resources from losses which do occur. Climate change scenarios also indicate that deprived households will see a disproportionate increase in exposure to more frequent floods.

The issue of low-income households paying proportionately more towards the costs of policy measures paid for through energy bills has been widely reported (Preston et al., 2013). But the answer is not simply to avoid taking policy measures; it is an argument for a fairer

application of the costs, and use of taxation as a more progressive route to fund policy responses.

So what can be done about these injustices?

To address climate injustice, we need to have a better understanding of the differential effects of climate change across different parts of the country and for different people and communities. A just approach means taking account of these differences and supporting appropriate targeting of resources towards those who may be most vulnerable and hardest hit, rather than simply following a straightforward cost/benefit approach. JRF's Climate Just website helps to highlight where differential impacts from flooding and heat may occur across the country in order to support socially just adaptation responses (Climate Just website).

Part of our efforts need to be directed towards awareness raising in different sectors where the consequences of climate change will be felt, but where currently there is a lack of focus on this as an issue. For example, climate change has been described by the medical profession as the 'biggest threat to public health' this century. Yet, our research shows little is being done to address this among public health professionals across the country. While the issue may be recognised in local needs assessments this is rarely translated into the coherent local strategic responses that are needed (Button and Coote, 2016).

Yet, well-insulated and ventilated homes, active travel (in other words walking/cycling), flood and heat resilient green space, strong social cohesion, a sustainable health and social care system and a sustainable food system can all have both health and environmental benefits (ibid).

There are positive signs of strategic thinking. For example, in Middlesbrough, where poverty rates are high and the local authority is working with the voluntary sector through Middlesbrough

Environment City on a range of initiatives to deliver fuel poverty, food growing and active travel schemes. The Big Lottery's Communities Living Sustainably initiative offers other examples of how local action can help to support change. Islington Council's work to address health and affordable warmth, with joint working across multiple partners inside and outside the local authority, is another positive example. But we need to see initiatives like this growing and being applied in other areas.

The care sector is another area where more attention is needed. In the 2003 heatwave, where several thousand people died in the UK, some of the most vulnerable people were older people in care homes. By the 2050s, similar heatwaves are expected to be a frequent occurrence. But overheating is not just a future issue. JRF research shows that care homes are already at risk of overheating now due to a mix of design, management and operational issues, including problems with heat management and control in care homes. We need to be more alive to the risks and begin to integrate this into regulatory practices and guidance so that care homes are adapted to avoid the negative health consequences of heat as our population ages (Gupta et al., 2016).

To minimise the negative impacts of climate change we clearly need to maximise our efforts to reduce carbon emissions. Recent policy has been moving in the wrong direction. We also need to start thinking more holistically about climate change mitigation and adaptation. There is already evidence that in some new build homes, there are risks of overheating due to a focus on providing air tight highly insulated homes without adequate consideration being given to ventilation, with associated health risks. Action to reduce emissions needs to be considered alongside the climate change impacts we will face, given the emissions already in the atmosphere. There are clear opportunities for 'win-wins' that address both climate change and poverty concerns. The most obvious example is taking action in the housing sector to combine carbon reduction with fuel poverty alleviation, through energy efficiency measures

to people's homes combined with other interventions that support benefits take-up for those on low incomes and help people to manage their energy consumption effectively. This will be costly, but housing is one of the big contributors to emissions, and energy bills form a substantial part of household energy budgets, so investing now could pay dividends later.

A more imaginative approach is also needed to visualise the future we want to see at the local level and to use the planning system to develop a low carbon and climate resilient economy and society. Local and national leadership is needed to help make sure we are creating safe places to live for the future.

Chapter 4:

Where we are now: four key sectors

4. Where we are now: four key sectors

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In any investigation into how complex systems need to change, it is good practice to root ourselves in our current position. Gaining an understanding of where we are today is the first step in exploring what needs to change, and how that change can be brought about. Here we revisit the four key sectors of food, transport, buildings and energy, but rooted in where we are now.

4.1 Food

4.1.1 Emissions

Most emissions associated with the UK diet relate to those from livestock (mainly cows and sheep). Agriculture is responsible for about 10% of the UK's production emissions of greenhouse gases (GHG) (see figure 3.2 earlier (DEFRA, 2015a)).

However, agriculture is responsible for a much higher proportion of emissions of two of the most potent greenhouse gases: nitrous oxide (75%) and methane (50%). The majority of nitrous oxide emissions are from soils, particularly following fertiliser application, manure and leaching, and the majority of methane emissions are from ruminant animals (such as cows and sheep) as they digest grass (ibid).

Of food consumed in the UK, 54% is produced here, 29% is imported from Europe, and 17% from the rest of the world. There are some notable exceptions to this general trend. Most of the meat consumed in the UK is produced here, whilst only 23% of fruits and vegetables consumed are grown in this country (DEFRA, 2015b).

This has important implications, as food brought in from overseas can have higher associated greenhouse gas emissions. Embedded emissions in imported food contribute to the UK's impact on climate change.

4.1.2 The current food system

Food production and provision

Increased weather variability, water scarcity, vulnerability to pests, and biodiversity and habitat loss are just some of the issues farmers will have to face in the future due to climate change, even with the small increases in global temperatures that are now impossible to avoid (Friel et al., 2014). These will affect our ability to produce the levels of food needed to enable everyone to consume healthy and sustainable diets.

This is on top of existing increasing pressures on agricultural production caused by a range of interconnected issues, including high demand, food waste and soil health degeneration.

Much of the research on food production focuses on the idea of 'sustainable intensification', arguing for increased production capacity on land already in use. This requires improving and maximising agricultural yields wherever possible (Godfray et al., 2010). However, as agricultural yields in the UK are already very high, potential emissions savings in this area are limited, and may in fact be cancelled out by an increased use of fertilisers and subsequent release of nitrous oxide emissions (Röös et al., 2016). In addition, declining soil health already threatens the production capacity of the UK and creates other environmental problems in the areas surrounding British farms (DEFRA, 2015a).

Food production isn't the only issue, however. The world currently produces enough food to feed everyone adequately, yet one billion people globally currently suffer from under-nutrition (Alexandratos and Bruinsma, 2012) and another one billion people are overweight or obese (Swinburn et al., 2011). This suggests access to food, trade and distribution also needs to be improved. Yet, only a small fraction of studies discuss both the health and environmental implications of overconsumption (Cafaro et al., 2006).

Even if agricultural yields were successfully maximised all around the world, it is argued there would still be insufficient food unless levels of demand are tackled (Bajželj et al., 2014).

Diet and health

The average diet in the UK today is based on excessive levels of cheap calorie-rich, nutrient-poor foods which are not adequate for health or sustainability goals (Cumberlege et al., 2015). Average diets are too high in saturated fats, added sugars and salt – largely due to an increased consumption of highly processed foods. The UK is failing to meet nutritional recommendations for fruits and vegetables, oily fish and fibre (Bates et al., 2014). Approximately 30% of adults in the UK meet the 5-a-day fruit and vegetable recommendations (ibid) – a smaller percentage than in 2006. 16-24 year olds are the least likely to eat enough fruit and vegetables (HSCIC, 2015).

In the UK, the average daily intake of protein for adult men and women (19-65 year olds) is much higher (approximately 88g and 65g respectively) than the recommended daily amounts for adult men and women of 55g and 45g respectively (these figures are different for children and the elderly) (Henderson et al., 2002). In the UK, the consumption of animal protein far exceeds that of plant-based protein.

More of the average household food budget is being spent on eating out. The number of eateries has increased by 50% in the last 10 years. Fast-service eateries are the most prolific, but also tend to serve the least healthy, highest calorific meals which has been shown to have an effect on levels of obesity. The types of products available for consumers to purchase 'on the go' can also make it difficult for individuals to pick more plant-based options. A recent survey looking at the types of sandwiches available for purchase, for example, found that 97% of all sandwiches on offer contained a meat, dairy, seafood or egg filling (Eating Better, 2015).

A significant proportion of the UK population are overweight or obese and obesity levels are on the rise. In 2013, approximately 25% of UK adults were obese compared with 15% in 1993 (UNFAO, 2013) while obesity in children aged 2-15 years has also increased (HSCIC, 2015). Obesity is a risk factor for many diseases that are common in the UK today, and for many chronic diseases such as type 2 diabetes, high blood pressure and colon cancer (ibid). Animal products make up the biggest contribution to obesity of any food group (Cafaro et al., 2006).

High consumption of processed foods and red meat are both associated with poorer health outcomes. The World Health Organisation's advisory body on cancer recently concluded that consuming large amounts of processed meat is a proven potential cause of cancer (International Agency for Research on Cancer (IARC), 2015). They conclude that for every 50g portion of processed meat eaten per day the risk

of getting cancer of the lower bowel increases by 18% (Bouvard et al., 2015). Moreover, red meat (which includes beef, lamb and pork) in general has also been categorised as 'probably' carcinogenic, with a strong association observed across many scientific studies. The strongest association between red meat and cancer is for colorectal cancer, but a link has also been seen for prostate and pancreatic cancer (ibid).

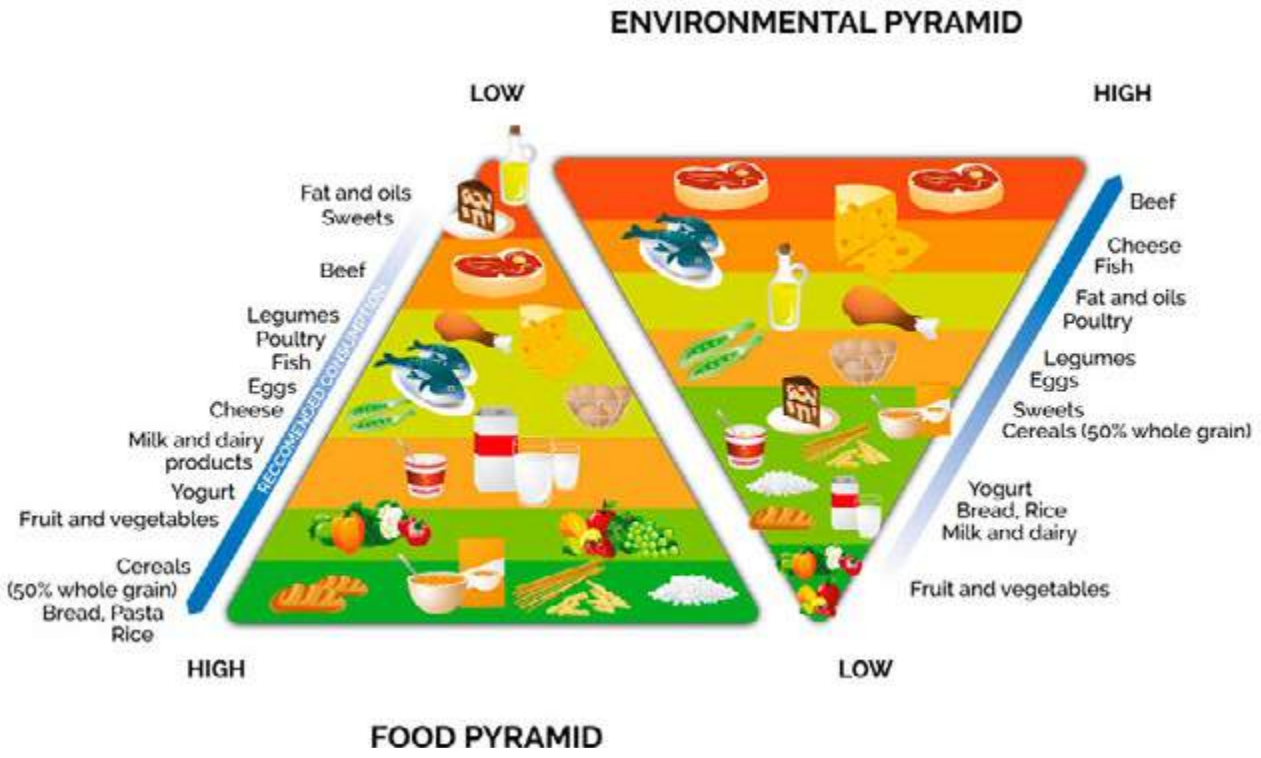
A sustainable food pyramid has been developed to sit alongside a healthy eating food pyramid, to demonstrate which foods are both healthy and low emission. Foods such as red meat, for example, feature at the top of the pyramid, demonstrating that these must only be consumed in small amounts in order to maintain a sustainable diet (Barilla Centre, 2015).

Government health advice has recently been updated to reflect the growing evidence on the health impacts of eating meat. The 'Eat Well' plate now recommends eating pulses and lower amounts of meat, and represents an important step in changes to dietary advice (NHS Choices, 2016).

Food waste

Food supply chains are becoming more complex and hidden from public view (Food Research Collaboration, 2014). The current food system produces a large amount of waste, with a knock-on effect on land-use and other resources as well as unnecessary greenhouse gas emissions.

In the EU just over 30% of all food we produce is wasted, one third of this at



The Barilla Food Pyramid.

the household level and the remaining two-thirds throughout the rest of the supply chain (FAO, 2011).

There are many campaign organisations dedicated to raising awareness of food waste, for example, Feeding the 5000, This is Rubbish, WRAP/Love Food Hate Waste and Fair Share. Feedback's Stop Dumping Campaign aims to end unfair trading practices that lead to significant food waste in the supply chain (Feedback website). The UK also has a multi-stakeholder commitment to reduce food waste (the Courtauld Commitment). This involves the UK government's food waste charity (WRAP), businesses from within the grocery industry and local authorities (DEFRA, 2015b). However, clearly there is still much more that could be done.

4.1.3 Public attitudes

The food products individuals choose to purchase are determined mainly by price, quality and taste (DEFRA, 2015b). These are thought to be the most important factors as they affect the consumer personally and immediately (Bailey et al., 2014). It is suggested that factors such as sustainability, animal welfare and health do not have a direct bearing on people's food choices, even if they believe these issues to be important (Cumberlege et al., 2015).

Individuals tend to underestimate the climate impacts of their diets and there is very low awareness about what changes make the biggest differences. Macdiarmid (2013) demonstrated

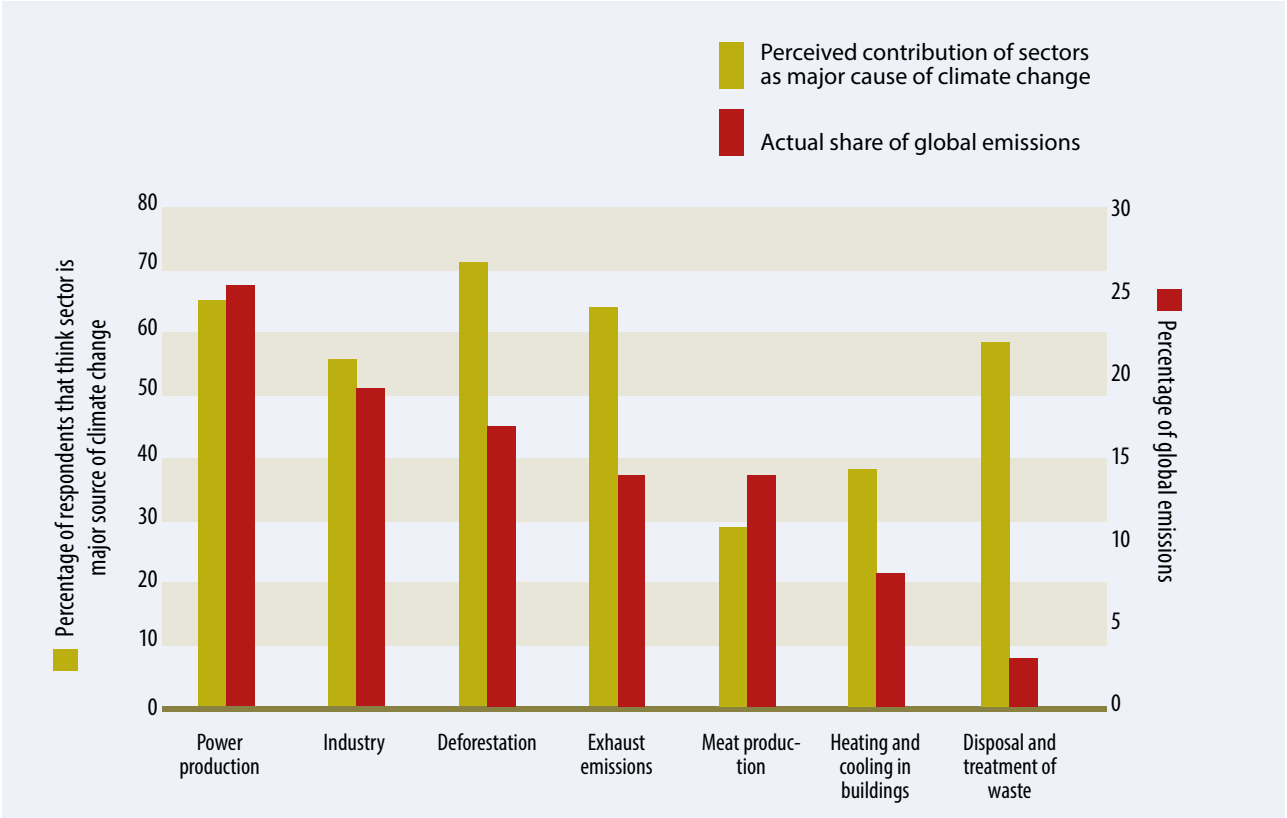


Fig. 4.1 *Comparison of perceived and actual contribution to climate change (Bailey et al., 2014).*

that although approximately 50% of people knew about the links between diet and climate change, only 20% of respondents felt confident that they knew how to change their diet to make it more sustainable. When asked about which diet-related behaviours they thought would produce the greatest benefit, very few people thought that changing the types of foods they were eating had any impact, with most people thinking that buying food that is produced locally and to organic standards, reducing food waste and avoiding unnecessary packaging were more important (ibid).

A recent survey conducted for Chatham House showed that, of all the sectors, the contribution of meat and dairy production to climate change is the most underestimated (Bailey et al., 2014). Figure 4.1 shows the discrepancy between the actual and perceived contribution of this industry to global greenhouse gas emissions.

Lea et al. (2006) explored the benefits and barriers to consumption of a plant-based diet (a diet dominated by plant foods and reduced consumption of meat and dairy) amongst Australian adults. They found that the main perceived barrier amongst all demographic groups was a lack of information about plant-based diet followed by an unwillingness to change eating habits. Other main barriers were unwillingness of the family to eat a plant-based diet and a lack of choice when eating out. Men were more likely than women to believe humans were 'meant' to eat large amounts of meat (ibid).

However, a large proportion of people would be willing to change their dietary habits, with surveys showing 63% of individuals may be willing to reduce red meat consumption and 76% willing to reduce confectionery (Macdiarmid, 2013). Fewer people, 45% of respondents, said they would be willing to consider a reduction in dairy products (ibid). However, if people are unaware of the association between meat and dairy and climate change they are less likely to change. Bailey et al. (2014) found that of those surveyed who were unaware of the association between meat and dairy and climate change, over 50% said that they were unwilling to lower their consumption of meat and 62% said the same of dairy.

Despite levels of overconsumption, many people in the UK believe that they should be eating more protein (Macdiarmid, 2013). Media influences and popular diets that encourage protein consumption (as well as discouraging carbohydrate intake) may be partly responsible. The meat industry also encourages this misconception (Swinburn et al., 2011).

4.1.4 Food costs and inequality

Many people in the UK are simply limited in food choices by what they can afford to buy (Tait, 2015). The recession in the UK, for example, had an influence on the purchasing habits of consumers and since then it has generally been found that people are either cutting back on certain foods or are trading down with

regards to quality (Dibb and Fitzpatrick, 2014).

About 11% of an average UK household budget is currently being spent on food. This increases to about 16% for low-income households (DEFRA, 2015b). The number of households experiencing real food insecurity is also becoming alarmingly high (Tait, 2015). With incomes decreasing and the cost of living going up, household budgets are being squeezed and food budgets are most frequently hit the hardest. Cheaper, less nutritious and more calorie dense foods can be substituted for better quality more expensive foods, whereas other costs such as energy and housing bills are not so flexible (ibid). An association has also been seen between areas of deprivation and the number of fast-food restaurants, which may widen health inequality if growth of these chains continues in the future (The Food Foundation, 2015).

4.2 Transport

4.2.1 Emissions

Transport is responsible for about a quarter of the UK's domestic greenhouse gas emissions, most of which come from cars and other road transport – see figure 4.2 (DfT, 2015a). Although international aviation and shipping is not included in the UK's total reported greenhouse gas figures, emissions from flying overseas are a significant source of emissions.

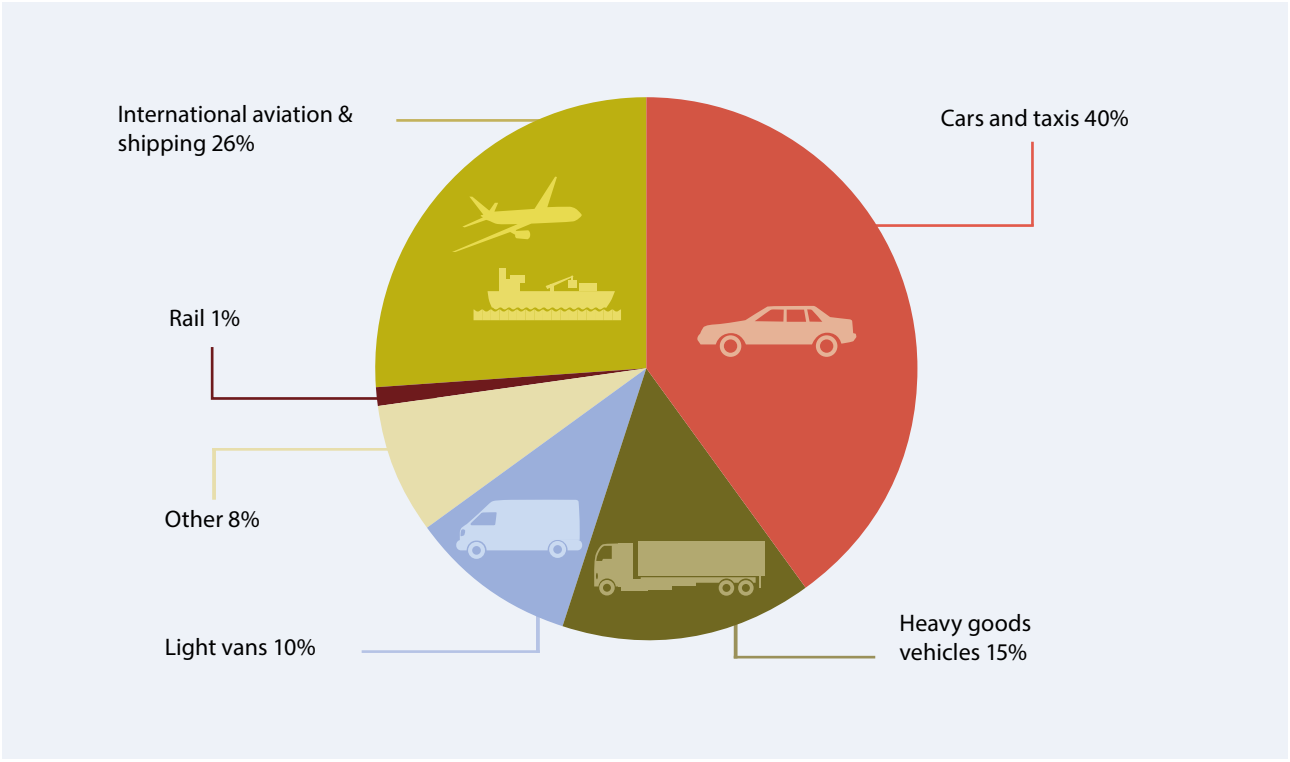


Fig. 4.2 *Breakdown of UK greenhouse gas emissions from transport by mode in 2012 (DfT, 2015a). Total emissions of 159 million tonnes CO_2eq, of which 118 million tonnes was domestic transport and 41 million was international aviation and shipping.*

Emissions from aviation have doubled since 1990 due to increased passenger demand (DfT, 2015b). This growth in demand for air travel (approximately 5% a year) is expected to outstrip any reductions in emissions due to efficiency or technological improvements (DfT, 2013a).

There is also enormous inequality in the contribution to greenhouse gas emissions from both car and air travel. A minority of users travelling comparatively long distances are responsible for the majority of greenhouse gas emissions from car travel while 60% of emissions from flying are associated with only 20% of people (Brand and Boardman, 2008; Brand and Preston, 2010).

4.2.2 The current transport situation

Decades of car-centric urban and transport planning have transformed the UK's towns, cities and transport systems so that most people outside London have become dependent on driving as their primary transport through choice or necessity. Much new development in the UK is characterised by low-density sprawl, out of town business and retail development and the decline of the high street (CBT, 2015).

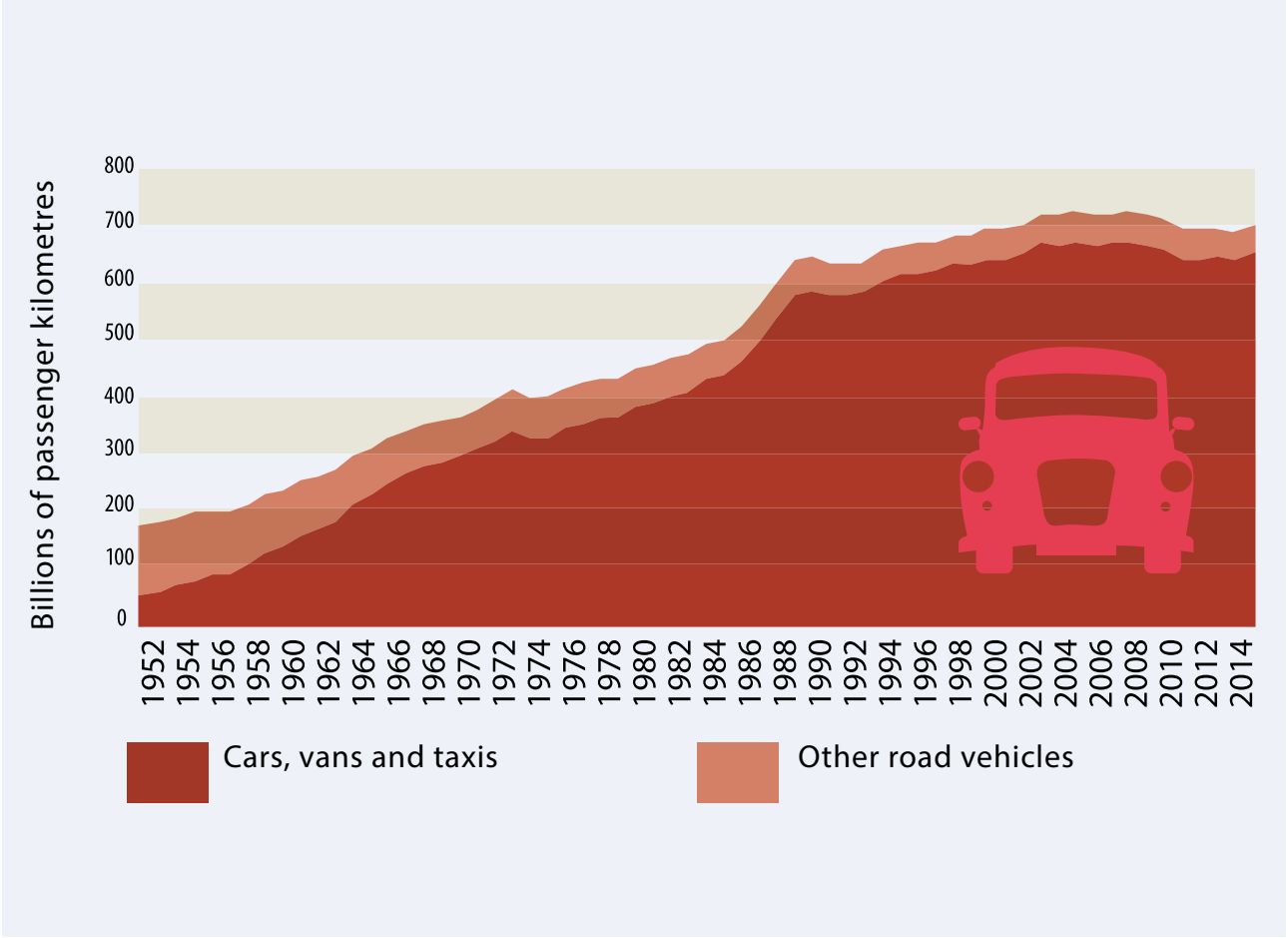


Fig. 4.3 *Growth in road travel in Great Britain, 1952–2014 (billions of passenger kms) (DfT, 2016d).*

The car clearly plays a dominant role in British society, with dramatic growth in car travel since the 1950s (see figure 4.3) and cars responsible for 64% of trips and 78% of the distance travelled in England (ONS, 2015a). The majority (two-thirds) of trips in England cover less than five miles (ibid), yet walking and cycling still constitute a small proportion of transport trips and distance travelled – a proportion that has dropped significantly over time. Fewer young people are learning to drive, however, there has been a large increase in the number of older people holding a full driving licence (ibid). The growing car culture is a vicious cycle: public transport services are cut back as a result of reduced demand, making car use more attractive and locking people into car dependency (Lucas and Jones, 2009).

Nearly two-thirds of public transport trips are made by bus, though the number of people making bus trips has been in decline since the 1950s, mirroring the growth in car travel. Despite privatisation, funding for socially necessary services and for concessionary passes (for example, youth and elderly) are still paid for by public money, representing 40% of operators' revenue (ibid). Yet, £78 million of public funding cuts have seriously undermined these publicly supported bus services, with over 2,400 bus services cut, altered or withdrawn since 2010 (CBT, 2015).

Encouragingly, rail travel is now at the highest level since the 1920s

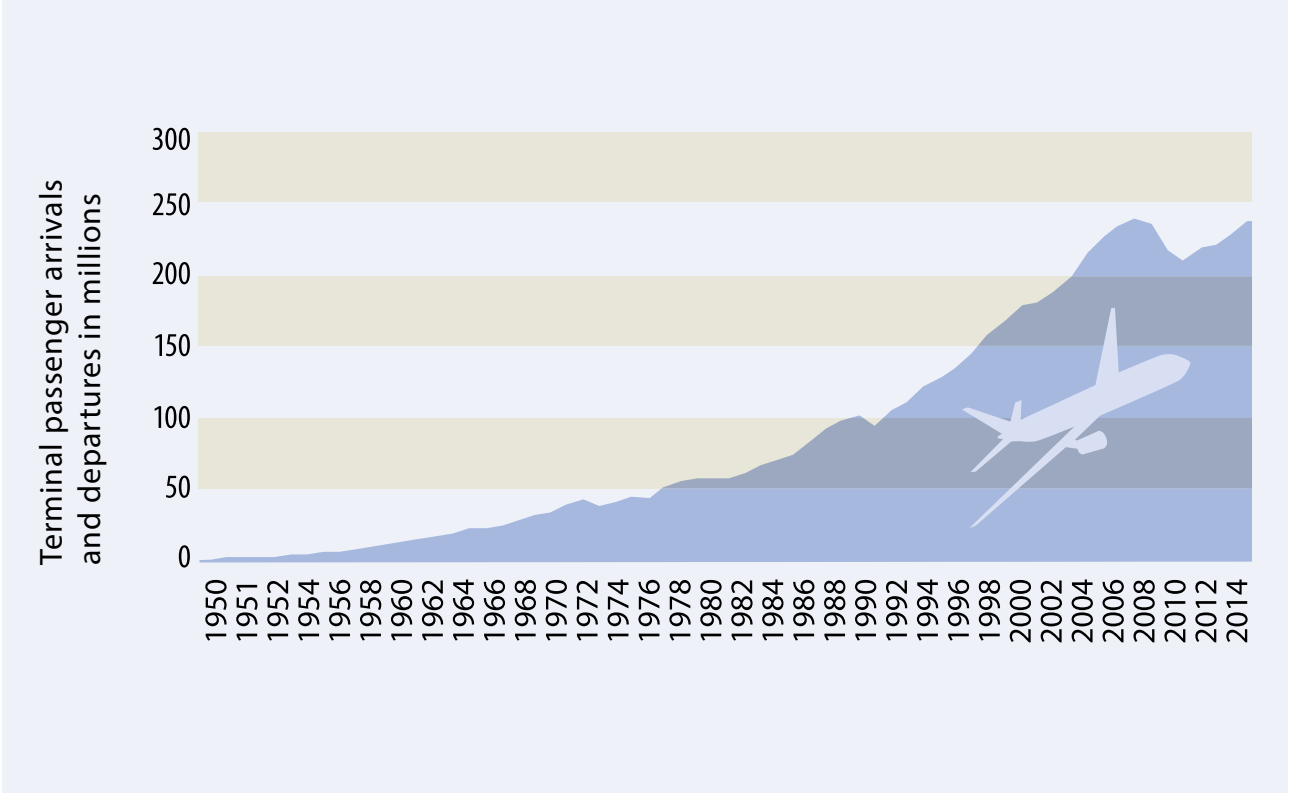


Fig. 4.4 *Growth in UK air travel, 1950–2014 (terminal passenger arrivals and departures in millions) (DfT, 2016e).*

despite massive cuts to services, overcrowding and the fact that rail fares have risen beyond the rate of inflation (DfT, 2016a).

Electric vehicles (EVs) are well recognised as a key measure to reduce carbon from the transport sector (Committee on Climate Change, 2015a) and the Government's plan is that by 2050 almost every car and light van will be an ultra-low emission vehicle (HM Government, 2011). EVs are already exempt from Vehicle Excise Duty (VED) and the government offers grants for plug-in cars and vans, while in Scotland the government offers interest-free loans of up to £35,000 (Energy Saving Trust Scotland website). Despite rapid growth, with over 80,000 registered EVs on the roads in 2016, they still represent less than 2% of sales in the UK (Lane, 2016). There are promising developments in electric buses, with a number of all-electric buses in operation around the country including London, Milton Keynes and Bristol. There has been a rapid expansion of EV charging points in the UK with over 3,700 locations in early 2016 (Zap Map). Ecotricity's Electric Highway also provides comprehensive coverage of the UK's motorways (Ecotricity website).

Air travel has increased dramatically since the 1950s (see Figure 4.4). While the Government is allowing for a generous 60% increase in flights by 2050 compared to 2005 levels, it has yet to come up with any plans on how this could be achieved given that current projections are much higher and airport expansion is still being considered. While the Airports Commission have suggested that expanding Heathrow is compatible with meeting the Government's climate target in 2050, evidence to Parliament showed there were doubts whether this could be achieved in practice (House of Commons Environmental Audit Committee, 2015).

4.2.3 Public attitudes

The car has long been regarded as a status symbol associated with power, masculinity, sexual success, freedom, family and other values (Urry, 2004; Gössling, 2013). Attitudes are changing, especially among younger people, but car ownership is still associated with success (DfT, 2015d). High social and cultural capital is associated with travel more generally (Barr et al., 2010). Frequent flyers are known to take additional flights simply to maintain their traveller status (Gossling and Cohen, 2014).

Attitudes to driving are complex and very segmented between different groups (Anable et al., 2006; Lyons et al., 2008; Thornton et al., 2011). Groups of the population with both the highest transport impact in terms of climate change and the greatest potential for change have been identified as 'educated suburban families' (who have high annual mileage and flights but are aware of climate change and their impacts) and 'affluent empty nesters' (who are older and tend to drive out of habit) (Thornton, 2011).

Encouragingly, surveys show that

many people are concerned about the effect of transport on climate change and say that they are willing to reduce the amount they travel by car (DfT, 2013b). The fact that this fails to translate into action is thought to be due to the host of other significant reasons why people continue to drive, including convenience, travel time, comfort, the need to carry passengers or things (encumbrance), trip chaining (where one discrete journey closely follows and is associated with another), and cost (Transport for London, 2013).

There is often an assumption that people must be able to drive, park and fly wherever they need to go. A strong value is placed on holidays and the freedom of choice that flying offers (Hares et al., 2010). Because of this, individuals have been found to be highly reluctant to change their behaviour, preferring an option to pay higher taxes than reduce flying (ibid).

4.2.4 Transport access and inequality

One in four households in the UK doesn't have access to a car; this rises to 68% for the poorest 10% of households (ONS, 2011). Poorer people are thus more dependent on public transport. Those with the most limited access opportunities also suffer the worst effects of other people's travel – for example, deprived areas suffer disproportionate rates of road deaths and injuries (Sustainable Development Commission, 2011).

Research has shown that there is a strong link between income and demand for air travel (Brand and Boardman, 2008). A major driver for the growth in aviation is thought to be cheap flights following liberalisation of the European market, which drove down the costs of air travel (Grote et al., 2014). However, while this has made flying an option for more people, evidence suggests that this growth in aviation was largely due to wealthier people taking more frequent flights (Graham, 2006).

The vast majority of flights are not business flights, nor family holidays, but leisure trips taken by a small proportion of frequent flyers (Devlin and Bernick, 2015). A staggering 70% of flights are taken by 15% of the population, while 52% of the population took no flights at all in 2014 (ibid). The following suggests that flying really is a 'first class problem' (A Free Ride website):

- 74% of leisure travel is by members of ABC1 social classes.
- Ownership of a second home abroad and household income of over £115,000 are the strongest predictors of frequent flyer status.
- The areas of Britain with the most frequent flyers are City of London & Westminster, Kensington & Chelsea and Surrey.
- The most popular destinations from these areas are known tax havens.

Most frequent flyers are from the richer sections of society. It is suggested that some privileged individuals are 'binge flying', an addictive behaviour where mobility is both frequent and long distance (Cohen et al., 2011). In a global context, per capita emissions from air travel are higher in the UK than any other country, and twice those of the USA (TGI, undated).

Ironically, the most environmentally-aware section of the population also tend to have higher carbon footprints from car and air travel than the general population (ibid).

4.3 Buildings

4.3.1 Emissions

Almost half of the UK's energy use is in buildings. This includes heating homes, workplaces, shops and public buildings; providing hot water; and powering appliances (DECC, 2015b). Although the officially reported greenhouse gas figures are not expressed in terms of buildings, it is estimated that homes, commercial properties and public buildings account for 17% of the UK's direct greenhouse gas emissions, mainly due to space heating (Committee on Climate Change website). Indirectly, buildings also account for two-thirds of power sector emissions, mainly due to electricity demand from lighting and appliances (ibid).

Photo by BRE Group / CC BY-ND

Passivhaus

4.3.2 The current building stock

The UK currently has an ageing and poorly insulated building stock. The UK housing stock ranks very poorly against other European countries in terms of energy efficiency. It comes last or near bottom for thermal performance of windows (11th of 11), floors (10th), roofs (8th) and walls (7th), and 12th out of 16 for homes in poor state of repair (ACE, 2015). Around 15% of the UK's housing stock are private rented houses which are currently unregulated in terms of energy efficiency but on average have poor energy efficiency performance.

The UK still relies mainly on natural gas for heating and hot water, although the use of biomass and to a lesser extent solar thermal and heat pumps is increasing (DECC, 2015c). Energy demand for cooking, lighting and electrical appliances has been fairly stable in recent decades, with the use of more efficient appliances countered by using a greater number of appliances (DECC, 2015b). As well as switching to zero carbon heating systems, the energy efficiency of appliances also needs to improve further.

The methods and technologies to build super-efficient new buildings are well established, for example, in the Passive House (Passivhaus) standard, which has been widely implemented in continental Europe. There are hundreds of examples of super-efficient new buildings in the UK (LEBD, undated; ZCH, 2015) and many thousands internationally (PHD, undated). However, as the Committee on Climate Change has outlined, the challenge of making our buildings energy efficient and low carbon is very large. For example, we need at least a further 3.5 million homes insulated over the next decade (2 million cavity walls and 1.5 million solid walls) (Committee on Climate Change, 2015a).

4.3.3 Buildings and inequality: fuel poverty

In 2013 the number of UK households in fuel poverty was estimated at 2.35 million (DECC, 2015d). The UK housing stock ranks near the bottom (14th of 16) compared with other European countries in terms of levels of fuel poverty (ACE, 2015). Older people and people with disabilities are more likely to be in fuel poverty. One study found that 24% of households including a disabled person suffered fuel poverty, compared to 16% of households with no disabled person (DWP, 2015). Those who are housebound face larger energy bills as they tend to spend more time at home, and are more reliant upon powered devices.

4.4 Energy

4.4.1 Emissions

Energy supply is responsible for 32% of the UK's greenhouse gas emissions at source, largely electricity generated from power stations, which does not include the non-electrical energy used for space heating in buildings.

4.4.2 The current energy system

The energy mix

Most of the UK's electricity is generated from fossil fuels: in 2015 30% came from gas, 23% from coal and a further 21% from nuclear (DECC, 2016b). In addition, the UK consumes significant amounts of natural gas, petroleum and coal directly for heating, transport and industry.

Renewable energy is rapidly increasing its share in the UK. In 2015, 8% of UK energy and 25% of electricity was generated from renewables such as wind, bioenergy, solar and hydro (DECC, 2016c). This compares to 4% energy from renewables in 2010 (ibid). The biggest contributor to this increase is electricity supply from renewable sources, while the proportion of energy for heat and transport from renewable sources is still very low. In July 2015, renewables generated almost enough electricity for every house in the UK (Heinzelmann, 2015).

Photo by chpv.co.uk/SSE/RWE / CC BY-ND 2.0

Despite this progress, the UK is not on track to meet its European Union (EU) target to generate 15% of its energy from renewable sources by 2020. EU progress reports have highlighted the UK as one of the countries most likely to miss their target (EC, 2016). Government officials have also privately indicated that the UK will struggle to meet the 2020 goal (Tickell, 2015). With the UK voting to withdraw from the EU, the status of this target is even more uncertain.

The UK Government is aiming to generate at least 30% of electricity from renewable sources by 2020 (DECC, 2011). However, the practical resource in the UK for wind, solar and other renewables is huge – many times larger than that which current targets plan to exploit (Committee on Climate Change, 2015a).

Energy ownership

The UK energy system is currently highly centralised and dominated by a small number of large companies. In 2014, 10 companies owned 86% of the UK's electricity generation assets. Six of these, 'The Big Six' (Centrica/British Gas, EDF Energy, E.ON, RWE npower, Scottish Power and SSE) together with ESB, Drax, GDF Suez and AES, form the 'Big Ten'. Collectively these companies were responsible for 95% of domestic supply and 80% of commercial supply. Community energy was only 0.3% of electricity generation capacity (DECC, 2014a). Even optimistic estimates suggest community energy will only meet 1.4% of electricity demand by 2020. Despite some positive steps, community energy initiatives in the UK have generally developed in spite

of, rather than because of, government policy (Smith et al., 2015).

The domination of the UK energy system and renewable energy developments by a few large private companies is in contrast to the situation elsewhere. For example, in Germany around half of renewable energy is owned by citizens (ILSR, 2013); in Denmark around three-quarters of wind turbines are under some form of community ownership (Dunning, 2014); and in the United States around a quarter of all electricity is generated by co-operatives or public power utilities (RAP, 2011).

An important recent trend has seen the 'Big Six' energy suppliers lose market share to small 'independent' energy suppliers. By 2015, small energy providers had captured 13% of the country's household energy supply after a sharp rise in the previous two years (Schaps, 2015). If this trend of customers leaving the 'Big Six' could be channelled towards suppliers with a commitment to support low carbon electricity supply this could have a huge impact on the UK energy market. If this trend could also be channelled towards local supply managed by community energy groups this change could be even more transformative.

4.4.3 Public attitudes

There is overwhelming public support for renewable energy. An ongoing survey of attitudes in the UK finds that over 80% of people support renewable energy in general. The level of support for specific renewable technologies is also high: solar (84%), offshore wind (76%), wave and tidal (77%), onshore wind (69%) and biomass (63%) (DECC, 2016d).

It is the case, however, that there is often public resistance to specific renewable energy projects at a local level. It is telling that a significantly lower proportion of people (around 55%) support large renewable energy projects in their area than support renewable energy in general (ibid). Opposition to renewable energy at the local level often manifests itself in campaigns and pressure on local authorities to reject planning permission.

4.4.4 Energy and inequality

While the expansion of community energy schemes has many benefits, there is a danger that it can replicate or exacerbate existing socio-economic inequalities. Models for community ownership are often in the form of options to purchase shares or other similar investments (RenewableUK, 2014). Many schemes are dependent on members having sufficient financial and other resources to invest (time, knowledge and skills, for example) (Johnson and Hall, 2014). Whilst these models distribute ownership into the community, it is often those who are better off with money to invest that benefit most (ibid).

Ownership of solar photovoltaic (PV) systems should be very well dispersed given the nature of the technology. This

is true to a point. The vast majority of installations are small-scale (generally rooftop) where rates of ownership by private individuals, community groups and small businesses can be expected to be high. However, most panels are installed by homeowners with capital to spare – community groups only own a very small percentage of the installed capacity (Monbiot, 2012; Ofgem, 2015). Furthermore, recent rapid growth in the amount of solar PV in the UK has mainly been driven by large solar farm schemes (DECC, 2015f). Here ownership is more likely to be by larger companies linked to landowners.

Chapter 5:

What needs to change?

5. What needs to change?

Photo by Alex Graves / CC BY 2.0

Once we understand our current position, it becomes clear that the challenges we face are multi-faceted and interconnected, with numerous causes and multiple consequences. There are lots of stakeholders with their own requirements, and many different changes are needed to meet the challenge. Here we revisit the four key sectors of food, transport, buildings and energy to identify what needs to change. We also begin to explore the various benefits such changes could deliver. A detailed analysis by Steven Shelley of the benefits of zero carbon in terms of employment can be found at this link here.

5.1 Food

The UK needs a food system that supplies adequate levels of healthy food with low associated greenhouse gas emissions. Food and farming needs to have a much more significant role to play in a zero emissions future than has been currently recognised. As well as contributing to a reduction in fossil fuel use, emissions can be reduced from biological sources, such as livestock and soils. Good land management can limit emissions and provide a certain level of carbon capture. A switch to lower emitting and less land intensive foods is necessary in order to achieve this.

It is clear that changes are needed within agriculture, and that further research is required relating to how we manage our land. Agricultural goals should prioritise providing enough nutritious food for everyone to eat because changing what you eat has been shown to have the biggest effect on emissions reductions. Duchin (2005), for example, notes that even a small change towards a healthier more sustainable diet would require farming practices and policies to change completely, and in many cases move in the opposite direction to where they are heading today.

Changes to cooking, packaging and transport, for example, are less significant to emission reductions (Blake, 2014). As the biggest emissions relate to animals (particularly cows and sheep), the biggest contributors of emissions in our diets are red meat (beef and sheep meat) and dairy products (particularly cheese) (Wellesley et al., 2015).

As explored in *Zero Carbon Britain: Rethinking the Future* (Hooker-Stroud et al., 2013), this will involve a dietary shift:

- The reversal of the growing trend for more meat-centric diets leading to a reduction of total consumption of all meat and dairy products.
- A reduction in levels of over-consumption (specifically targeting meat and processed foods).
- Increased consumption of healthy foods:
  - An increase in fruit, vegetable, pulses and complex carbohydrate consumption in line with health recommendations (promoting lower greenhouse gas emission, seasonal options).
  - An increase in plant-based proteins such as pulses and meat substitutes.

A shift to more sustainable farming practices is also required:

- Maintain and improve biodiversity, keep soils healthy and reduce pollution.
- Support those who work in agriculture to grow a wider range of crops, including pulses.
- Incorporate nutrient output as a key goal for agriculture.
- Free up some grassland to grow biofuels for renewable energy, for wildlife restoration and to improve land management.

5.1.1 The benefits of improving food and agriculture

Plant-based diets have been found to be very beneficial to health. An extensive literature review by the American Dietetic Association concluded that vegetarian diets are associated with lower cholesterol and blood pressure levels, lower rates of type 2 diabetes and hypertension, lower

average body weight and had reduced risks from cancer and ischemic heart disease (Craig and Mangels, 2009). Some of the elements of a vegetarian diet that were highlighted to be responsible for these benefits were lower average saturated fat intakes and higher consumption levels of whole grains, fruits and vegetables, soya products and nuts resulting in increased amounts of fibre and phytochemicals in the diet (ibid).

A study in the UK compared vegetarian diets with non-vegetarian diets and found vegetarian diets to be significantly healthier. Vegetarians were at lower risk for all causes of death, but at significantly lower risk of heart disease and cancer (Appleby et al., 1999). The changes in the diet described here would be the same for plant-based/flexitarian diets that met sustainability criteria too. It is argued that these health benefits would still be seen even if some meat were still present in the diet because the benefits relate mainly to an increase in plant food consumption (Lea and Worsley, 2001). Indeed some of the 'vegetarians' in the study above ate meat on occasion (less than once a week) (Appleby et al., 1999).

In more recent years, studies have been conducted on the health benefits of meat reduction in the context of climate mitigation scenarios. Scarborough et al. (2012), for example, used the carbon budget scenarios proposed by the Committee on Climate Change (CCC) to model the potential health benefits. They found a 50% reduction in meat and dairy consumption would result in approximately 36,910 deaths being delayed or averted per year in the UK. Another study estimated that 18,000 premature deaths from coronary heart disease could be averted per year if meat and dairy consumption were reduced by 30% (Friel et al., 2009).

Improving soil health, biodiversity and resource use could also form part of a mitigation strategy against climate change. Soils are important carbon stores, meaning that good land management can mitigate against climate change by increasing these stores (Food Research Collaboration, 2014). Biodiversity also affects soil function and as such can have a direct impact on the stability and productivity of agricultural systems (Lemanceau et al., 2014). Because of this, many people argue that our agricultural systems need to switch from more intensive practices to more diversified or 'agro-ecological' systems of production. As well as providing the food we need, these systems would provide many other benefits to our land and soils, such as improvements in soil fauna and structure, and better retention of nutrients. Perhaps more importantly, they are far less likely to contribute to local environmental problems, such as water pollution and biodiversity loss (Food Research Collaboration, 2014; Kremen and Miles, 2012).

Stories for Change

Veronica Burke

Co-creator, Bread Matters

Bread is our most wasted food in the UK. We must think it's rubbish really! If you've put real skill into making it and you know the people who've produced it, I don't think you want to throw it away.

Bread Matters promotes the social, economic, cultural and health benefits of ma ing bread using slow fermentation and homegrown grains. Our purpose is to inspire the individuals and groups, and to disseminate the knowledge and skills, that will enable communities to nourish healthy people from the fields a ound them, enrich their local economy and cultivate food sovereignty.

Bread Matters

"One part of the work is discovering the best adapted wheats for our climate and conditions. We've found an innovative milling method that we're hoping will enable us to keep more layers of wheat in, at the same time as producing a lighter flour. We're going to bring nutritionists in and agree a nutritional standard for the flour and the bread. We've started on organic farms and we want everybody who grows it to participate in an agreed certification system, so that we're all growing to sustainable standards and taking care of the soil. Because that's our real asset, in terms of food, and that's what we're depleting all over the world.

We've created a community benefit society, so that ordinary people own it. It's not an institution that's also being funded by one of the big food interests or some corporation, it's an independent body.

And the milling being close to the farm or the bakery, you take away the massive footprint of shipping the stuff around. And you take it out again by having real bread within walking distance of everyone.

The other big theme is teaching people, supporting them to start community-scale bakeries. Which means real jobs in respected work – not machine-minding. More jobs per loaf, not less.

It can be socially unacceptable to say it, but food banks are not solving the problem. People who are hungry need fed, and if what's available is sitting in a carrier bag in George Square in Glasgow, then yes, it's absolutely right to give them that food. But it doesn't address their dignity or improve their entitlement to a basic income to support themselves.

We get loads of enquiries from people who want to start a community bakery, or add a bakery to a community shop or Post Office. It's partly a fiscal thing, we need to make our local economy work. And it's about identity: we want to make this place flourish and have decent jobs, because without those we'll need a food bank, won't we?"

http://www.breadmatters.com

5.2 Transport

To reach zero carbon in the future, fossil fuel energy used for driving and flying needs to be eliminated. This is not a simple technical matter of switching to different fuels or energy sources but requires changes in attitudes, planning and infrastructure, economic incentives and political and institutional changes. Meeting all of the UK's energy needs from renewable sources will need significant reductions in demand from all sectors, including transport.

While walking and cycling can replace shorter car trips (and significantly improve health), the biggest carbon savings will come from replacing longer trips with mass public transport, such as train, bus, tram or metro (see figure 5.1). Given the limited scope for reduction in emissions for larger aircraft through technology and efficiency, this has to include measures to reduce the demand for flying. To achieve a shift in how we travel and how much we travel requires the following key changes:

- Change attitudes to driving and flying.
- Reduce car dependency through better urban and transport planning.
- Replace driving with walking and cycling for short trips.
- Replace longer car journeys with public transport use.
- Make driving less attractive than alternatives.
- Reduce flying.
- Make all cars, light vans and buses electric, hydrogen or run on biofuels.

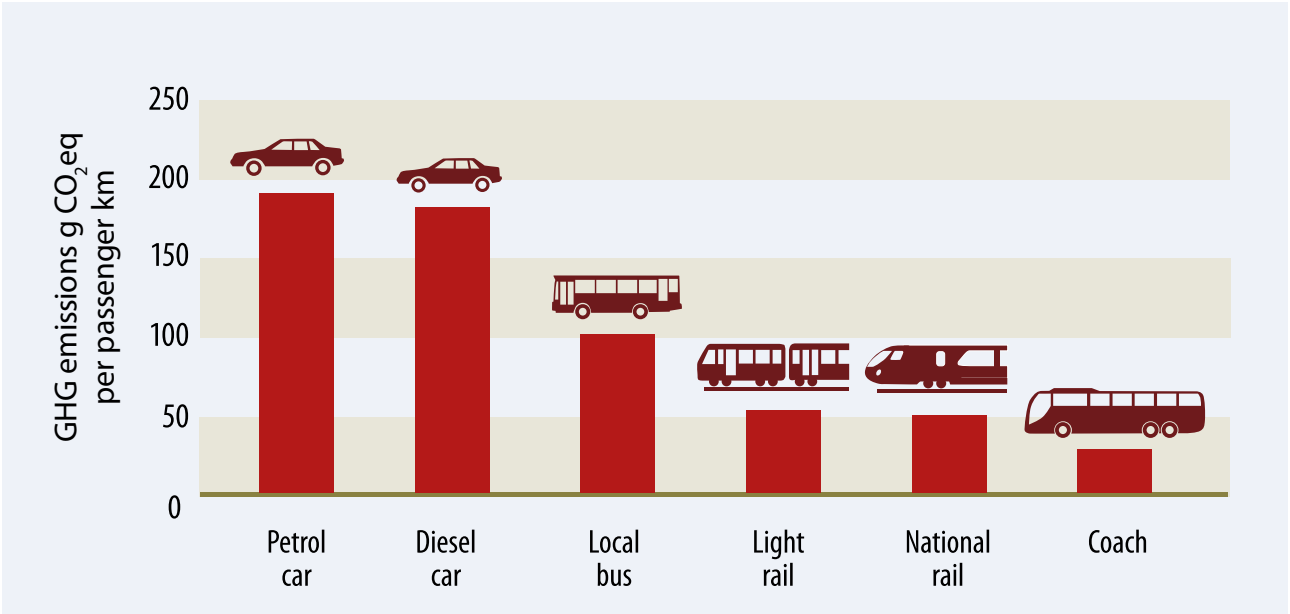


Fig. 5.1 *GHG emissions by transport mode (DBEIS, 2016).*

To seriously address car dependency and demand for air travel, the alternatives need to be as or more convenient and cost-effective than driving or flying. This is going to require a range of policy measures including more integrated urban and transport planning, high quality infrastructure and services, behaviour change programmes and economic incentives and disincentives.

5.2.1 The benefits of improving the way we travel

Reducing demand for driving and flying is not only more economic than simply meeting demand with new technologies, but has many other significant benefits, such as cleaner air and improved health. Improvements in alternative ways to travel can also help address inequalities.

Environmental benefits in addition to tackling climate change include: cleaner air, with fewer cities exceeding air quality health standards; increased tranquillity in rural areas (CPRE website) and quieter streets in urban areas; and reduced loss of countryside from road building and widening.

More active travel and improved air quality can contribute to improved health and well-being for the general population – it is estimated that around 40,000 deaths each year in the UK are attributable to air pollution largely from traffic (Royal College of Physicians, 2016). A reduction of the number of cars on the road will also result in reduced road casualties.

An increase in independent mobility through improved access to public transport can have a range of positive impacts on many different groups, including: improved cognitive skills, social development and emotional intelligence for children (Bhosale et al., 2015); improved ability for households without a car (almost one in four households, often the poorest) to access work and leisure activities (Allen, 2016); and greater accessibility for young people, the over 65s and disabled people.

The economic benefits of decarbonising the transport sector include reduced costs of car travel to society, including road casualties, air pollution and noise (Douglas et al., 2011). The health costs from air pollution alone are estimated to be more than £20 billion a year (Royal College of Physicians, 2016). Investment in zero carbon alternatives can also create jobs in the UK's green vehicle sector (DfT, 2016b).

5.3 Buildings

The buildings sector is vital in the transition to a zero carbon future. To get to zero, the UK requires around a 50% reduction in energy demand from buildings, along with a switch away from fossil fuel powered heating systems to zero carbon technologies (Hooker-Stroud et al., 2013).

The vast majority of today's buildings will still be in use in 2030, and beyond. The UK has a poorly insulated and draughty housing stock compared with

other countries. Reducing the heat loss from existing buildings is a must in achieving a zero carbon future and may be one of the most challenging aspects of this transition.

Retrofitting existing buildings can include: cavity wall or solid wall insulation; floor and loft insulation; improved glazing and doors; and draught-proofing. A programme to retrofit all dwellings in the UK with the above measures, as required, could reduce the average heat loss of the housing stock by around 50% (DECC, 2010). Heat loss can be reduced even further if more insulation is used, thermal bridges are eliminated, very high airtightness standards are achieved, and Mechanical Ventilation with Heat Recovery (MVHR) is installed.

Switching from current heating and hot water systems – mainly gas boilers – to zero carbon emission systems – like heat pumps and solar hot water – is a key challenge of getting to zero emissions. The energy efficiency of appliances, such as freezers, TVs and washing machines, also needs to improve.

In order for future energy demand to match up with supply from a zero emissions renewable energy system, energy storage needs to be incorporated into buildings to make energy demand more flexible. Smart meters give users real time information and allow them to better manage their energy use (Ofgem, 2016). In the longer-term it may be possible for this technology to inform users about when would be a good time to use energy, or even to automatically control appliances to optimise when they use energy (DECC, undated).

It will also be important to increase the amount of energy storage in our buildings, for example, through hot water storage. Electricity storage in buildings, such as the Tesla Powerwall, may also have benefits for the energy system and for individual households. When combined with smart meters, such storage can make buildings much smarter and more flexible users of energy.

When building highly efficient new buildings and retrofitting existing buildings, we need to consider the types of materials and components used. Ideally we would choose materials that have low embodied energy and carbon, materials that store carbon (such as wood or hemp) and materials that have been and/or can be recycled.

In summary, the key changes required are:

- Super-efficient new buildings built to Passivhaus standard, or equivalent.
- Reducing heating demand by at least 60% from 2010 levels by retrofitting the entire existing building stock, as required, with additional insulation, better windows and doors, and improved airtightness.
- Switching to zero carbon heating and hot water systems (such as solar thermal and heat pumps), and ensuring these systems operate very efficiently.

- Moving to highly efficient lighting and appliances.

- Making energy demand in buildings more flexible so it can match up better with energy supply from renewables. This involves increasing the amount of energy storage in buildings. Smart meters and better controls can also make energy demand more flexible and responsive, both using automatic controls and human responses.

- Moving to low embodied energy and low carbon construction materials; these use less energy and cause less carbon emissions in their production.

5.3.1 The benefits of improving housing

The challenge of decarbonising our buildings presents numerous benefits and opportunities (ACE, 2013; ACE, 2015), including helping combat fuel poverty, creating jobs and improving energy security.

©URBED/Carbon Co-op

Making homes highly energy efficient is one of the best ways to end fuel poverty, which was estimated in 2013 to affect 4.5 million households in the UK. It can also improve health and reduce health costs. Cold homes can cause or worsen respiratory problems in children, aggravate the conditions of the disabled and those with health concerns, and is linked to premature death in the elderly. It is estimated that cold homes cost the NHS £1.3 billion every year by causing or exacerbating cold-related illnesses (Washan et al., 2014).

In economic terms, a mass energy efficiency programme would create many thousands of good jobs and would bring great economic opportunities for UK. Research by Cambridge Econometrics shows that government investment in the energy efficiency of housing for fuel poor households brings enormous benefits to the economy, with a three-fold return in GDP for every pound invested by government (ibid). Research by Frontier Economics shows that an energy efficiency programme could generate economic benefits of £8.7 billion to the UK economy and that the benefits are comparable with other national infrastructure projects (Frontier Economics, 2015).

Finally, bringing all UK homes up to a higher standard of energy efficiency (EPC Band C) would reduce UK gas imports by 26%, strengthening UK energy security (Washan et al., 2014).

5.4 Energy

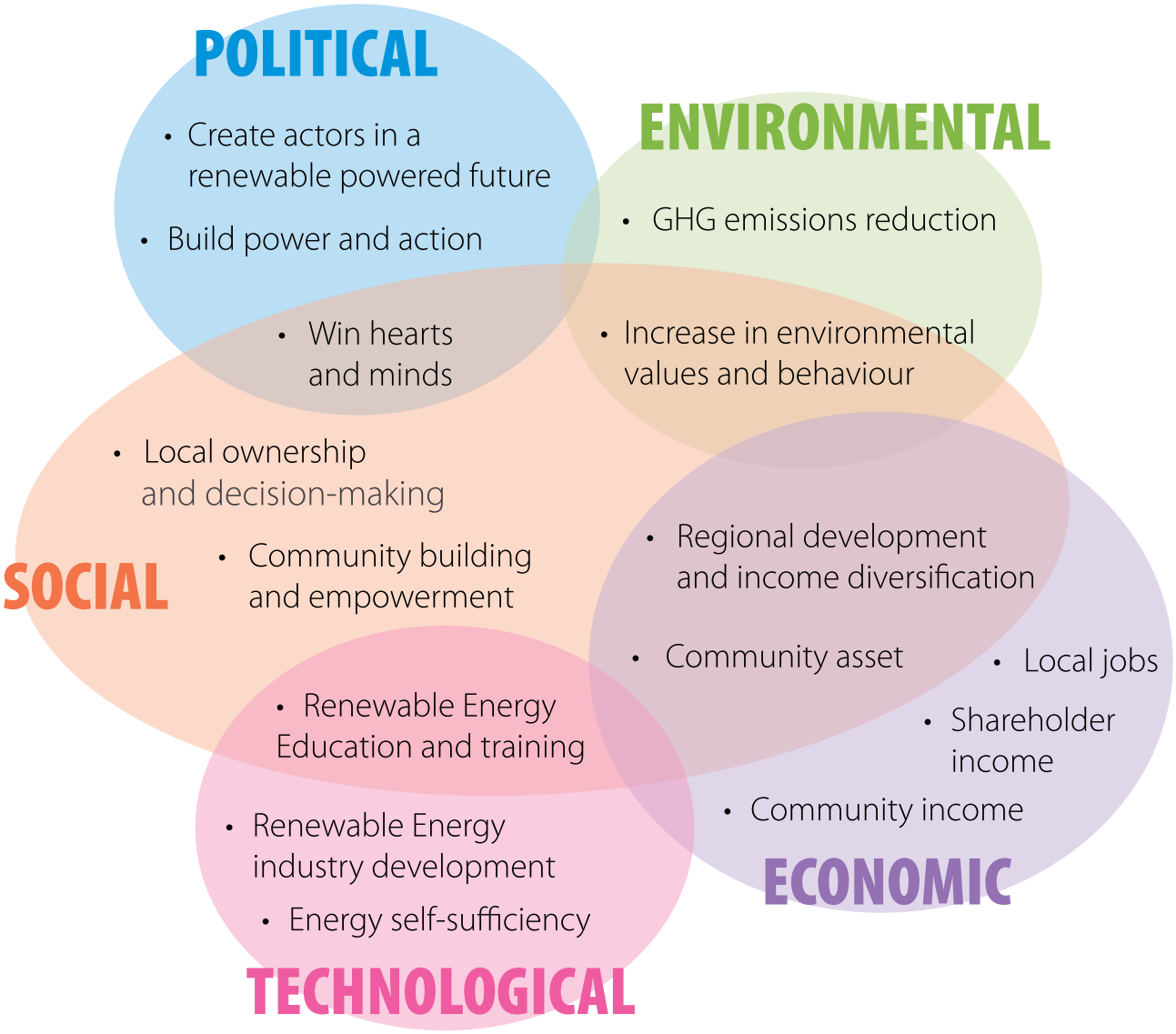
The UK has fantastic natural resources for renewable energy. As numerous reports indicate, provided that we reduce our energy demand and cut wasteful usage, the UK can meet its energy needs with 100% renewable energy, becoming entirely self-sufficient (Hooker-Stroud et al., 2013; Pöyry, 2011; Mackay, 2008; DECC, 2013a; Friends of the Earth, 2012; WWF, 2011; Quiggin and Wakefield, 2015; RSPB, 2016).

However, this will not be easy. It will require:

- A huge scaling up of installed renewable energy systems including onshore and offshore wind, solar and tidal.
- A strengthening and expansion of the electricity transmission and distribution network to allow energy from widely dispersed renewable systems to be delivered to where it's needed.
- A repurposing of some land to grow biomass needed for parts of a 100% renewable energy system.
- Willingness on the part of individuals, households, businesses and communities to support and participate in a new type of energy system.

5.4.1 The benefits of a clean energy system

Significant growth in renewables would provide significant economic, social and environmental benefits to communities (Capener, 2014), particularly when delivered in the form of community energy projects. These may include reduced energy bills, increased energy awareness, energy advice for those at risk of fuel poverty, the use and development of local skills and expertise, improvements to energy efficiency of local buildings using dividends from renewable energy, and greater local energy self-reliance (Fenna et al., 2015). There is the potential for much more substantial growth in community energy if ambition is increased (Capener, 2014).



The benefits of community renewable energy projects.

Chapter 6:

Barriers to change

6. Barriers to change

Photo by NASA Goddard Space Flight Center / CC BY 2.0

Once we have acknowledged where we are today and recognised what needs to change to get Britain to zero carbon, the next step is to identify the barriers to these changes. Clearly we face a complex array of hurdles. Whilst there are specific barriers to change in our food and agricultural systems and in our transport, buildings and energy sectors, there are also many barriers common to all sectors or which require more fundamental changes from society and government. This section pulls together evidence from across the sectors and from different disciplines to help understand the multifaceted and pervasive nature of this vital challenge.

6.1 Worldviews and values

Annick de Witt (2015) argues the current lack of progress on climate change arises from clashes in worldviews. For example, even if people agree on the need to act, divergences in worldviews on *how* to act can inhibit action, such as the arguments between those who support nuclear power or wind power.

Many now believe that climate change itself is not the root problem, but an escalating symptom of much deeper issues in our relationship with nature and the environment and with each other, and in a focus on people as consumers rather than citizens.

The values that our society currently promotes, and the activities they encourage, do little to help reduce emissions or limit climate change.

6.1.1 Disconnection from nature

In an exploration of the historical roots of the environmental crisis, historian Lynn White Jr. argues that the main strands of Judeo-Christian thinking allowed the overexploitation of nature by maintaining the superiority of humans over all other forms of life on Earth, and by depicting all of nature as created for the use of humans (White, 1967).

> *We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect.*
>
> Aldo Leopold (1949)

Thomas Berry suggests a core aspect of our inability to deal with environmental problems such as climate change appears to be the belief that we regard ourselves, as a species, as separate from nature and separate from each other (Berry, 2003). Even in ecological thinking, any reference to 'the environment' subliminally leads to a perception of humans and nature as distinct entities.

This belief, that we are separate from, or even somehow 'above' nature, allows continued inaction even when there is clear evidence that our actions are deeply damaging the habitats of other humans and other species, and even threatening our own existence as a species.

As Carl Folke points out in *Reconnecting to the Biosphere* (2012), there are now no ecosystems without people and no people who do not depend on an ecosystem functioning (Folke and Gunderson, 2012). They are inextricably intertwined in a new play of interdependent social-ecological systems. Global spiritual leader, poet and peace activist and writer Thich Nhat Hanh puts this succinctly: "The Earth is not the environment. The Earth is us. Everything depends on whether we have this insight or not." (Hanh, 2013)

> *There is growing recognition of the inadequacy of the separated disciplinary approach for the solution of planetary scale problems.*
>
> James Lovelock (1989)

Western philosophy and the 'ownership' of nature

In western thought, a philosophical and theological separation between humans and nature has occurred gradually over the last 400 years, resulting in increasingly fractured views of the world.

In the 17th and 18th centuries, philosophers and scientists, such as Newton and Descartes began pushing back the frontiers of knowledge, driven by a more evidence-based methodology and analysis. Whilst this resulted in a great flou ishing of scientific i vestigation and innovation, knowledge and ethics were broken apart. Modern knowledge could be owned, from the behaviour of a community to the DNA of an animal, with no contradiction in this being used to serve non-ethical purposes. The world began moving toward being a place where nature could be seen merely as a resource rather than a part of a wider whole, making it easier to see it as something that could be owned, mastered and even exploited.

By the end of the Enlightenment, reductionist methodology had overturned the polymath approach, separating the world into different disciplines, such as philosophy, physics or the arts, each of which then began to largely develop alone in their silos.

6.1.2 Prevalence of extrinsic values

The values we hold have a profound effect on behaviour. A major study published by five NGOs investigated the role of values in campaigns and communications (Crompton, 2010). This starts from the finding that across cultures what people say they value in life is surprisingly similar, which can be grouped into four broad areas: self-transcendence, self-enhancement, conservation and openness to change (Schwarz, 2012).

Self-transcendent (or 'intrinsic') values include universalism and benevolence, which are based on more inherently rewarding pursuits and are generally concerned with the well-being of others (Crompton, 2010).

Self-enhancement (or 'extrinsic') values include achievement and power. These are more competitive values centred on external approval or rewards (ibid).

While we are all motivated by all of the different values, we hold them to different degrees and at different times. Many different factors determine which values are stronger for an individual, including the influence of their family, their peers, their role models, faith and spiritual groups, and the media. Some of the values oppose one another, for example, intrinsic and extrinsic values, so that encouraging one set of values can help to decrease the influence of the other (Spence et al., 2014).

The prevalence of advertising and media stories that focus on money, status, celebrity and other extrinsic values would suggest that these values predominate in UK society. However, it would appear that most people

overestimate the importance that others place on extrinsic values (Common Cause Foundation, 2016). Surveys have shown that most people in the UK (74%) care more about intrinsic values like honesty, helpfulness, social justice and equality than they do about extrinsic values like image, wealth and status (ibid). While it may be surmised that people tend not to own up to extrinsic values, the survey was designed to eliminate this potential source of bias.

This seems likely to create a negative feedback loop where people are reluctant to act in line with their intrinsic values because they believe that these are likely to be out of kilter with the value priorities of most fellow citizens. The greater this misperception of others' values, the less likely a person is to get involved in civic action like voting and the less positively they feel about becoming involved in volunteering or contacting a political representative. This is possibly because people take social cues from others, and if they view society as selfish and materialistic they are less likely to act on their own compassionate values (ibid).

In many cases, it is more expensive to do the 'right' thing (for example, eating healthier food, taking public transport, buying green electricity). However, where more sustainable behaviour is less costly, conventional wisdom is that appealing to economic self-interest is the best way to motivate people. However, there is evidence that using economic appeals is not always effective (Markowitz and Shariff, 2012; Crompton et al., 2015).

Using economic incentives as a motivation for action on climate change risks creating a conflict between two values — materialism (extrinsic) and environmentalism (intrinsic) (Brown and Kasser, 2005). Consistent reliance on appeals to wealth creation or status may undermine motivation to continue performing pro-environmental behaviour for its own sake (Markowitz and Shariff, 2012). Focusing individuals' attention on possible financial gain may backfire by reducing their engagement in subsequent pro-environmental actions, as their emphasis shifts from doing good to gaining a profit (Evans et al., 2013; Thøgersen, 2013; Crompton et al., 2015).

6.1.3 Consumerism

The UK is a very materialistic culture; people are encouraged to consume more and more 'stuff', most of which is designed to end up as landfill after a very short time. Even if people replace this type of consumption with more experiences, such as leisure activities, this may not necessarily reduce emissions if those experiences also consume fossil fuels; for example, flying to exotic locations. Even significant life events like having a baby or getting married have become increasingly commercialised. What people in industrialised economies feel they need is now well beyond what is actually required to live a good life (NEF, 2010).

> *We buy things we don't need with money we don't have to impress people we don't like.*
>
> Palahniuk, 1996

Photo by Henry Lawford / CC BY Cropped

As Oliver James showed in his book 'Affluenza', wealth and misery go hand in hand, creating a vicious cycle of consumerism (James, 2007). Anxiety and depression makes us want to consume more, but the more we consume the more anxious and depressed we become (ibid). We buy things to make us happier but they make us feel worse. Studies have shown the detrimental effects of materialistic world views on well-being and mental health; young adults whose primary focus is financial success show higher levels of anxiety and depression (Kasser and Ryan, 1993). A comparison by UNICEF of children's well-being in the UK, Sweden and Spain found that low levels of child well-being in the UK may be related to an increase in excessive materialism (IPSOS Mori and Nairn, 2011).

Although children recognise that family time is more important than consumer goods, the authors of the study observed "a compulsion on the part of some parents to continually buy new things both for themselves and their children. Boxes and boxes of toys, broken presents and unused electronics were witness to this drive to acquire new possessions, which in reality were not really wanted or treasured." Interestingly, UK parents seemed aware of the futility of this but seemed compelled to continue and cited advertising 'as a source of constant pressure', whereas parents in Spain and Sweden were under much less pressure (ibid).

6.2 Communications

The way in which the problems and solutions for climate change are communicated has a profound impact on their acceptance, and on broader changes in behaviour and society. Much of the information we receive about climate change science, impacts and solutions is through the media – TV, radio, print media and increasingly online or social media. If this information is inaccurate, biased,

incomplete or non-existent this will adversely impact public opinion, behaviour and support for efforts to address climate change properly.

Whilst a lack of prominence of an issue in the media or in public discourse obviously contributes to a lack of concern and lack of political action, misinformation and media bias can introduce doubt where there should be none. Lack of clear information and distorted perceptions also mean that even when people want to make a 'better' choice environmentally or societally, they may struggle to find the right solutions.

The media's power to set the public agenda is well established and politicians often act in anticipation of what they think the media influence on public attitudes will be (Gavin, 2009). The media is also a hugely important influence on government policy, being seen as a barometer of public opinion, though more often it helps shape that opinion. The important influence of the media is demonstrated by a government decision to axe important proposals for energy efficiency measures for home extensions after a prolonged campaign by *The Daily Mail* against the so-called 'conservatory tax'. This was despite 11 of the UK's biggest building trade associations, representing the bulk of the construction industry, urging support for the measure (Harvey, 2013).

The role of advertising in promoting and perpetuating a culture of materialism is also key.

6.2.1 Advertising

Psychological research has been used to powerful effect in marketing and advertising, where "applied psychologists are working feverishly to accelerate and exacerbate materialistic desires" (Osbaldiston and Schott, 2012). On the one hand there is a huge well-funded industry to encourage us to consume more, and on the other a relatively tiny body of work to try to

change behaviour in more helpful ways. However, even where psychological interventions are used to try to change behaviour (for example, reduce energy demand) these rarely address or challenge unstated assumptions about materialism and consumption (Capstick et al., 2014).

Advertising fuels an insatiable desire for more stuff, including cars, electronic goods, cosmetics, food and clothing. There is a weight of evidence suggesting a strong link between advertising and increased consumption (Brulle and Young, 2007; Alexander et al., 2011). Advertising encourages us to spend and borrow more, and work longer hours for more pay, with people trapped in a cycle of 'living to work, working to earn, and earning to consume' (the work-spend cycle) (NEF, 2010; Alexander et al., 2011). By creating dissatisfaction with who we are and what we have, advertising encourages us to spend more to consume more (Gannon and Lawson, 2010). Vance Packard's seminal book *The Hidden Persuaders* shows how advertisers tap into hidden needs, such as insecurity, reassurance of worth, ego gratification and immortality (Packard, 1957).

Advertising invades both public and private space – on billboards, public transport, online, through product placement and guerrilla advertising. In the US it is estimated that the average person is exposed to over 5,000 advertisement and brand exposures per day (Media Dynamics, 2014). People are often not even aware of the marketing, as much of it is subliminal, creating positive associations with brands, logos, jingles and slogans (Gannon and Lawson, 2010).

Children are particularly vulnerable since they have not developed the cognitive abilities to know they are being sold to (ibid). Children are particularly targeted by advertisers as they are seen as independent consumers, as having significant influence over family choices, and are future adult consumers (Boyland and Whalen, 2015). Increasing media literacy is a standard response to address the subliminal effects of advertising but education alone is not sufficient as even adults and children who are more media literate are not immune to media influence (Alexander et al., 2011).

Levels of advertising have also been identified as a significant barrier for change. Of all food adverts, 60% relate to convenience foods and confectionery whilst only 3% promote fruit, vegetables or pasta. Tens of billions of dollars are spent each year on advertising to keep our food consumption levels high (Cafaro et al., 2006) and the advertising of obesogenic foods to children is still common practice. A report on the impact of food advertising on childhood obesity found that TV advertising played an important but modest part and was only one of many influences on children's food choices (OFCOM, 2004). However, a review of the international evidence on food marketing to children concluded that even short-term exposure results in children increasing their food consumption (Boyland and Whalen, 2015).

In some cases, the regulations are poorly targeted. While restrictions on advertising for products high in sugar, salt or fat during children's programmes were implemented in 2009, researchers found that the proportion of junk food ads seen by children actually increased slightly, as children viewed them during family viewing (IH&S, 2012). Campaigns to ban junk food advertising before the 9pm watershed have widespread public support (Food Active, 2015).

Sophisticated marketing also plays a large part in creating and perpetuating a wide range of intense and often positive feelings towards the car (Sheller, 2004). From 'dispense with a horse', the message from the world's first car advertisement in 1898, car advertising has consistently 'sold men dreams' (Appnova, 2015). Marketing also plays a powerful role in the promotion of flying, with airlines also using masculinity and sexual desire, sometimes controversially, to sell flights (Bloodworth, 2013). Travel journalists promote exotic long haul destinations to fill space or because of 'freebies' provided by these destinations (Gossling and Cohen, 2014). Children are even targeted in frequent flyer programmes (ibid).

Exposure to commercial advertising has been shown to lower levels of concern about 'bigger-than-self' problems such as climate change (Crompton, 2013). A report that carefully reviews the evidence for the cultural impacts of advertising shows that it frequently promotes values that are counter to human well-being, environmental sustainability and a fair society (Alexander et al., 2011). For example, the values promoted by North American magazine adverts between 1900 and 1980, resulted in the promotion of "materialism; submission and seduction; selfishness and greed; simplistic symbols; conformity; pornography; chronic anxieties; envy; competitiveness; disrespect of elders; disrespect of tradition; and the creation of dissatisfaction." (Pollay and Gallagher, 1990)

Even adverts that promote intrinsic values, such as the quality of family life, risk reinforcing the perception that such values can be satisfied by material things (Alexander et al., 2011). Advertising predominantly appeals to extrinsic values that emphasise status, money, power, body image and by repeatedly promoting these values is likely to strengthen them at a societal level (ibid).

The advertising industry is largely unregulated. The entirely industry-led Committees of Advertising Practice (CAP) write and maintain the UK Advertising Codes, which are administered by the Advertising Standards Authority (ASA). These do little to tackle the intrusive nature of advertising, and particularly the impacts on children. More primary research is needed on the cultural impacts of advertising in view of its increasingly pervasive nature.

6.2.2 Climate silence

Climate communicators have expressed concern about the silence that exists on climate change – with individuals, the media and politicians appearing unwilling to discuss the topic (Marshall, 2014; Corner, 2014). This matters because an absence of discussion on climate change leads to a perception that the issue is not one of high public concern.

While there are high levels of public concern over climate change, people have a 'finite pool of worry' about what to attend to; personal circumstances and national events can push climate concerns to one side (Pidgeon, 2012). Inaccurate perceptions of others' opinions (known as 'pluralistic ignorance') have also been found to contribute to self-silencing among those concerned about climate change (Geiger and Swim, 2016). Despite the fact that a large majority of the public are concerned about climate change, many people underestimate the degree to which others are concerned. This is a common phenomenon found in other policy areas: for example, in the 1970s most white Americans supported racial desegregation but believed that most others supported segregation (ibid). This leads to a spiral of silence where people believe they are in the minority and stay silent, which makes others unwilling to express their views.

The lack of reporting by the media of key findings, events or issues contributes to the blanket of climate silence, which in turn undermines levels of public awareness and concern. With some notable exceptions, the reporting of climate change by the UK media has significantly waned in the last few years (Corner, 2014). In the US much of the mainstream news media failed to report on the massive 2014 People's Climate March in New York, attended by hundreds of thousands of people (Johnson, 2014), prompting comparisons with Burma's control of the media (Delina et al., 2014).

While many social issues go through a cycle of interest followed by increasing boredom, climate change is considered a hard subject to sell to the media (Anderson, 2009). Newsroom priorities of politics and economics squeeze out scientific and environmental stories: the fact that an issue is important doesn't necessarily make it news (Smith, 2005). Analysis of what makes a story newsworthy suggests there are 15 news values that drive journalists' attention including bad news, conflict, power elites, magnitude, although celebrity news dominates in both the popular and quality press (Harcup and O'Neill, 2016).

Many of these values would be relevant to climate change yet the increasing globalisation of news, with media dependent on international agencies and PR, also leads to an emphasis on human interest and celebrity-focused entertainment style reporting (Anderson, 2009). It is difficult for NGOs with limited resources to lead the agenda. Narratives and visuals are often lacking for reporting of mitigation strategies

(O'Neill et al., 2015) and even the use of eye-catching stunts to garner attention can backfire and cast protesters in a negative light (Gavin, 2010).

Journalists are also concerned to protect their professional independence and wary of being seen to promote a values-based agenda or tell the public how to behave (Smith, 2005). This is despite the fact that journalists sometimes take a normative stance in relation to other issues, such as terrorism (ibid).

While online and social media communications are routinely used by NGOs to provide information, address the news media, strengthen support and mobilise action, the quality of online scientific communication on climate change has been found to be poor and the debate little better than in traditional media (Schafer, 2012).

While coverage of climate change is generally low, issues such as the contribution of the meat and dairy industry to climate change receive particularly little mainstream media attention. There are also few campaigns by NGOs on the issue of dietary changes and climate change; where there has been communication it has been "scarce and relatively muted" (Bailey et al., 2014). Low public awareness and media attention to these issues also makes other actors within the food system, such as the government, less willing to impose changes as they do not think they will have support for their actions (ibid).

Undoubtedly the consequences of climate change can induce fearful emotions, and 'fear appeals' in the form of catastrophic imagery have been widely used by climate campaign groups and the media. While images of polar bears on melting ice can attract people's attention, fear appeals have been found to be generally ineffective for motivating personal engagement with climate change (O'Neill and Nicholson-Clarke, 2009). They can leave people feeling helpless or overwhelmed if no alternatives are provided and there is a chance they can backfire with people adopting defensive reactions, such as avoidance or denial (Risbey 2008).

6.2.3 Media bias and misinformation

There is significant evidence of media bias and misinformation in the reporting of climate change. While objectivity is an important characteristic of news reporting, when journalists lack the time or expertise to judge competing claims they may give equal importance to unequal facts, leading to information bias (Dunaway et al., 2015). This notion of 'balance-as-bias' is where views of marginal climate change deniers or sceptics are given almost equal prominence to the broad scientific consensus (Boykoff and Boykoff, 2004). This approach has meant that UK tabloid coverage of climate change has significantly diverged from the scientific consensus (Boykoff and Mansfield, 2008).

Researchers have looked at the way the media frames climate change,

which in turn shapes public opinion (O'Neill et al., 2015). In the UK, the broadsheets, especially *The Guardian*, have been found to give the issue the greatest coverage, framing it in a variety of ways; *The Telegraph* frames were found to be varied but deeply conflicted; while *The Daily Mail* was narrowly focused on the uncertainty of the science, impacts and solutions (ibid). Specific policy measures, such as the impact of renewable energy subsidies, are often reported negatively. For example, one study found that: "Cost as a theme tended to be associated with negative coverage: in *The Sun*, no articles in which cost featured as a main theme were positive; while 60% were negative and none positive in both *The Daily Mail* and *The Telegraph*." (PIRC, 2011)

In 2011, an independent review of BBC coverage of scientific issues, including climate change, found that climate change deniers were still continuing to find a place on the airwaves, hindering objective reporting of the issue (Jones, 2011). In 2014, there were demonstrations by direct action groups outside Broadcasting House protesting against a debate on the BBC's Today Programme between Lord Lawson, a renowned climate sceptic, and Sir Brian Hoskins, the eminent climatologist, which resulted in scientific inaccuracies (Jewell, 2015).

Bias, exaggeration and inconsistency in coverage of issues like climate change leads the public to distrust the media and the information provided (Lorenzoni et al., 2007). Media headlines, such as, "Planet is not overheating, says professor," and, "Scientists are exaggerating carbon threat to marine life," (Krebs, 2016) lead significant numbers of people to believe that climate change is not caused by human activities or to think that there is uncertainty about the scientific consensus.

Although the numbers of people in the UK who deny that climate change is real is very small, there are still those who are uncertain about the causes or unconvinced that humans are the main cause. Although the vast majority (79%) of the British public agree that climate change is happening, nearly a quarter (23%) believe it is not caused by humans, while nearly two-fifths (39%) believe that concerns over climate change have been exaggerated (YouGov, 2013a). While the British public is becoming more aware of the scientific consensus on climate change only a small proportion (16%) believe scientific consensus is strong (Energy Climate and Intelligence Unit, 2015).

Organisations with vested interests in sustaining the current high carbon system influence public opinion via the media as well as directly influencing government policy and legislation (Cave and Rowell, 2014). The fossil fuel industry have well-funded and organised campaigns to promulgate climate denial (Jacques et al., 2008; Farrell, 2016). Evidence of a "deliberate and organised effort to misdirect the public discussion and distort the public's understanding of climate" by fossil fuel corporations in the US has

been well documented in peer-reviewed journals (Brulle, 2014). In the US alone, the fossil fuel industry has spent hundreds of millions of dollars on front groups to discredit mainstream climate science (Union of Concerned Scientists, 2007; Moser and Lee-Ashley, 2014). ExxonMobil are currently under investigation for the allegation that they have deliberately misled the public despite the fact that their scientists have known about the risks and accepted the scientific consensus on climate change since 1982 (Banerjee et al., 2015).

In 2013, there was widely reported misinformation about a global warming slowdown, which was seized on by US climate deniers to dismiss climate change (Boykoff, 2014). This was accompanied by an increase in the proportion of US citizens who believed climate change was not happening, suggesting that the media misreporting had influenced public attitudes (ibid).

This continued media bias on climate change is damaging because misinformation sticks and is very hard to correct. Myths and misinformation are propagated through social networks, especially when they confirm pre-existing attitudes. The more they gain acceptance, the harder they are to correct in the public mind (Southwell and Thorson, 2015). Correcting media misinformation and reaching all the relevant people is hugely difficult and costly, and if not done carefully may even be counterproductive (Southwell and Thorson, 2015). There are many studies suggesting that media coverage can reinforce pre-existing attitudes, particularly as people tend to select media sources in line with their own views (Feldman et al., 2014). Thus, people who are already climate sceptics will tend to seek media that confirm that view.

However, there is also evidence that where there is persistent and clear coverage of an issue, especially from trusted sources like television, it can directly change attitudes (Sanders and Gavin, 2004). In the UK, television is trusted more than other media and an important source of news, particularly for older people who are more likely to vote (ibid).

An analysis of BBC and ITV news coverage of the 2013-14 UN IPCC reports found, despite extensive coverage, sceptical messages and viewpoints were widespread, and for many viewers who were unsure or lacked strong views this was highly likely to have generated confusion and uncertainty (ibid). Researchers suggested the fact that such extensive coverage failed to mobilise public concern was due to the way the commentary on climate change was presented (ibid). Clearly, a continued media discourse that undermines or questions the scientific consensus on climate change will undermine public faith in the science and support for action.

It has even been suggested that problems of media bias on climate change in the UK are a result of systematic failings (Gavin, 2009). In Germany a system of proportional

representation allows more space for green politics, which in turn supports a market for media that reflect green concerns (ibid). Thus, German media are much less likely to report on the uncertainty of climate science and tend to give less space to climate deniers (ibid).

Corporate and political influence on the media

There is also considerable evidence that corporate or political affiliations can lead to media bias (Craufurd, Smith and Tambini, 2012). This is powerfully illustrated by the resignation of the Chief Political Commentator of *The Telegraph* in protest over troubling omissions of negative stories that would upset its advertisers (Oborne, 2015). There are also examples of how advertisers influence coverage of issues, such as an article in *The Spectator* money section on the case for investing in crude oil, placed next to a full-page advert for a company offering spread bets on the price of oil (Ramsay, 2015).

Rather than independent watchdogs who act as a check on the power of the establishment, it is suggested the media are more like 'guard dogs' who operate in the interests of the existing power structure (Donahue et al., 1995). The media are essentially businesses that depend on advertising revenues and "defer to the mainstream values of a dominant fossil fuel culture and the status quo" (Corbett, 2015).

A further problem is that economic pressures and shrinking budgets have meant news media are more reliant on ready packaged stories (Corbett, 2015). Over half of news content is instigated by non-journalists with the business/corporate world four times more likely than NGOs or charities to get its PR materials into press and broadcast news items (Lewis et al., 2008).

There is also the problem of unsubstantiated green claims in marketing, commonly known as 'greenwash' or implying certain products make you a better person, described as 'valuewash' (Hurth et al., 2015). Environmental claims in advertising are covered only by a voluntary code of practice (CAP, 2014) and there is no mandatory requirement for companies to provide information about environmental credentials of their products, or proper enforcement of self-declared claims.

6.2.4 Media ownership

Part of the problem of media bias is the fact that Britain's media ownership is highly concentrated, especially within local, regional and national press (Media Reform Coalition, 2014):

Print Media: Three companies (News UK, DMGT and Trinity Mirror) control 70% of national newspaper circulation; five companies control 70% of regional daily newspaper circulation; over a third of local areas have a single monopoly daily local newspaper.

Broadcasting (Radio and TV): Radio news is a duopoly with BBC and Sky reaching 68% and 43% of the radio news audience respectively, and the latter providing news bulletins for virtually all of national and regional commercial radio. While BBC accounts for a majority of TV news consumption; ITV is the major alternative.

Online news: Of the top 20 online news sources in the UK, most are owned by 'old media' companies (for example, *The Daily Mail*) or digital companies (for example, Yahoo), though the latter get most of their news from traditional brands.

Although media plurality is viewed as vital to the health of the press and a functioning democracy (OFCOM, 2012; Media Reform Coalition, 2014), just five billionaires (Rupert Murdoch, Jonathan Harmsworth, Richard Desmond and the Barclay Brothers) own 80% of UK newspapers (Vanbergen, 2015). Ownership undoubtedly influences the editorial position on issues, and such concentration can give media owners a disproportionate influence on public opinion.

The web is not necessarily a level playing field either: those with more resources can optimise search engine results for higher profile and much of the news content on the web reflects published output from conventional media (Gavin, 2010). Although the web offers activists additional space to raise issues and ideas, the contribution of web commentary to informed debate is often "unedifying or distasteful" (ibid).

Restricting advertising or reducing media bias and concentration will not be easy due to the huge amount of economic and political power each industry wields. The commercial and online media depends on advertising revenues and would likely oppose new taxes or regulation. While a number of measures to address the problems have been proposed, these will need a wider public campaign to gain the necessary political support.

6.3 Psychology and behaviour

Despite the evidence that climate change is one of the greatest threats to the planet, there are still a significant number of people who are ignoring, denying or failing to act with appropriate urgency. A large body of psychological research has helped to understand the reasons for the gap often observed between attitudes and behaviour (also known as the 'value-action gap').

The lack of action on climate change is partly due to the many and well documented psychological barriers (for example, Swim et al., 2011; Gifford, 2011; Clayton et al., 2015), even where there are high levels of awareness and concern for climate change (Lorenzoni et al., 2007). Psychology Professor Robert Gifford identified no less than 29 'dragons of inaction' – psychological obstacles ranging from cognitive biases, ideologies, social comparisons and perceptions of risk, which prevent us from acting on or

even thinking about climate change (Gifford, 2011).

Insights from psychology and other disciplines have been used to design behaviour change programmes. Social marketing techniques have also been employed to influence behaviour, and in recent years a Behavioural Insights Team (BIT) (aka 'the nudge unit') was set up by the government, to integrate behavioural sciences into policymaking generally (BIT website).

A few of the psychological barriers to action on climate change are discussed below.

6.3.1 Scepticism and helplessness

While many people accept climate change is happening and that humans are responsible, they may still fail to take responsibility or act accordingly, a phenomenon described as 'stealth denial' (Rowson, 2013). This is linked to feelings of powerlessness or scepticism about the efficacy of actions taken by individuals or about the political response (Capstick and Pidgeon, 2014). In the face of a challenge as enormous as climate change people have profound doubts about the ability to do anything about it (ibid).

It is suggested this feeling of helplessness is a 'psychological' barrier in response to social, cultural and political factors, such as the political dominance of the fossil fuel industry (Norgaard, 2010). Without tackling some of the wider economic and political barriers to climate change, this leads to widespread scepticism about the efficacy of individual actions taken to address it (ibid). For example, past climate change campaigns have invited scepticism by focusing on small actions (for example, turning off appliances) or by emphasising the role of the individual while neglecting the role of government and industry (NESTA, 2008).

Some psychologists believe that feelings of helplessness are 'the pivotal issue' in terms of preventing more environmentally responsible behaviour (Kaplan, 2000). Clear evidence from a large number of studies shows that providing people with more information about the problem and what to do about it may increase knowledge but is not sufficient to motivate action or change (Lorenzoni et al., 2007; Spence and Pidgeon, 2009). Ironically, provision of more information on an environmental problem may actually increase the sense of helplessness in some cases (Kaplan, 2000).

We also hold distorted perceptions in the way in which we view society, which contributes to inaction. In Britain and across Europe there is a widespread view among citizens themselves that people in general are 'too selfish' to act on climate change, prompting scepticism of the efficacy of collective action (Fischer et al., 2011). However, people may be less selfish than we think, as discussed in 6.1.2.

6.3.2 Lack of information and knowledge about solutions

While information alone is not sufficient in most cases to motivate action, there are certainly areas where a lack of information or knowledge is a barrier. For example, a lack of information about what a plant-based diet is and how to prepare alternative foods was perceived as the biggest barrier amongst younger people, while older individuals were most likely to be unwilling to eat new or unusual foods (Lea et al., 2006).

There are also knowledge and information gaps in relation to energy efficient buildings, with a lack of occupant understanding in operating low carbon technologies or unfamiliarity with new methods and technologies, such as Passivhaus buildings or ventilation systems, amongst builders and installers.

6.3.3 Conformity to social norms

Humans are social animals and our beliefs are a function of group identity; it's often not what we learn so much as how and from whom that matters (Clayton et al., 2015). We tend to look for information consistent with what we already believe and dismiss information that requires us to change our minds and behaviour (Festinger, 1954).

We compare ourselves and our actions to others, particularly people we admire amongst our own social groups ('in-group'), to decide what is the proper course of action and how we ought to act (ibid). This reinforcement of beliefs within the in-group can be seen within social, political and organisational cultures. Conversely, we often behave in ways to differentiate ourselves from our 'out-group'. We tend to behave in accordance with our perceptions of how others behave (descriptive norms) as well as behaving in ways that we consider to be socially acceptable (injunctive norms).

People are heavily influenced by observed social behaviour even while they are poor at recognising or acknowledging it (Griskevicius et al., 2008). Thus, when asked to rank reasons for saving energy at home, people ranked other people conserving energy as bottom although it was actually twice as important than any other motivator in practice (ibid).

Social norms are an important influence on key decision-makers and corporate scientists. For example, senior decision-makers have been found to be highly susceptible to peer pressure that prevents them from acting on climate change despite personal concerns (Rickards et al., 2014). Studies have also shown that scientists working in car companies internalised climate scepticism, partly as a result of social pressure and the influence of selected external media sources (Rothenberg and Levy, 2012).

The power of social norms is illustrated by the difficulties in restricting car use, which is seen as normal and the default way to travel for most people (Pooley et al.,

2011). Thus, when measures to restrict car use are proposed, there is often a strongly negative emotional response from the public, "as social norms have been violated and order disrupted" (Gossling and Cohen, 2014). To reduce car dependency requires overcoming a combination of physical, personal and societal difficulties, which is a challenge even for those with strong environmental values (Pooley et al., 2011).

6.3.4 Lack of urgency

One of the reasons for an apparent lack of urgency on climate change is the psychological distance, where climate change is considered distant in terms of time, geography (to most Western countries), social impacts (more likely to affect others) and uncertainty (of effects in the future) (Spence et al., 2012). There is a tendency to discount future risks, which means individuals are generally much more concerned about losses now and tend to ignore distant or future risks (Gifford, 2011).

The lower the psychological distance of climate change the generally higher the levels of concern (Spence et al., 2012). While some have suggested that for most people in the UK climate change is perceived as something happening a long way away that doesn't pose a prominent personal threat (Lorenzoni et al., 2007), other surveys suggest that more people agree than disagree that climate change is happening now and will affect their local area (Spence et al., 2012).

Climate change may fail to motivate urgent action because it is not recognised emotionally as a moral wrong that demands to be righted (Markowitz and Shariff, 2012). Climate change generally lacks the features that generate rapid, emotional reactions that influence moral judgement (ibid). For example, it is not intentional (no one wants climate change to occur or is trying to make it happen), it provokes feelings of guilt that cause individuals to downplay their own responsibility or to blame others, and it is relatively abstract (ibid).

6.3.5 Bad habits

Most of our daily behaviours are carried out over and over again in the same time and place, helping associate the behaviour with the context. What are seen as socially acceptable ways of behaving – such as driving to work, frequent flying, taking daily power showers and eating meat – eventually become ingrained habitual behaviours that are even harder to change (Lorenzoni et al., 2007; Verplanken et al., 2008).

For example, across a wide range of demographic groups, car owners tend to travel by car out of habit without consideration of the alternatives (Thornton et al., 2011). In the UK, the dependency on driving and flying is developed and perpetuated through social structures and systems, often from a very early age. Many parents use their car as a way of getting

babies to sleep (Sheller, 2004) and taxi their children around due to concern about children's safety on the roads (Hembrow, 2011; Bhosale et al., 2015). These behaviours increase car use and habituate children to journeying by car.

6.3.6 Undue reliance on individual behaviour change

Previous modelling has suggested that lifestyle changes could reduce UK greenhouse gas emissions by 30% (Spence and Pidgeon, 2010). Yet, on the whole, interventions relating to climate change appear to have had a more limited impact.

For example, out of 38 studies designed to reduce household energy use, mostly through social psychological interventions, many resulted in energy reductions of about 10% (Abrahamse et al., 2005). A comprehensive review of nearly 80 studies of energy efficiency found that the savings generally ranged from 5-20%, though this did not account for a possible rebound effect (where the cost savings are spent on other energy consuming behaviours) that would undercut the energy savings (European Environment Agency, 2013).

An analysis of 100 behavioural change programmes in Australia found that most consisted of a home energy audit, some basic retrofits, information and a list of actions for individuals to adopt, but failed to take account of the systems, standards and norms shaping consumption (Moloney et al., 2010). A more recent review of interventions to reduce energy in the workplace found most achieved reductions of less than 10% (Staddon et al., 2016). A major review of around 100 EU energy behaviour change programmes found these to be generally ineffective at bringing long-term reductions in energy consumption (Gynther et al., 2012).

Traditionally, behaviour change interventions have tended to concentrate on fairly innocuous and inconsequential behaviours, like turning off computer screens, rather than the harder, more necessary actions, such as reducing personal aviation by those on high incomes (Capstick et al., 2014). It is suggested they don't go far enough in addressing the fundamental shifts in policy and lifestyles needed (Crompton, 2008). Simply concentrating on encouraging or 'nudging' individuals to make 'better choices' may be helpful in some cases, but is not enough on its own.

The use of the behaviour change approach has been criticised for presenting an overly individualistic and rational perspective of behaviour and failing to recognise the socially grounded nature of human behaviour (Shove, 2010) or recognising that many barriers exist at societal level (Heiskanen et al., 2010). Instead, it is argued, everyday practices like driving a car or taking long hot showers are socially and culturally determined and interlinked with institutions, physical structures (such as the way our cities are designed) and daily life (Shove, 2010). The term 'practices' rather than behaviours is used to emphasise the collective social context shaping and framing daily actions (Moloney et al., 2010).

> *It is not enough to just expect people to 'just try harder' through taking 'small steps' without addressing the systemic nature of both environmental problems and daily practices.*
>
> Moloney et al., 2010

It is unrealistic to expect individual behaviour change to be the catalyst without changes in the wider system, and yet changes in national legislation/policy are difficult and complex. The focus of much diet-related research, for example, is at the level of the individual or household, in part because it is perceived to be easier to change behaviour at this level, and in part because of the dominant ideological narrative being focused on the individual in our society.

The support of uncontroversial policy interventions (for example, provision of more information) without reference or challenge to the political power structure, shifts the blame from those in power to individuals (Shove, 2010; Moloney et al., 2010; Butler 2010). It is even argued that 'the agenda of behaviour change itself', which is grounded in a particular worldview of individualism, prevents more radical change involving challenges to the status quo (Capstick et al., 2014). It is thought this emphasis on voluntary measures reflects the general reluctance by governments to regulate individuals and industry (Lorenzoni et al., 2007).

6.4 Carbon lock-in

Despite the many benefits of low carbon technologies and practices, industrialised economies have become dependent on fossil fuel systems over many decades through a process described as 'carbon lock-in' (Unruh, 2000). This is where high carbon systems are stabilised and perpetuated by technical and institutional co-evolution, despite the known impacts and existence of cost-effective alternatives (ibid). A systemic bias against low carbon technologies and practices results because of inertia at corporate, government and system-wide levels, which in turn are a result of the historical development of the fossil fuel system (Perry, 2012). This self-perpetuating inertia of the high carbon energy, housing, transport, agriculture and other systems creates persistent systemic forces that are hugely resistant to change (Unruh, 2000).

For example, the current highly centralised method of providing electricity is not the only or best way for electricity to be provided, particularly when all the environmental impacts are considered (Perry, 2012). Yet, it becomes very difficult to change because an entire technological,

institutional, governance and social system has built up around it (ibid). Energy systems comprise infrastructure (generation and distribution capacity), legal frameworks, institutions, financial support, investment models, consumer preferences, and practices and habits that have developed and are reinforced over time (Geels, 2011; Bolton and Foxon, 2013).

Institutions that develop energy policies co-evolve with energy markets and are likely to be more sympathetic to incumbents and reluctant to threaten their viability (Chmutina and Goodier, 2014). The UK energy system is characterised by a lock-in to centralisation with significant system inertia due to large sunk costs, long-term investments and institutions (Unruh, 2000; Chmutina and Goodier, 2014). It is extremely difficult for small-scale renewable energy suppliers to break into a system designed for large-scale centralised fossil fuel energy production. Despite the growth in community energy schemes in recent years, these face a wide array of barriers, and the sector still contributes a very small proportion of overall energy supply to the grid.

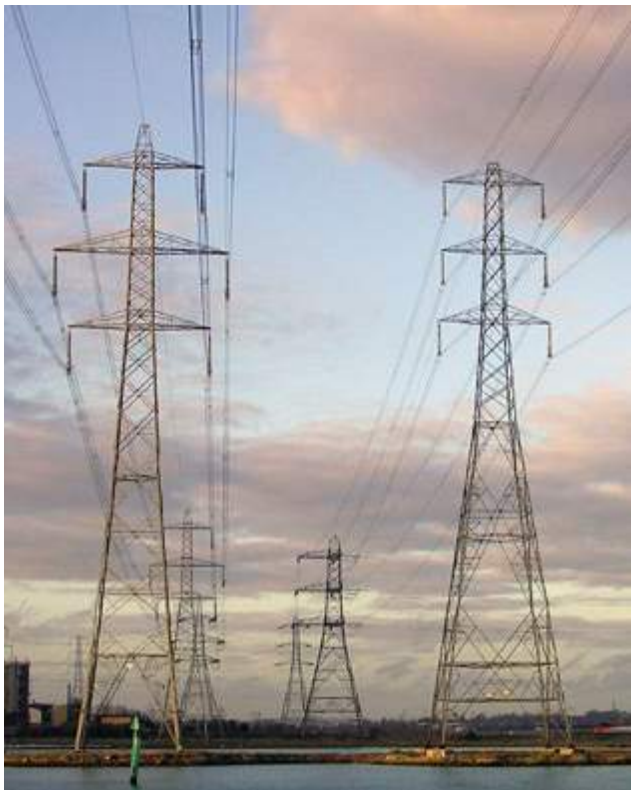


Photo by Jim Champion / CC SA / Cropped

The electricity grid can also hold back renewable energy projects if it does not have the capacity at particular locations to accept the power that the proposed renewable energy systems would generate. Concerns have been voiced that National Grid (which maintains the long distance transmission lines) and the 14 distribution network operators (DNOs) that distribute electricity around regions are not investing sufficiently in upgrading the grid to allow for more distributed, renewable energy (Farrell, 2015).

This has the effect of preventing renewable energy schemes that are otherwise viable. For example, one small hydro scheme was quoted £5.7 million to connect to the grid (Blake, 2015). There are numerous structural barriers to renewable energy that arise from needing to overcome the incumbent stranglehold of an energy system designed for fossil fuels and centralised generation.

Similarly, the daily routine of car commuting is more of a 'locked-in' practice than 'behaviour choice' due to a lack of choice in other forms of transport or lack of time or money to spend on alternatives (Moloney et al.,

2010). The UK's transport system has been designed over decades in a way that has made it heavily dependent on fossil fuels, and the practice of driving a car is part of a complex system involving machines, cities, cultures, ways of governance and lifestyles (Urry, 2008). To replace driving on a collective scale with cycling, say, therefore requires policy interventions at a system level – for example, restrictions on car use or investment in cycle infrastructure – rather than simply campaigns that focus on encouraging people to use bikes (Watson, 2013).

The cost and convenience of flying compared to alternatives can make people 'locked into' flying to holiday destinations and reluctant to consider alternative modes (Hares et al., 2010). Institutionalised practices within the tourism industry make flying more convenient and slow travel less appealing, and mean that most people automatically assume they will fly to certain destinations (Dickinson et al., 2011). For example, the difficulty of booking European train travel in the UK, especially on trains that cross borders, the difficulties of booking bikes on public transport and lack of integration of different modes, means that instead of being free to choose how to travel, individuals are instead funnelled into high carbon air travel (ibid).

The food and agricultural system is also 'locked into' industrialised production methods with intensive livestock rearing and use of nitrogen-based fertilisers on grasslands contributing significantly to greenhouse gas emissions. There is a lot of resistance to change, and much concern over the industry's ability to adapt and provide the changes that will be necessary. One of the main industry barriers in the UK is the number of farmers that rely on livestock for their income. Whilst some could move to crop production, not all land is suitable for this, so other solutions are needed.

Access to food retailers and markets, public transport and safety are all community level determinants that may shape dietary choices. These in turn are influenced by policies at a national level that relate to education, transport systems, health provision and food access and availability. National level determinants are also affected by international factors, such as globalisation, trade liberalisation and levels of development (Popkin, 2005). All of these factors have influenced the nutrition transition, resulting in high levels of meat, dairy and processed food consumption, and have led to a high prevalence of obesity. Understanding the role of the wider food system in these changes has been highlighted as an important area in bringing about dietary shifts in the UK population (Swinburn et al., 2011).

6.4.1 Difficulties in scaling up innovative practice

Recognising the need to overcome the problems of carbon lock-in has resulted in a lot of focus on potential 'levers' for change to catalyse the transformation. The development

and rapid growth in 'transition management' theory suggests that, under certain conditions, innovation at a local level can break through and spread to different locations and create transitions in the wider social and economic system (Rip and Kemp, 1998). Other theories, such as social practice theory, suggest moving to a low carbon society involves developing new systems of low carbon social practice and different social institutions, habits and fashions (Urry, 2013). Both theories suggest a key role for local communities, enterprises and local government to overcome the problems of carbon lock-in.

Scaling up is not a question of simply getting bigger but involves innovations and ideas becoming circulated and adopted elsewhere. This leads to the creation of standards and networks, the adoption of practices within professions, or the development of new finance mechanisms (Buckeley, 2016). The onus for change is, therefore, not only on the innovators but also on the incumbents, so that part of the work of scaling up involves creating windows of opportunity (ibid).

While there are many examples of highly innovative local projects, and evidence of carbon reductions at a project level, evidence of their contribution at a broader local or regional level remains unclear. This is partly due to the fact that these projects are still relatively isolated in comparison to the mainstream, and many face problems in scaling up. Greenhouse gas emissions are also clearly influenced by wider economic and structural factors beyond the control of local players.

Many community or volunteer-led initiatives have trouble simply surviving due to internal issues, such as skills, resources and management which make them vulnerable to funding cuts or loss of key people (Hargreaves et al., 2013). Many local projects reliant on volunteers suffer problems of fatigue and burnout.

It is also important to note that not all grassroots groups and innovations want to scale up in terms of size (ibid), particularly if this means supporting and conforming to the prevailing system which many set out to challenge (Smith et al., 2015). For example, there is tension between the aims of government policy that sees community energy as a useful adjunct to the incumbent large-scale, centralised system, and the aims of many grassroots community energy groups who support more radical decentralised alternatives (ibid).

There is also an unfortunate tendency for government to view community groups as a means of cheap delivery of government policy aims (Mayne and Hamilton, 2013). Lastly, communities are heterogeneous bodies and any attempt to influence them needs to be sensitive to the many different outlooks and motivations underlying them.

However, for those groups who are interested in diffusing their ideas to the mainstream to gain wider influence, there are many challenges. It is suggested that all grassroots groups

encounter social or political barriers at some point, and they have to seize opportunities in a shifting policy landscape (Smith et al., 2015). Some may say they have succeeded in spite of policy rather than because of it (ibid).

The difficulties in scaling up innovative practice were explored in an analysis of the Canelo project in Arizona, a pioneering project in the US straw bale housing movement (Seyfang, 2010). Straw bales are a highly energy efficient as well as carbon-neutral building material. Although the project aims to influence the wider housing system using education and workshops to spread ideas and experience, it faces significant challenges getting its ideas and practices adopted more widely (ibid). These challenges include the fact that the collective, inclusive model of building based on manual labour is not practical for high volume house building (ibid).

6.4.2 Inconvenience and unattractiveness of alternatives

In many cases, there are practical or technical barriers that make zero carbon alternatives within the food, transport, buildings and energy sectors less convenient and attractive. These barriers perpetuate the carbon lock-in by making it more difficult for alternative or zero carbon technologies, infrastructure or services to get a foothold.

For example, it is still generally more convenient to travel by car than public transport, particularly when it involves more than one connection or carrying luggage or passengers. This needs to change so that making a door-to-door journey by public transport, bike or foot, or some combination of these, is just as convenient (DfT, 2013c). There are a number of barriers to door-to-door journeys: inadequate information, poor interchange facilities, poor connections and restricted ticketing (Palmer et al., 2011). To facilitate door-to-door journeys requires:

- Accurate and accessible information about the different transport options.
- Convenient and affordable tickets for the entire journey.
- Regular and straightforward connections at all stages and between different modes.
- Safe, comfortable transport facilities (DfT, 2013c).

In addition, assuming that trips can be taken by bike or on foot, just because they are short, ignores the difficulties caused by the physical environment, complex household interactions and attitudes (Pooley et al., 2011). For cycling, numerous surveys and studies have shown that the main barrier in the UK is the perceived safety risk due to the high levels and speed of traffic on the roads (DfT, 2013b; TfL, 2014a). This is particularly the case for children, with many parents unwilling to let their children cycle on the road for fear of traffic (Guliani et al., 2015).

Women, who tend to be more risk-averse, are also discouraged from cycling due to safety concerns, with less than a third of cycling journeys made by women compared to men. Women cyclists have been described as the 'indicator species' for how bike-friendly a city is (Baker, 2009). Campaigners have developed progammes to address the lack of women cycling (for example, Bike Belles featured here as one of our Stories for Change). This is despite the fact that the estimated health benefits of cycling are substantially larger than the risks (from accidents) relative to car driving (de Hartog et al., 2010).

In the case of retrofitting buildings, there are a range of other barriers, such as lack of information, hidden costs, the 'hassle factor' and social norms, that impede and prevent action. For example, many people are unwilling to undergo the disruption and stress of building energy works (Weiss et al., 2012). As Wilson et al. (2014) highlight, the decision to undertake an energy efficiency retrofit should be understood as a process or journey. It is within the conditions of everyday domestic life that decisions emerge, and these decisions may be tied into other aspects of home renovation. There is also insufficient space in many modern homes, where floor space is at a premium, to install energy storage such as hot water tanks.

Stories for Change

Sheridan Piggott

Founder of York Bike Belles

If you can demonstrate to people that what they are doing is not just good for the planet but will improve their quality of life and they'll have a great time doing it, that is transformational.

York Bike Belles encourages women to start riding, or ride a bike more often, through an inspiring combination of motivational communications and confidenc -building activities in fun, relaxed environments. Bike Belles addresses the fact that while on average 20% of men cycle, only 10% of women do.

York Bike Belles

"When I moved to York about 4 years ago, York City Council very forward-mindedly decided they wanted to target cycling for women and families, and I came up with the concept of Bike Belles.

One of the cultural barriers to cycling in this country is that it's viewed primarily as a sport – a male dominated, competitive sport. Don't know how that happened, because cycling for centuries has been a form of everyday transport that women and all members of the community have thrived on. It's one of the best, most sustainable and healthiest ways to get around.

What we had to do with Bike Belles is to go back and look at what the barriers are, address them in an appealing way and recreate that everyday cycling culture.

Women don't feel they've got the right skills in terms of cycling in traffic, with children, and doing maintenance. When they overcome those barriers it leads to all sorts of other benefits – we've seen massive increases in confidence, independence, improvements in physical and mental health.

Women want activities that feel not just important to them, but to their communities – their families and friends. It's about collaboration and co-operation and in our meetings everyone has an equal say. Starting from the female means that those qualities are central to the project.

We engaged about seven and a half thousand women in the York area and at least twenty thousand people have engaged with the project online. We do activities like bike maintenance, bike rides, bike loans, that address some of those key barriers women face. We have a group of women champions who help promote it in their circles and deliver activities themselves.

We target women, but we don't exclude anybody else. We often get men coming along on rides. We've recently engaged with some mental health groups in York and their clients have come along. It's grown from being just for women to being an everyday, friendly cycling community for everyone – one of the things that's lacking in our cycling communities across the country."

https://www.facebook.com/yorkbikebelles

6.4.3 The planning system

The role of planning is particularly important for a zero carbon future. Local planning authorities have a legal duty to ensure that their planning policy contributes to the mitigation of and adaptation to climate change (Planning and Climate Change Coalition, 2012). Climate change is also a core planning principle of the main planning guidance, the National Planning Policy Framework (NPPF) (ibid).

For example, housing location and density of housing are key factors determining how people travel (Taylor and Sloman, 2008). Developments of low-density housing or those built near to major roads and motorways, and further from employment centres, are likely to increase car-dependency (ibid).

Despite the benefits of good planning, the planning system has in recent years been "continually undermined and devalued", (Henderson, 2015) and the social purpose of planning has been slowly abandoned (Ellis and Henderson, 2014).

The planning system can, of course, also be a barrier to a zero carbon transition. Data shows around a third of planning applications for renewable energy schemes withdrawn or rejected, two-thirds approved. However, there is a higher rejection rate for onshore wind applications with half withdrawn or rejected (DECC, 2016e). Common reasons for rejection are that wind turbines would adversely affect the landscape's visual appeal (Smith, 2015a). However, the reasons for rejection are not always simple or consistent and the planning system is there to balance different interests (ibid). Despite high public support for renewables generally, there is often opposition to specific projects at local level.

The government has in recent years clawed back many of the planning powers from local communities. In 2015, the National Infrastructure Commission was established to take decisions on Nationally Significant Infrastructure Projects (NSIPs), usually large-scale developments relating to energy, transport, water or waste (Smith, 2016). Development Consent Orders for these projects are granted by the government as an alternative to needing planning permission from a local authority. The government also announced new planning processes to fast track applications for shale gas, giving local authorities 16 weeks to make a decision before the Communities Secretary steps in to take the decision on their behalf (DECC, 2015g).

By contrast, in 2015 the government changed the rules to make it easier for local communities to block larger wind turbines (50MW and above). Guidance states that authorities should only grant planning permission if:

- The development site is in an area identified as suitable for wind energy development in a local or neighbourhood plan.

- Following consultation, it can be demonstrated that the planning

impacts identified by affected local communities have been fully addressed and therefore the proposal has their backing (Smith, 2015a).

Under the Planning and Energy Act 2008, local authorities had the capability to specify, as a condition of planning permission, that minimum energy contributions be made from on-site renewables and/or that higher standards of energy efficiency or energy performance should apply to new build developments. Some 200 local authorities have exercised those powers and have been exemplars in driving forward energy performance standards faster than the Building Regulations.

However, in 2014 the rules were amended, removing the power from local governments to set energy efficiency standards for new buildings, although powers to specify the sourcing of energy from on-site renewable technologies were left in place (REA, 2014). In addition, the current Government removed the right of local authorities to set higher energy performance standards for new homes using the Code for Sustainable Homes (DCLG, 2015), although higher energy performance standards may still be set for non-domestic buildings (for example, using the BREEAM sustainable buildings code).

As well as constant changes to the planning system, local governments are also dealing with cuts to funding, which have resulted in spending cuts particularly in the areas of planning and development, transport, housing and regulation and safety (Innes and Tetlow, 2015).

6.4.4 Lack of support for local government action

As well as providing support for low carbon communities, councils at all levels (parish, town, city, county, unitary) are key innovators and drivers of the low carbon system in their own right. Local government is responsible for local policy and delivery of planning, housing, local transport and waste, areas which all have profound implications for carbon. The Government's localism agenda and policy for devolution, while criticised for divesting responsibility, means there are opportunities for more radical solutions.

While councils have reported thousands of initiatives on transport, community, housing, and the low carbon economy, challenges reported include resourcing and funding as well as organisational change and staff turnover (LGA, 2016a). For example, a survey of local government found that insufficient funding was the main barrier to making existing roads safe for cyclists (LGA, 2015a). Local governments are already over-stretched due to government budget cuts. Funding is not the only issue – innovation also needs human resources and most local councils are facing such severe budget cuts that they barely have the capacity to support core statutory services, let alone take on additional projects.

Cities also face barriers to action. A report prepared for 2015's COP21 UN climate summit in Paris identified over 26,000 additional climate actions that cities have not yet taken due to a range of barriers (C40, 2015). These include coordination with government, governance and capacity within the city, challenges in collecting and presenting information about the benefits of climate change action, difficulties in engaging urban stakeholders, difficulties in collaborating with the private sector, and access to funding for climate action (C40, 2016a). The majority of these challenges cannot be overcome unilaterally by cities, but require support from partners, such as national governments or the private sector (C40, 2016).

6.5 Economics and finance

> *Climate has now firmly moved from an environmental issue to a financial and economic one.*
>
> Transforming Finance, 2016

Many financial barriers to the zero carbon transition are rooted within the current neo-liberal economic paradigm. Businesses are already under pressure, facing many challenges to operate profitably in the current economic system, so additional change can be seen as another burden.

Individuals may perceive a barrier that they cannot afford to invest in zero carbon technologies and behaviours – especially in the absence of stable government incentives or full cost pricing of business as usual. For example, there is a perceived barrier that newer zero carbon technologies are more expensive, in comparison to the sheer economies of scale of the incumbent fossil fuel systems, plus the fact that many of the true costs of that system are either subsidised or externalized. There are also perceived disadvantages of being the first to adopt new technologies, financial disincentives to change, and an un-level playing field for cleaner technologies and non-corporate entities.

Another barrier is that many capital expenditure profiles for investment in clean technologies are 'front end loaded'. This means most of the cost comes at the beginning of the project, but then the ongoing costs are significantly lower. For example, once you have built your windfarm there are no ongoing coal, oil or gas costs. However, under the existing system, this 'front end loaded' investment poses huge difficulties in mobilising the initial finance in order to deliver longer-term returns.

There is also an underlying fear that it is impossible to create an economic paradigm that can work without

perpetual fossil fuel driven growth. This makes governments unwilling to instigate the economic measures (changes in regulations, kick-start subsidies and tax breaks) to deliver a zero carbon future at a fast enough rate.

This reluctance to fully rise to the challenge may be driven by a mixture of concerns, including macroeconomic impacts – especially if the UK acts first, unpopular public perception of higher energy bills, but the key ideological barrier resides in resistance to 'interference' in markets. Despite some pioneering, innovative financial initiatives to support the zero carbon initiatives, we don't yet have an economic framework capable of supporting and nurturing this transition. The over-arching barrier remains a dogged neo-liberal faith in the primacy of market forces.

6.5.1 Lack of a level playing field

Often low or zero carbon alternatives have a higher upfront cost, particularly in the early stages when new technologies are more expensive than established ones due to development costs or economies of scale. However, when true costs are evaluated, including the 'externalised' costs of polluting activities, then a zero carbon future does indeed carry lower costs than the unsustainable alternative – a case that has been powerfully made by reports such as the Stern Review and others (Stern, 2011; EPA, 2015). However, as these costs are rarely included in the price individuals pay, polluting

Photo by Images Money / CC BY / Cropped

alternatives often appear much cheaper than they really are. By not including these 'externalised' costs an unfair playing field is created between fossils fuels and alternative clean energy sources.

Cost to the individual can therefore be a significant barrier to the adoption of new technologies, behaviours and support for government policy.

Renewable energy

In the UK, the costs of renewable energy subsidies have been passed onto consumers in the form of higher bills. It is estimated that in 2014 this added £45 to the average household bill, and will add about £105 a year by 2020. However, estimates of the impact on bills have been criticised for not including the reduction in the wholesale price of electricity caused by increased supply from renewables. Furthermore,

the whole approach of adding the cost of subsidies to energy bills is criticised by many as 'regressive', since poorer people contribute a higher proportion of their income (Preston et al., 2013).

The higher upfront cost of zero carbon heating systems, compared with current standard systems like gas boilers, is an important financial barrier to roll out. Lower running costs, alongside subsidy schemes such as the Renewable Heat Incentive (RHI), can make these systems a cost-effective investment over several years. However, access to capital to cover the upfront cost can remain a financial barrier.

Buildings

A key barrier to building all new buildings to Passivhaus standard, or equivalent, is the increased upfront cost. This additional cost is not excessive (estimated at 3-8% above a conventional building for the fairly mature European market) and can easily be recouped over the life of the building through reduced energy bills (Passipedia, 2016). In the UK, current estimates of additional upfront costs vary and may be higher than the above (recent estimates range from 0-25%). However, costs are falling as construction industry familiarity increases and the cost of materials and components reduces (de Selincourt, 2014).

The embryonic nature of some markets, such as that for solid wall insulation, means there is a lack of 'economy of scale'. This means that early adopters confront higher first costs (NEF, 2014). The need to reduce early adopter costs and help grow markets, along with the need to address fuel poverty in some households, makes a good case for subsidies to pay all or part of the cost of more ambitious retrofit measures, as well as other major changes required for sustainability. Access to capital is clearly important since a 'whole-house' retrofit may cost tens of thousands of pounds and the payback period from energy bill savings may be long.

A higher upfront cost for the most efficient appliances, which could be justified once energy efficiency, longevity and repair costs are considered, may nonetheless impede decisions based on whole-life costs, and can put efficient appliances out of the reach of the less well off.

Transport

In the ten years to 2015, train and bus fares have risen by over 50%, while the cost of motoring has increased by around 20%, but in real terms (relative to the rate of inflation) public transport fares are relatively higher and motoring costs relatively lower than ten years ago (DfT, 2016a). The main reasons people do not use the train for long trips are convenience and cost, while cheaper fares would encourage more people to use the train for shorter trips (DfT, 2015e). Cost is also an important barrier to travelling by bus for many people (Transport Focus, 2013).

Studies have found that a key barrier to electric vehicles (EVs) is the higher upfront costs; even though lower running costs make EVs nearly comparable with conventional cars, consumers require short payback periods (Egbue and Long, 2012; Element Energy, 2013).

Since the 2005 budget, Vehicle-Excise Duty (VED) has been graduated according to carbon dioxide emissions as an incentive to drivers to purchase vehicles with lower emissions. This played a part in the significant increase in the market share of more fuel-efficient cars over this time (Society of Motor Manufacturers and Traders, 2012). The successful VED policy was abandoned in the 2015 budget when a standard flat rate was introduced covering 95% of cars, providing no incentive to purchase more efficient models.

The aviation industry receives tax exemptions in fuel duty and VAT (for plane tickets) estimated to be around £10 billion in 2014 (Lees, 2014), which is not compensated for by the revenue from Passenger Air Duty of £3 billion per year. Aviation fuel pays no tax due to opposition from the International Civil Aviation Organisation (ICAO).

Food

The top three factors in people's food choices are price, quality and taste (DEFRA, 2015b). Healthier foods are generally found to be more expensive than processed food (Monsivais, 2015; Moubarac, et al., 2013) and the price gap between healthy and unhealthy foods is growing (Jones et al., 2014).

Other examples

There are many other examples where zero carbon alternatives, and particularly new technologies, are put at a financial disadvantage compared to the status quo. In many cases, there is a clear imbalance in funding and support for existing unsustainable practices, compared with the transition to sustainable ones.

For example, in relation to cycling, the Dutch spent £24 per person per year on cycling compared to less than £2 per person in England (All Party Parliamentary Group on Cycling, 2013). It was recommended that funding in the UK needed to be at least £10 per person increasing to £20 (APPGC, 2013). In 2016 the Government announced funding for walking and cycling in England of only £316 million over 5 years between now and 2021, much of which is not new funding (DfT, 2016c). This equates to roughly £1.20 per person per year, but not inclusive of local spending. In contrast, the Government proposes investment of £15.2 billion in over 100 major road schemes (DfT, 2014). The funding in Scotland seems a little better, estimated at around £6-7 per person for cycling in 2015 (SPOKES, 2015), but still less than the £10-20 required.

In many cases, there are perverse or poorly aligned incentives for people to behave in un-environmentally friendly

ways, and in some cases there is no incentive to change at all. For example:

- In many cases, the party paying for energy efficiency improvements does not get the full benefit from reduced energy bills. For example, the tenant rather than landlord pays the energy bill or the property is sold soon after the efficiency improvements are made and whilst the sale price or rental income may be increased by energy efficiency improvements, this may not fully cover the expenditure.

- At present there is a lack of incentive to consider energy storage and energy demand management. Electricity storage is poorly aligned with existing regimes in the electricity system. There may be 'positive externalities' for the investor whereby their energy storage gives system-level benefits for which they are not rewarded financially (Grunewald et al., 2012).

- There are also perverse incentives to drive in the form of company car taxation and business travel remuneration schemes. Many organisations, deliberately or unthinkingly, provide an incentive to employees to drive for business use by providing a flat rate business travel mileage, which in many cases generously compensates employees who drive, and which sometimes costs the business more than paying for public transport costs. While there is some essential business use, a company car generally acts as an incentive to buy larger cars and drive more (Gossling and Cohen, 2014).

In all of these cases there is a lack of a level playing field, with financial incentives heavily weighted in favour of the incumbent fossil fuel system or status quo.

6.5.2 Fossil fuel subsidies

A report by the International Monetary Fund (IMF) revealed the level of subsidies provided to the fossil fuel industry globally is around 6% of total global gross domestic product (GDP) (IMF, 2015). The G20 countries provide $444 billion a year in subsidies to fossil fuel companies, almost four times the amount of global subsidies to renewable energy (Bast et al., 2015). These subsidies are financing the exploitation of uneconomic high carbon assets that cannot be burnt if internationally agreed targets in Paris are to be met, and are diverting investment from low and zero carbon alternatives (ibid). The UK is one of the few G20 countries (and the only G7 country) that is increasing its fossil fuel subsidies while cutting back on support for renewable energy (ibid). Governments are willing to subsidise and support the fossil fuel industry as their interests in cheap energy and security often align.

As table 6.1 shows, these subsidies are enormous – conservatively estimated at £26 billion a year in the UK. The majority of this subsidy is termed 'indirect' as it comes in the form of

Energy source	Subsidies	Reference
Fossil fuels	£26 billion in 2015 or more than £412 per person (this includes both direct and indirect subsidies)	IMF (2015)
North Sea oil and gas	$4.5 billion 2010-2014	Bast et al. (2015)
Renewables	£3.5 billion in 2014/15 or £55 per person £9.1 billion in 2020/21 (expected)	DECC (2015f)

Fig. 6.1 *UK subsidies for fossil fuels and renewables*

not paying the costs of climate change and local air pollution. However, there are also significant 'direct' subsidies to fossil fuel companies in the form of pre-tax subsidies and uncollected tax revenues (IMF, 2015).

North Sea oil and gas have corporation tax reductions in the UK, and UK public funding is used for exploration of fossil fuels. In the five years to 2014, the UK subsidies for oil and gas development in the North Sea was $4.5 billion, most of which went to international companies (Bast et al., 2015). Domestic fossil fuels also get subsidies for 'security of supply', which renewables don't.

The UK government has a direct interest in supporting national fossil-fuel production, since fossil fuel related tax receipts are over £25 billion a year (HMRC, 2016). While the tax receipts are a direct source of revenue for the Treasury, the environmental damage caused by the industry incurs hidden costs, such as the health costs of air pollution, which society bears as a whole and which entail direct government expenditure.

The way money moves from the public to the private sector to support a range of technology choices currently uses a variety of very different terms, depending on how it is being framed. 'Incentives' sound good, whilst 'subsidies' can sound bad. Also some technology choices offer direct financial benefits to those living locally, whilst others do not. This leads to bias and inequality in public perception/acceptance.

> *Theresa May gives a £10,000-plus bribe if you live near a frack site. If you live near a wind farm, nothing ...The asymmetry is amazing.*
>
> Barry Gardiner, Shadow Energy and Climate Change Secretary (Mason, 2016)

Nuclear power also receives government support in the form of clean-up costs, insurance and political influence. New nuclear power projects

will also receive guaranteed prices for the energy they generate in future.

The government has recently announced a deal for a new nuclear power plant, Hinkley C, which involves the government committing £92.50 per megawatt hour over 35 years for its electricity output – more than twice the current wholesale price. It has been shown that cancelling Hinkley C and switching to renewables would save Britain at least £30-40 billion in energy bills (Intergenerational Foundation, 2016). Onshore windfarms would cost £31.2 billion less than Hinkley, and solar photovoltaic power £39.9 billion less over 35 years to build and run, based on both the value of subsidies paid by the taxpayer for the electricity and the cost of building the infrastructure (ibid).

Phasing out national subsidies presents an opportunity to shift public finance into clean energy sources. However, governments are often reluctant to undertake reform due to a number of barriers (Whitley and Van der Berg, 2015):

- Lack of transparent information on subsidies. Globally, there are about 800 types of fossil fuel subsidy, mainly in national budgets.
- The contribution of fossil fuel revenues to government budgets.
- Misperceptions and misinformation about the contribution of fossil fuel subsidies to economic development.
- Vested interests blocking reform.

The combined effect of these barriers is to create inertia and further carbon lock-in (ibid). The most common driver for reform of subsidies worldwide is a crisis, typically when the fiscal costs are so high that governments have no choice (Bast et al., 2015). Only in rare cases are environmental issues a motive for reform (ibid).

Encouragingly, falls in oil prices have facilitated the phase-out of consumer subsidies in around 30 countries in 2014 (Merrill et al., 2015). In the UK, where subsidies are largely production-related, the opposite has occurred, with taxes on the North Sea oil and gas industry effectively abolished in the 2016 budget.

6.5.3 Lack of access to finance

The costs of transition to a zero carbon future are high. Estimates, for example, of the capital required for future power investment in the UK vary widely, due in part to the different scenarios and the degree of decarbonisation, but range from £3.1 to £11.1 billion per year by 2020 (Blyth et al., 2015). A UK government estimate puts the required investment at £100 billion for the period 2014-2020 (DECC, 2014b).

Even with business as usual there are concerns about the 'investment gap' in the UK power sector, since several billion pounds of investment per year is needed over the next decade. Financing needs are acute, with a number of power stations reaching the end of their useful life and greater expansion of renewable energy needed. A major university study

looking at the expansion of a more decentralised civic or community owned renewable energy production system identified a finance gap for community energy schemes as a key barrier (Johnson and Hall, 2014).

Traditional models of financing via the large utilities are not proving sufficient to provide the necessary investment (Blyth et al., 2015). In 2012, the UK Government set-up the Green Investment Bank with a mandate to invest in renewable energy and carbon emission reducing projects. It was hoped that the UK Green Investment Bank could follow the strong example provided by other infrastructure investment banks, such as Germany's KfW or the European Investment Bank. However, the privatisation of the Green Investment Bank has cast doubt on whether it will continue to be dedicated to providing the capital that renewable energy projects need. The UK Government has insisted that a 'special shareholder' will ensure that the bank continues with its green mission but others are unconvinced that this is a sufficient safeguard (Vaughan, 2016).

Concerns about 'keeping the lights on' and a lack of traditional finance have also led the UK Government to set-up new financing schemes – the Government Guarantee Scheme and Private Finance 2. Under the Government Guarantee Scheme, the Treasury guarantees that lenders to 'nationally significant' infrastructure projects will be repaid in full and on time, irrespective of project performance. Such schemes are welcome in securing investment in renewable energy projects, however, they tend to favour large, traditional and centralised energy supply projects (Blyth et al., 2015). So whilst they may finance, for example, large offshore wind projects, alternatives may be needed to ensure finance is available for smaller-scale and community energy projects.

As well as difficulties in securing direct finance, a major barrier for decentralised electricity supply projects is the difficulty of securing contracts on good commercial terms for selling the energy they have generated (Platt et al., 2014). This is most commonly achieved through a power purchase agreement (PPA) with an existing supplier, typically one of the Big Six energy companies. However, independent renewable generators have struggled to secure commercially viable agreements from the Big Six due to their weak negotiating position (ibid).

6.5.4 Assumption that growth is good

> *Growth for the sake of growth is the ideology of the cancer cell.*
>
> Edward Abbey, 1968

There is a pervasive assumption in society that growth is synonymous with improved well-being and is sustainable and desirable. Yet, somewhere in-between 1950 and 1970 the increase in social welfare stagnated or even reversed in most rich countries, despite a steady increase in GDP growth (van der Bergh, 2011).

More fundamentally, the more the world grows, the more resources are needed and the more pollution is created generally. Many studies have clearly shown that the planet has reached its carrying and absorbing capacity as a result. The impossibility of continued economic growth on a finite planet was explored by the Club of Rome over 40 years ago (Meadows, 1972). More recent studies have demonstrated that humanity has already transgressed three planetary boundaries for climate change, biodiversity loss and changes to the global nitrogen cycle (Rockstrom et al., 2009). The world's population is using nature's services and resources at a much faster rate than nature's ability to replace and absorb them.

Globally, increasing growth has been demonstrated to be the most important driver of environmental impact, with correlations between world economic growth and atmospheric carbon dioxide, global material use and impacts on ecosystems (Antal, 2014).

Growth is conventionally measured by GDP, which describes the sum total of all the goods and services that the economy produces and measures the income earned from that production. Yet, GDP is a hopelessly indiscriminate measure of economic progress so that the costs of pollution, car accidents and prostitution increase GDP, while important but uncosted items are ignored.

> *Yet the gross national product does not allow for the health of our children, the quality of their education or the joy of their play. It does not include the beauty of our poetry or the strength of our marriages, the intelligence of our public debate or the integrity of our public officials. It measures neither our wit nor our courage, neither our wisdom nor our learning, neither our compassion nor our devotion to our country, it measures everything in short, except that which makes life worthwhile.*
>
> Robert F. Kennedy, 1968

GDP provides a very distorted view of societal well-being. Using GDP to gauge economic progress "is like using

a speedometer to determine whether we are going the right direction, and whether we have fuel in the tank." (Evans, 2012). Although GDP was never designed to measure national well-being it has become a proxy for social welfare and has immense importance in policy discussions and public debate. Yet, instead of leading to increased well-being, pursuit of GDP growth has led to the problem of 'uneconomic growth' (Daly, 2013).

Despite the clear unsustainability of endless economic growth, any discussion that growth is not desirable or that there needs to be less consumption and production of goods is still considered something of a taboo (Sekulova et al., 2013). To effectively tackle climate change (and other global environmental problems) requires questioning the widely held belief that growth is good and GDP is an accurate and appropriate measurement of societal progress.

6.5.5 Neo-liberalism, privatisation and free trade

Neo-liberalism is a school of economic thought that is now the prevailing economic orthodoxy in the UK and many other industrialised societies. It combines belief in deregulated ('free') markets with concerns about personal freedoms. At its core is the notion that government involvement with the free market should be stopped because it inevitably leads to economic inefficiency. Competition is the key driving force of neo-liberal economics (Monbiot, 2016). Free market economics, based on the idea of individual liberty, means that individuals, acting via market forces, should be allowed to choose how to allocate resources. As such, markets are seen as powerful ways to optimise a system, because they rely on human behaviour in a competitive environment of 'free choice'.

Neo-liberal deregulation undermines the ability to deal with climate change by weakening the ability of society to meet social needs and regulate environmental destruction. The belief in the overriding power of the market to meet society's needs results in the commodification of everything, including nature, as well as privatisation of public services and natural assets. However, without sufficient regulation in competitive markets, firms are driven to make profits at the expense of the environment, resulting in the continuing ecological crisis. The reliance on individuals alone to solve the problem is a symptom of the problem: an ideology grounded in the supposed wants and needs of individual consumers.

In Expert View below, Andrew Simms discusses the problems and misguided assumptions about human nature underpinning neo-liberalism, and why it is time for a paradigm shift. He argues one of the greatest barriers to that shift might just be our reluctance to believe in its possibility.

Expert View

Neo-liberalism? We're just not like that and we can make it happen

Andrew Simms

Co-director of the New Weather Institute

"Where there is no vision, the people perish."
Proverbs (29:18)

"It is easier to imagine the end of the world than a change to the current economic system."
Attributed to various people

We have the technology to 'make it happen', that much is demonstrated by the work of the Zero Carbon Britain project. But, despite numerous, innovative financial initiatives to support green energy, we don't yet have the economics. The obstacle is a tenacious, ideological hybrid of a classical faith in the primacy of markets called neo-liberalism.

It was born in April 1947 in the Swiss mountain town of Mont-Pèlerin when the likes of Milton Friedman and Friedrich von Hayek, scions of the Chicago School of Economics, Ludvig von Mises of the Austrian school, and philosopher Karl Popper gathered to perfect a market system that would underpin their vision of a free society. They sought to halt the spread of ideas that emphasised common purpose and governments acting directly in the public interest. Instead they pushed an economic counter-revolution that married the old, neoclassical belief in deregulated markets with newer liberal concerns about personal freedom, fully conflating the two.

Even early on, however, Karl Popper, author of *The Open Society and Its Enemies*, broke ranks, pointing out that "proponents of complete freedom are in actuality, whatever their intentions, enemies of freedom". Popper saw the logical consequence of ignoring how power, unregulated markets and unrestrained individual behaviour would interact. He reasoned that this notion of freedom paradoxically would be, "not only self-destructive but bound to produce its opposite, for if all restraints were removed there would be nothing whatever to stop the strong enslaving the weak".

Yet, today, even critics of neo-liberalism can become hypnotised by its success. Instead of challenging its fundamentally flawed logic and view of human nature, they argue over and seek to re-engineer parts of its machinery. As if there is a ghost in the machine, that can be exorcised, or captured and put to better use.

In seeking out and building a new economics, however, I think it is better to start straightforwardly from asking what it is we want to achieve? In the face of potentially catastrophic climate change, corrosive economic inequality and pervasive impoverishment of the human condition, I'd argue quite simply that this will include operating with planetary boundaries, doing so in a way that shares more equally the benefits of our economies and consciously favouring things that are likely to promote social justice and raise human well-being.

But after neo-liberalism's recent, near systemic collapse, tenaciously the old order restored itself, using its own economic failure to justify more of what caused the problems in the first place. A market failure was cleverly transformed in the public imagination into a problem to do with public spending. We were told to put our hopes of a better life on hold and suffer austerity for the sins of a reckless financial system. And, in a strange act of passive compliance and of the victim's often odd assumption of guilt, many accepted and internalised this version of events.

Rampant, self-seeking individualism designed into the heart of neo-liberialism had nearly destroyed the system itself. So everyone had to be disciplined, except, of course, the actual guilty parties. Support and investment in the public domain was sacrificed in the name of protecting a flawed financial architecture. Without exposing and discrediting the neo-liberal assumptions that naturalise such policy choices we won't be able to 'make it happen'.

But who are we? Mainstream economics tends to make sweeping, highly reductive assertions that are conveniently self-fulfilling. 'You are narrowly self-interested, perfectly informed and rational – you are "economic man",' runs the argument, and your world is, 'competitive, infinite and barrier-free.' You have evolved through Jeremy Bentham's concept of the importance of 'utility' – the greatest good for the greatest number, French mathematician Leon Walras' general equilibrium theory of the economy, and seek to maximise your utility through 'expressed preferences'.

But here's the trick – the only way the mainstream has been confident enough to measure that, is through *what* you spend – regardless of *why* you spend – and how all that adds up into our national income – or, GDP. Famously, that means we are meant to be living the dream whether we're spending on wild flower seeds for the garden, extra door locks through fear of crime or asthma inhalers due to poor air quality. That is literally the bad smell of mainstream, *aka* apocalyptic economics.

In the eyes of GDP that cannot distinguish economic quality from the quantity – more is always better. I am simplifying – but that means the success of the dominant economic model of the Anthropocene is measured by the voracity with which we over-consume – and in doing so overburden our biocapacity, undermining our life supporting ecosystems. Hence and gnomically, our success is, in fact, measured by our failure.

There's a niche in the economics literature that explores the question: does studying economics make you a bad person? (Harford, 2010). Professor Robert H. Frank was one of its early exponents, based at Cornell University in Ithaca, New York. He was struck by the insistence in economics on the essential selfishness of human nature – like the economist Gordon Tullock's assertion that 'the average human being is about 95 per cent selfish, in the narrow sense of the term' (Frank et al., 1993).

Frank and his colleagues chose to investigate whether the 'self-interest' model of the economy was a reflection of how people in essence were, or whether it was an artificially constructed model that attracted an unrepresentative, more selfish sample of society to its cause, and was actually making people selfish. His troubling conclusion was that the appeal, study and internalisation of neo-liberal economic models did indeed select an unrepresentative, more selfish slice of society.

A study at the dawn of the Reagan–Thatcher economic revolution noted that economics undergraduates were more likely to behave selfishly and 'free-ride' off the more public-spirited behaviour of others (Marwell and Ames, 1981). And, more recently, Yoram Bauman, an environmental economist at the University of Washington, looked at the impact of economics teaching on students majoring in other subjects. Those who began as part of the more generous majority, not full-time students of economics, actually became more selfish as a result of exposure to studying the 'dismal science' (Bauman, 2011).

That's an old term but according to Dr Marc Arvan, an assistant professor of philosophy at the University of Tampa in the US, it could be an understatement. He conducted an experiment looking into the relationship between 'moral judgments and three "dark" personality traits: Machiavellianism (in other words tendencies to deceit), narcissism (over-inflated sense of self-worth), and psychopathy (lack of guilt and remorse)' (Arvan, 2013).

To do so he looked at people's beliefs concerning several issues including 'economic libertarianism' – the notion that the role of the state in relation to the market should be minimal, only intervening to prevent or punish the breaking of the law. This is the ideal habitat in which 'economic man' is supposed to prosper. But Arvan found that this view 'correlated significantly . . . with all three dark personality traits.' In other words, the projection of an economic system built on foundations of self-interest, individualism and self-regulation, which is supposed to be good for everyone, in fact describes the habitat for a dark triad of personality dysfunctions including psychopathy, Machiavellianism and narcissism.

The materialism relied on by neo-liberal markets displays similarly self-reinforcing and negative dynamics. It's been shown in countless studies, summarised by American academic Prof Tim Kasser, that holding more materialistic values is an indicator for having relatively lower levels of well-being. Classic studies show that merely being exposed to images of fancy consumer goods triggers materialistic concerns, which makes us feel worse, and behave more antisocially (Bauer et al., 2012).

Children, for example, exposed to advertising were seen to be less likely to interact socially. Other studies show how by simply referring to people as consumers rather than, say, citizens, triggers more competitive and selfish behaviour (ibid). When you can be exposed to anything from 500–3000 daily 'cues' to think in this way from exposure to media and advertising, it can have a huge cumulative effect – not just on our own well-being but on others through how we behave toward them (ibid).

Psychology Professor, Dacher Keltner, points to research that show how image-conscious people who drive the highest social status cars, also exhibit the most antisocial behaviour on the roads (Preston, 2013). To combat what they called the visual pollution of excessive advertising, in 2007 Brazil's biggest city, São Paulo, led by the city's conservative mayor, Gilberto Kassab (Adbusters, 2007)

introduced The Clean City Law. The result was a near-total ban effecting billboards, digital signs and advertising on buses. Several US states strongly control public advertising, too, and in Paris, recent rules reduce advertising on the city's streets by 30% and cap the size of hoardings (Godfrey, 2011). No adverts are allowed within 50 metres of school gates.

Yet, the fact that we might not fully be in the driving seat of our own lives can be felt as an affront. It can feel like a weakness, an insult to our sense of ourselves. But not only is the evidence overwhelming that our choices are hugely influenced by cues in the environment around us and the behaviour of others – it seems that much of the time 'rational economic man' is often not making conscious rational choices at all in the way supposed by mainstream economics.

There is a debate about how much, but research in neuroscience (Bear and Bloom, 2016) indicates that many of our choices are made during pre-conscious brain activity – a mixture of highly subjective, conditioned and instinctive processes. If anything, the brain can be that kind of friend who, whatever you do and for whatever reason, pats you on the back after the event and says 'good call', you took charge and did the right thing.

The doctrine of neo-liberalism, it seems, pushes you towards becoming the kind of human being that it relies on. The study of this branch of economics appears to behave like an intellectual version of *Invasion of the Body Snatchers*, turning the host mind to its own pre-set purpose. It is a kind of reality-by-assertion. In fact, there has been a deluge of findings recently from evolutionary biology, anthropology, psychology, ecology and neuroscience that contradict the reduction of humanity to competitive vessels of short-term, self-interested individualism.

From our primal beginnings, biology reveals that the emergence of life on Earth itself owes as much to processes of symbiosis and association as to competition (Margulis and Sagan, 1986). This

appears to be the case with early-evolving bacteria, engaged in a kind of giant social networking exercise in which micro-biological forms evolved the tricks that still lie at the heart of life.

Nature – often – is riddled with strategies that contradict the market myth that life is a brutal individual struggle of the survival of the fittest. There are evolutionary victories for **symbiosis**, for example, in the bacteria that fix nitrogen in plant roots and which consequently make life continuingly possible. And, for **collaboration**, as was the case with primeval slime mould which got life going. There is also the **co-evolution** that gave us the pollinating honey bee responsible for those one in three mouthfuls of the food we eat. And then there is '**reason**' itself, another advantage for problem-solving animals like elephants, dogs, cats, rats, sperm whales and, apparently, sometimes, humans. In a world witnessing the unhealthy concentration of economic power and cultural homogenisation, optimal diversity, too, is a key condition; nature's insurance policy against disaster.

Yet, we regulate the economy in favour of one-sided, competitive individualism and, ironically in the process, through the failure to control emerging monopoly and oligopoly, allow the spread of monocultures and clone towns that are increasingly vulnerable to a wide range of external shocks. Interestingly, companies with more progressive governance structures, co-operatives like John Lewis and mutuals like the Nationwide, proved more resilient and successful after the financial crisis.

In fact, what seems to make humanity fairly special is our prodigious and skilful capacity for empathy and co-operation. In this broader view we are in fact 'super-co-operators' who are living in an 'age of empathy'. Professor of biology and maths at Harvard University, Martin Nowak, notes that contrary to the pseudo-Darwinian caricature of animals caught in a death struggle, mechanisms of co-operation including direct and indirect reciprocity are fundamental. In fact, from David Hume to Darwin himself, and Kropotkin writing

in *Mutual Aid*, the power of co-operation as opposed to competition is the forgotten story of ourselves.

Science now shares a lot with the truths stumbled on by the world's great religions that value unselfish action. Nowak writes that, 'they have come to the conclusion that love, hope and forgiveness are essential components of what is needed to solve the biggest problems' (Nowak and Highfield, 2011). And that he is 'struck – perhaps awestruck – by the extent to which humans co-operate . . . no animal species can draw on the mechanisms (of co-operation) to the same extent as seen in human society'.

Empathy is the antithesis of market-sociopathy and the biologist and primatologist, Frans de Waal, sees this as the great, under-recognised human quality (de Waal, 2010). The fact that we are 'hard-wired' for altruism, the expression of our ability for empathy, has kept society as a whole from falling apart. 'Feeling' for each other, in such a way that it shapes mutually supportive, rather than competitive behaviour, is designed-in. To flourish, we need an economics that plays to these extraordinary strengths, rather than contradicting and suppressing them.

De Waal sees amusing contradictions in the highly selective co-option by mainstream economics of evolutionary theory. Just as a rejection of real Darwinism, or refusal to endorse it, washes over the religious, conservative branch of the Republican movement, the very same political persuasion promotes a Social Darwinism that depicts 'life as a struggle in which those who make it shouldn't be dragged down by those who don't'. Hence, neoconservatives draw invisibly on early misinterpretations of Darwin's theories and their application to the world of business. It was the nineteenth century philosopher Herbert Spencer, for example, who coined the phrase 'survival of the fittest'. He thought equality was a bad idea, and that it was counterproductive 'for the "fit" to feel any obligation toward the "unfit"'.

Yet, quite the opposite is true in practice. Not only is inequality associated with economic disasters – it tends to peak before collapse – it also raises costs to society as a whole across the board as we see in the work of Kate Pickett and Richard Wilkinson (Pickett and Wilkinson, 2009). Equality, on the other hand, is very productive indeed. Calling on our inborn capacity for empathy, writes De Waal, 'can only be to any society's advantage'. I think it is time for a paradigm shift in which the colossally erroneous notion of 'economic man' at the heart of neo-liberalism, is removed from the centre of our theoretical solar system, much as the Earth once had to be replaced by the Sun to correct a similarly mistaken belief.

It turns out that one of the greatest barriers to that shift might just be our reluctance to believe in its possibility – a reluctance that itself appears to be based on misunderstandings about how the world actually is, and wrongly second guessing what other people are truly like. To begin with, *New Scientist* magazine described how "Many theories ... begin with the idea that inequality is somehow a beneficial cultural trait that imparts efficiencies, motivates innovation and increases the likelihood of survival. But ... rather than imparting advantages to the group, unequal access to resources is inherently destabilising and greatly raises the chance of group extinction." (Rogers, 2012).

The behavioural economist, Dan Ariely, conducted a survey in the US based on a classic thought experiment by the political philosopher John Rawls. First people were asked to estimate how wealth was actually distributed in the country. Respondents were broken down according to voter persuasion, Republicans and Democrats, men and women, and high-, medium- and low-paid. All groups, with very little variation among them, substantially overestimated how equal their society actually was. They were then told to imagine that they are going to be randomly inserted into an income group in the society – it could be richest, poorest or somewhere in the middle – and asked what they think would be the ideal distribution of wealth in that society. Of course, this isn't just hypothetical,

random insertion to an income group is precisely what happens to us when we are born. In answer to this question a fascinating thing happens – all the groups with only minor variation opted for a very substantially *more* equal distribution of wealth (Norton and Ariely, 2011).

Perceptions and misperceptions are fundamental to believing in the possibility of change. As described elsewhere in this report, research by the Common Cause foundation revealed how, regardless of age, geography, wealth and voting behaviour – 74% of people attach more importance to compassionate values - embracing justice, tolerance and responsibility – than to wealth, image and ambition – so called selfish values. But 77% of us think others hold dominantly selfish values. The contradiction might partly explain the lack of political enthusiasm for more shared, common, collective solutions to our problems.

What it says, however, for the task of economic transition, is that a shift in attitude and faith in each other matters far more than any post-facto, obsessively detailed platform of minutely priced policies. For all the sophistication of financial markets, the economists and analysts who serve them are fond of invoking the 'confidence fairy' in ultimate explanation of how they work. Even the digital money at the very heart of markets relies for its existence on nothing more solid and dependable than the emotion of trust. What this suggests is that to dispense with the demonstrably failed economic model of neo-liberalism – and the exorbitant, unbalanced privilege it gifts to the magicians and owners of finance – we must first stop believing in it. Do that and the space emerges for a more co-operative, fair, enriching, resilient and sustainable economic vision to flourish.

This is adapted and extracted from the Coleridge Lecture given by Andrew Simms at the Bristol Festival of Ideas in May 2016. Republished with permission.

Privatisation

One of the principles of neo-liberalism is that of the small state. State owned assets and enterprises are seen as inefficient and interfering with a free market. There has thus been a systematic contraction of publicly owned and national utilities and industries. Energy, water, railways, telecommunications have all been privatised in the last 40 years.

The governance of large corporations (and all privately owned companies) is driven by the legal responsibility to act in the interest of shareholders – maximising the return on their investment in the short-term, rather than acting responsibly towards the environment in the longer-term. For example, whilst polluting remains more profitable it is not in energy companies' interest to support renewable energy (Chmutina and Goodier, 2014). It is also questionable whether private investment by profit seeking companies, the only model at present in the UK, is the best means to raise the necessary investment in the grid or deliver energy efficiency schemes, for example. The current business model is a disincentive for demand reduction as profits are based on increasing units of energy sold (Barton et al., 2015).

The privatisation of major industries not only means that governments are far less in control of making the services provided available to all who might need to use them, but also means that in many cases valuable funds flow out of our economy or into the hands of private shareholders. Investment is often not available where it is necessary for a sustainable transition.

Privatisation is one of the main reasons for the UK's high rail fares. The cost to the public purse in running railways has risen two to three times since privatisation as a result of debt write-offs, payments to contractors and dividend payouts, equivalent to around £1.2 billion a year (Taylor and Sloman, 2012). Much of the profit flows out of the UK, with many of Britain's rail franchises owned and operated by state owned companies in other countries including Germany, France and the Netherlands (Bowden, G., 2015).

The 1985 Transport Act, which deregulated bus services, was introduced to improve bus services but instead had the opposite effect (Taylor and Sloman, 2016). This marked a significant decline in bus passenger journeys outside London, as private bus operators, many of them with monopolies in local bus markets, raised fares and cut non-profitable services (ibid). In the ten years to 2013, the dividends paid out to shareholders by bus companies across Britain totalled £2.8 billion, around £277 million a year (ibid). Despite the massive public subsidy to bus companies, there is little public accountability for how it is used (Philippson, 2014), with no requirement for bus companies to give local authorities details of passenger numbers on subsidised services.

In considering how we should maximise our renewable energy

resources, a comparison can be made with the different models by which the UK and Norway exploited the windfall of discovering North Sea oil and gas. Norway kept the fossil fuel extraction within a state owned company and invested the profits in a sovereign wealth fund. The UK privatised the state oil company, sold leases to private companies and taxed their profits. It is estimated that by doing so the UK state missed out on hundreds of billions of pounds in potential revenue (Manley and Myers, 2015; Scottish Government, 2014). The transition to renewable energy offers a strategic chance to build a more inclusive system, to learn from mistakes of the past and have broader ownership of critical infrastructure.

CASE STUDY: *Impact of trade liberalisation on food*

A study of Central America found that food availability increased with trade liberalisation. This increase was not seen for all foods, however. The availability of poultry meat, dairy, imported fruits (such as apples and grapes), chips and other processed foods, corn and maize all increased. The increased consumption of animal products (meat and dairy), as well as levels of imported fruits and vegetables are both key issues in sustainability and the increase in processed foods is a key issue for health. The authors of the study conclude that trade liberalisation has "direct implications for health concerns", but the study also shows that trade liberalisation could also be a barrier to implementing environmentally beneficial changes (Thow and Hawkes, 2009).

Another study followed the changes in the sugar-sweetened carbonated drinks industry in Vietnam. They found that after the removal of restrictions on foreign direct investment (another key component of trade liberalisation) sales of sugary drinks increased dramatically – from 3% per year to 12% per year. This demonstrates that trade liberalisation can quickly create shifts in patterns of consumption (Schram et al., 2015). The benefits from this new investment were mainly seen by transnational corporations, in this case Coca-Cola and PepsiCo. Two domestic companies, which had previously had a market share of 21%, went out of business. In 2013, almost 69% of sales on the global drinks market were sold by two companies. Foreign companies for these reasons have been identified as key actors in the creation of new food environments. The authors conclude that the findings "provide substantial support" for links between trade liberalisation and the nutrition transition (ibid).

This influence can limit the capacity of governments to introduce new regulations concerning food. In Vietnam, for example, the government was warned that its proposed tax on sugary drinks could be found to be in violation of their free trade agreements (ibid).

Free trade

Free trade or trade liberalisation is a direct result of the neo-liberal principle of free markets. Free markets are themselves something of a myth since markets cannot exist without the external intervention of the state. It is a case of re-regulation rather than deregulation (Plastow, 2010). Free trade in turn facilitates globalisation, the increased mobility of goods and services (and other things) that allows us to eat fresh strawberries from Africa in December. There has been an enormous expansion of world trade since 1950 due to advances in transport and communications and growth of free trade policies (WTO-UNEP, 2009). Neo-liberalism has been described as 'ideological software' for competitive globalisation; imposing far reaching programmes of state restructuring and rescaling (Plastow, 2010).

Free trade can affect carbon emissions in three main ways (WTO-UNEP, 2009):

- Scale – increased economic activity which leads to greater material and resource use.

- Composition – the way trade changes the structure of a country's production in response to changes in relative prices. The impacts of this on emissions within an individual country depends on that country's comparative advantage. For example, the shifting of steel production from UK to China reduced associated emissions in the UK but will have increased them in China (Carbon Trust, 2011). Where a country has a competitive advantage due to lower environmental standards this can have a damaging effect.

- Technique – improvements in how goods and services are produced, so that the emission intensity of output is reduced. This can reduce emissions.

According to a comprehensive assessment of the literature, most trade and investment agreements tend to increase carbon emissions, largely through scale effects (WTO-UNEP, 2009).

Transatlantic Trade and Investment Partnership (TTIP)

It has been suggested that the proposed EU-US free trade agreement, the Transatlantic Trade and Investment Partnership (TTIP), is likely to increase carbon emissions overall as a result of composition effects (Ecorys, 2014). The TTIP is also likely to jeopardize the ability of the EU and US to put in place the proper regulations to meet climate targets (Porterfield and Gallagher, 2015).

This could include broad restrictions on regulatory authority under investor-state dispute settlement (ISDS) provisions, limits on carbon intensity standards, modifications of the US fossil fuel export regime, and restrictions on renewable energy programmes (ibid). For example, the US reportedly used

the TTIP negotiations to successfully pressure the European Union to weaken the carbon intensity standards of the EU's Fuel Quality Directive (FQD) to facilitate the export of high carbon intensity oil (Porterfield and Gallagher, 2015).

The EU is also trying to create an "automatic" and "expeditious" process for importing US crude oil and gas which would facilitate increased imports of liquefied natural gas (LNG) to the EU and encourage increased fracking in the US, both of which could increase emissions (ibid).

While the vote to leave the EU has made a trade deal between the EU and USA less likely, it does not preclude the UK signing up to TTIP at a later date (Hilary, 2016). It has also been suggested that once the UK leaves the EU it will pursue its own trade deal with the US. This is likely to look like 'TTIP on steroids' (Glivanos, 2016).

Corporate influence

One of the concerns about free trade is the increasingly powerful influence of corporations over sovereign nation states. One way this occurs is through investor-state dispute settlement (ISDS) provisions that are included in most free trade agreements. These give investors the right to challenge government decisions affecting their investments (Provost and Kennard, 2015). The inclusion of ISDS provisions in TTIP is one of the key concerns for opponents of the agreement. ISDS was originally invented to protect Western companies' investment in developing countries where the national legal system was not supposed to be strong enough, but over time more ISDS provisions were included in agreements between OECD states (Provost and Kennard, 2015).

Investors have used ISDS to sue for compensation over a huge range of government measures, including environmental and social regulations, which they say infringe on their rights (ibid). They can sue to recover money they have already invested, but also for alleged lost profits and "expected future profits" (ibid). "When parliaments have voted to restrict sales of cigarettes, protect water supplies from mining companies, freeze energy bills or prevent pharmaceutical firms from ripping off the state, corporations have sued, often successfully." (Monbiot, 2016)

For example, in 2009 Vattenfall, the Swedish energy giant, used ISDS to successfully sue the Federal Republic of Germany over strict environmental conditions imposed by the local authorities on a proposed coal fired power plant (Provost and Kennard, 2015). In another case, a Canadian corporation CMC used ISDS provisions in NAFTA to challenge California's ban of a suspected carcinogen and won the right to pollute or be compensated for not doing so by the California taxpayer (Castree, 2008).

Increasingly, the massive financial risks associated with investor-state arbitration will effectively grant foreign investors a veto over

government decisions. As one lawyer who defends sovereign states in ISDS cases said "I think the investor-state arbitration system was created with good intentions, but in practice it has gone completely rogue." (Provost and Kennard, 2015)

The more trade liberalisation that occurs the more influence transnational corporations have on markets and consumption patterns. For example, transnational corporations have increasingly been consolidating food production, distribution and retailing; in particular, the rise of supermarkets reflects this phenomenon. Large supermarkets now dominate how food is purchased in the UK, moving away from more traditional markets that sell less processed foods and more fresh seasonal ones (Baker et al., 2014).

Transnational corporations have also promoted trade deregulation through various types of political activities. There is evidence to show their influence over food policy through mechanisms such as lobbying, financial incentives and framing – amongst many others. Evidence suggests that their aim is to keep the debate focused on the consumption or physical activity levels of individual consumers, placing the blame for the levels of obesity seen today on individuals rather than on the food industry (Mialon et al., 2016).

Transnational corporations also use threats to withdraw from a country if governments try to regulate their activities (Mialon et al., 2016). As transnationals can act globally they have the capacity to 'punish and reward' countries for their policy choices through relocating jobs and investments. For example, Coca Cola and Frito-Lay (a PepsiCo company) have been found to have prevented junk food taxes from being implemented, in Louisiana and Maryland respectively, through the promise of new business in the area instead of the 'inevitable' plant closures that would follow the implementation of such a tax (Jacobson and Brownell, 2000).

Some researchers have argued that pursuing free trade agreements in agriculture not only undermines efforts to reduce greenhouse gas emissions from agriculture but is a distraction from dealing with the more important problems of agriculture sustainability and food insecurity (Moon, 2011).

6.6 Politics and governance

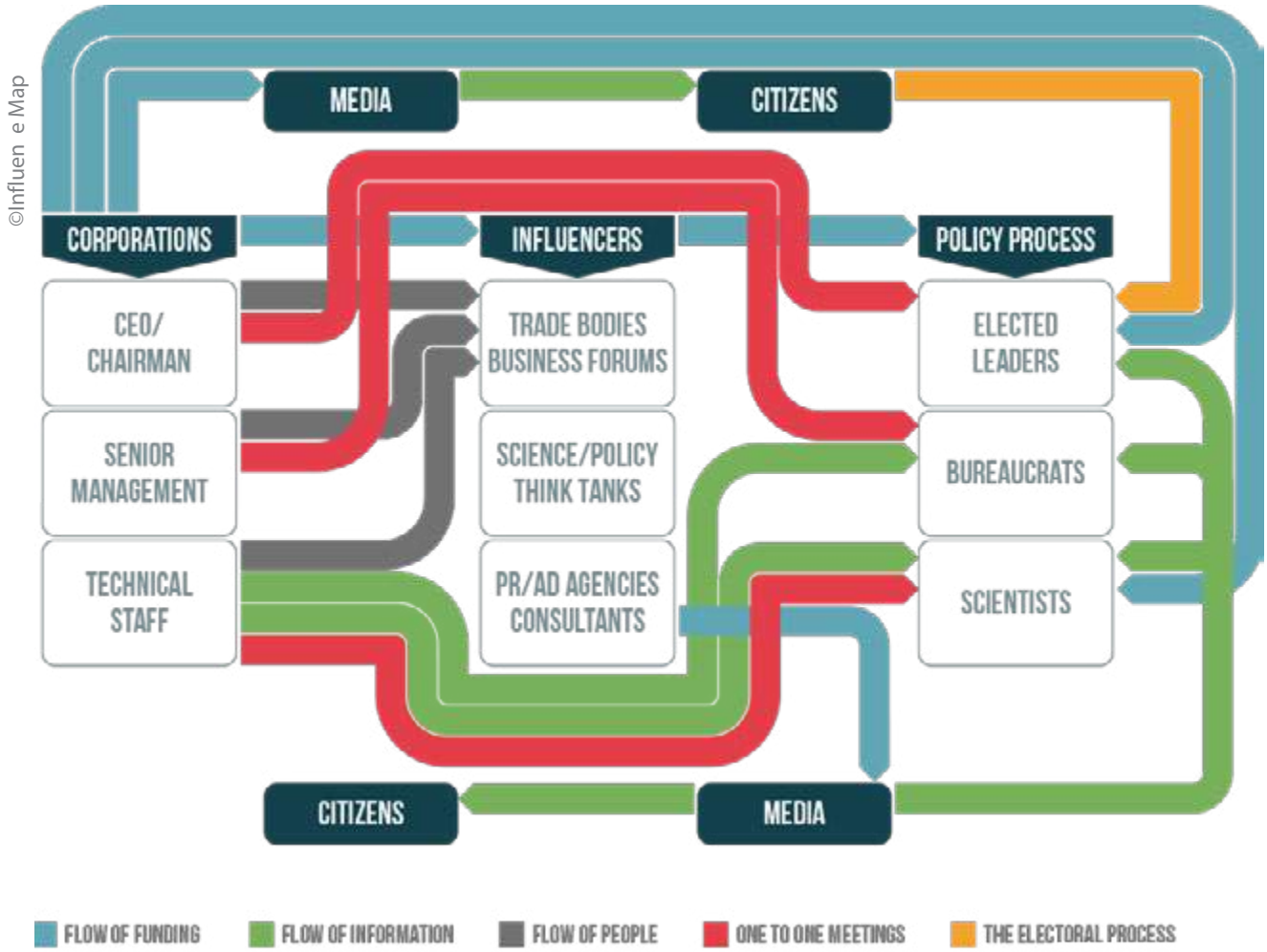
The key obstacles preventing decisive climate action are political, with political risks involved in implementing unpopular policies and confronting powerful vested interests (Bailey and Preston, 2014). The large number of people that would be affected by a transition to zero carbon makes changing the fossil fuel system a complex and conflict-ridden problem (Barry et al., 2015). "Energy system changes in short are political power struggles" (ibid). Because of modern industrial society's dependence on fossil fuels, governments take a very cautious approach to policies that could affect energy supply and prices (Snell and Schmidt, 2012) and thus impact key

sectors, communities and households. Political action on climate change is, therefore, weak.

Strong legislation on climate change and good governance is critically important to 'making it happen'. The UK prides itself on being a democratic nation. However, democracy requires transparency, accountability, good education and information provision, as well as fair representation for all, independent of wealth and power. In terms of the creation of a sustainable future, our system of governance leaves a lot to be desired, with the wealth and power of corporations and vested interests having an unfairly large impact on government decision-making through a variety of means.

6.6.1 Vested interests and regulatory capture

One analysis suggests that just 90 private and state-owned companies have contributed nearly two-thirds of cumulative worldwide emissions of industrial



Corporate influence over the policy process.

carbon dioxide between 1751 and 2010 (Heede, 2014). Half of these emissions have been since 1986 (ibid). These major entities have fossil fuel reserves that will, if exploited, lead to dangerous levels of climate change. If the world is to achieve the goal of staying below 2 degrees of warming, no more than 20% of proven fossil fuel reserves can be consumed prior to 2050 (McGlade and Ekins, 2015). Yet, companies continue to explore new sources.

To protect and further their interests, fossil fuel companies and other vested interests influence public support for action on climate change via the media, as well as directly lobbying governments on policy and legislation. The phenomenon of 'regulatory capture', where powerful industries with huge financial stakes in an outcome can have undue influence on the regulatory process, is well recognised. It is also described as 'a form of political corruption' or 'crony capitalism'.

Regulatory capture is a complicated phenomenon because there are a number of ways it occurs, including:

- Legislation that favours business interests.
- Self-interested and ideologically motivated behaviour by civil servants or politicians.
- Budget cuts to oversight agencies.
- The imposition of procedural obstacles to regulation.
- Information capture where all the information available to policymakers comes from industry sources (Shapiro, 2012).

The relative size of the fossil fuel industry has been found to be significantly and negatively associated with ambitious climate change policies in different countries – in other words, the bigger the industry in a given country, the less aggressive the climate-related policies tend to be (Steves and Teytelboym, 2013). Examples of regulatory capture impacting on climate change include the following:

- In the US the fossil fuel industry spent $721 million (approximately £480 million) on political campaigns to secure industry-friendly politicians and $163 million (approximately £109 million) on TV ads to support fracking, tar sands and natural gas (Moser and Lee-Ashley, 2014).
- In Europe, ExxonMobil reportedly spent at least £56 million in 2014 on lobbying the European Commission and on donations to EU universities and organisations, though this figure may be underestimated (Mandel, 2016). The company lobbied on greenhouse gas-related legislation, natural gas policy, air quality and energy efficiency legislation, as well as against the decarbonisation and electrification of EU transport (Mandel, 2016).

- Big fossil fuel companies like BP and Shell, as well as trade associations for the oil and gas industry, were part of a concerted push to curb EU policy support for renewable energy in favour of gas (Neslen, 2015). In 2014, despite opposition from sustainable energy companies and environmental groups, the European Commission outlawed 'non-market' subsidies for clean energy from 2017 and also ended nationally binding renewable targets after 2020 (Neslen, 2014; Neslen, 2015).

- In the early 2000s, the UK aviation industry lobbied hard for emissions trading as a way of legitimising the expansion of air traffic in the UK and avoiding future taxes (Buhr, 2012). While the European Commission proposed in 2005 that all airlines arriving in or departing from the EU should be included in the EU Emissions Trading Scheme (EU ETS), objections from non-EU airlines mired it in controversy and it was not introduced until 2012 (ibid). This has still not been extended to international flights.

- Car manufacturers and related organisations have organised successful campaigns to water down carbon dioxide emission targets on cars and there is much evidence of the motoring lobby's influence on transport policies, such as fuel duty rises, speed limits and cameras, alcohol limits and congestion charges (Douglas et al., 2011; Carrington, 2013; Gossling and Cohen, 2014).

- Since 2009, successive governments have responded to lobbying efforts by the motoring industry to delay or freeze increases in fuel duty, and this tax has fallen in real terms over the last ten years (Hopkinson, 2012). These delays are estimated to represent lost revenue to the Exchequer equivalent to £9.4 billion over five years (Office for Budget Responsibility, 2011).

- Large house builders hold considerable 'land banks' – they currently own enough land to build around 600,000 homes (Ruddick, 2015). This land is bought at a certain price and often held for some time. Owners of such land resist higher energy efficiency standards, since these will make it more expensive to build properties on their land and, therefore, reduce their profit margin.

- Overcoming vested interests is not a simple process: modern economies have been built on fossil fuel and other high carbon systems; the financial resources of the various industries are enormous and their political influence is often deeply entrenched.

6.6.2 Lack of transparency on lobbying and revolving doors

Any organisation has the right to represent its interests to government, and there are examples of more enlightened corporations, such as Aviva, Ikea and

Unilever, lobbying for improvements in environmental policy and legislation (Monaghan, 2014). However, there are serious concerns about the current levels of influence by certain powerful industry groups and the secrecy associated with that influence (Cave and Rowell, 2014). This influence undermines efforts to reduce the impacts of climate change in several ways:

- It can actively shape policies that increase emissions and delay or weaken policies and legislation to mitigate climate change.

- It helps perpetuate a high carbon system through continued support for subsidies and other forms of preferential treatment that make it harder for low carbon alternatives to compete or gain a foothold in the market.

- It fosters public scepticism about climate change science and the solutions (and hence lessens support for action) via influence on the media discourse.

It is estimated there are around 4,000 people working in the £2 billion UK lobbying industry, mostly for corporate interests (Alliance for Lobbying Transparency, undated). There have been calls for many years to increase transparency of lobbying activities and, in 2014, the Government enacted the Transparency of Lobbying, Non-party Campaigning and Trade Union Administration Act 2014, which set-up a formal registration process for lobbyists.

The Act requires only a very small sub section of lobbyists (agencies) to register. The majority of lobbyists – those working for corporations, trade unions, charities or trade bodies – are not required to register. Of agency lobbyists, only those that meet Ministers or Permanent Secretaries face-to-face must register, as telephone and email lobbying and lobbying of civil servants are excluded from the Act.

Moreover, the Register reveals nothing about who they are lobbying, what they are lobbying on and how much they are spending. The Chair of the Commons Political and Constitutional Reform Committee, MP Graham Allen, criticised the Act as a 'dog's breakfast' that is not fit for purpose (Farey-Jones, 2013). An analogous Lobbying (Scotland) Act was passed in March 2016. While it is an improvement on the UK Act as it includes in-house lobbyists, it has also been criticised by the originator of the Bill as not fit for purpose as it excludes lobbying by phone and email (BBC, 2016).

The lack of transparency on lobbying also undermines democratic accountability and weakens checks on corporate and institutional corruption. The UK's 2014 Act clearly fails to meet the OECD's '10 Principles for Transparency and Integrity in Lobbying' (OECD, 2013). For example, it fails to provide a comprehensive definition of lobbyists or foster a culture of integrity.

In contrast with the weak provisions on corporate lobbying, Part 2 of the UK's 2014 Lobbying Act, known as the 'gagging law', deliberately restricts charity campaigners, despite the fact that some charities have campaigning as part of their listed core charitable objectives (Griggs, 2015). In a separate move, the UK Government is further trying to restrict lobbying by charities, preventing charities who receive government grants from using funds to lobby government (Cabinet Office, 2016).

This initiative originates from a free market think tank, the Institute of Economic Affairs, with links to the Global Warming Policy Foundation and tobacco firms that have a vested interest in preventing lobbying by public health and other charities (Cave, 2016; Tobacco Tactics website). Over 130 leading charities have condemned the move (Bond website, 2016). The Government announced in December 2016 that it was replacing its original proposals with standards based on good practice and common sense after receiving robust and repeated representations from the charity sector (Etherington, 2016).

The heavy handed approach to charity lobbying compared to the minimal control over corporate lobbyists prompted MP Paul Flynn to ask: "Why do the Government consistently dabble in the shallows, worrying the minnows, while the big, fat salmon swim by unhindered?" (Flynn, 2016). This failure to regulate corporate lobbying properly is perhaps itself an indication of the power of lobbyists.

The concept of 'revolving doors', where politicians and civil servants move backwards and forward to industry, and the appointment of industry experts to agencies, commissions and regulatory bodies are an endemic part of modern government and a serious problem in the UK (Cave, 2016).

While there have been high profile cases involving revolving doors which have discredited Parliament, it is suggested that this is particularly problematic in relation to lobbying and there is a need to tighten the regulation of former Ministers and MPs lobbying after they have left office (Transparency International UK, 2011).

In the four years to 2011 it was estimated that at least 50 employees from EDF Energy, npower, Shell and others have been embedded in government to work on energy issues, 36 of whom were inside the (former) Department of Energy and Climate Change (DECC) (Cave and Rowell, 2014). At any given time there were estimated to be a dozen people seconded from the fossil fuel and related industries working in DECC (DECC, 2015h). Similarly, it was revealed 15 former civil servants are now lobbying government for the oil and gas industry (Mandel, 2016).

The Government has Business Appointment rules that apply to Crown Servants (civil servants, armed forces, the diplomatic service and intelligence agencies) and to Ministers when they leave office (Cabinet Office, 2010). For example, Ministers are expected to seek advice if taking up appointments up to two years after leaving office.

Currently, an independent advisory public body, the Advisory Committee on Business Appointments (ACOBA), considers applications under the rules about new jobs for former Ministers, senior civil servants and other Crown servants (ACOBA website). However, there is no legal requirement for Ministers and civil servants to consult ACOBA and no controls on former Ministers and civil servants who have joined industry for the purpose of lobbying their former departments (Cave, 2016).

6.6.3 Lack of political will and cross-party support

Lack of political will on support for climate action is seen by many as a fundamental obstacle to action on climate change (Wiseman et al., 2013). Without political will there is no support for meaningful policy or legislation (particularly the long-term stable policy commitments needed for investment), no appetite to take on vested interests, and certainly no desire to take politically unpopular decisions. Climate change is an immediate but long term challenge with wide reaching consequences requiring difficult policy choices, benefits of which may not be visible for many years. Following the global recession in 2008 and changes in government since 2010, climate change has appeared to drop off the UK political agenda. This reinforces public perceptions that climate change and energy decarbonisation are no longer key concerns (Bailey and Preston, 2014).

It is debatable whether there are sufficient politicians with climate change as a key issue on their agenda in 2016. In 2008, there was overwhelming cross-party support, and only five MPs did not support the Climate Change Act. However, since 2010, political momentum for action on climate change has greatly diminished and the political parties are increasingly divided on climate change (see below, *'Political manifestos on climate change, renewables and energy efficiency'*).

In many ways, the Government is going backwards on climate change (Barry, 2013; Campaign against Climate Change, undated). Public spending cuts since 2010 have undermined green investment, with many climate-related policies or funding withdrawn while fossil fuel investments and tax breaks have increased (see sections 6.5.2 and 6.6.4). It is argued that the discontinuity and uncertainty of policies is the main reason for the limited development of renewable energy in the UK (Chmutina and Goodier, 2014).

Over the last 25 years of energy policy on renewables, there have been changes to long-term commitments that have undermined investor confidence. Policies to support community renewable energy, for instance, have been described as "uncoordinated, poorly designed, hurriedly implemented and truncated" (Smith et al., 2015). Investors lack trust that the political process will deliver consistent policy (Chmutina and Goodier, 2014).

Political manifestos on climate change, renewables and energy efficiency

(Evans, 2015a)

CONSERVATIVES: "We will cut emissions as cost-effectively as possible, and will not support additional distorting and expensive power sector targets." ***Support the UK Climate Change Act. Pledge to "halt the spread of onshore windfarms", and support low-cost measures on energy efficiency.***

DEMOCRATIC UNIONIST PARTY (DUP): ***No mention of climate change.***

GREEN PARTY: "Climate change is the greatest challenge of our time and only the Greens are determined to tackle it." ***Believes UK should reduce emissions to 10% of 1990 levels by 2030. Want to strengthen the Climate Change Act. Believe renewables can meet all our energy needs. Aim to cut energy demand by a third in 2020, half in 2030, two-thirds in 2050.***

LABOUR: "Tackling climate change is an economic necessity and the most important thing we must do for our children, our grandchildren and future generations." ***Pledged to agree new carbon budgets under the Climate Change Act. Would set "a legal target to remove carbon from our electricity supply by 2030". Renewables will be part of energy mix, overseen by an Energy Security Board. Aim to insulate five million homes by 2020.***

LIBERAL DEMOCRATS: "Climate change, one of the greatest challenges of our age, is by its nature global." ***Pledged to pass a Zero Carbon Britain Act to bring net emissions to zero by 2050. Would set "indicative target" to get 60% of UK electricity from renewables in 2030. Aim to improve at least four million homes over five years.***

PLAID CYMRU: "[We must recognise] the impacts of climate change upon poverty." ***Pledged to introduce a Climate Change Act for Wales. Energy policy will focus on increasing energy generation from renewable sources. Pledged to work to reduce the amount of energy used in Wales.***

SNP: "We will use our influen e at Westminster to ensure the UK matches, and supports, Scotland's ambitious commitments to carbon reduction." ***Pledged to maximise support for offshore wind and for onshore wind to continue to receive support. Pledged to push the Energy Company Obligation to be funded through general taxation.***

UKIP: "[The UK's] failing energy policies... will do nothing to reduce global emissions." "Our major global competitors...are switching to low-cost fossil fuels, we are forced to close perfectly good coal-fi ed power stations to meet unattainable targets for renewable[s]." ***Pledged to repeal the Climate Change Act. Pledged to withdraw subsidies for new wind turbines and solar photovoltaic arrays.***

While 2015's COP21 UN climate summit in Paris resulted in a government commitment to enshrining net zero carbon emissions in law (Hansard, 2016), many of the policies needed simply to meet existing carbon targets over the next 15 years are lacking (Committee on Climate Change, 2015 [Lord Deben letter] and 2016).

This situation is not helped by the abolition of the Department of Energy and Climate Change (DECC) in 2016, widely viewed as a major setback for climate policy, or by the vote to leave the EU, which has profound implications for UK legislation and policy on climate change (Institute for European Environmental Policy, 2016). While until recently in the UK climate change has not been a partisan issue, there are strong links between leading Brexit campaigners and climate deniers stemming from an ideological opposition to regulation (Desmog website).

> *Knowing what's right doesn't mean much unless you do what's right.*
>
> Theodore Roosevelt

> *We all know what to do, we just don't know how to get re-elected after we've done it.*
>
> Jean-Claude Juncker, ex-PM of Luxembourg (BBC, 2014)

Even when politicians are aware that climate change is important and urgent they may still be unwilling to commit to action. The propensity of senior decision-makers in politics and business (particularly those with a clear understanding of the issues) to act on climate change is influenced by a wide range of factors, including:

- Selective filtering of climate change evidence and analysis.
- An education grounded in neo classical economics with bias towards short-term, financial outcomes and faith in technical solutions to complex ecological challenges.
- Antagonism to egalitarian and ecological values.
- Identity and behaviour shaped by dominant masculinist ideals (emotion-free, value-free rationality) – applicable to women as well as men.

- Their own high cost/high carbon lifestyle and insulation from climate problems.

- Dominance of pragmatic, market-based strategies.

(Rickards et al., 2013 and 2014).

Although these factors don't apply to all politicians, strong similarities exist amongst many people in positions of seniority who have to 'play the game' to stay in it, thus perpetuating the system (ibid).

Others have highlighted the problems with the pervasive view within policy circles that technology alone can solve the problems of climate change and a failure to see the transition to a zero carbon future as a political and ethical issue rather than just a technical one (Barry, 2016).

For example, there is generally a political failure to acknowledge transport growth and its effect on emissions, as politicians tend to place undue faith in technological solutions and are reluctant to address the highly skewed contribution to transport emissions from a minority of relatively wealthy people (Gossling and Cohen, 2014). Political taboos, such as unnecessary journeys glamorised by advertising or the behaviour of high-income frequent flyers, are not addressed because of the political risk of interfering with perceived mobility and freedom (Gossling and Cohen, 2014). This needs fundamental social and cultural change that involves "transcending neoliberal forms of governance" (ibid).

Cognitive biases also cause decision-makers to ignore trends that conflict with their perceptions of the desirability of the status quo (Howlett, 2014). Environmental risks pose challenges to the existing social, political and economic order. It is thought that one of the reasons that conservative white men in the US have significantly lower worries about environmental problems than other adults is because it threatens their identity and position, therefore, they resist attempts to change the status quo (McCright and Dunlap, 2013).

There is also a tendency for 'group-think', which occurs when a group of individuals holding common sets of beliefs reinforce the group 'paradigm'. Policy decisions are socially constructed and senior decision-makers appear particularly reluctant to act on their personal concerns about climate change because of the discrepancy between those concerns and the perception of their peers' views (Rickards et al., 2013, 2014).

Senior decision-makers also place a strong emphasis on avoiding career risks (ibid) and tend to avoid blame for unpopular actions rather than seek credit for popular ones (Weaver, 1986; Hood, 2010; Howlett, 2014; Bache et al., 2015). This is a result of negativity bias, a general psychological bias where we tend to pay more attention to negative than positive information, and value losses more highly than gains (Howlett, 2014). Novel or substantive policy interventions needing political

courage are rare because the political costs of potential failure outweigh the benefits of potential success, which causes politicians to avoid action, deny the problem exists (ibid) or engage in blame-limiting strategies (Bache et al., 2015).

Relatively short-term electoral cycles, such as rolling council elections, build in short-termism and create further incentives for politicians to avoid unpopular decisions (ibid). One of the strategies for blame-avoidance is passing decision-making to other bodies, creating a system of 'fuzzy governance' where it is not clear who is responsible for what (ibid). It is suggested this system is created or tolerated by politicians as a self-defence mechanism (ibid). Creating long-term, meaningful policy is further hampered by the process of 'institutional churn' where policies and bodies are subject to almost constant reform and a scattergun on/off approach to funding (ibid).

At a time when there is a need for massive social change and collective action, the deepening individualisation of social life and the contraction of the public sphere is an obstacle to mobilising people. There is also a growing disillusionment with politics and the possibilities of political action. Politicians remain the profession least trusted by the British public, below estate agents, journalists and bankers (Ipsos MORI, 2016). Many people also suffered disillusionment with protest movements following the failure of the 2003 'million' march against military action in Iraq. Despite a strong nucleus of organisations and activists in the climate movement, there is a need to reach beyond the choir to mobilise other sectors outside the environmental movement. Young people are key, with 42% professing no interest at all in politics (ONS, 2014), yet they are the ones that will be left to deal with the consequences of today's inaction.

6.6.4 Inadequate legislation and policy

Deregulation and repealed legislation

Despite the importance of legislation in providing the framework for urgent action on climate change, in the last few years the Government has shifted strongly away from regulations towards voluntary approaches and self-regulation to achieve policy aims, regarding legislation as a last resort (BIS, 2015). This includes a 'One In, Two Out' rule whereby "Any measure which regulates or deregulates business and is expected to result in a direct net cost to business must be offset by measures that deregulate business and provide savings to business of at least double that amount." (ibid)

This is despite the evidence that the overwhelming majority of voluntary approaches have limited impact and perform poorly (McCarthy and Morling, 2015). The Government's so called 'bonfire of red tape' has resulted in a number of useful and effective pieces of legislation being scrapped, including the Code for Sustainable Homes which

set sustainability standards for new homes and required all new homes to be zero carbon by 2016, as well as accompanying energy efficiency targets in the Building Regulations (HM Treasury, 2015).

The little known 2015 Deregulation Act takes this one step further. The aim of the Act is to reduce the legislative and regulatory burdens affecting businesses, organisations and individuals, as well as repealing legislation that no longer has practical use. It is meta-regulation that allows for all other legislation and regulations to be assessed on the criteria of how they affect 'growth', and changed in relation to this, placing business interests above environmental and other criteria.

It is already having an impact on climate-related regulations. For example, it amends the Planning and Energy Act 2008 (England) so that local planning authorities can no longer require that developments in their area meet higher energy efficiency standards than are required by building regulations (Legislation Update Service, 2015). Some groups have called for a repeal of the law (Kaucher, 2015).

In 2015, the Government announced the end of three key policies for buildings:

1. The Zero Carbon Homes policy – a long-awaited ambitious plan to make all new homes in England 'zero carbon' from 2016 – was scrapped (Oldfield, 2015). While the Government's announcement did not specifically mention proposals for non-domestic buildings, it is widely assumed that plans to make these carbon neutral by 2019 will also be shelved. This policy would have driven a much-needed improvement in the energy use and carbon emissions of new UK homes and a step change in construction industry skills. It is also uncertain whether the Welsh Government will proceed with ambitious carbon emission requirements in its Building Regulations. The EU Energy Performance of Buildings Directive would have required the UK to deliver 'nearly zero energy buildings' from 2021 (and from January 2019 in the public sector). Whether or not the UK will hold similar legislation outside of the EU is unclear.

2. The Code for Sustainable Homes was withdrawn and the right of local authorities to require developers to meet Code standards that are more ambitious than minimum Building Regulations was removed.

3. The Green Deal scheme, which provided loans for energy efficiency improvements with repayment tied to the property's energy bills, had government support and finance withdrawn.

As yet there are no proposals to replace these policies.

Inadequate policies

To reach zero carbon will require ambitious and effective policies in all sectors. However, despite a large number of policies and programmes to reduce carbon emissions from buildings and transport and to support renewable energy generation, there are inadequacies and shortcomings in many of these.

For example, policies and programmes to improve energy efficiency and reduce carbon emissions in buildings include Building Regulations, energy supplier incentive schemes, information and advice schemes, and a programme to introduce smart meters. However, many of these are unambitious and insufficient. Even before the Energy Company Obligation (see below) was scaled back and the Green Deal was scrapped, policies were not sufficient to deliver the rapid cuts in emissions needed (James, 2012). The current UK Government target to insulate one million homes over the five-year Parliamentary term is 78% lower than the number of homes treated during the previous parliament, and funding for insulation has been cut back to 2007 levels (Murray, 2015a).

Shortcomings associated with the current policies include the following:

Regulations: The Building Regulations (Part L) implement minimum energy efficiency/carbon emission standards for new buildings and major refurbishments. Standards have been progressively tightened over time through these regulations. However, in the latest (2016) revision of the Building Regulations, the Government failed to tighten energy use and carbon emission requirements (RIBA, 2015). At present, minimising embodied energy and carbon is not part of Building Regulations. They are addressed, to a limited extent, in buildings codes such as BREEAM and the now discontinued Code for Sustainable Homes.

From 2018 (under the 2011 Energy Act) landlords will need to bring privately rented properties up to Energy Performance Certificate (EPC) level E – if it can be done cost effectively (RLA, 2015). This level of energy efficiency is well short of what is required, and there already seems to be a dangerous loophole where the worst properties might be deemed too expensive to retrofit. This risks leaving vulnerable householders in poor condition homes that are highly expensive, or even impossible, to properly heat.

Incentives: The main subsidy scheme for domestic energy efficiency is the Energy Company Obligation (ECO). This requires large energy suppliers to fund energy efficiency improvements that generate carbon and fuel bill savings in qualifying households, with a current focus on vulnerable and fuel-poor households. At times during the scheme it was mandatory that some of the measures were the more expensive and less established ones, such as solid wall insulation. However, due to the risk of targets not being met, the scheme

has reverted to 'low hanging fruit' like loft and cavity wall insulation and it is uncertain whether future versions of ECO will do enough to support more expensive measures. The ECO is due to come to an end in March 2017 and current proposals for its replacement would see funding reduced significantly (DECC, 2016f).

Information and advice: The Carbon Trust and Energy Saving Trust were set-up by government to provide advice on energy efficiency and carbon emission reduction in buildings but both have seen their government funding withdrawn.

Switching appliances: The EU Energy Labelling and Ecodesign Directives introduced mandatory energy efficiency labelling and set minimum efficiency standards for appliances (EC, 2016). However, uptake of the most efficient appliances remains low in the UK (Committee on Climate Change, undated). With the UK voting to withdraw from the EU, replacement legislation may be required to drive the continued improvement of appliance efficiency.

Similarly, there are a number of policies designed to support renewable energy generation that have been successful in incentivising the installation of renewable energy systems. These include the Renewables Obligation, Feed-in Tariffs (FITs), Contracts for Difference, Levy Control Framework and carbon pricing. However, the policies are limited by the ambition of government targets and constraints on funding. Shortcomings with the current policies include:

Significant reduction in Feed-in Tariffs (FITs): The FITs scheme has successfully encouraged the installation of renewables, particularly photovoltaics (PV). However, in early 2016 the tariffs paid to generators were significantly reduced (EST, 2016), creating huge instability in the industry. The subsidies were reduced because of falling prices of renewable technologies but also due to concerns over the cost of support schemes (the Government considered that its controversial Levy Control Framework, discussed below, was in danger of being breached). Renewable energy companies are seeing the impacts, with one company citing a 75% reduction in wind power planning work since the cuts were announced (Whitlock, 2016).

Levy Control Framework (LCF): The cap that the UK Government places on financial support for low carbon energy supply. The risk of the LCF going over budget has been cited as a reason for the 2016 reductions in renewable energy subsidies. It is now being questioned whether the LCF is fit for purpose. For example, the LCF is designed to limit the impact of subsidies on energy bills. However, one of the reasons for higher subsidies is lower wholesale electricity prices, which are passed on in the form of lower bills. It is, therefore, arguable that the LCF cap is excessively

constraining, putting at risk the UK's carbon targets and the wider benefits of the renewable energy transition (Evans, 2016).

Lack of effective carbon pricing: The carbon price of the EU Emissions Trading Scheme (EU ETS) has been unstable and often very low, which led to the UK Government introducing a 'carbon floor price' or minimum carbon price. However, this does not apply across all energy consumption sectors and is not considered to be high enough to deliver the rapid emission reductions required (Sandbag, 2013).

Stories for Change

Arno Schmickler

Programme Director, Energiesprong UK

I'm an architect by background. Coming to Britain, it's almost impossible what people put up with in terms of the quality of the building stock. It's appalling to see what's still being delivered today in terms of energy efficiency in the UK.

Energiesprong refurbishes houses to Net Zero Energy, meaning that annually a house does not consume more energy for heating, hot water, lights and appliances than it produces. The refurbishments are financed f om the energy cost savings and executed within 10 days, so residents don't have to move out. Energiesprong UK has 17 founding partners. These are frontrunners in the field of sustainability and innovation from the social housing sector; as well as construction companies that share the vision of working together towards more comfortable, better looking, affordable and sustainable housing.

Energiesprong UK

"Energiesprong were looking for other countries to take the concept of net zero energy buildings to, because they felt the Dutch market is too small for big enough innovation to drive down costs. They felt Britain was the country to go to, because we've got very poor building stock to start with, poor energy performance and quite a market driven approach to interventions.

The social housing sector is a rewarding starting point, because social landlords tend to care about the residents. It's important to work with the residents as well, because they are the ambassadors.

If you're thinking about enveloping a building, you've got a huge opportunity to uplift the kerbside appeal and deliver a more desirable property. That's what we've seen in the Netherlands. It started in the social housing sector and then owner-occupiers came knocking on the door saying "Where can I buy one of those?" You start with individuals and then transform the business that person represents.

It's important to also link from residential buildings to office buildings to industrial buildings, so we think about how we decarbonise neighbourhoods. It might be that if we've got a new development, we could supply renewable electricity through that to existing stock. That's the wider vision.

At the moment in the UK, new build is all about quantity rather than quality. Building regs have been lowered so we'll need to retrofit the new build properties 5 years from now, they're so bad. We need to challenge that.

A big risk at the moment is the pressures the UK Government have put on the social housing sector with the rent cuts, the right to buy extension and forced council house sale. There's uncertainty into the future as well, because government might turn round overnight and change something else. Where there's so much uncertainty, people retreat to what they know and try to cut out every risk. That's the biggest barrier in terms of implementation.

We've created the stage for people to come and act on, but at the moment in the UK everybody is still sitting in the audience. We're trying to pull people onto the stage and say, "Let's do this together".

There are two steps towards meeting our targets. One is the 2030 target of decarbonisation of residential buildings. Then 2050 is the overall carbon emissions. If we want to meet the 2050 targets we've got one chance to retrofit property to net zero energy standards. Improving a little bit here, there and everywhere – where you might get double glazing or boiler replacement – that will never get us there. We need to go in big."

http://www.energiesprong.eu

Weak targets and loopholes

The Climate Change Act (CCA) is world leading in its legislation of greenhouse gas emission reductions (see box on CCA in Section 3.2). The aim to increase the headline target in the Act from an 80% reduction by 2050 to 100% or 'zero carbon' would be a big step forward. This needs to be done soon to ensure that the shorter-term carbon budgets reflect the need for urgent action and prevent lock-in to inappropriate infrastructure choices, such as fracking or airport expansion.

Even with the current 80% targets there are concerns about loopholes in the CCA that prevent carbon budgets from including emissions from key industries. The contribution of the 'traded' sectors (primarily electricity generation and energy intensive industry) currently sits outside the remit of the CCA. Instead it is determined by the EU ETS, described as "a kind of offshore carbon haven" due to the overly low carbon price and excess allowances (Morris, 2016). So while on paper the carbon budgets cover the economy as a whole, they really only apply to the non-traded sector (including transport, heating in buildings, agriculture, waste and some industry), which accounts for just 60% of emissions (ClientEarth, 2016).

This loophole is described as an 'accounting trick' and 'fatal flaw' which runs counter to the intention of the Climate Change Act. To cut carbon emissions in real terms this loophole must be closed (ibid). Yet, rather than close the loophole, the Government blocked a series of Energy Bill amendments designed for that purpose (ibid).

> *It is clear that in order to stay on track to the 2050 target in the Act, actual emissions must be reduced. The accounting rules should not be used to mask the real progress to the UK's legal commitment.*
>
> Committee on Climate Change (Committee on Climate Change, 2015a)

The Committee on Climate Change also recognises this loophole and in the fifth carbon budget has recommended cost-effective paths for the power sector which ignore the allocation of emission allowances in the EU ETS and require the power sector to reach a carbon intensity of below 100g of carbon dioxide per kWh in 2030 (ibid). To achieve this would mean about 75% of power generation by 2030 would be renewables, nuclear or plants fitted with Carbon Capture and Storage (CCS) (ibid). The commercialisation of the CCS programme was cancelled in November 2015. Given the current doubts over whether CCS can deliver by 2030, and given the need for greater ambition on climate change, there will need to be even more reliance on renewables if the power sector is to meet this 2030 target.

There is also concern about the lack of accountability at local level for meeting the CCA targets. The Committee on Climate Change's budget reports set out reduction scenarios for different sectors but the high level national targets in the CCA are not linked to local targets. Before its abolition in 2016, the Department of Energy and Climate Change (DECC) was formally responsible for delivery of the carbon plan. Now this is transferred to the Department for Business, Energy and Industrial Strategy (BEIS).

However, the contribution of different sectors (for example, food, transport, energy) and accountability for this responsibility is described as 'opaque' (Bache et al., 2015). In the case of transport, responsibility for achieving carbon reductions have been delegated downwards to local authorities, but the wide range of organisations responsible makes accountability very 'fuzzy' and there is a clear sense of policy drift on priorities from carbon to economic growth and job creation (ibid). The absence of accountability mechanisms at a local or national level makes it very unlikely that even the 80% reduction targets in the CCA will be met (ibid).

Between 2008 and 2010, local authorities were required to report their performance against indicators reflecting national priorities. Most authorities signed up to indicators on climate change and set out targets to reduce emissions in their area. For example, indicator N186 required data and targets on per capita carbon dioxide emissions in the local authority area, including emissions arising from buildings, industry and surface transport. The Audit Commission recommended that far stronger levers, specifically a change from voluntary agreements to statutory requirements, would be required to encourage more comprehensive action at the local level (Bache et al., 2015).

However, this requirement to report on indicators was abolished with the Localism Act in 2011 and there is now no requirement for local authorities to negotiate or even set targets to reduce their own area-wide carbon emissions (Bache et al., 2015). As one local authority officer interviewed for the study noted in relation to transport: "We could all do a lot more if the DfT [Department for Transport] was a little clearer and stronger. We're all too short-term and narrow at the moment and there is no transformative thinking." (ibid)

Inadequacy of existing laws

Even if all the current environmental laws at international, national and local level were enforced, this would still not stop climate change or biodiversity loss (Thornton, 2015). It is suggested that a new generation of environmental laws that comprehensively protect the planet and biodiversity is needed. The biggest barrier this faces is securing parliamentary time in the next few years, particularly following the vote to leave the EU, the implementation of which will take up a great deal of

parliament's time and energy. However, it is important not to lose sight of the failings of the current legislation and proposals to strengthen it.

6.6.5 Lack of citizen access to legal remedies

Compared to other countries it is generally expensive and difficult for NGOs and citizens in the UK to bring legal cases against polluting firms or other private parties, with the UK legal costs system considered "by far the most punitive of any country in the EU" (Thornton, 2015). In the UK, citizens are subject to enormous costs if they lose a case, though – following a legal challenge – adverse costs in England and Wales in environmental cases against the government are now capped for individuals (ibid). However, there are no caps on environmental cases against companies and other private parties, so claimants bringing environmental cases still face unlimited liability (ibid).

Judicial Review is a procedure in English law that allows individuals and organisations to apply to the courts to review the legality of a public body's actions where it is believed an authority has acted unlawfully (Friends of the Earth, 2008). Environmental Judicial Review has grown into one of the most significant areas of litigation (Tromans et al., 2013) and is an important check and balance on government powers, often forcing the government to take action on environmental matters and comply with its own legislation.

Yet, this important remedy is being quietly undermined. In 2015, changes were proposed to Judicial Review that will make it extremely difficult for charities to seek this legal remedy (Ministry of Justice, 2016). The proposed changes require applicants that require costs to be capped to provide financial information when applying for Judicial Review. The financial information includes a declaration of funding sources when applying and details of any third party funding. Experts have commented that this would undoubtedly deter charities and NGOs from undertaking judicial proceedings (Law Society, 2015). The charity leaders' network ACEVO has said: "the overwhelming effect of the reforms would be to introduce a massive chilling effect on charities' ability or willingness to seek Judicial Review and severely damage the confidence of individuals and organisations in becoming members or donating funds in the first place." (ACEVO, 2015)

The UK situation contrasts with the US where a number of environmental laws, such as the Clean Air and Clean Water Acts, have a 'private attorney general' provision, which provides for citizens to go to court to enforce the law because this is seen as a public good (Thornton, 2015). While few people in the UK would wish to adopt the litigious culture of the US, it is argued that it is now easier for Chinese citizens to challenge polluters in the courts than it is for people in Britain, with the Chinese Government recently enacting a law allowing citizens to bring environmental cases against polluters (ibid).

Chapter 7:

Making it happen

7. Making it happen

Photo by Scott Wylie, CC BY 2.0

> *There is exciting research and writing in the social sciences and humanities suggesting that we have more agency and potential for collective action than we think...This research shows that small changes can make a big difference, and that individuals working together can generate rapid social change.*
>
> O'Brien and Synga, 2013

Based on our assessment of the barriers to change, we now offer a synthesis overview of the wide range of powerful research and practice that is currently going on to explore how these barriers can be overcome and make change happen. We are confident the zero carbon transition can be brought about through well-planned, concerted pressure for positive change across all sectors.

There is no single approach that guarantees success, but a combination of interventions in different ways can leverage change. Tackling climate change and getting Britain to zero carbon means addressing psychological barriers to action, countering consumerism, tackling the inertia of the fossil fuel and other high carbon

systems, addressing the power of vested interests, changing an unsustainable economic system based on growth, and overcoming a lack of political will to challenge all of the above. Understanding the complexities of systemic change is important. We need to know where interventions could be effective, and equally where they may be more limited.

The overarching headline is that we need to do this together. Whether that is in campaign coalitions, community co-operatives, or through a forging a collective identity. It will take many of us pulling in the same direction to enable change to happen, and each and every one of our actions can contribute to building a zero carbon future.

7.1 Worldviews and values

Paying conscious attention to worldviews and the values we promote can help embolden and empower individuals and communities to take the practical action urgently needed in homes, communities and places of work, and to push for the wider systemic changes needed in tackling climate change.

By fostering intrinsic values such as empathy, co-operation, social justice and ecological concern, and by encouraging reconnection with nature, we can start to shift towards being a society that cares about climate change and other 'bigger-than-self' problems, and works together to solve them.

Annick de Witt (2015) argues that developing strategies that build synergies between the traditional, modern, post-modern and newly emerging integrative worldviews offers an important opportunity to accelerate change. This could serve to maximise their synergies while mitigating their conflicts, and help them unite around a common vision.

People with worldviews that are based on concern for other humans, species and future generations are more likely to support action to protect the well-being of those humans and species (cChange website). Therefore, fostering worldviews based on values of co-operation, social justice and ecological concern rather than values such as power and status could play a large part of the transformation necessary to deliver a zero carbon future.

Changing cultural values isn't easy, but lessons from history show that evolution in our thinking is possible. Campaigns on slavery, universal suffrage, apartheid, gay rights and others show that radical shifts in attitudes are possible even within a generation. Faith, spiritual or ethical beliefs have often had a role to play in catalysing these societal and cultural changes, and this is now also being seen in the context of climate change. Alongside this, there is an important role for the arts and cultural bodies to help communicate difficult messages and catalyse the transformation.

For many people, part of the role of faith, spiritual practice and ethics is to help explore answers to deep questions.

How should we live our lives? How should we treat our fellow humans? What is our responsibility to the natural world? How should we care for the future? Such questions have profound implications on the way people react to issues such as addressing climate change or reforming markets, social justice, leadership or lifestyles. They provide a way of understanding the world and can provide support and comfort in times of great change and uncertainty.

7.1.1 Reconnect with nature

The importance of feeling connected to nature has long been seen as a way of fostering pro-environmental behaviour (Mayer and McPherson, 2004). This means feeling a sense of community, kinship and belonging to the natural world, and a person viewing their well-being as interlinked with the protection of the natural world (ibid).

This relationship between connectedness to nature and concern for nature is explained by the psychological argument that if the self is expanded to include nature then any action that destroys nature will be seen as self-destruction (ibid). While people do sometimes engage in self-destructive behaviour, in general there is much evidence that the greater a person's feeling of connection with the environment, the more likely they are to act in ways that protect it (ibid).

However, it is important to recognise that definitions of environment are mediated through other aspects of culture. For example, people can be very protective of landscape which may already be ecologically damaged, they may be very protective of their local environment but disregarding of the global environment, or they may use the protection of a specific part of the environment – even their own garden – as a personal moral offset for wider environmentally destructive behaviours.

There is also evidence that increasing direct exposure to nature through activities, such as hiking, outdoor play, rambling and nature walks, increases the sense of connectedness with nature, which in turn leads to higher levels of health and well-being (Mayer and McPherson, 2004; University of Rochester, 2010; Kamitsis and Francis, 2013; Jordan, 2015).

Expert View

The power of history to shift worldviews

Paul Allen

Zero Carbon Britain Coordinator

Over the past decade, as project coordinator, I have made a great many presentations on the technical findings of the Centre for Alternative Technology's Zero Carbon Britain research to a diverse range of audiences. The zero carbon transition we describe requires a great many changes to how we live, challenging what we currently think of as normality. One way I have found to help people reconcile this, and engage them in what needs to happen next, is to offer context by framing this transition within a much wider historical timeline.

As we go about our everyday lives, our current relationship with energy, used to deliver many of the things that shape our lives and make us happy, is only the most recent chapter in a very long story. The global climate agreement forged at the UN Summit in Paris recognises that we must now make some hard choices around the relationship between human beings, energy and happiness; so taking the long view may offer us some useful perspectives.

The 'Extraordinary Story of Human Beings, Energy and Happiness' helps us to better understand today's energy-extreme lifestyles; seeing them not as a natural evolution of human development, or even well intentioned progress gone slightly wrong, but rather a deliberately designed break in our connection with each other and with nature. Understanding this story can change how we think about our world and ourselves, and open us up to new possibilities. It began a very long time ago...

Expert View

Values matter

Tom Crompton PhD

Director and co-founder of the Common Cause Foundation

Huge political will and momentum will be necessary in order to drive through the structural changes that climate change demands. This, in turn, will require a new level of vocal public demand, far exceeding anything we have hitherto seen. And this demand will be motivated by people's commitment to particular values.

There's a grave risk that the current emphasis on 'simple things you can do to help save the planet' will divert attention from the necessary structural interventions, and harden the perception that responses to climate change are really all about influencing consumer choice (Thøgersen & Crompton, 2009; Crompton, 2013).

Rather, cultural values – what matters to us collectively – will be key in creating sustained and irresistible public demand for structural change. We know that a person's values are among the most important predictors of his/her feelings of social and environmental concern, and his/her motivation to act in line with such concern. It is crucial, therefore, to ask how our values are structured and influenced.

Drawing on decades of research in social psychology, it is possible to make the following general points:

- A group of values – 'intrinsic' values, which include values such as 'responsibility', 'helpfulness', 'social justice' and 'equality' – are

associated with stronger expressions of social and environmental concern, and deeper commitment to civic participation.

- Another set of values – 'extrinsic' values, which include values such as 'wealth', 'social recognition' and 'preservation of a person's public image' – stand in opposition to intrinsic values. Subtly drawing a person's attention to these values serves to reduce their social or environmental concern. Repeatedly drawing attention to these values (for example, through frequent exposure to advertising or celebrity culture) erodes social and environmental concern, and commitment to civic participation, in a more durable way (Crompton & Kasser, 2009).

- Intrinsic values can be engaged in relation to a wide range of different issues – perhaps far removed from climate change. Such apparently unrelated issues are nonetheless found to strengthen concern about climate change. So, for example, in one experiment we found that drawing people's attention to the intrinsic value 'broadmindedness' led to a strengthening of concern about climate change – even without any mention of social or environmental issues (Chilton et al., 2011).

- Fortunately, and despite repeated reminders about the importance of extrinsic values, most people hold intrinsic values to be particularly important. In the UK, for example, 74% of a demographically representative sample of a thousand adults surveyed by Common Cause Foundation held intrinsic values to be more important than extrinsic values (Common Cause Foundation, 2016).

- Unfortunately, most people underestimate the importance that others attach to intrinsic values and overestimate the importance that they attach to extrinsic values. In the survey mentioned above, this was true of 78% of respondents (ibid).

- People who hold this biased perception of their fellow citizens are less likely to vote and are less likely to state an intention to become involved in other forms of civic action – for example, volunteering, attending a public meeting, or getting in touch with an elected representative (ibid).

There are at least three crucially important insights to be drawn from such an understanding of values.

Firstly, building public demand for structural responses to climate change will require sustained action, at the level of values, across many domains. Climate change will not be addressed by working within the environmental sphere, regardless of the contribution that environmentalists might make. Rather, it will require concerted action to promote intrinsic values (and weaken extrinsic values) across many domains – for example, in the National Health Service, social security or comprehensive education.

I am not arguing that climate change must be highlighted in these other domains (though that would be great). Rather, I am arguing that intrinsic values are properly seen as inherent to work in these areas. Strengthening public commitment to intrinsic values in these domains will 'spillover' and strengthen public commitment for action on climate change. Fortunately, this invites the engagement of a wide range of organisations that have no formal remit to work on climate change.

Secondly, ways must be found to both expose and reduce the prevalence of extrinsic values in the social surround. The media and advertising agencies have a crucial part to play here, and the idea of 'corporate social responsibility' should be broadened to include an understanding of the values that a company promulgates publicly. It may well be the case that a business which has taken important steps to reduce its direct environmental impact (or 'footprint') is nonetheless wreaking environmental havoc through the values

that it promotes through, for example, its marketing strategies (its 'mindprint').

Environmental organisations themselves are certainly not above reproach here. Many of today's strategies for building public environmental concern – for example, by insisting that a financial value is put on biodiversity – seem short-sighted. Viewed from an understanding of values, it can be seen that such approaches are likely to be counterproductive (Crompton et al., 2015).

Thirdly, it is important to provide social proof of the existing commitment that most people show to intrinsic values – because of the evidence that most of us don't properly appreciate the importance that fellow citizens attach to these values. Providing such social proof – including through projects aimed specifically at correcting this misunderstanding – will help to embolden others to publicly espouse intrinsic values, creating further social proof of their importance and contributing to a positive feedback process. There is a role for governments, media organisations, and public institutions, such as museums, in helping to create this social proof.

Zero Carbon: Making It Happen represents an important milestone. It asks, unflinchingly, 'why are we not doing enough to motivate ambitious responses to climate change?' and, 'how can we achieve much more?' These are questions that can only be properly answered in the light of an understanding of values and how these are shaped.

http://valuesandframes.org

7.1.2 Promote intrinsic values

For 'bigger-than-self' problems like climate change, people with strong intrinsic values tend to be more concerned and are more likely to act to address the issue (Crompton, 2010). People with predominantly extrinsic values, on the other hand, tend to have lower levels of concern about bigger-than-self problems, and are less motivated to act (ibid).

It has been argued that civil society organisations should, therefore, work to promote intrinsic rather than extrinsic values so that these more compassionate values become strengthened at a societal level and can start to challenge the assumptions that people are solely motivated by money, image and status (Crompton, 2010). For example, a campaign can promote the collective value of change rather than appealing to self-interest (ibid). This can work across the political spectrum, as intrinsic values such as integrity, loyalty and responsibility are key values held by those of all political persuasions (Corner et al., 2016).

The use of intrinsic factors may have greater effects on adoption and use of some low carbon technologies and behaviours than financial factors, particularly when the possible financial benefits are small (Clayton et al., 2015). For example, in one experiment people responded better to a nature-focused appeal than an economic appeal to get their tyre pressure checked (Bolerdijk et al., 2013).

Furthermore, research suggests that the benefits of promoting intrinsic values can go beyond the targeted action. When people are stimulated to think about a pro-environmental behaviour, like car-share, using intrinsic motives, a completely different behaviour, like recycling, can be induced (Evans et al., 2013). Similarly, encouraging people to think about climate change as a motivator for saving energy led to a higher propensity to donate to environmental charities (Spence et al., 2014). This behaviour 'spillover' effect is less likely to occur if extrinsic motives are engaged (Thøgersen and Crompton, 2009; Evans et al., 2013; Spence et al., 2014).

There is also interesting research showing that promoting intrinsic values may be just as important as promoting action on climate change directly (Chilton et al., 2011; Crompton et al., 2015). One study of people with lower carbon lifestyles found that values of social justice (for example, concern about impacts on poor people in developing countries), as well as links to their community, were more important motivating factors than environmental concerns (Howell, 2013). Others have found that motivations related to perceived injustice often outweigh those related to financial gain (Adger et al., 2016). Perceptions of justice and fairness also affect people's perception and acceptance of policies on climate change (Clayton et al., 2015). There is evidence that individuals' willingness to act in response to flooding events is strongly influenced by perceptions

of fairness in the response from authorities and undermined by distrust in authorities (Adger et al., 2016).

7.1.3 Counter consumerism

The UK and much of the global economy is dependent on the promotion of ever increasing levels of consumption of natural resources. Maintaining current levels of consumption is not an option – ecological limits to growth mean we will all be forced to reduce consumption eventually. However, the later this reduction occurs the greater the ecological damage and impacts, therefore, it is better to minimise this by reducing consumption levels now (Lorek and Fuchs, 2013).

Much of the problem lies in the fact that consumption is necessary to economic growth and questioning the neo-liberal growth paradigm is a political taboo (Gossling and Cohen, 2014). There is such a pervasive assumption in society that growth is sustainable and desirable, that any discussion of buying and producing fewer goods is still considered to be unthinkable despite the clear impossibility and unsustainability of endless economic growth (Sekulova et al., 2013).

The whole issue of reducing consumption is difficult to tackle and requires questioning some widely held beliefs and paradigms in society, including the underlying assumption that 'growth is good' or the use of GDP as a measurement of societal value. Yet, above a certain (rather lower than we might imagine) threshold, reducing consumption can improve quality of life and provide greater happiness unrelated to material consumption or GDP (Tukker et al., 2008). Thus, as well as shifting our production and consumption models and patterns away from ever-increasing resource consumption, there needs to be a broad discussion about alternatives to the current unsustainable economy.

Although this will be unpopular and risks accusations of hair-shirt environmentalism, reducing consumption does not mean we will all be worse off, indeed quite the opposite, as non-material factors, such as health, social cohesion, family and community, are much more important elements of well-being than how much stuff we own or consume (NEF, 2010).

While certain levels of consumption are necessary, and beneficial to well-being, it is the excessive and disposable patterns of consumption in western industrialised economies that are of concern. As a society there is a need to start promoting the benefits

Repair café in Cambridge.

of reducing consumption so that it can be viewed as a positive step that can increase well-being, rather than being thought of as a sacrifice (Hill, 2011).

The following initiatives, ideas and policy interventions could be used to directly counter consumerism:

Reducing the working week: It has been suggested that overconsumption is interlinked with a range of other problems, such as overwork, unemployment and a reduced quality of life (NEF, 2010). Reducing the working week to 21 hours has been proposed as a way to break that cycle, and help people become less attached to consumption of stuff, and more attached to relationships and activities that absorb less money and more time (ibid). If a much shorter working week became the norm, with everyone using their time differently and many people earning less, ideas would change about what really makes a good life and how much money is 'enough' to live on (ibid).

The sharing economy: The sharing economy enables produce, items and services to be given or exchanged. Many people will be already familiar with charity shops and freecycle, and there are a growing number of online communities, such as swapz, swapcycle and swishing, where people swap items for free. Although on the whole these are still largely niche activities that barely dent overall consumption levels, research has shown that online exchange is contributing to waste prevention, and the volume of items exchanged online could be increased with very little investment (Batley, 2011). Specific examples of the sharing economy in action include:

- Repair Cafés: Started in the Netherlands, these are meeting places where volunteers teach people how to repair their household items for free to prevent waste and share valuable skills. There are now over 1,000 Repair Cafés worldwide, including a growing network in the UK (Repair Café website).

- The Swedish government is introducing tax breaks on repairs, including slashing the VAT rate on repairs and allowing people to claim back from income tax half of the labour cost of repairs to appliances (Orange, 2016).

- Real Junk Food Cafés: A global organic network of pay-as-you-feel cafés that divert food destined for waste. There are now dozens in the UK (Real Junk Food Café website).

- Share Shop in Frome, Somerset: The first of its kind in the UK, allows people to share and borrow a huge range of items, from DIY equipment, cutlery and furniture to craft materials, children's books and clothes (Share Frome website).

- Lending clubs: Sharing tools, especially as they become more specialist, enables a community to have the right tools for the job without having to pay for them.

Projects and initiatives to reduce consumption:

- Buy Nothing Day: A global campaign to reduce consumerism and spend a day without spending (Buy Nothing Day website).

- Zero Waste Week: A grassroots campaign raising awareness of the environmental impact of waste (Zero Waste Week website).

On the production side there is also growing interest in the principles of the Circular Economy, "an industrial system that is restorative or regenerative by intention and design", which aims to design out waste, make consumable products non-toxic, durable products reusable, and to use renewable energy (McKinsey, 2013). A circular economy considers all the inputs and sees how they can be used in a closed loop system.

There is a role for the private sector in driving innovation and low carbon economic activity in this area, and there are now a growing number of companies using circular economy principles. For example, Kingfisher, owner of B&Q, has started designing products for disassembly and offering rent/repair services at stores in Poland (Kingfisher, undated).

It is estimated that in London alone there is the potential to create over 40,000 jobs in circular economy sectors like reuse and remanufacturing (London Waste and Recycling Board, 2015).

Examples include GrowUp Urban Farms, which uses aquaponics and vertical growing to grow salads, herbs and fish sustainably, or Globechain, which has a global network to reuse unwanted items for social causes (ibid).

7.1.4 The role of spiritual and ecological worldviews

Given the materialist nature of modern culture combined with global problems such as climate change and inequality, it is perhaps not surprising that many people are seeking to reconnect with spiritual roots and seek new meaning (Rowson, 2014).

'Spiritual but not religious' (SBNR) is a term increasingly used to identify spirituality independent of any organised religion, instead placing an emphasis upon the well-being of the mind-body-spirit – a shift from an institutional to a personal understanding of spirituality (Thurston and Ter Keile, undated).

The number of people in the UK reporting themselves as 'no religion' is rising with every generation (Lancaster University, 2016). However, these 'non-religious' groups are not necessarily atheist, with a quarter taking part in some form of spiritual activity each month (ibid). Studies have found that many young adults in the US are looking for both a deep spiritual experience and community experience that provides meaning in their lives (Flory and Miller, 2008).

Over recent decades, a great many individual and group practices have

evolved, some based on meditation and physical actions that help engage the body, imagination and intellect to work within a frame that encompasses ecological perspectives and practice.

For example, there is evidence that practice of meditation and mindfulness can foster greater empathy and compassion for others, and can serve as an 'antidote to consumerism', by fostering more sustainable behaviour (Ericson et al., 2014). Mindfulness has been shown to reverse the impact of the 'hedonic treadmill' effect where people quickly become habituated to higher material welfare associated with increased consumerism (ibid).

In addition to the many religious-based beliefs that shape human relationships with natural systems, there are also many non-religious worldviews that adopt a predominantly ecological perspective, seeing humans as part of the environment and the latter as valuable beyond human requirements. Examples include Aldo Leopold's Land Ethic, Albert Schweitzer's Reverence for Life, deep ecology and James Lovelock's Gaia theory (see box below).

Ecological or ecocentric worldviews

Aldo Leopold's Land Ethic: A holistic environmental ethic that takes as the highest good the integrity, stability and beauty of the biotic community. An action is right if it preserves those qualities, both because protecting land is necessary for protecting humans and because the Earth is to be viewed as a 'living being' (Leopold, 1949).

Albert Schweitzer's Reverence for Life: In Schweitzer's philosophy an inherent worth is ascribed to all living things, which rejects a view of human superiority. This requires a worldview that includes humans as part of nature, and views natural ecosystems as a totality in a complex web of interconnected elements (Reverence for Life website).

Thomas Berry: Distinguishes the 'environmental movement' (adjustment of the Earth to the needs of humans) from the 'ecological movement' (adjustment of humans to the needs of the Earth/life community) (Berry, 2003).

James Lovelock's Gaia Theory: A science-based worldview that recognises the functioning of the planet as a living 'super-organism' and stresses the role of humans as part of larger nature (Lovelock, 1974).

Animal Rights Movement: The campaign for animal rights arose from concern for animal welfare and historically was part of a wider movement associated with abolition of slavery, reform of schools and prisons and the poor law (Thomas, 1983).

Deep Ecology: In 1972, Norwegian philosopher Arne Naess defined wo different forms of not necessarily incompatible environmentalism. The first

being 'shallow' anthropocentric ecology, which views humans as somehow above or outside of nature whilst also placing a 'resource' value on nature which humans are entitled to control, or (in slightly softer terms), steward, to their own ends. In contrast 'deep' ecology sees humans and the environment as one interconnected whole (Naess, 1989).

Social Ecology: Although deep ecology provides a valuable framework and a powerful critique of the anthropocentric framing of our civilisation, some feel it has not suffici tly engaged with political and social factors. The work of many social ecologists, such as Murray Bookchin, has offered a valuable critique, building on deep ecology and offering an analysis of how social systems such as patriarchy, capitalism and imperialism are inherent to the current ecological crisis (Institute for Social Ecology website).

Radical Ecology: Building on both deep ecology and social ecology, radical ecology seeks to change the 'conditioning factors' that exist within our individual consciousness and in our social, economic, political, legal and technological systems. It seeks new ways of living in full partnership with the rest of the natural world through experiments in non-hierarchical social structures, new economics, indigenous science and a revitalised spirituality (Merchant, 2005).

Indigenous Science: Like Western science, indigenous science relies upon direct observation for forecasting and generating predictions. It also has specialisations and validity tests. It has, however, a more ecocentric perspective. Unlike Western science, the data from indigenous science are not used to control the forces of nature; instead, it discovers ways and means of accommodating nature in delivering our needs (http://www.wisn.org).

7.1.5 Role of faith and religion

To date, the enormous potential of faith networks to engage and motivate people around action on climate change has scarcely been recognised. In a world where many wider political and cultural attitudes do not support the zero carbon transition, religious faiths can have enormous influence on the attitudes and actions of their followers, and the major faiths also wield significant economic and political power (Hulme, 2016).

Historically, religions and faith communities have played a major role in advocating or securing social change, for example, in the abolition of slavery, civil rights, trade union and anti-poverty movements, a tradition of radicalism that many faith groups and organisations still uphold. Climate change is important to many different faith groups as it raises questions about the relationship with the Earth and other people, materialism, altruism, justice and other fundamental teachings (ibid).

It should be said that faith is clearly no guarantee that an individual will adopt or support actions towards a zero carbon transition, as a person's faith is often bound up with a wider set of political and cultural attitudes. In fact, there are examples where quite the opposite is true: it has been found in the US that the citizens who are most dismissive of climate change are more likely to be Evangelical Christians (Leiserowitz et al., 2007).

However, over recent years the main global religions have released increasingly radical statements on the need for urgent climate action and the need to care for the Earth, and in the run up to the COP21 UN talks in Paris the major religions embraced addressing climate change as a core concept (see box below).

On top of this, hundreds of religious and spiritual organisations from across all faiths signed a joint statement

Faith perspectives on climate change

This summarises some of the major perspectives on climate change from the five major faiths (in alphabetical order) based on work by Climate Outreach seeking language that works across all of the major faiths (Climate Outreach, 2016):

Buddhism: Buddhism is not a prescriptive faith; it's a way of life that is practised through being and doing rather than through ritual. A core concept is 'dana' which can be translated as 'generosity'. Action on climate change can therefore be portrayed as a generous donation rather than a sacrifi e. For Buddhists, action can also be expressed through changing internal values. The Buddhist Climate Change Statement to World Leaders (signed by 26 Buddhist leaders including the Dalai Lama) states: "The threats and disasters we face ultimately stem from the human mind, and therefore require profound changes within our minds." The world has become unbalanced because we have failed to understand our interconnectedness with the Earth. "Our lives are inextricably interwoven with the natural world through every breath we take, the water we drink, and the food we eat. When the Earth becomes sick, we become sick, because we are part of her."

Christianity: For Christians, 'Creation' can be a far more powerful frame than 'Earth' or 'natural world'. Creation is a direct expression of the divine and a gift to us, and we have responsibility as its stewards. In the Catholic Encyclical of 2015, Pope Francis said: "The Earth was here before us and it has been given to us." Following on from the Encyclical, in October 2015 the heads of Catholic bishops' federations on every continent issued a joint appeal to COP 21 delegates that they produce a "comprehensive and transformational agreement" to address global climate change during the United Nations climate negotiations.

Hinduism: Hindus see the natural world as an expression of the divine and believe we are one part of a highly organised cosmic order named Rta. The Hindu Declaration on Climate Change issued in 2015 said: "Climate change is a stark symptom of the deeper problem of humanity living out of balance with what Bhūmi Devi, our shared planet, can renewably provide." Also in Hinduism, the internal change in values is as important as the outward change in behaviour. As the Hindu Declaration said, "We become servants of the Divine, all our actions, including those in protection of the world around us and all the beings therein, becoming acts of worship."

Islam: The Islamic faith teaches that Allah has placed humans as stewards (khalifah) of the Earth to protect and safeguard His creation. The dominant narratives are rooted in or built on language from the Qur'an and the Sunnah/Hadith (sayings, doings, affirmations) of the Prophet Mohammed, which are regarded by Muslims as the source of all truth and guidance. Muslims see the world as the creation of Allah: "Allah created the universe in all its diversity, richness and vitality." Language around Creation as a Ni'mat (which can be translated as gift, blessing or favour) is resonant: "Excessive pollution from fossil fuels threatens to destroy the gifts bestowed on us by Allah." (Climate Outreach, 2016). Balance figu ed prominently in the Islamic Declaration on Global Climate Change issued in 2015: "The Earth functions in natural seasonal rhythms and cycles. Climate change is a result of the human disruption of this balance."

Judaism: Jewish narratives centre on humanity being caretakers of Creation. There is also a strong sense that climate change is a moral issue. There is focus on justice as a core value and use of language around social justice and intergenerational rights. The Jewish Environmental and Energy Imperative of 2012 states: "We weep at the heavy burden that climate change imposes on the world's poor...we tremble at the harm we impose upon our own descendants" (Coalition on the Environment and Jewish Life, 2015). Judaism is an action-based faith: "We are a people of menders, of healers, and our fractured planet – compound fractures, at that – cries out for healing."

confirming the need for ecological stewardship, intergenerational equity and climate justice (World Council of Churches, 2015).

There are numerous examples of faith and spiritual communities directly engaging with action on climate change at a political level, and a rich history of spiritually led activism from inspirational individuals who were not bound by the doctrine of their religion. The work of Mama Efua, Desmond Tutu, Gerrard Winstanley, Sojourner Truth and Julia Butterfly Hill, demonstrates the transformative power of spiritual principles in action (McIntosh and Carmichael, 2015).

Spiritual and religious practice can be successfully combined with social and political change. A cross-

generational dialogue between a homeless youth advocate and an internationally renowned Christian theologian shows how the desire for social change at the heart of the Occupy movement can be successfully united with a powerful spirituality (Bucko and Fox, 2013). Such work helps enable individuals and communities to access a path where ecological framing goes hand in hand with personal transformation and radical social change. Examples include:

- The SanghaSeva group facilitates 'Meditation in Action' retreats that integrate meditation with participation in positive actions, such as planting trees on deforested land. The group aims to offer opportunities to explore living fully through positive actions (SanghaSeva website).

- Initiated in 2013 by a group of teachers, staff and friends of the Buddhist Insight Meditation retreat centre, Gaia House, the Dharma Action Network for Climate Engagement (DANCE) is a forum for the wider community to catalyse Dharma responses to the climate crisis, (Dharma is a Sanskrit term which is used to refer to wisdom teachings and deep inquiry). A network of DANCE groups has since grown across the UK that continues to generate projects with a core intention to support creative ideas, connect practitioners and encourage engagement with a wide range of responses to climate change. Examples include sponsored vigils, awareness-raising bicycle rides, and direct action at London museums as part of the arts collective "Art not Oil" to protest for an end to oil company sponsorship of the arts (DANCE website).

- Christian Aid and Tearfund are running a 'Big Shift' campaign supporting churches and individuals to move their energy from fossil fuels to renewables and to send a clear message to the UK government to move away from fossil fuels. The campaign is framed in terms of both stewardship and climate justice for the world's poor (Big Shift website).

- The Church of England has voted to withdraw some of its investment funds from tar sands and coal. Speaking for the Church, the Reverend Canon Prof Richard Burridge said: "The church has a moral responsibility to speak and act on both environmental stewardship and justice for the world's poor, who are most vulnerable to climate change." (Vaughan, 2015)

There are also many examples of faith groups supporting action at an individual level through the promotion of less materialistic and lower impact lifestyles. For example, the Church of England's 'Shrinking the Footprint' campaign is a national campaign to address climate change (Church Care website) while the Catholic Church

offers a 'Live Simply' award to parishes that demonstrate the principles of living more simply, for example, encouraging people to walk or cycle to church, or to generate their own electricity (CAFOD website). Muslim Climate Action (MCA) is a group of UK Muslim organisations concerned about climate change (MCA website). The organisation shares best practice and showcases work that the Muslim community is doing to tackle climate change. For example, the resources on its website include a 'Muslim Green Guide to Reducing Climate Change' and a toolkit to support young Muslims to get their local mosques and communities thinking about environmental issues (ibid).

Reconnect – supporting campaigners in stressful times

Spiritual or religious practices and networks can be an important source of support in uncertain and stressful times.

The phenomenon known as 'burnout' (where a person or group reaches exhaustion caused by continued action, combined with the stress of fear, urgency and anger) has been seen to affect people working in the area of environmental and social campaigning (Macy and Johnston, 2012).

In response to this, the Transition movement has developed a process of 'Inner Transition', which involves a revisiting of relationships with ourselves, each other and the Earth. Practical measures that have been taken include: a free mentoring service, inviting local therapists, coaches and supervisors to offer free one-to-one support to activists; a group simply taking time to get to know one another; supporting people who are taking on too much (Banks, 2016).

Tools have been developed by spiritual practitioners to help support people campaigning for change. For example, Joanna Macy's Work That Reconnects which draws on deep ecology and Buddhist practice to build motivation, creativity, courage and solidarity (Macy, 2012).

Macy explores three equally important elements of 'the work that needs doing': creating positive solutions; grassroots campaigning and activism aiming to 'stop the wrong things happening' and so limit the damage that is being done both to human and natural systems; and 'reconnection'.

'Reconnection' aims to teach by direct experience that human beings are deeply connected to each other and are actually part of nature, creating stronger connections and understandings both among humans and between humans and natural systems, with the aim of increasing both well-being and capacity for action (ibid).

7.1.6 Role of the arts

> *Humans are capable of a unique trick, creating realities by first imagining them, by experiencing them in their minds...By this process it begins to come true. The act of imagining somehow makes it real...And what is possible in art becomes thinkable in life.*
>
> Brian Eno, *The Big Here and Long Now*, 2003

Arts and culture have long been another powerful catalyst in transforming existing social norms and worldviews. Arts can do what science, politics, academia, media and other disciplines simply cannot. Art has the power to create spaces for dialogue; art can communicate information which might otherwise be alienating to people; art can bring communities together and make difficult things understandable; and art can inspire people with visions of a sustainable future. In short, art can transform worldviews (Arts Council of Wales, 2014). Whilst it is important to engage the more formal arts, much broader-based mass culture – including video games, films, TV shows – is also

A scene from The Roadless Trip by Sarah Woods.

powerful, for example, in the way that the future is commonly portrayed as ecological collapse and dystopia.

In one survey of artists, an overwhelming number of respondents were of the opinion that the arts can communicate important ideas and information which might otherwise be alienating or too complex, or which might cause people to switch off (ibid). Sustainable development is overrun with jargon, environmental science is thick with facts and figures, and the media and politicians too often present biased opinions (see section 6.2). The arts can help transform difficult complex information into something understandable that we can act on (ibid).

Dialogue is a key aspect: 94% of the respondents in the survey stated that the arts can support a cultural shift towards a sustainable future by creating 'spaces for dialogue' (ibid). This is not necessarily a pre-existing 'arts space' or venue: 62% said that their projects are carried out in site-specific or non-building-based spaces. The key point here is having access to a safe, creative space where people have 'permission' to speak, to explore their ideas and connect with other people (ibid).

By opening up a creative space for dialogue, the arts enable people to consider crucial questions by exploring their own personal understanding of them. Facilitated well, people are able to acknowledge their uncertainty and confusion (ibid).

> *It is very difficult to give up our uncertainties – our positions, our beliefs, our explanations. These help define us; they lie at the heart of our personal identity. Yet I believe we will succeed in changing this world only if we can think and work together in new ways.*
>
> Margaret Wheatley, 2001

At times of social and political change, or changes in worldview, artists are often the outriders, becoming more engaged and socially aware before the rest of society. The artist Suzi Gablik (1991) reminds us that "persons who grow up in a society are culturally 'hypnotised' to perceive reality the way the culture experiences it...The challenge of the next few decades will be to awaken from this hypnosis."

Expert View

The Great Imagining: how the arts spark cultural change

Lucy Neal

Theatre-maker, a core member of Transition Town Tooting, and co-founder director of London International Festival of Theatre (LIFT)

"It's the job of the artist, poet or storyteller to point out the ground under our feet, to offer us images through which to wake up to our present condition, to show us anew the moment we stand in."

Mat Osmond, Dark Mountaineer

Finding our part to play

It's hard to imagine, at this 'moment we stand in' that, as humans, we're accountable for reimagining our world on behalf of ourselves, subsequent generations and all species.

Whilst blueprints, such as the Centre for Alternative Technology's 'Who's Getting Ready for Zero?' demonstrate how societies across the globe can transition to low carbon futures, there's no collective map of how they're invented socially, or how a cultural commons is created for the future we want and can find our place in.

When facts and figures about climate change cannot catalyse the shifts needed to move towards a zero carbon future, the arts have a tradition of sparking cultural change and speaking differently, creating emergent space to rethink the future – collectively. With

poetry and metaphor, they explore the language of the heart, the pain of what we're losing and the deep yearning in us for the restoration and celebration of life. They re-engineer time to allow our imaginations to flourish, glimpsing other ways of seeing and feeling, and it is from these experiences that different futures can emerge.

Artists use the word 'practice', but it's one that everyone can use to describe a daily life that combines creativity and intentional change. Drawing on patterns of belonging, empathy, kindness, community resilience, stewardship, reskilling, alternatives to 'limitless' growth, the arts energise people's capacities for action, activate their skills and transform their capabilities.

In recent years, UK artists along with pioneering initiatives such as Platform London, Cape Farewell, Julie's Bicycle, Tipping Point, Artsadmin, Emergence, Creative Carbon Scotland and others have created a step change in recognising the role the arts play in reimagining a more viable future on the planet, shifting society's rules and values away from consumerism and commodity towards community and collaboration.

Playing for Time

My own handbook *Playing for Time* has gathered an abundance of over 100 stories of artists and activists, reclaiming a traditional role for artists in the community as truth-tellers and agents of change. Few fall into the conventional, siloed categories of 'dance', 'music' or 'visual arts' - or art that can be purchased, coveted or consumed; all include recipes for action to trigger ways of making art 'as if the world mattered'.

When science cannot play the role of interpreting the challenges we face, or questioning the values that underpin the need for change, the arts have the ability to challenge the status quo and engage people collectively at an imaginative level. They draw on the perspectives of everyone to create a future we want to live in: their

metaphors, dreams, disruptions and symbolism provide that 'other space' from which a new exploration of the self and the world can emerge, and an unshakeable belief that change can and does happen. Excitement for getting our hands on life and being an agent of change gets inhibited by a culture of commodity, but, like a tide turning, it can be reached for, reclaimed, reinvented, renewed, rediscovered and remembered. The arts have the power to build our resilience and reinvent us: they hold the things we care about; give us moments to begin from again; extend our imagination, collective courage, and intuitive knowledge that we're part of a larger whole. The opportunity to play for time is in our hands. The chance to reweave our world is within our imaginative grasp.

This is an extract from a longer article. Republished with permission. For more information see Neal, 2015.

7.2 Communications

The way in which we communicate and frame the zero carbon transition is critical in improving traction and engagement. Reducing the impact of advertising, whilst increasing the media profile of both problems and solutions, and correcting commonly held misconceptions or misinformation, will help build support for action. This section outlines some of the key aspects.

7.2.1 Restrict advertising

Given the pervasive and detrimental nature of advertising, restrictions should be introduced on this largely unregulated industry. Suggestions to reduce the worst impacts include a ban on advertising in public spaces; a ban on all TV advertising to children under 12; regulations to limit the amount of information gathered, shared and used without our permission online, and; a tax on all ads that encourage greater consumption (Gannon and Lawson, 2010).

Others have suggested these and other ways to reduce the negative impact that ads have on cultural values and reduce the pervasiveness of advertising (Alexander et al., 2011):

- Use the existing powers of the Advertising Standards Authority (ASA) to regulate the use of extrinsic values more widely.
- Amend the Code of the Committee of Advertising Practice (CAP Code) (CAP website) to take more account of the impact of advertising on cultural values.
- Enable ways to reduce exposure to advertising (for example, software to block online adverts).
- Protect and promote alternative advert-free ways of subsidising media (for example, the BBC licence fee).
- Add disclaimers to billboard adverts to make the public more aware of the unconscious impacts of advertising (Alexander et al., 2011).

It has long been argued that greater regulation around the advertising of obesogenic foods, such as fast foods and carbonated sugar-sweetened drinks to children is both needed and justifiable, even within a 'free market system', to protect the rights of children. Governments can also use the 'precautionary principle', which allows action to be taken even before definitive scientific proof is available when the risks are such that delaying action could be damaging (Swinburn et al., 2011). Many countries and cities elsewhere in the world have imposed some restrictions on advertising (see case study below).

It is unlikely restrictions on advertising will happen without a large and sustained campaign. However, it is likely that a campaign to limit advertising would have public support.

CASE STUDY: *Restrictions on advertising around the world*

São Paulo banned outdoor advertising in 2006 with the controversial 'Clean City' law, which has improved the urban environment (Kohlstedt, 2016).

Several states in the US, including Alaska, Hawaii, Maine and Vermont, have also banned billboard advertising (ibid).

Spain has banned 'cult of the body' advertising before the watershed (for example, slimming products, surgery procedures and beauty treatments) because of a link to eating disorders in young people (Volz, 2010).

Sweden does not allow TV and radio advertising to children under 12 (Olsen, 2010).

Numerous European countries regulate television advertising to children. For example, Austria has banned advertising during children's programmes before 8.15pm, while Greece has banned toy advertising between 7am and 10pm and has banned adverts for toy weapons entirely (Kang, 2001).

For example, there is widespread public support for campaigns to ban junk food advertising before the 9pm watershed (Food Active website), although this is fiercely resisted by the industry (Farey Jones, 2016). New campaign organisations have also been set-up to limit the impacts of advertising on people's lives and to better regulate the industry (Adbrake website). The campaign 'Leave our Kids Alone' wants an end to all advertising to primary school children and younger (Leave our Kids Alone website). Meanwhile, unilateral action has been taken by NHS England, which has removed adverts, price promotions and checkout displays for high sugar and salty foods in hospitals and other health centres (Meikle, 2016).

There may also be support from establishment figures who have strongly criticised extreme consumerism, for example, the Pope in his Encyclical and leading figures in the Church of England.

While concerns about the impacts of advertising and increasing materialism are not new (Packard, 1957), more recently there have been overt campaigns to challenge the power of advertising through 'culture jamming'. These include spoof ads or 'subvertisements', such as the anti-car ad 'Autosaurus' (Adbusters, undated). Canadian TV channels refused to air this and were successfully taken to court by Adbusters (Morrow, 2009). The UK-based activist group Brandalism, posted fake ads all over Paris during the December 2015 COP21 talks (Brandalism website).

> *The financial collapse happened because people borrowed money they didn't have, to buy things they didn't need, to achieve a happiness that wouldn't last...The whole of consumer society is based on stimulating demand to generate expenditure to produce economic growth. This involves turning genuine values upside down. Advertising creates a thousand blandishments that focus our minds on what we don't have, while real happiness lies in rejoicing in what we do have. So in a curious way a consumer society is a mechanism for creating and distributing unhappiness.*
>
> John Sentamu, Archbishop of York (in Bingham, 2015)

These are small but high profile attempts to challenge the mainstream media and the underlying ideology of advertising, though the groups' resources compared to the spending power of the advertising industry are tiny. However, in the right circumstances they can have real impact.

For example, one jammer's email exchange with Nike about their refusal to put the word 'sweatshop' on his custom Nikes went viral worldwide (Centre for Communication and Civic Education website). Larger organisations, including Friends of the Earth, PETA and Greenpeace have also used culture jamming successfully to raise awareness of social and environmental issues.

'Tweetjacking', the process of turning others' tweets against them, has also been used successfully to counter corporate greenwash, as demonstrated by a twitter campaign by McDonalds that was pulled after a twitter backlash (Lyon and Montgomery, 2013).

Marketing and advertising can also be a force for good. The considerable creative power of the marketing and advertising industry can be used in ways that are helpful to climate change by promoting sustainable marketing of products as well as marketing sustainability (Hurth et al., 2015).

Marketing needs to evolve so it is not simply pushing consumption but is part of a service to promote valuable products and services that make people's lives better (ibid). To help support this goal, a framework of six principles has been developed including understanding people's real needs, adopting a long-term sustainability mindset, and taking a rigorous approach to measuring the sustainability of all marketing decisions (ibid).

For companies like Tesla, social need fulfilment rather than profit is the end

goal, removing patents to promote EV technology to that end (Hower, 2014). Examples of sustainable marketing include companies like Max Burgers, Patagonia and B&Q promoting eating less meat, buying fewer clothes or sharing power tools respectively. M&S stocking only sustainably sourced fish or Sodastream's anti-bottled water campaign are further examples (Hurth et al., 2015).

7.2.2 Break the climate silence with more stories and positive imagery

It is important to break the prevailing climate silence amongst the public, media and political discourse so that levels of public support for effective policy action are more visible. Focusing attention on climate change is important because it helps to make the issue more salient, thus helping to prime action (Spence et al., 2014).

More effective communication and improved communication skills on climate change can help towards this. To maximise effectiveness, communications programmes and campaigns need to be carefully designed. For example, information that highlights the links between specific actions and effects has been found to be most effective in motivating behaviour change (Spence et al., 2014).

The innovation charity NESTA looked at how to harness the potential of social marketing for changing behaviour on climate change, using insights from successful commercial

Photo by Marc van Woudenberg, CC BY 2.0

advertising (NESTA, 2008). It suggested climate change communications should emphasise the normality of taking action on climate change and the importance of fairness, they should make the issue personally relevant and should be focused on positive opportunities (ibid).

Looking at the elements of successful marketing campaigns it suggested many climate change campaigns had struggled because they neglected the importance of opportunities and the power of positive emotions – as communications need to work at both a rational and emotional level (ibid).

The use of alarming language around climate change is considered appropriate and necessary in view of the severity of the threat it poses (Risbey, 2008) but the use of fear in climate change campaigns needs to be

combined with a sense of personal or social efficacy (Spence and Pidgeon, 2010). Fear can be highly motivating under the right circumstances and when there is a clear way of responding that deals effectively with the situation.

Studies of public health campaigns have shown that the greatest behavioural change comes from strong fear appeals coupled with effective responses that individuals can take (Witte and Allen, 2000). The recommended responses must make people believe they are able to achieve them and that they will help to minimise the threat (ibid).

While there is the potential for 'green fatigue', this can be countered by new stories and unusual images, particularly focused on the positive benefits of climate mitigation. For example, in terms of reducing dependency on car use, the positive marketing of alternatives can highlight the benefits associated with not driving, for example, productive time spent on public transport, reduced stress, fun or freedom. Not only do these emphasise more positive intrinsic values they also use a similar aspirational/lifestyle tactic used in car advertising.

Storytelling is a particularly effective way of engaging attention and sympathies, as stories have universal and direct appeal and can be more salient and memorable than information alone (Slater et al., 2014). To increase the chances of climate communications being heeded, the source needs to be trusted, the message should be relevant and clear and the audience should be motivated and able to act (Clayton et al., 2015).

Visuals in news media can have a strong framing effect and impact opinion and behaviour (Powell et al., 2015). Visuals are known to evoke a heightened emotional response and are more memorable, thus powerful images can have a strong mobilising effect. Historically, the climate change movement has tended to rely on negative images of catastrophic impacts rather than positive images of solutions (Corner et al., 2016).

While negative images can indeed be very powerful (for example, a photo of a drowned Syrian refugee child provoked sympathy and action around the world), the use of images associated with death and destruction for climate change need to be used sparingly and be accompanied by messages that provide agency (Spence and Pidgeon, 2010).

Based on lessons from past social movements, it has been suggested that the climate movement should adopt local and positive icons and imagery that people can relate to, such as local energy solutions (Delina et al., 2014).

A project set-up by climate organisations and photographers, Climate Visuals, is an evidence-based resource for climate change communication (Climate Visuals website). The research involved in-depth discussion groups to find out how people respond to different images of climate change, followed up with surveys of 3,000 people in the UK, Germany and US (Corner et al., 2016). The research developed seven key principles for visual

Lessons from history: The role of non-traditional media

History shows that the lack of traditional media support for climate change movements can be countered by non-traditional forms of communication. Historical analysis of the early US labour and civil rights movements suggested that independent media and communication networks were an important element of both movements (Krajnc, 2000). For example, while the mainstream media covered major strikes it was generally hostile to the US labour movement in the early 20th century (ibid). To fill the gap, the alternative socialist press (political parties, trade unions and individuals) was prolific: be ween 1912 and 1913 there were over 300 English and foreign language publications, with a total circulation of more than two million (Krajnc, 2000). This alternative media was the main vehicle for promoting class consciousness and helped foster an alternative future vision of society (ibid).

In the Philippines, citizen-led radio broadcasts helped publicise and mobilise people for the 1986 Revolution (Delina et al., 2014). The 19th century Chartist campaign to secure votes for all men used the first mass circulation newspaper, the *Northern Star*, to give it national and extensive reach, with an estimated circulation of 400,000 in 1839 (Chase, 2016).

climate change communication that can be used by climate campaigners:

1. Show 'real people' not staged photo-ops.
2. Tell new stories.
3. Show climate causes at scale.
4. Climate impacts are emotionally powerful.
5. Show local (but serious) climate impacts.
6. Be very careful with protest imagery.
7. Understand your audience (Corner et al., 2016).

7.2.3 Use alternative and social media

Given the important role of the media in communicating information, ideas and values, it is essential that climate change, and particularly potential solutions, receives sufficient coverage in the media.

While there are many studies suggesting that media coverage can reinforce pre-existing attitudes, particularly as people tend to select media sources in line with their own views (Feldman et al., 2014), there is also evidence that where there is persistent and clear coverage of an issue, especially from trusted sources like television, it can directly change attitudes (Sanders and Gavin, 2004).

However, as the barriers section has shown, climate change is a hard subject to sell to the media, and it is difficult for NGOs, with their limited resources, to lead the agenda. In a series of seminars to share learning between media editors and environmental and development specialists, a number of ways of working were identified that might lead to more effective public understanding and debate of climate change (Smith, 2005).

These included new resources to base stories around, and use of new production/broadcasting technologies to reach more diverse audiences and encourage interactivity, which can help tell more stories about everyday lives (ibid). The most important conclusion was for science and policy specialists to act as a source of "ideas, advice, and critical feedback relating to climate change storytelling" (ibid).

A lack of traditional media support for progressive social movements is not a new thing, as the box below shows. In the absence of media support social movements have historically relied on alternative media to communicate and mobilise support.

Modern campaigners have new tools such as online and social media, which are low-cost and enable rapid and widespread communication to a global audience, and can be used to mobilise large numbers of people very quickly. Online and social media communications are routinely used by NGOs to provide information, address the news media, strengthen support and mobilise action.

The importance of Facebook over Twitter in driving news traffic has been found in many studies, to the point that the goal for many news organisations is to work out what works best on Facebook, so that it will be subsequently shared (Harcup and O'Neill, 2016). This, according to the Editor-in-Chief of Buzzfeed is "stuff that makes you laugh and stuff that makes you angry" (ibid).

Not surprisingly, fun stories and arresting visuals are the most commonly shared or tweeted items (ibid).

Research has shown how Twitter is a valuable tool for raising awareness of climate change and fostering public acceptance (Cody et al., 2015). There is evidence that Twitter is more focused on the consensus on the science of climate change and evidence of need for action than other media (O'Neill et al., 2015).

A good example of the effective use of Twitter is the campaign 'Who's the Most Powerful Climate Sceptic of All?' run by Avaaz to put pressure on Rupert Murdoch and mainstream media (using #telltheclimatetruth and #thedebateisover). This proved particularly effective in generating tweets about the 2013 Intergovernmental Panel on Climate Change (IPCC) report (Pearce et al., 2014).

Launched to counter media bias in Murdoch media outlets, the Avaaz website included a list of media editors' Twitter usernames and ready-made tweets (ibid), complemented by

an online petition (Avaaz, undated). The campaign appeared to make a significant contribution to conversations about the IPCC, although it wasn't clear if the campaign's tactics were effective in changing media reporting (Pearce et al., 2014). However, the importance of social media in driving news traffic, discussed above, suggests that more positive coverage of climate change on social media is likely to be helpful.

As well as social media there is also a resurgence in print pamphlets, zines and graphic novels, which can all be used by climate campaigners and policymakers to get their message out. For example, an independent German scientific advisory body have produced a graphic novel setting out practical measures to accelerate the transition to a low carbon society (WGBU, 2015).

To counter the fossil fuel industry influence on policy discourse some have suggested explicit media campaigns parallel to those executed by the fossil fuel industry (Norgaard, 2010). However, in the absence of equivalent resources, the climate movement needs to be much more astute in how it counters misinformation and lobbying power.

For example, following a Greenpeace Youtube video, 'Lego: Everything's NOT Awesome', which showed an Arctic Legoland being swamped in oil, and received over 6 million hits, Lego did not renew its partnership contract with Shell (where Shell-branded Lego sets were sold at petrol stations) (Greenpeace, undated).

7.2.4. Tackle misinformation head-on

The continued incidence of "tendentious and misleading coverage of climate science" has prompted leading climate scientists to urge other scientists to challenge such poor reporting (Krebs, 2016), while others have suggested science and policy communities need to be more active on this (Smith, 2005). Groups like the Union of Concerned Scientists in the US have taken News Corp to task for its misleading coverage of climate science, calling for standards and practices for communicating the subject (Huertas and Adler, 2012).

Media editors are sensitive to external feedback and have pointed out that environmental and policy specialists have the capacity to shift the terms of debate through responses to news reporting (Smith, 2005). Given the considerable constraints and pressures on the media, this is an area where climate scientists and policy specialists can help inform debate and reduce uncertainty.

A large network of climate scientists around the world have also heeded the call and provide up to date scientific feedback on the accuracy or otherwise of online climate coverage (Climate Feedback website). In the period May-June 2016, two articles from UK broadsheets were classed as having low to very low scientific credibility (ibid).

The organisation Carbon Brief also provides a daily summary of where the national newspapers stand on climate change and energy based on analysis of articles and editorials (Carbon Brief, 2016). There are also numerous resources for communicating effectively about climate change, for example:

- The Psychology of Climate Change Communication: a guide for scientists, journalists, educators, political aides and the interested public (Shome and Marx, 2009).

- Resources for Communicating Climate Change (Climate Outreach, 2013).

On specific sector issues there is also a need to counter misinformation or misconceptions. For example, the misconception that British society is locked into car use in urban areas is belied by the situation in other northern European countries (Pooley et al., 2011). There is no physical reason why cycling rates in Britain cannot reach the levels of say, the Netherlands. High cycling rates can be found in hilly places like Switzerland and Norway, in medieval towns with narrow streets, in places that are much colder, hotter, wetter or windier than the UK, and in places with longer commuting distances (Hembrow, 2011). Research on car use has suggested that campaigns could make more explicit the misconceptions about car travel (Gardner and Abraham, 2007).

7.2.5 Increase media plurality

The current concentration of UK media, which gives media owners a disproportionate influence on UK public opinion, needs to be addressed. Remedies put forward to foster media plurality include clear ownership thresholds established in law, with triggers for intervention (Media Reform Coalition, 2013). When an audience share rises above a certain threshold it is proposed there should be public interest obligations to ensure editorial autonomy and prevent owners and shareholders from exerting undue influence on news output (ibid).

Following an inquiry into media plurality in 2013, the House of Lords made a number of recommendations including the introduction of a new framework for regulating the ownership of media enterprises, with media regulator Ofcom taking a leading role in deciding whether specific media transactions can go ahead (House of Lords Communications Committee, 2014).

Independent think tank ResPublica has also made a number of suggestions for regulating the concentration of media power, including:

- A new levy imposed on the revenues of major online search and social networking services.

- A new decentralised structure for the BBC to improve editorial independence.

- Enhanced transparency for meetings and relations between senior media and political figures.

- New legislation to support media plurality and extend the existing public interest test (Schlosberg, 2016).

Admittedly, many of these recommendations are unlikely to win political support in the current climate without a widespread and sustained public campaign.

7.3 Psychology and behaviour

Changes to our diets, the way we travel and how we choose to heat and power our homes can make an enormous difference to our greenhouse gas emissions. Behaviour change at all levels is essential for a rapid transition to a zero carbon future and there are many useful insights from psychology and behavioural change studies that can be employed to encourage action on climate change and increase public support for policies. While changes are needed at a structural, industry or government level, individual behaviour does impact on climate change, and individuals can also promote action at an institutional or policy level.

Such interventions can produce meaningful and lasting change in behaviour (for example, in addiction to behaviour programmes) or small changes that add up to a large positive effect. Interventions on behaviours that affect climate change can range from provision of better information (for example, energy labelling) to making certain environmental choices more noticeable (for example, using smart energy meters) or attractive (for example, providing financial incentives for energy efficient appliances) (Swim et al., 2011).

7.3.1 Address scepticism and helplessness by promoting efficacy of action

To overcome feelings of powerlessness we need to be provided with opportunities for effective engagement in which our actions matter (Norgaard, 2010). Individuals can be motivated by perceptions of efficacy – both their own ability to act and the perceived effectiveness of that action. A systematic review of interventions to reduce energy in workplaces found that providing participants with control and responsibility to alter practices were particularly effective strategies, resulting in electricity savings of 30% or higher (Staddon et al., 2016).

While focusing on personal action often reinforces helplessness, addressing collective action can strengthen perceptions of efficacy and thus the intention to act (Barth et al., 2016). For example, the use of electric vehicles (EV) can be incentivised by building on the belief that a group is capable of affecting change, include targeting communications at communities or framing individual EV use as part of a collective endeavour (ibid).

Providing examples of solutions that show what is possible and foster a sense that other people care can be very empowering and can show that the actions of individuals can make a difference. Surveys have shown that a majority of people agree with the idea of 'doing one's bit' on the basis that they are contributing to action at a cumulative level (Capstick, 2013). However, we often need to see that other people are contributing before we commit to action. The belief that a group is capable of effecting change ('collective efficacy') is an important factor that influences behaviour (Barth et al., 2016).

Taking responsibility for climate change involves a powerful moral dimension, either from personal conviction or to contribute to the collective good, but needs to be coupled with a sense of control over the outcome of actions and a demonstration of the worth of those actions (Harrison et al., 1996). It is suggested that more success stories of collective action can help to overcome a negative view that society is too selfish and could encourage more people to take action (Fischer et al., 2011).

There also needs to be a sense of shared personal and national responsibility, so that people see that government and industry are also doing their bit. One study found a marked difference in the sense of shared responsibility for pro-environmental behaviour between communities in England and the Netherlands, with the Dutch group more positive than the English groups (Harrison et al., 1996). This breakdown in the social contract in England was attributed to multiple causes, including greed and the consumer society (ibid).

7.3.2 Provide effective information and training

While provision of information alone is not generally sufficient, information that highlights the links between specific actions and effects has been found to be most effective in motivating behaviour change (Spence et al., 2014). In some cases, additional information or training can help overcome resistance to change.

For example, improving cooking skills and knowledge of alternative dishes is important to help individuals move to a more plant-based diet in the future (Cumberlege et al., 2015). Suggesting that individuals try one new dish a week that doesn't have meat as the main food source, for example, is thought to be an effective way of encouraging willingness to change at the consumer level (Dibb and Fitzpatrick, 2014). Campaigns such as Meat Free Mondays encourage a day-based approach to plant-based eating (Meat Free Mondays website) whilst Eating Better's #MeatFreeLunch campaign focuses on a meal occasion.

NGOs could increase the amount of information on, and further promote other organisations that are working towards, improved dietary sustainability (for example cafés and restaurants) so that individuals can support those

trying to make a change (The Food Foundation, 2015).

Calling for the elimination of all meat and dairy products in people's diets may not be the most effective way to promote change (Lea et al., 2006). The fact that mostly plant-based 'flexitarian' diets still include some meat and dairy products means that they do not invoke the same strong negative reactions that vegetarian or vegan diets might. Flexitarian diets can be seen as less restrictive, allowing the promotion of a diversity of foods and encouraging experimentation.

It has been shown that simple messages or 'rules of thumb' are the most successful ways of creating movement in the right direction (Cumberlege et al., 2015). For example, encouraging people in the UK to choose root vegetables and vegetables that can be 'field grown', such as carrots and parsnips, is a simple way of increasing the consumption of UK grown veg (Garnett, 2006).

Fruits and vegetables that are shipped to the UK or transported by road have much lower associated emissions than those that are flown in, so it is not always distance that dictates whether associated emissions will be high or low. A good rule of thumb here is that foods that spoil easily (for example, berries), that have been grown overseas, are likely to have been flown here to ensure a quick arrival to supermarket shelves, particularly if grown outside Europe (ibid).

Climate conditions and farming methods also influence emissions relating to fruits and vegetables. When produced out of the British season, many fruits and vegetables imported from elsewhere in Europe can be lower in emissions than British grown produce (Garnett, 2014). Improving awareness of which fruits and vegetables are in season is, therefore, also needed.

Labelling could be introduced to convey messages relating to seasonality and mode of transport. As long as it is kept relatively simple, consumers have identified labelling as being a helpful method of conveying this type of information and enjoy greater transparency in the products they buy (The Food Foundation, 2015). Labelling has also been shown to provide a good incentive for manufacturers to improve their products (Bailey and Harper, 2015).

Knowledge of the methods and technologies for energy efficiency (for example, for Passivhaus) must increase for builders and installers through training, exemplar projects and information sharing. This is already occurring – for example, in the 'Passivhaus Diaries' of the Green Building Company (GBS, 2009).

Familiarity and awareness must also be increased among users of energy efficient buildings, so that they are comfortable and can operate the buildings efficiently. Firstly, systems must be designed to be as simple and intuitive to operate as possible. A so-called 'soft landings' approach is then needed, with an extensive period of handover and support from the project team to the building owners/occupants.

Since 2013, the Royal Institute of

British Architects' plan of work for architects has included a stage for Post Occupancy Evaluation to assess a building's in-use performance and rectify any issues identified by data collection and occupant feedback. This helps to ensure that buildings are operated efficiently and allows lessons to be learnt for future projects (Bunn, 2014). This approach should become standard practice.

7.3.3 Use the power of social norms

Given that people tend to behave in accordance with perceptions of how others behave (descriptive norms) as well as in ways that are socially acceptable (injunctive norms), there is enormous scope for using social norms to encourage sustainable behaviours. The importance of normative beliefs – individuals' beliefs about what others expect of them – is often also underestimated both by individuals themselves and in studies (Nolan et al., 2008).

Approaches that use the power of social influence, for example, engaging volunteers in a particular neighbourhood to make energy reduction interventions and to advise neighbours, can be effective and can reinforce more significant behaviours through peer pressure (Abrahamse and Steg, 2013).

Many people are highly motivated by the idea of 'doing the right thing' based on what they think society and their peers expect of them. Trying to promote energy efficiency retrofit as standard good practice for all, rather than the preserve of 'eco-warriors' or 'energy geeks', is important. Framing the issue in terms of 'avoiding waste is common sense' has been found to be effective, whilst emphasising health and quality of life benefits can also work well with some audiences (Corner at al, 2016).

There have been cases where social norms have been used to encourage sustainable behaviour but have instead reinforced unhelpful behaviours (Griskevicius et al., 2008). For example, drawing attention to people littering can increase the incidence of littering (ibid), or comparing household energy use to that of neighbours can cause households that use less than the norm to increase their use (Allcott, 2011).

Ways to avoid such unintended consequences include focusing communications on how people *should* behave (injunctive norms) or on how many people are taking positive action, especially people who are similar to the target audience (Griskevicius et al., 2008).

Giving positive feedback to low energy users can help convey that this is socially desirable, utilising the power of injunctive norms (Allcott, 2011). Social norms are especially effective in conditions of uncertainty when people are unsure how to act so there is a good opportunity when a new environmental law or policy is introduced to influence wider public opinion through communications utilising social norms (Griskevicius et al., 2008).

High profile individuals acting in

ways that help to tackle climate change can help to normalise such behaviour. For example, in London the Mayor's vision is for cycling in London to "be a normal part of everyday life, something people hardly think about and feel comfortable doing in ordinary clothes." (Mayor of London website)

Policies have to be put in place that make walking and cycling safe, convenient, comfortable and 'accepted and normal' (Pooley et al., 2011) for everyone, including vulnerable road users, such as the elderly, disabled and parents with young children.

Social norms can also be used to increase the uptake of electric vehicles (EVs) through programmes that get people to experience EVs, which have the benefit that people are then more likely to recommend EVs to others (Buhler, 2014; Barth et al., 2016).

High profile individuals, such as celebrity chefs and food writers, could also be involved in setting new food trends and discussing important food issues. Hugh Fearnley-Whittingstall, for example, created the campaign 'Hugh's Fish Fight', which brought attention to the amount of fish being wasted in the North Sea due to quota systems and was successful in getting the policy on fish quotas changed (Fish Fight, 2014).

Religions can also help establish new social and ethical norms and promote the shift in lifestyles and intrinsic values that are essential to support action on climate change (Hulme, 2016).

Some good examples of the use of 'peer-to-peer' learning that capitalises on social norms include:

Transition Wilmslow community energy scheme: This utilised a peer-to-peer community engagement approach by training 40 local residents to provide advice in the local community. The group reported that they felt that residents were 'fed up' with being targeted by commercial energy measures. They therefore developed a "friendly, neighbourly approach" which helped 73 out of 100 householders pledge to take action to reduce their energy use. This was one of over 200 community schemes that won awards from the £9.2 million Local Energy Assessment Fund (LEAF) administered by the Department of Energy and Climate Change (DECC, 2014d).

Green Open Homes: A national network that aims to support low carbon open homes events across the country through free resources and advice. By visiting real homes and hearing stories from people like themselves, visitors can overcome knowledge or perception barriers as well as change their social norms and expectations. The Green Open Homes project has had over 10,000 visitors to over 600 homes (Green Open Homes, undated).

Legislation and policy can also be helpful in establishing new social norms, as was the case for recycling and use of plastic bags. For example, mandatory policies setting minimum efficiency standards in buildings could help establish a new social norm that everyone must undertake appropriate energy efficiency measures in their homes.

7.3.4 Address a lack of urgency

To address the view of climate change as a distant future threat, which allows people to discount the risk, the proximity of climate change in both time and place needs to be emphasised (Marshall, 2014; van der Linden et al., 2015). Young people show a clear preference for a narrative that frames climate change as an issue for the 'here and now' rather than talking about how climate change will impact future generations (Climate Outreach, undated).

Framing climate change in terms of local risks – for example, when extreme weather events occur – helps make the issue more salient and the benefits of action more tangible (Spence et al., 2011; Messling et al., 2015).

Thus, it is found that people who have experienced flooding are likely to be more concerned and are more likely to act on climate change (Spence et al., 2011). The Environment Agency and local authorities have also focused on the impacts of severe weather events to make messages more relevant and immediate to people (LGA, 2016b).

However, the psychology of how people respond is complex, and caution is needed when highlighting the 'here and now', as it can sometimes backfire (Brugger et al., 2015; Butler et al., 2016). For example, it may make climate change appear overwhelming and induce guilt or mistrust, which triggers defensive reactions to reduce the negative feelings, but does not result in any positive action (Brugger et al., 2015).

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Or, in the case of flooding, it may be seen as an excuse for inaction by public bodies (Butler et al., 2016).

Framing climate change as local or personal may also cause individuals (in the West) to focus on what they perceive as less severe than say, impacts on developing countries (Spence and Pidgeon, 2010). To avoid trivialising the issue, it is also important to highlight the distant impacts of climate change which many people are concerned about (ibid).

There is also research that a combination of abstract thinking about global issues combined with specific goals at local level may be the most useful approach to environmental issues (Rabinovich et al., 2009). In the case of severe weather events, climate change can be used to highlight more novel solutions, such as new housing design, to better manage the risk in future (Butler et al., 2016).

Framing a global threat like climate change as an issue that incites moral passion can help to increase the sense of urgency and shift public attitudes

when it becomes a narrative shared by large numbers of people (Lifton, 2014). Framing environmental degradation from climate change in terms of human stewardship and preventing destruction of the purity of the natural world has been shown to increase moral engagement and policy support by people not usually engaged in the climate change debate (Markowitz and Shariff, 2012).

Similarly, linking action on climate change to positive (moral) emotions such as hope, pride and gratitude can help support action on climate change (ibid). Pride has been shown to have powerful motivational properties. Eliciting positive moral emotions as well as improvements in well-being can help to reduce feelings of guilt and can be rewarding (ibid). On the other hand, guilt can be associated with positive behaviour intentions, particularly when someone acts to avoid violating moral standards in the future (Renner et al., 2013). For example, studies have shown that guilt can be used positively to reduce energy use in shared houses (Leygue et al., 2014).

Note that it is important not to be judgemental when framing something as 'moral', as this can lead to resentment by others in the form of feelings of moral inferiority, confusion or imagined reproach (Monin, 2007). People with these negative feelings adopt defensive strategies, such as casting doubt on the virtue, labelling the action naïve 'do-gooding', or distancing themselves from the morally superior person or action (ibid).

7.3.5 Use transition moments to break habits

Natural periods of change or transition have been found to be a good opportunity to change habits. A change in context, such as moving house, has been shown to help disrupt a habit by providing a window of opportunity where people can shift their actions in line with how they would like to behave (Verplanken et al., 2008). Thus, people who had recently moved house were less likely to travel by car, and this effect was strongest for people with pro-environmental views (ibid). This effect was confirmed in more recent studies in which it was partly attributed to the large upheaval associated with moving house, forcing residents to reconsider their existing habits and making them more open to change (Thomas et al., 2016; Thomas and Poortinga, 2016; Verplanken and Roy, 2016).

Recognition of this has led to many initiatives that are based on transition moments in people's lives – young people leaving home, starting a new job, changing jobs, moving house. For example, the transition from school to university is a teachable moment that has been used to promote healthy lifestyle habits (reduced smoking, exercise, fruit and vegetable consumption) to students using an online intervention (Epton et al., 2013).

Embarking upon parenthood represents one of the biggest changes in people's lives, so arguably is the

ideal time to instil better habits. Total responsibility for someone else's future fosters an entirely new outlook on the nature and meaning of existence. Presenting decarbonisation as a health issue taps into a key concern for new parents – the immediate and long-term prospects of survival for their child.

7.3.6 Use behaviour change programmes more effectively

Although behavioural change studies have been criticised for failing to address the fundamental shifts in policy and lifestyles needed for a zero carbon future, there is still an important role for them, provided they are not seen as the dominant approach to reducing climate change. Indeed, they can be a valuable complement to the wider set of structural, political and economic levers needed to address climate change, including regulations and standards, market mechanisms and policy solutions.

Better programme design can improve the outcomes and it is important to learn what works from the effective interventions (or what didn't work in other cases) and refine and apply this elsewhere. While traditional government policies have focused more on the rational dimensions of behaviour change – provision of information and financial incentives – more recent policies in Wales are developing more emotionally literate interventions, such as the use of mindfulness, that account for the influence of emotion and unconscious thoughts on behaviour (Lilley et al., 2014).

Better targeting can also help by reaching those thought more open to change (thus more people are likely to change behaviour), and by focusing on those who currently have the highest impact (thus each change in behaviour has higher efficacy). For example:

- Lea et al., (2006) found that younger generations show a greater willingness to change their eating behaviours. Making allowances for different target audiences within behaviour change campaigns should, therefore, further their success.

- 'Educated suburban families' have been shown to have both a high annual mileage and a high number of flights but they are aware of climate change and their impacts (Thornton et al., 2011). As a group, they may be receptive to initiatives promoting very fuel-efficient cars, car clubs, cycling and the possibility of home working (ibid).

- A study that looked at the energy behaviour of residents in identical flats in Germany before and after major energy retrofits found that 20% of the households were consuming 50% of the heating energy (Galvin, 2013). This group of 'heavy' consumers showed very stable patterns of consumption, bound up with fixed habits and behaviour, and the physical environment. Rather than a scattergun approach it was

suggested this group could be targeted through a one-to-one approach to tackle routines, false beliefs, physical barriers or lack of skills that were locking people into overconsumption (Galvin, 2013).

Behaviour change at all levels is essential for a rapid transition to a zero carbon future and there are many useful insights from psychology and behavioural change studies that can be employed to encourage action on climate change and increase public support for policies. While structural transformation is needed, individuals do and should have some direction over their own behaviour and perspectives which work across disciplines are needed to bring the individual and structural approaches together, or complement them (Whitmarsh et al., 2011). The knowledge and insights from psychology and behavioural change studies can and should be used to influence co-operative behaviour and social action in positive and far reaching ways, or to tackle more damaging and entrenched behaviours like frequent flying.

7.4 Overcoming carbon lock-in

Overcoming the problems of carbon lock-in involves the development of low carbon communities and innovation and support at local levels. Changes to communities, villages, towns and cities need the backing of policy and planning processes. Specific practical changes need to be made to make zero carbon alternatives more attractive. The development and support of low carbon communities is important and potentially transformative for a number of reasons:

- Low carbon interventions often have co-benefits for local communities – for example, an income stream, cleaner air, addressing fuel or food poverty. They are also often enjoyable and fun activities, developing cultures of sharing and co-operation.

- Local examples of low carbon technologies and practices give people hope and address feelings of powerlessness, giving them a sense of agency and collective efficacy.

- Examples of behaviour, such as insulating your house, riding a bike, eating less meat and installing solar panels, help to facilitate social learning and normalise such behaviour.

- Low carbon communities also offer potential for bottom-up political change, to complement the role of advocacy groups.

7.4.1 Encourage and promote innovation at a local level

There are plenty of examples of innovative practice at a small-scale or 'niche' level, with a growing number of communities around the UK (and globally) practising low carbon lifestyles, or developing solutions to climate change. It is estimated that there are between 600–6,000 community groups in the UK addressing climate change in some way (Mayne and Hamilton, 2013), while others have estimated over 5,000 community groups have undertaken energy initiatives in the last five years (Community Energy Coalition website).

A large number of low carbon community projects have resulted from Transition Town initiatives, a community-led process to help neighbourhoods, villages, towns and cities become more resilient in the face of climate change and transition towards a low energy future (Transition Network website). Groups develop practical, positive solutions to suit local circumstances. These have included the following (Transition Network, 2015):

Food: The Transition Community Café in Fishguard (Bro Gwaun) in Wales uses perfectly good food that would otherwise have gone to landfill and turns it into affordable healthy meals.

Transport: The Million Miles project across the Black Isle in Scotland cut car travel by over a million miles in three years by promoting public transport, active travel and car sharing.

Disability and low carbon enterprise

Disability Essex: Commissioned a Passivhaus building in 2010 to be its flagship centre for Disability Studies, housing operational headquarters and a training centre. The building provides a model of how to easily integrate sustainability into construction, whilst meeting the needs of disabled users by offering 'absolute accessibility' for a wide range of conditions, including physical, sensory, cognitive, mental and learning impairments (Disability Essex website).

Flower Pod: Enables people with learning disabilities to:

- Participate in the growth, care and sales of beautiful flowers and confetti.
- Potentially take part in performances, tours and talks.
- Gain important skills needed for more independent living.
- Enjoy physical activity, fresh air and the natural world.
- Get to know other people beyond their immediate circle of family and paid-for carers.
- Participate in the development of Flower Pod activities and support each other.

(Flower Pod website)

Buildings: The Aadehuizen Project is a housing development of 23 houses and a community building in Olst, in the Netherlands. This is the first ecovillage project in the country, with 12 Earthships (buildings with walls made from tyres packed with rammed earth) and the remainder of the buildings made from straw bale.

Energy: Many transition groups are involved in community energy schemes. For example, Brixton Energy, which grew out of Transition Town Brixton, has installed 134.24kW of solar energy across three schemes.

Described as 'a social experiment on a massive scale' the 'Transition Model' envisages groups scaling up activities all the way to national level (Transition Network website). Note that scaling up may not always mean making a project bigger but rather spreading the message of Transition across different groups and communities, and allowing initiatives to develop elsewhere. Started only a decade ago in recognition of the urgency of the problem, by mid 2016 there were over 1,200 Transition groups in 45 countries (Giangrande, 2016).

Other villages and towns are organising themselves to significantly reduce their reliance on fossil fuels. For example, Ashton Hayes in Cheshire aims to become England's first carbon neutral community (Ashton Hayes Going Carbon Neutral website). Since 2006 they have cut their carbon dioxide emissions by 40% by working together, sharing ideas and behaviour change, and now have a community owned renewable energy company (ibid).

It is also vital that local initiatives are as inclusive as possible and not the preserve of a privileged few. At the grassroots level, sustainable enterprise is thriving, with initiatives that incorporate a wide range of benefits for people with disabilities, such as Disability Essex and Flower Pod (below).

The reach of these low carbon communities to the wider population is still relatively small and the extent to which the activities have wider implications for systemic change is yet to be seen. While many community-scale projects are too small to reduce greenhouse gas emissions significantly by themselves, Rob Hopkins, one of the founders of Transition Network, has suggested they "help people recognise that they have power to make a difference," (Flintoff, 2013) and give them confidence and the impetus to take political action.

As well as building a community of committed people, every local project undertaken helps expand the political choices available and makes it difficult for decision-makers to say that something can't be done. It is suggested that one of the strengths of low carbon communities lies in empowering people, which complements the delivery role of local authorities (Mayne and Hamilton, 2013). Local communities are undoubtedly important for spreading the ideas, enthusiasm and experience necessary for a wider transformation process.

Stories for Change

Anna Joyce

Project Manager, Flower Pod

Most people don't appreciate that the flowers they buy from a florist aren't grown in this country, they need to be told. You can do that through flowers. They sit in a vase in your house, reminding you. They'll sit there for a week. It's got more chance of getting through.

Flower Pod is a horticultural-based service for adults with learning disabilities offering learning and recreational activities. It is part of Reach, which is the new name for the Southwell Care Project in Nottinghamshire. The learning and recreational activities focus on growing beautiful cut fl wers that are sold to local domestic and businesses markets to generate an income. Flower Pod offers consumers the opportunity to buy locally produced fl wers with a low carbon footprint whilst supporting some of the most vulnerable people in society.

Flower Pod

"I married an architect and he is involved in a lot of environmental, sustainable buildings. I'm also from a background of growing, horticulture, botany, landscape; so via osmosis it's been getting under my skin.

Flowers are a great link, from the clients and volunteers growing them, to giving them out at the other end, perhaps to a bride. It's made all the more serious because they know they've been grown by people with learning disabilities and they love that feeling, knowing they've contributed something more than just buying a bunch of flowers.

Flowers resonate deeply with people – it might mean something like a song would or a piece of music. The people we support may never have a chance to nurture and look after a child. I think there's an innate need in all of us to do that, and flowers satisfy that to some degree.

We have clients with learning disabilities and they're not aware they're interested in seeds and plants. But they've got their names on some of the seeds and the trays of cuttings, and as they come weekly they can see them growing, and I think it's almost an animal instinct it satisfies.

We have lots of volunteers who think they want to help us with gardening, but within hours of them coming, the barrier is broken down between them and the clients, and they end up coming for the clients rather than the flowers.

It's social inclusion, mixing people up, forcing the issue somehow. I think it leads to a much better community, a much better society that will go forward as one voice in terms of creating zero carbon Britain. It's no good one section of society fighting for one cause. We're all together and we can all believe in one another and contribute."

http://fl werpod.org

Instead of traditional political advocacy, the coupling of leadership/action driven by a combination of motives (such as poverty, health, housing) with 'action networks' of low carbon communities that influence behaviour may be a better approach (Hale, 2010). Rather than seeing individual behaviour as an alternative to political action it is suggested it should be seen as a means to it: "Individual action on the scale necessary will only emerge through collective decisions in the networks and communities...which give them both the motive and opportunity to act." (ibid) People are more likely to act if they see that their action contributes to an effective collective effort. There is a need for a visible, collective project that individuals can coalesce around to make their actions feel worthwhile (Hindley and Benton, 2013).

The rapid growth of the Transition Network and low carbon community initiatives both in the UK and globally demonstrates the enormous appetite for positive local solutions and inspiring action, which has a positive feedback loop. Successful local projects generate their own momentum and attract more people, and help to spread ideas through society. For example, Incredible Edible, a project started in the small town of Todmorden to help build resilience by growing food on public land, has quickly grown to 100 groups (Incredible Edible Network).

By the same token, a lack of success can leave people feeling disillusioned and disempowered. Therefore, to properly harness the positive energy within communities requires support. This is already happening to some extent with local community projects often undertaken in association with or with support from local government. However, more needs to be done both locally and at a national level to provide long-term and systematic support.

Straw bale house

7.4.2 Support scaling up

While there are many examples of highly innovative local projects, these often require support to overcome the problems many have in scaling up, or simply surviving. The role of intermediaries – organisations that can connect grassroots projects, share knowledge, publicise success and build momentum – is very important (Hargreaves et al., 2013).

For example, the growth of community energy schemes

demonstrates the benefits of scaling up, with a growing number of knowledge networks, intermediaries and support organisations. A total of 94 intermediaries were identified in one study (ibid). These intermediary organisations, such as Community Energy England and Community Energy Scotland, help to initiate new projects, share information, offer services and, increasingly, lobby policymakers (ibid). They also play a role in brokering and managing partnerships outside the sector, for example, with large energy companies, by finding capital for investment as well as a stream of revenue for other community projects (ibid).

Measures proposed to take the learning and experience of the Arizona-based Canelo straw bale housing project (see section 6.4.1) to the mainstream include more stringent building standards that force mainstream builders to look for new techniques, and funding and institutional support similar to that given to technology innovators (Seyfang, 2010). Inspired by the Canelo project, social enterprise Amazon Nails was formed to work towards the mainstream adoption of straw bale housing in the UK (Amazonails website). The UK's first straw bale house was built in 1994, by 2001 there were 70, and in 2015 it was estimated there were around a thousand in the UK and a hundred or so in Ireland (Jones, 2015). In 2015, the first straw bale homes on the open market went up for sale in Bristol (Gill, 2015) developed by the University of Bath working with a specialist architectural firm (Modcell website). Using prefabricated straw bale walls, the development moves it from a niche technique to a mainstream product.

Low carbon community movements are important change agents who play a complementary role to local authorities, but their potential is limited by structural issues, such as the government policy framework and incentives which are weighted to technical infrastructure and market solutions (Mayne and Hamilton, 2013). This restricts the potential reach, scale and speed of carbon reduction. Suggested solutions to address this include:

- Reintroducing statutory obligations for carbon reduction for local authorities.
- Investment in the human and social infrastructure for community action.
- More funding (ibid).

The Government's support for community organised sport has been suggested as a useful model as it comprises a long-term strategy, is inclusive, helps to mobilise the community, and has significant (£1 billion) funding attached (Hamilton and Berry, 2013). Unlike community-led climate action, community organised sport has formal structures, support services and significant funding to help improve knowledge and skills and encourage ongoing participation

(ibid). Similar support for low carbon communities could address some of the current issues they face in increasing their reach and scale of activities.

7.4.3 Make alternatives convenient and attractive

In all sectors, making zero carbon alternatives more convenient and attractive in practical terms can help facilitate their uptake and address the problem of carbon lock-in.

Food

Some studies have shown that direct replacement of meat products with vegetable-based alternatives is particularly effective at overcoming skill barriers. Meat replacements, such as vegetarian sausages or 'chicken' pieces, may be important as they can be prepared in an almost identical way to their meat equivalent (Lea et al., 2006). Less direct, but other good substitutes are foods such as pulses, nuts and seeds. These will require a greater knowledge of cooking skills but can be promoted as a way to add more variety to the diet and introduce new cooking techniques and flavours (Cumberlege et al., 2015).

New products could also be developed by food manufacturers to improve the number of low/no meat and dairy options of ready meals and processed foods. A beef lasagne, for example, could begin to be substituted with both more vegetables and beans, or some of the beef could be replaced by a vegetarian mince alternative. It has been shown that a significant proportion of consumers would be interested in buying these products (Mintel, 2014). This also helps to overcome practical barriers, such as long work hours, which may be particularly relevant for people on low incomes, who have fewer options with regards to which products they purchase and less time to prepare the foods that they buy (Tait, 2015).

If these products could be manufactured so that the taste (and cost) remained similar, many consumers may also buy them without even noticing a change, which would help to limit resistance. This may be one of the most effective solutions to introduce in the short-term, whilst many individuals are unaware of the links between meat and dairy and climate change and are less willing to change certain behaviours themselves (Cumberlege et al., 2015).

The engagement of the food industry in producing more plant-based meat alternatives, ready meals and convenience foods is, therefore, another important area for change (Lea et al., 2006). Restaurants and food-to-go chains could also easily increase their range of vegetarian and vegan options. Ultimately, restaurants designed around high meat and dairy dishes will either need to be frequented much less regularly by the same customers or change what they are entirely, becoming a different type of restaurant or company (Cumberlege et al., 2015). Supermarkets could use

new healthier and sustainable options to attract customers through the improvement of their product choice and reputation. Here, again, more options could be deemed a positive contribution to creating business opportunities through innovation and increasing diversity (ibid).

Transport

Studies have shown that the rise in cycling in Denmark, Germany and the Netherlands was not only due to investment in cycling infrastructure but was also supported by making driving expensive and inconvenient and by land-use planning to promote compact, denser developments (Pucher and Buehler, 2008). The towns, cities and countries with high rates of cycling have invested in high quality walking and cycling infrastructure (for example, off-road routes) complemented by softer measures (such as publicity or bike training), while at the same time often restricting the convenience or increasing the cost of using a car.

Improving the actual and perceived safety of cycling (and walking) is done most effectively through the provision of off-road segregated cycle paths as well as reducing traffic speeds on roads. This has been done effectively in many other European countries and cities where cycling is the norm. For example, in Copenhagen 50% of residents commute by bike every day and there are more bikes than inhabitants. To match the Dutch level of cycling there needs to be much greater investment in cycling infrastructure (Hembrow, 2011). Cycling campaigners have called for some of the £15 billion for roads to be reallocated to cycling instead (Geffen, 2016).

This investment in walking and cycling infrastructure can pay for itself. There is much evidence that the health and economic benefits associated with high quality walking and cycling infrastructure far outweigh the costs (for example, Woodcock et al., 2009; Rabl and Nazelle 2012). Each additional hour spent in a car per day is associated with an increase in the likelihood of obesity (Frank et al., 2004). Experts have suggested the NHS could save £2-6 billion a year by 2025 through Dutch levels of spending on cycle provision (Lovelace and Woodcock, 2014).

Additional funding at local level can achieve good outcomes:

- Funding for 18 cycling demonstration towns led to increases in cycling to work among 1.3 million commuters that increased over time and provided extremely cost-effective health and environmental benefits (Goodman et al., 2013).

- Funding for 77 local authorities to improve local sustainable travel, including measures to promote walking and cycling (LSTF website), suggests this has contributed to a 24% growth in cycling in Nottingham and 43% in Manchester between 2011 and 2014 (Sloman et al., 2015).

The real and perceived safety of cyclists and walkers can also be addressed at minimum cost through speed reduction. Most Northern European countries have default speed limits of just 30km/h (19mph) in residential and urban areas. While safety is the main aim of lower speed limits, driving more slowly at a steady pace will generally save fuel (unless an unnecessarily low gear is used) and encourage higher levels of walking and cycling (DfT, 2013d). There is convincing evidence that 20mph speed limits are effective in reducing accidents and injuries, traffic speed and volume, as well as improving perceptions of safety (Cairns et al., 2014). Sherwood in Nottingham reported a 17.5% increase in walking and cycling as a result of a 20mph pilot (Nottingham City Council, 2014).

Increasing the number of public charging points may also improve uptake of electric vehicles (EVs) (Lim et al., 2015), as experience in Oslo has shown. Plug-in hybrid vehicles may also help the transition. Overnight parking offers an alternative low cost network (Element Energy 2013) with 70% new car owners having access to a garage or off-street parking where an EV charging unit could be installed by householders (ibid).

Buildings

Combining energy works with general home repairs, maintenance and improvements, so that the costs and disruption become marginal, offers major opportunities for low carbon retrofits (Maby and Owen, 2015). It has been found

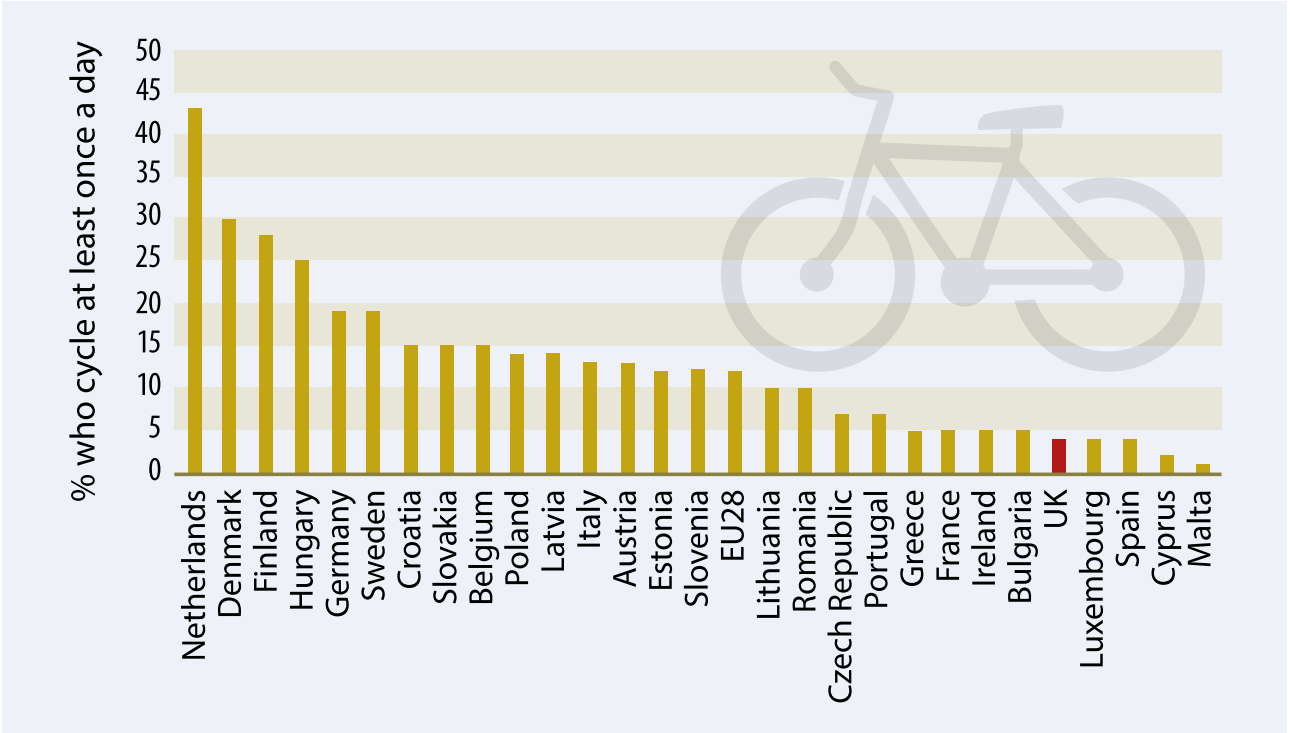

Fig. 7.1 *Proportion of residents who cycle daily by EU country (European Commission, 2013).*

that most homeowners wait until building components reach the end of their useful life before considering replacement (Achtnicht and Madl, 2014) so, as well as being affordable and offering a good payback, there must also be a good opportunity to retrofit (ibid).

The market for refurbishment and renovation of existing homes is estimated at £11 billion annually. Each project is an opportunity for energy reduction. Such work is often delivered by sole traders or micro enterprises, often overlooked in policymaking, but it is suggested that these local building tradespeople could be the frontline for promoting energy efficiency improvements (Maby and Owen, 2015).

For many existing homes that have not undergone a whole-home energy efficiency retrofit, heat pumps would not necessarily be a good choice from an energy or cost perspective, since they would not operate as efficiently. However, there is an opportunity to combine whole-building retrofit with heat pump installation in order to maximise energy savings and minimise cost compared with doing these separately (Wang et al., 2015). This could occur at a convenient time to minimise disruption, such as when a home is sold or between rentals.

CASE STUDY: *Energiesprong*

Energiesprong is a Dutch Government-supported approach to delivering 'whole-house' refurbishments that achieve net zero energy (NEF, 2015). So far, the programme has delivered over 800 pilot-scale refurbishments and has begun delivery against an agreement between housing associations and builders to refurbish 111,000 homes to net zero energy levels.

Energiesprong solutions use customised, off-site prefabricated walls and roofs, which are pre-fitted with windows and doors. This not only insulates the building but gives it a modern, updated look. In addition, an energy module is provided which holds everything needed for sustainable heat, hot water, power and ventilation and just needs to be plugged into the house.

Three key aspects of the Energiesprong approach are:

Quality and assured performance: High quality standards, assured manufacturing and delivery methods, inspection and verification mean that a long-term (30 year) performance warranty can be offered.

Affordability: Assured performance, coupled with efficiencies of scale reduces costs and allows for the refinancing of the upfront investment. Guaranteed energy cost savings, generation of on-site renewables and real estate value improvements make the solution affordable, independent of public grant.

Desirability: The fast, low disruption, hassle-free process, improved aesthetics and comfort levels, increased asset value and neighbourhood renewal make the refurbishments highly desirable.

Inspired by the Dutch Energiesprong approach, a range of organisations have come together to form Energiesprong UK. The intention is to create a 'game-changer' for the retrofit sector in the UK.

Examples of retrofit best practice

Retrofit for the Future

The Retrofit or the Future competition catalysed the retrofit of ver 100 homes across the UK. Funded by the Technology Strategy Board (now called Innovate UK) it awarded up to £150,000 to 86 teams to implement retrofits in eal homes, and encouraged collaboration between housing providers, designers, contractors and researchers. Analysis of data from 37 properties found that three projects achieved the desired 80% reduction in carbon dioxide emissions, with 23 reaching between 50% and 80% (Innovate UK, 2014). The project also developed a Low Energy Buildings Database (LEBD, undated), which stores information and measured energy use data from hundreds of exemplar buildings. The database includes examples of buildings retrofit ed to the EnerPHit standard – the Passivhaus standard for existing buildings.

Super Homes network

The Super Homes network is a rapidly expanding network of 200 energy aware households. These pioneering homeowners have retrofit ed their old homes to the highest standards of energy efficie y. The homes are at least 60% less reliant on fossil fuels. The network's website provides a wealth of information about retrofit and the homes can be visited on open days *(SuperHomes website)*.

Similarly, in rolling out zero carbon heating and hot water systems it is important that windows of opportunity are taken and that systems are installed in situations where they can operate efficiently and that make strategic sense. A big opportunity, currently being missed, is to have incentives or mandates to install heat pumps in new buildings. New builds are the most appropriate for heat pumps as the technology operates most efficiently in well insulated buildings with underfloor heating. New homes would provide a very suitable area to grow the market for heat pumps and build familiarity with the technology. New buildings and major renovations also provide a good opportunity to install solar hot water systems. However, there are no mandates for new homes to have zero carbon heating systems, and incentives such as the Renewable Heat Incentive are generally unavailable to new homes (Ofgem, 2015).

Since biomass fuels may have a limited role for heating in a zero carbon future, it makes most sense to install biomass systems strategically – for example, in historic buildings that are likely to be very difficult to make sufficiently airtight for an efficiently operating heat pump. It may also be best to distribute biomass heating systems widely so as to minimise local air pollution impacts. Biomass could be combined with heat pumps and/or solar hot water to make a very efficient system – this may work well in district heating systems.

One study looked at the drivers and barriers to homeowners in Germany switching from fossil fuel to renewable heating systems (Michelson and Madlener, 2016). To switch to renewable heating, homeowners need to be aware of, and concerned about, the impacts of fossil fuels, and convinced of the convenience and usability of alternatives such as wood pellet boilers and heat pumps. It was suggested that a sufficiently high grant could provide a signalling effect that overcomes homeowners' habits and routines, while better communication of basic technical principles and usability of technologies could overcome the perceived difficulties of use.

A report by the Energy Technology Institute (ETI, 2015) highlights that low carbon heating systems need to be made an attractive choice by offering something better than existing heating systems. They suggest:

- Improve low carbon heating experiences. Low carbon heating designs should improve heat experiences (for example, by improving indoor air quality) and allow people to get clean and comfortable in diverse ways.

- Make low carbon heating simple to prepare for and install. Workable low carbon heating options should be designed so they can be installed in a similar timeframe to a gas boiler replacement. People need to know what solutions will work in their area and how to prepare their homes for low carbon heating systems.

- Make heating easier to control. Controls for low carbon heating should make it easier for consumers to get the experiences they want in their homes.

Better training and awareness is required for low carbon heating systems, and though this should be delivered naturally to some extent as the UK market for new technologies grows, there is no room for complacency as the efficient operation of these systems is vital.

7.4.4 Effective planning and policy support

The role of planning is particularly important for a zero carbon future. For example, cities, towns and villages can be better planned to make it harder to drive and more convenient to walk, cycle and use public transport. Key to this is ensuring that new housing is near to shops and services and well-served by public transport and good walking/cycling infrastructure.

European cities such as Copenhagen, Hamburg and Vienna have pioneered denser development with better public transport, excellent support for cycling and walking, and a focus on low carbon growth (CBT, 2015).

The neighbourhood of Vauban in Freiburg, Germany (population around 5,000), was planned as Europe's largest car-free development. An extensive

©Daniel Schoenen

Car-restricted zones in Vauban housing development in Freiburg, Germany

network of cycle routes and a public transport system of light rail and bus means there is little need to own a car (Field, 2014). In residential areas pedestrians come first and car access is only permitted for deliveries; children playing and cycling in the streets is common (ibid).

London is by far the least car-dependent city in the UK, though cities such as Manchester, Nottingham, Liverpool and Brighton also demonstrate the success of local initiatives in reducing car dependency (CBT, 2014). Dense urban areas are better able to support good public transport services that play a large part in reducing car dependency. There are a growing number of examples from this country where local authorities have taken a more integrated approach to developments, planning them around public transport, walking and cycling (see case studies below).

Changes needed to existing planning policy to encourage sustainable travel and reduce car dependency include the following:

- Higher national minimum densities for housing, which makes public transport more cost-effective. The Sustainable Development Commission has recommended increasing from the current 30 dwellings per hectare (dph) to 50 while some have suggested 100 dph is needed for sustainable transport (Taylor and

CASE STUDIES: *Examples of developments planned to reduce car dependency*

Hackney, London: Almost 90% of developments planned in the borough are car-free, with the council guaranteeing that every resident will live within three minutes of a car-club bay. Household car ownership has dropped from 44% to 35% over 10 years and has the highest level of bus usage in London, despite an increase in population of 45,000 over the same period (Moss, 2015).

Tower Hamlets, London: The council's 'car-free homes' planning policy was introduced in the late 1990s to help reduce traffic congestion and better manage the limited supply of on-street parking spaces. It also helps to reduce the level of air pollution and encourages more people to walk, cycle and use public transport (Tower Hamlets website).

New Road, Brighton: A run-down road in the centre of Brighton was turned into England's first shared-space street in 2007. This has transformed the area: traffic levels have dropped by 93%, the number of pedestrians has increased by 62%, and there has been a 600% increase in activities like sitting, eating and drinking that encourage people to spend time in the space (Healthy Cities website).

Sloman, 2008). Most new London housing developments and Georgian terraces are already around this level, while in Vauban, Germany, housing density is 95 dph (Field, 2014).

- 50% of transport funding in new development areas to be spent on walking, cycling and public transport (Taylor and Sloman, 2008).

- Tighter parking provision. New developments in Europe have much lower levels of provision. It is suggested that there should be a maximum of 0.5 spaces per household with a significant proportion of developments car-free (Taylor and Sloman, 2008). Copenhagen's policy to remove 3% of parking every year and not build any new roads was thought to be a major contributor to the fact that there was zero traffic growth in the old city for 15 years (Havlick and Newman, 1998). Removal of parking provision has the added benefit that it can double the number of dwellings that can be provided on a given site, increasing the potential supply of affordable homes (CPRE, 2006).

The Merton Rule was a ground-breaking planning policy initiated by officers in Merton Council in 2003 that required large new commercial buildings to generate at least 10% of their energy needs from on-site renewable energy at a time when there was no national

requirement for renewables (Merton Council website). This was adopted by many other councils and eventually became part of national planning guidance, helping support an emerging renewables industry and increasing the amount of renewable energy installed in UK new builds (ibid). It has since been superseded by new energy requirements though some have suggested resurrecting it in the light of government backtracking on renewable support and policy (Green Building Press, 2015).

Unfortunately, the Government has advised that, under the Deregulation Act 2015, Local Planning Authorities should not require any additional local technical standards or requirements relating to the construction or performance of new dwellings, including any policy requiring any level of the Code for Sustainable Homes to be achieved by new development (Pickles, 2015). This backward step in planning needs to be overturned to allow councils to push for higher standards and support local low carbon industries. A number of 'mini Stern' reviews have shown that local councils investing in low carbon infrastructure can create massive benefits for a region, including savings on energy bills and the creation of thousands of jobs (Gouldson et al., undated). The actual *Stern Review: The Economics of Climate Change* can be downloaded via a google search.

7.4.5 The role of local authorities

> *Local authorities have a crucial role in helping the UK reach its ambitious carbon emissions targets.*
>
> Committee on Climate Change, 2012

Local authorities have significant influence on the development of sustainable buildings, renewable and low carbon energy, sustainable transport, locally grown food, reduction of waste and other aspects of a low carbon economy. They are ideally placed to link top-down policies and bottom-up delivery, and are major players in the local economy, as purchasers of goods and services and as local regulators (Damso et al., 2016). The role of local governments in governing climate action can be categorised in the following way (UN Habitat, 2015):

In house: Management of municipal buildings, land and facilities. Local government's energy spend in 2012 was estimated to be around £900 million (LGA, 2016b).

Public provision: Local government-led development of low carbon infrastructure and services. For example, councils are responsible for delivery of social housing, social care, transport and education.

Public-private provision: Development of low carbon infrastructure and services with private sector engagement.

Regulations and incentives: Local governments are responsible for local planning of housing, transport, waste and mineral extraction, and small-scale energy schemes; they also set local council tax and business rates.

Enabling and supporting: Provision of information, awareness raising and demonstration projects to encourage action by local people and support for community-led initiatives.

Corporate-community-led: Direct action taken by corporates and communities that are outside of council influence but aligned with local policy goals.

Climate Local is a Local Government Association (LGA) initiative to "drive, inspire and support council action on climate change", which helps councils to reduce greenhouse gas emissions and increase resilience in the face of climate change (Climate Local website). In January 2016, 113 councils (of which 112 were from England) and one national park authority had signed up, which requires them to outline commitments and actions on climate change (LGA, 2016b). This represents only a third of councils in England (ibid).

By contrast, all but four of Denmark's 98 municipalities have a Climate Action Plan and 79% of these have community carbon targets, nearly half of which are above the national target (Damso et al., 2016). The rural municipality of RinglobingSkjern in West Jutland has a target of 100% self-sufficiency in renewable energy by 2020, largely based on local businesses (ibid). Fifteen municipalities have a target of becoming carbon neutral for the entire municipality (producing enough renewable energy to offset fossil fuels in transport) and a further four for heating and electricity sectors only, while five municipalities aim to be free of fossil fuels entirely, in one case by 2025 (Damso et al., 2016). Local authorities in the UK could do well to follow Denmark's example.

Many UK authorities have developed innovative approaches to promote low carbon solutions, and can be pioneering in their transition to sustainability or through ambitious setting of environmental targets. Examples include:

Food: In Scotland, local authorities are required to offer a food waste recycling service to households, which is driving an increase in the amount of food waste being recycled (mainly at anaerobic digestion plants) (Renewable Energy Association, 2016).

Transport: Nottingham's Workplace Parking Levy reduces the incentive for employees to drive to work and raises finance for new public transport infrastructure (see case study in section 7.5.1).

Buildings: The comprehensive redevelopment of a high rise housing estate in Tower Hamlets, London, has seen residents rehoused in newly refurbished flats with much reduced energy bills and improved health and well-being for residents (UKGBC, 2015).

Energy: Nottingham City Council is the first city to become a fully licensed independent supplier. Its company Robin Hood Energy is the first local authority owned energy company run on a not-for-profit basis since the market was nationalised in 1948 (see case study, section 7.5.5). Bristol City Council has set-up Bristol Energy – a municipal energy company owned wholly by the council. It aims to reinvest profits to fight against fuel poverty and support locally generated renewable energy.

Many local authorities were in a good position to deliver Green Deal programmes but have now had to withdraw schemes, highlighting the importance of longer-term strategic planning (Rosenow and Sagar, 2015). There is a role for local authorities as delivery partners but, in the current climate of cuts, few of them have suitably qualified and experienced people. There needs to be a framework of powers and responsibilities as well as a way of measuring and comparing performance.

Budget cuts are making it extremely difficult for local authorities to continue existing services and projects, let alone initiate new ones. Increased revenue funding is necessary as well as capital investment. However, some local authorities have worked around the funding cuts by pooling resources, partnership working and use of volunteers (LGA, 2015a).

In the case of transport, London has a unique advantage over other UK cities receiving a steady stream of transport funding from the congestion charge, a revenue grant from central government that is renewed on a three-yearly basis, as well as part of the Council Tax on London residents. However, in other parts of the country the funding mechanisms are far more complicated resulting in short-term planning horizons due to uncertainty of funding (Palmer et al., 2011). An immediate measure that can help is combining local authority transport capital and revenue funding, as well as allowing the use of other budgets for transport projects that deliver health and other targets (LGA, 2015b). Money currently lost to shareholders of private bus companies across the UK could also be ploughed back into services, were they to be returned to municipal ownership.

In the absence of further government funding, local authorities can also fund infrastructure and behaviour change programmes through other ways, including: development planning

contributions (known as Section 106 or, more recently, Community Infrastructure Levy); congestion charging; parking charges, and; funding from health or growth/ regeneration pots. Local authorities also have considerable financial resources, largely untapped, in the form of their pension funds. There is huge potential for reinvestment of some of the money in their pension funds into more environmentally and socially beneficial projects (see section 7.6.1).

There are also good opportunities for councils to make significant financial savings from energy efficiency and increase revenue from renewable energy schemes (LGA, 2016a). For example, it is estimated that solar and medium wind schemes could generate income of up to £790,000 a year for a county council that owned and operated them (ibid). While a package of energy efficiency measures could save between £60,000 and £2.4 million a year depending on council size (ibid). Many local authorities have set up their own renewable energy schemes (see box, right).

Examples of city and local authority renewable energy schemes in the UK

The Bristol Solar City project aims to install 1GW of solar photovoltaics (PV) by 2020, with opportunities for local community groups to invest in installations on council properties rent-free.

Lancashire County Pension Fund has committed approximately £200 million to low carbon projects, including a £12 million investment in Westmill Solar, a community solar project.

Cornwall Council has supported a wide range of community energy projects throughout the county through a revolving investment fund of £2 million. The projects include electric vehicles, energy efficie y and renewable energy, including geothermal, marine, biogas and solar.

Lambeth Council is partnering with Repowering London – a non-profit th t facilitates community owned renewable energy projects – to offer community shares and raise citizen loans. The aim is to raise £180,000 to invest in community owned solar projects on housing estates in Brixton.

Thamesway Energy is a Municipally Owned Energy Service Company (MO-ESCO) with renewable energy assets in Woking and Milton Keynes. Energy is distributed over a private-wire electricity network and a heat distribution network.

7.4.6 The role of cities

> *We believe that a better global future lies in urban innovation and action. As the majority of future humans will live in cities, it just makes sense that our solution to climate change will reside there too.*
>
> C40 website

Urban density presents many opportunities that enable more efficient infrastructure and planning. As with smaller local authorities, cities are also in a position to catalyse wider climate action, using innovative approaches and governance techniques, even where they don't have strong power (Arup, 2015). To help cities plan for climate action, a number of guiding principles have been developed, the first of which aims to ensure cities are ambitious and that planning reflects the scale and urgency of the challenge (UN-Habitat, 2015).

Some cities have already set themselves ambitious goals. For example, Adelaide in Australia aims to be the first carbon neutral city in the world, with a plan to achieve that in less than five years (South Australian Government website). Copenhagen is close behind with plans to be carbon neutral by 2025 (State of Green website). Munich, Germany has a target to supply the entire municipality of one million people with renewable electricity by 2025. The city has already invested €900 million in renewable energy projects and has plans to invest €9 billion to deliver its 2025 target (C40, 2014 in Platt et al., 2014).

A global network of over 7,000 cities, including nearly 40 in the UK, have signed up to a common platform for the sharing of data and knowledge, and pledged to reduce carbon dioxide emissions by at least 40% by 2030 (Covenant of Mayors for Climate and Energy website). Signatories have to submit within two years a Sustainable Energy and Climate Action Plan (SECAP) outlining the key actions they plan to undertake (ibid). In addition to this, a network of more than 80 of the world's biggest cities (C40), including London, has been collaborating since 2006 to drive urban action on climate change (C40 website).

In the UK, eight 'city deals' have enabled cities like Birmingham to deliver low carbon growth, through £3 million government funding to trial new technologies and engage residents on domestic energy reduction (Scott, 2012; NAO, 2015). The Government's Local Sustainable Transport Fund (LSTF) has also enabled over 40 local authorities including cities to invest in sustainable transport infrastructure and services (LSTF website).

There are a large number of good practice examples of how cities are leading the way on climate change (C40 2016b):

Food: Milan's Mayor initiated a Milan Urban Food Policy Pact, signed by 100 other mayors, to create a network of cities developing and implementing sustainable food systems (Milan Urban Food Policy Pact website).

Transport: Oslo, Norway is now the electric vehicle capital with the highest number of EVs per capita achieved through a range of incentives and over 1,000 electric vehicle charging points installed.

Buildings: New York's Greener Greater Buildings Plan is one of the world's most comprehensive energy efficiency packages, affecting half of the city's building volume.

Energy: The redevelopment of Heygate, an old social housing area in Elephant and Castle, London, uses highly efficient technologies like combined heat and power, and is projected to be climate positive with a reduction of over 10,000 tonnes of greenhouse gases annually.

Cities and local authorities can be key drivers for a decentralised, renewable energy system. Through a twin approach of engaging in the energy supply market and raising finance for low carbon energy infrastructure (both inside and outside city boundaries), it is argued they could transform the energy system to make it cleaner and more affordable while providing opportunities for job creation and growth (Platt et al., 2014). Decentralised energy can be used to improve city and local authority finances by generating income directly through ownership or indirectly through the business rates paid by decentralised energy schemes (ibid).

7.4.7 Further devolution to local authorities

Devolution deals for English local authorities also offer opportunities for additional control and innovation, though it is unclear at this stage whether this will help the transition to zero carbon. Although it has been suggested that the areas proposed for devolution were being set-up to fail as they were the ones that have suffered the greatest cuts (Sandford, 2016), there is hope that devolution can bring about progressive change (Millett, 2016). For example, the Greater Manchester local authorities are planning to form a local energy supply company that would reinvest funds in local communities, and are taking steps that would make Manchester 'a globally recognised low-carbon hub' (ibid). While these plans existed before the proposals for devolution, they will be made easier as a result due to the greater levels of control and additional funding (ibid). A devolution deal for Cornwall also proposed a low carbon enterprise zone with support

for geothermal energy, smart grid solutions, energy efficiency and roll out of community energy schemes (Cornwall Council, 2015).

In future, a strengthened role for local authorities in delivering energy efficiency schemes, either directly or supporting community interest organisations, is needed. There is also scope for local authorities to provide Council Tax rebates for properties that are more energy efficient. The freedom for local areas to push ahead with higher standards of energy efficiency, energy performance or on-site renewable energy, where they deem it appropriate, is an important one. It allows local areas to experiment, demonstrate what is possible, and develop knowledge and skills for new technologies and building methods. Given the freedom, some local areas may choose to be very ambitious. This has occurred in Ireland, where some local authorities, such as Dun Laoghaire-Rathdown County Council and Dublin City Council, have adopted a requirement that all new buildings must meet 'Passive House standard or equivalent' (Colley, 2016).

There are proposals for additional devolution to Scotland, Wales and Northern Ireland, while the future independence of Scotland is also still a possibility. The results reported by the Committee on Climate Change suggest that Scotland is leading the UK with more ambitious climate change targets and has performed better than the UK as a whole in reducing greenhouse gas emissions (Committee on Climate Change, 2015c; 2016b). Similarly, despite less devolved powers than Scotland, Wales has initiated some groundbreaking measures such as a new Well-being of Future Generations Act (see Section 7.6.5).

7.5 Economics and finance

There is an urgent need for a shift in economic ideology away from an outdated economic model that has exacerbated environmental problems and inequality to a fairer and more ecologically sustainable economic paradigm. Many argue there is a need to focus completely on wider goals set by society, that work within the limits of natural resources, rather than simply increasing GDP. This transition can be facilitated through business and ownership models based on broader environmental and social objectives rather than a narrow focus on profits and returns to shareholders.

There needs to be a level playing field for low and zero carbon alternatives so that the large subsidies for fossil fuels are removed and their price reflects the full costs of pollution and other societal damage. There is a clear opportunity for new forms of financing the investments we need in energy, buildings, transport and food systems that also have lower societal costs and provide multiple benefits, such as jobs, improved health and cleaner air.

7.5.1 Level the playing field: taxes and charges

Low carbon alternative technologies, infrastructure, services and behaviours are often more expensive than fossil fuel-based alternatives. This is because there is not a level playing field: there is a greater level of government subsidy given to the fossil fuel industry, and the societal or 'external' costs of the industry (for example, the health costs of air pollution) are not currently accounted for in their pricing (IMF, 2015).

Photo by Ozzy Delaney / CC BY 2.0

Tax unsustainable options

In terms of encouraging behaviour change in food choices, taxation could be a useful tool. The government has the ability to impose the necessary taxes and new regulations, and indeed has done so with regards to improvements in other areas, such as transport and housing (Bailey et al., 2014). As price is one of the primary influencers in consumer choice for food, incentives could be developed to make sustainable options more financially appealing. Taxes could be levied against unsustainable foods, such as meat and dairy products. Moreover, subsidies should be switched from high carbon food products, such as lamb and beef, to lower carbon plant-based food items, such as fruits and vegetables (Cumberlege et al., 2015).

The money raised from various taxes could be used in improving nutrition, education, public health and exercise programmes (Cafaro et al., 2006). This would help to mitigate a negative response from the public by ensuring that the money raised is of benefit to the whole of society (Wellesley et al., 2015).

A study that compared the responses of the American and Brazilian governments to the obesity crisis found that upstream interventions are the more effective. Unlike in America, policies were implemented in Brazil to help local authorities make positive changes to their health care systems alongside the development of awareness campaigns. Public health services were better funded and obesity prevention programmes were also introduced. They also successfully managed to regulate food markets in Brazil, which is now internationally recognised as having one of the most effective obesity prevention programmes in the world (Gómez, 2015).

Taxes can also be an effective measure in the transport sector. Motoring taxes that reflect the full societal cost of driving, such as fuel duty (levied on petrol and diesel at the pump) and Vehicle Excise Duty (VED), are important environmental policy tools to encourage greater fuel efficiency and a shift to more efficient vehicles. While fuel costs are just part of the overall cost of motoring (which also includes insurance, vehicle tax, maintenance and repairs, purchase, depreciation), this is the most obvious cost component of running a car. High fuel costs tend to suppress driving as people make fewer unnecessary journeys (Hopkinson, 2012). The successful policy of graduating VED by carbon dioxide emissions (replaced in 2015 with a flat rate for 95% of cars) needs to be restored, and fuel duty needs to rise to reflect the full costs of motoring to society.

Another financial incentive for newer and cleaner vehicles, such as electric buses, is the introduction of clean air zones in Birmingham, Leeds, Nottingham, Derby and Southampton by 2020 as a result of high levels of air pollution. While this will not affect private cars, the owners of the most polluting buses, coaches, lorries and taxis will have to pay a charge to enter the zones, but newer and cleaner models will be exempt (newer models tend to have lower greenhouse gas emissions) (DEFRA, 2015c).

Using fiscal measures can also be effective to suppress demand for air travel. Air travel demand is relatively inelastic, so that prices would have to go up considerably to drive down demand (Brand and Boardman, 2008). This would most likely be resisted by the airline industry and national governments (Grote et al., 2014).

Given the disproportionate impact of flying by a relatively small proportion of wealthy individuals, a frequent flyer tax has been proposed as a more politically acceptable solution to replace Air Passenger Duty. This focuses efforts on the frequent flyers while still allowing for occasional holidays and the economic benefits of international trade and inbound tourism (Murray, 2015b). Under this proposal, a levy is set at zero for the first outbound flight and then increased progressively for each subsequent flight (for example, £20 for the second flight, £60 for the third, reaching £420 by the ninth flight). This is estimated to prevent passenger demand from increasing by more than 60% in 2050, as well as raise £9.7 billion a year for the Exchequer by 2030, far in excess of the revenue projected from the Passenger Air Duty (Devlin and Bernick, 2015). The excess revenue can be used to support improvements to rail infrastructure and rolling stock. While international aviation is often promoted as benefiting the UK economy, instead it is a massive drain with the UK trade deficit on air travel and tourism estimated at £16.9 billion in 2015 (ONS, 2016) as money is taken out of the economy by British people holidaying abroad.

Congestion charging and road pricing

One of the fairest and most effective disincentives to driving is road pricing, which has been consistently recommended as a way forward by countless government and external studies (for example, Eddington, 2006; Johnson et al., 2012; DfT, 2012).

Congestion charging (a form of road pricing) has been successful in London in both reducing car dependency and raising revenue for investment in public transport and other infrastructure. In 2013 car driver trips in London were 14% lower than in 2001, despite a 15% increase in London's resident population over the same period, while the volume of road traffic fell by a similar amount (TfL, 2014).

National road pricing covering all roads is thought to be technically feasible in the next few years, with significant benefits for the environment, economy and social inclusion (DfT, 2012). This would consist of a distance charge set by Government with variations by time and place so that drivers would pay more on congested roads (for example, in town and city centres) and less on uncongested roads (for example, on rural roads) (ibid). Road pricing could gradually replace fuel duty, which will become redundant as more people switch to electric vehicles.

However, despite the demonstrable benefits of congestion charging it has proved extremely difficult to win public and political support. In Edinburgh and Greater Manchester proposed congestion charges were overwhelmingly rejected by the public in referendums in 2005 and 2008 respectively, and the political difficulties makes it much less likely to be adopted elsewhere (Mullen and Marsden, 2015). The failure to win support for charging schemes outside London has been explained by a lack of information and a lack of belief in the charge's effectiveness (Hensher and Li, 2013).

While congestion charging appears regressive, as the payment as a proportion of total income decreases as income increases, detailed analysis shows that the poorest income group as a whole suffers the lowest average burden of the charge, since a higher proportion of poorer households than richer households do not own a car (Blow et al., 2003). Clearly, those low-income households with a car will be affected, but on the whole many more low-income households benefit from the improved public transport than are burdened by an increased charge. A road charge could also progressively replace fuel duty as electric vehicles become more popular, so it is not an additional burden on poor car-owning households.

Workplace parking charges

Using economic disincentives to drive, combined with incentives for alternative travel, has been shown to be highly effective at both a workplace and national level:

- In central Cambridge, car commuters were much more likely to walk or cycle for part of their journey if their workplace restricted parking or charged for it. The study found 90% of people drove to work if there was free workplace parking, 65% if they were charged parking and 20% if there was no parking (Goodman et al., 2011).

- An Australian study found a 42% reduction in driving at one hospital that implemented restrictions on parking and introduced paid parking compared to a 5% reduction at an adjacent hospital that introduced measures to encourage sustainable and active travel but had no 'stick' measures (Petrunoff et al., 2015).

- A review of 20 (mainly private) UK organisations found those who had restricted parking in some way achieved more than twice the reduction in car use compared to those who had not (Cairns et al., 2010).

While Australia is a world leader in introducing Workplace Parking Levies (WPL), to date only one UK local authority, Nottingham City Council, has introduced a WPL (see case study below).

Food production subsidies

Reducing subsidies for livestock and increasing environmental subsidies could help livestock farmers to grow a wider variety of protein sources and diversify their income away from animals alone. Studies have shown that linking productivity to greenhouse gas emissions can be an effective way of lowering emissions related to livestock, but these reductions will not be enough to prevent serious levels of climate change (Garnett, 2014). Policies could be created that reward farmers for sustainable practices: as livestock subsidies decrease, environmental subsidies can increase, presenting opportunities for energy crops, wildlife restoration and better land management. Taxes could also be dropped for all organic or diversified production systems, and for animals reared to high welfare standards, and taxes introduced and/or increased on fertilisers and pesticides (Cafaro et al., 2006).

7.5.2 Remove fossil fuel subsidies and introduce carbon pricing

The scale of government subsidies for fossil fuels worldwide calls into question the commitment to internationally agreed climate targets (Bast et al., 2015). Greater transparency on this can help expose government hypocrisy on climate change (Compston, 2014).

CASE STUDY: *Nottingham's Workplace Parking Levy (WPL)*

(Dale, 2016)

What is the Workplace Parking Levy?
Nottingham's Workplace Parking Levy (WPL) was introduced in 2011 to tackle the problems of congestion by providing funding for public transport and acting as an incentive to find alternatives to driving to work. Employers with workplace parking in the City are required to licence any parking place and are charged if they have 11 or more parking places for staff (excluding blue badge places). The annual levy is currently set at £379 per year per parking space and set to rise each year by the rate of inflation. The revenue raised over 23 years will go towards an extension to the existing tram system, redevelopment of the railway station and support for the bus network.

What were the barriers to implementing it?
The main barriers were public and business acceptance. There was much public opposition when it was proposed, with the business community particularly critical. Prior to its implementation it was argued that the levy would discourage business investment and damage the economy, was unfair to motorists and would be ineffective against congestion (Dale et al., 2014). Before it was introduced 60% of businesses surveyed said they would relocate some activities away from Nottingham and more than 50% said they would reduce planned investment (ibid). However, the proposed cost of the WPL was less than 1% of turnover in most cases and was unlikely to have a significant adverse effect on employers' investment and location decisions (ibid).

How were the barriers overcome?
Nottingham City Council's long-term political stability is thought to be the main factor which allowed it to take the political risk of implementing a scheme that would provide long-term gains but with short-term pain. There was already a strong sustainable mobility culture in the Council and history of innovation, helped by the fact that many elected Members and officers had been in post for a long time and had a good understanding of the traffic issues and potential solutions. Although new taxes are always unpopular, the Council took the view that people working in the city had a choice to avoid it by travelling differently. The Council also provided exemptions for small employers (<10 parking places) as well as key public sector workers like the NHS, which meant most of the burden fell on the largest companies who were more able to pay. The council also tried to make it as easy as possible for employers and ran an extensive communications campaign. The final decision was made by an independent Planning Inspector,

which was seen as fair and free from political influence.

What have been the results so far?
The WPL has funded the extension of the tram system to the south of the city. In the first year of operation it raised £7.77 million of revenue, of which £7 million was ring-fenced for public transport improvements. As the tram was only completed in September 2015, the longer-term impacts on congestion will not be apparent for some time. However, the share of people using public transport for travel in the inner city area has risen to 40% for the first time and the large number of passenger journeys on the tram suggests that it is helping take cars off the road. Since the scheme was implemented there has been a reduction in parking spaces. The council have tracked inward investments to the city and there is no evidence that the WPL is acting as a deterrent to business, nor is there any rational business case for relocation based on the WPL. An evaluation of the WPL by the City Council in partnership with Loughborough University will report back in 2017.

Can it be replicated elsewhere?
Other councils will need a high degree of political will to propose this in the face of inevitable opposition from business. However, in a climate of severe budget cuts this measure is a promising way to fund key public transport improvements.

Phasing out fossil fuel subsidies presents an opportunity to shift public finance into renewable energy sources, though this will require a great deal of political will and overcoming blocks to reform by vested interests. A report by the Nordic Council of Ministers provides useful guidance on the principles for successful reform of subsidies, including clear and robust consultation and communication to build support (Merrill et al., 2015). Several case studies show how good communication helped build support for reforms that entailed an increase in consumer energy prices, and cases where reform was hindered by a failure to engage stakeholders properly leading to public protests (ibid). New or improved social safety nets have been provided in many countries to facilitate reform. For example, reforms of coal subsidies in Germany and Poland were accompanied by support for regional economic development, social assistance and generous severance packages for affected workers (ibid).

Carbon pricing

Moving from a fossil fuel economy to one based on clean energy could be achieved by applying a carbon tax to all fossil fuel use. Renewable electricity generation is already cost competitive with fossil fuels without subsidy in many situations around the world, and will be competitive in the UK provided fossil fuels pay a fair carbon price. To

create a level playing field between fossil fuels and clean energy sources it is necessary to include the pollution costs in the prices of fossil fuels (Lagarde, 2015). This is known as the 'polluter pays' principle.

A global carbon price (and prices on other greenhouse gases in proportion to their warming potential), delivered by carbon taxes or carbon trading, would reduce emissions sharply in a cost-effective way. In practice, this will be difficult to achieve but something we should work towards. It is difficult to be sure exactly what level the carbon price should be. For the UK, the Committee on Climate Change (CCC) has suggested that a price of £30 per tonne of carbon dioxide equivalent in 2020, rising to £70 in 2030, would be consistent with achieving UK Government targets for emissions reduction (Bowen, 2011). A higher carbon price may be needed for the more rapid emission reductions many believe are necessary.

In order for such a carbon price to be politically acceptable, it has been suggested that the revenue generated should be returned to all citizens on an equal share per person basis. Whilst such a levy would raise energy prices, many people, particularly those on lower and middle incomes, who generally pollute less, would come out ahead financially (Hansen, 2015).

Carbon prices are already being applied around the world, albeit at a generally very low carbon price and with only partial coverage of fossil fuel use. It is estimated that 20% of global greenhouse gas emissions are now subject to some form of carbon pricing. For example, Canada's province of British Columbia introduced a revenue-neutral carbon tax (where revenue is used to reduce other taxes). Since 2008, when the tax was introduced, the province's fuel consumption has reduced by nearly a fifth; GDP has kept pace with the rest of Canada; and the tax shift has enabled British Columbia to have Canada's lowest income tax rates. About 60 other countries, states and provinces are now considering implementing carbon pricing (Skeptical Science, 2016).

Renewable subsidies

There is a need for support to overcome the infrastructural and regulatory barriers of an energy system designed and built for centralised generation and fossil fuels. In the absence of fair prices for fossil fuels and the necessary level of carbon pricing, there is a strong case for subsidising renewable energy sources to incentivise their uptake.

New technologies need support to develop the scale of production necessary to reduce costs. Schemes like the Feed-in Tariff have been very successful in incentivising the uptake of renewable energy and reducing their costs. However, an important distinction is that these subsidies are transitional and, in time, renewables will compete without subsidy. In the UK, it is predicted that onshore wind and large solar farms are likely to be

competitive on cost, without subsidy, with new gas-fired power generation by 2020, provided gas pays its fair share through a carbon price (Committee on Climate Change, 2015a). Globally, various forms of renewable energy have already achieved cost parity with fossil fuel generation. These include solar power in North and South America, offshore wind in Asia, and onshore wind in many regions (IRENA, 2015).

Where governments have subsidised renewable energy, deployment has been rapid and costs have reduced. For example, Germany's pioneering Feed-in Tariff guarantees good prices for energy from renewable sources such as solar photovoltaics (PV). The policy has proved extremely effective: by 2015 Germany had a world leading 38GW of solar PV, generating 7.5% of their electricity. They have also seen a dramatic reduction in the installed cost of PV – from 500€/kW in 2006 to 1,300 €/kW in 2015 (Wirth, 2015).

Despite the common perception that subsidies for renewables raise energy bills, when all government policies are taken into account, including those for energy efficiency, analysis shows that average energy bills are lower than they would otherwise be (DECC, 2014c). In addition, estimates of the impact on bills of renewable energy subsidies have been criticised for not including the reduction in the wholesale price of electricity caused by increased supply from renewables. It has been estimated that renewables reduced the wholesale price of electricity by £1.55 billion in 2014, with a potential knock-on reduction in consumer bills (Good Energy, 2015).

Meeting the costs for subsidies through general taxation rather than passing on the cost to consumers through energy bills may be both fairer and more popular but would be necessary to overcome political resistance to higher government spending.

Interventions are also needed in the energy market so that saving energy is prioritised over new supply. Changes to the electricity market have been proposed by Green Alliance who advocate the creation of a 'negawatts' Feed-in Tariff paid on the basis of avoided energy consumption, with recipients competing in auctions to deliver energy savings in homes and businesses at lowest cost. In addition, the electricity market must be reformed so that energy demand reductions can compete on an equal basis with electricity generation in the so-called 'capacity market', which aims to ensure that there will be enough supply to meet demand at all times (Mount and Benton, 2015).

7.5.3 Access to finance: local, municipal banks and citizen finance

Alternative forms of finance are needed to address the investment gap for renewable energy and other technologies and infrastructure.

In economic terms the capital requirement for much of the transition to a zero carbon economy

(infrastructure, services and so on), is 'productive spending' as it benefits the economy – for example, in terms of cleaner air, improved health, more employment. It can also help individuals save money – for example, through reduced energy bills as a result of improved building insulation and energy efficiency. Cuts in productive spending, such as many of those implemented through austerity measures, can actually significantly weaken the economy (Ostry, 2016).

Local and municipal banks

Germany's long tradition of civic and municipal ownership of energy supply is thought to have been facilitated through regular access to finance from co-operative, state owned and local banks (Barton et al., 2015). Local financial institutions are able to build project expertise, develop ties with local government and co-ordinate local stakeholders.

It is a similar story in Denmark where co-operatives and, more recently, larger-scale citizen ownership models contributed to a rapid expansion of onshore wind (ibid). If the UK is to achieve levels of community or civic energy ownership similar to other European countries, it will require the growth in citizen and mutual finance that supported the growth of the European civic energy sector (Johnson and Hall, 2014).

Citizen finance

Examples of emerging citizen finance in the UK include Abundance Investment, which offers debentures for small-scale investors, and Pure Leapfrog, which provides affordable finance through a Community Energy Fund. There are also community banks, such as Robert Owen Community Banking, which seek to invest in community energy projects. The County of Hampshire is in the process of establishing a community bank and cites the example of the German banking model in supporting renewable energy as an inspiration (Johnson and Hall, 2014).

Crowdfunding is where the public are able to invest in new businesses, films, community projects and other ventures. This can be preferable to traditional funding because any risk can be spread between a large number of people, who all only stand to lose a small amount if something goes wrong. It's an effective way to fund projects where lots of people benefit a little, for example community projects. The investor's, 'return' can be varied, from a copy of a film to a stake in a company, or simply a sense of being part of a project.

Peer-to-peer lending is normally used to finance a venture from an existing organisation. It can be used for microfinance but can also offer small business loans.

Low and zero interest loans

A big opportunity missed by the Green Deal was to make the cost of capital cheaper by providing low or zero interest rate loans. Given the long payback periods for some energy efficiency measures and the tight margins by which they are cost-effective, this is vital to incentivise higher uptake. Low interest rate 'preferential' loans (at 3% interest or less) would make a scheme like the Green Deal much more attractive than it was with commercial interest rates (of around 7% or more). Such low interest rate loans could be provided by the UK Green Investment Bank – and perhaps should have been in the case of the Green Deal (Shankleman, 2015).

In the Netherlands, the government had a scheme similar to the UK Green Deal domestic housing refurbishment scheme. While the Green Deal was considered a failure due to low uptake, in the Netherlands the scheme was hugely successful. A key difference was the interest rate. In the UK it was around 8%, whereas in the Netherlands it was around 2%. Due to the success of the scheme in the Netherlands their suppliers are looking to export to the UK and France. In Scotland, zero interest rate loans are being provided for energy efficiency measures through the Home Energy Efficiency Programme (EST, undated). It is unfortunate that, following the scrapping of the Green Deal, the repayment of these loans cannot be tied to the property's energy bill.

Central bank and intra-bank (between banks) lending has a very low interest rate (around 0.75%). If this was also available for low risk renewables, for example, wind, solar PV and hydro with accredited developers, then this could have a huge impact on the projects that were commercially viable. While a greater role for government leadership in the transition to zero carbon would be welcome, giving the renewables industry similar treatment to the banking sector could radically change our domestic position by allowing greater deployment of renewable energy and a faster transition.

To be most effective it is important that subsidies provided for energy efficiency measures are integrated with a 'pay as you save' loan system (Green Age, 2015), so that the maximum number of households can be incentivised to undertake energy efficiency measures for a given subsidy budget.

A simpler, lower cost 'pay as you save' loan system than that currently available lets people borrow what they need. There are good examples of well designed schemes from the public sector. Salix have provided interest-free loan schemes for energy saving investments, paid back through energy savings, which have proved popular with local authorities, the NHS, schools and universities (Salix, undated). Nottinghamshire has used the Local Authority Energy Finance (LAEF) scheme to carry out energy saving improvements in over 75 schools (Nottinghamshire County Council, undated). There are also examples of successful low interest 'pay as you save'

loan schemes from other parts of the world, as shown in the box below.

Similarly, to overcome the barrier of higher upfront costs in buying more efficient appliances, small amounts of low cost finance may be helpful to allow the purchaser to spread the additional cost over time. This could make the upfront cost no more than for less efficient models and allow the extra cost to be paid off as the user benefits from lower energy bills.

Green mortgages

An alternative solution to cover increased construction cost is to provide specific finance, such as green mortgages, for the additional build cost. The repayment of this finance can then be spread over time as the occupants benefit from very low energy bills. This requires a willingness on the part of buyers to pay an upfront premium for highly energy efficient homes in recognition of their low running costs.

Additional build costs for energy efficiency measures can in this way be passed to the owner. Some organisations, such as the Ecology Building Society, are already showing a willingness to provide such finance. This may reduce developer resistance to higher energy efficiency standards as the costs would be passed to buyers. An alternative way to raise finance to fund the zero carbon transition is a Tobin Tax commonly known as the Robin Hood Tax.

7.5.4 Alternatives to growth and GDP

> *Questioning growth is deemed to be the act of lunatics, idealists and revolutionaries.*
>
> Tim Jackson, 2009

Global economic growth has been the main driver of climate change (Antal, 2014). Yet, despite the clear undesirability, not to mention logical impossibility of infinite economic growth, the need for growth remains largely unquestioned. As Herman Daly pointed out while most standard economic models assume that "natural resources" are a subset of the human economy, it is in fact the other way around (Daly, 2007).

Green Growth

The response to the negative impacts of our highly industrialised and globalised lifestyles has been the development of 'green growth' or 'green capitalism', which relies on nominally free markets and market-based instruments to address environmental problems. It is argued by proponents that market approaches which link self-interest to

CASE STUDIES: *Examples of successful 'pay as you save' energy efficiency loan schemes from other parts of the world*

How$mart, Midwest Energy, USA
Available to Midwest Energy customers, How$mart provides money for energy efficiency improvements, repaid through energy savings on customers' monthly energy bills. A monthly How$mart surcharge covers the cost of qualifying improvements, and the surcharge is estimated to be less than the projected savings. Additionally, the surcharge is tied to the location. If the property is sold, the next customer pays the surcharge. The process starts with an energy audit to determine potential savings. Midwest Energy then develops a conservation plan with recommended improvements (Midwest Energy, 2016).

PACE (Property Assessed Clean Energy), PACE Nation, USA
PACE operates across the USA providing loans for energy efficiency, renewable energy and water conservation upgrades to buildings. PACE pays for 100% of a project's costs and is repaid for up to 20 years with a charge added to the property's tax bill. PACE financing stays with the building upon sale. State and local governments sponsor PACE financing to create jobs, promote economic development and protect the environment (PACE website).

Energiesprong, Netherlands
Energiesprong aims for large-scale uptake of highly ambitious net zero energy retrofits. Householders have an energy contract similar in cost to their pre-retrofit energy bill. The energy contract provides an energy allowance that should meet the householders needs – additional energy consumption must be purchased at additional cost to deter excessive/wasteful energy use and ensure that the financing is sufficient. Upfront cost is repaid over time by the difference in cost between the energy contract and the actual energy use. See section 7.4.3 and Stories for Change in Section 6.6.4 for more details.

KfW Bank, Germany
The German infrastructure bank KfW underwrites 'pay as you save' loans for energy efficiency improvements provided by retail banks lending to households. The system is such that the higher the energy efficiency standard that is achieved, the smaller the fraction of the loan that must be repaid, up to a maximum 30% reduction. This incentivises people to take out larger loans and retrofit to better standards, undertaking ambitious whole-home retrofits rather than smaller, single measure improvements (KfW, 2016).

environmental outcomes are a more flexible way to increase efficiency, innovation and profits while achieving environmental goals (Mansfield, 2007).

This approach embedded environmentalism into the existing neo-liberal system rather than challenging the fundamental problems of growth. It proved popular with a whole generation of policymakers and environmental NGOs who promoted green consumerism and market-based solutions like tradeable permits (Prudham, 2009). Even the Kyoto Protocol had flexible mechanisms to 'deploy markets as the solution to environmental problems' (Bakker 2007).

A large part of the concept of 'green growth' is the idea of dematerialisation, which is the degree to which economic growth can be 'decoupled' from energy and material use through greater production efficiency. This has been suggested as a way of achieving growth without the environmental side effects (Doll, 2010). There is some evidence that it can help.

Between 2000 and 2014, 35 countries managed to increase their GDP whilst decreasing their 'production' (domestic) emissions of greenhouse gases (Carbon Brief, 2016). While some of this would have been achieved by countries 'exporting' their emissions, 21 of those countries also managed to increase their GDP whilst decreasing their 'consumption' (domestic and international) emissions of greenhouse gases (ibid).

However, while this absolute decoupling is encouraging, these changes are relatively recent and it is unclear how long this can continue. This decoupling is also only evident for energy use and carbon emissions and doesn't address the impacts of growth on ecosystems and unsustainable material and resource use. Relying on decoupling to happen fast enough to avert our already changing climate is a high risk scenario. In general, the impacts of growth tend to swamp any efficiency gains (Lorek and Fuchs, 2013). While technical efficiency improvements leading to dematerialisation and decoupling are necessary, they are insufficient. The urgency of the ecological crisis requires us to address the issue of continued growth.

Degrowth

Degrowth represents a shift away from the prevailing paradigm of economic growth. It has been defined as a "downscaling of production and consumption that increases human wellbeing and enhances ecological conditions and equity on the planet" (Research and Degrowth website). It is not the same thing as recession or depression (Kallis, 2015) and is based on the idea that societies can prosper and people can flourish within the ecological limits of the planet without economic growth (Jackson, 2009).

Others have similarly argued that growth isn't possible and a new economic model is needed (Simms and Johnson, 2010). The idea of degrowth is that everyone can live a good life

without the need for growth. This will require some radical cultural and structural changes. This includes a re-evaluation of 'work' to include household, family and voluntary work that produce social 'use value' and not just monetary 'exchange value' (Joutsenvirta, 2016). Degrowth proponents believe it is possible to have meaningful work, sustain a functional welfare state and increase equality and eliminate poverty, without ever continuing growth (Degrowth website).

The idea that growth creates work and generates wealth is a powerful one which makes challenging the growth paradigm more difficult. Yet, according to the Secretary General of the Club of Rome, growth does not create jobs, it destroys them (Maxton, 2015). In the last 35 years, the world has experienced the fastest economic growth in human history, but at the same time unemployment has gone up (Maxton, 2015) both in absolute and relative terms.

Economists are also familiar with 'persistent jobless growth' – identified by the World Economic Forum as one of its 10 upcoming global trends in 2015 (Summers, 2015). Yet, economists' belief and reliance on 'Okun's Law', an economic rule which suggests a positive relation between output and employment, remains strong (Antal, 2014).

Degrowth is still not considered a realistic alternative by most mainstream economists and there is still scepticism about whether degrowth can be put into practice. Some researchers have suggested that "it seems easier to imagine the end of the world than to imagine the end of growth" (Evans, 2012). Yet there is a growing community of researchers and practitioners and debate around the practical measures that will help put degrowth into operation (Degrowth website).

Some of the institutional changes that are suggested will be needed include a guaranteed basic income, a shorter working week and job-sharing, removal of subsides for polluting activities, green tax reform and reducing advertising (Evans, 2012; Kallis, 2015). These policies would reduce economic insecurity without the need for further economic growth (Kallis, 2015). Many of the examples given in this report, such as Transition's REconomy enterprises (see Section 7.5.5), are based on sustainable, ecologically-sound solutions that benefit local communities and do not aim for growth.

Degrowth rejects the idea that 'more is better' and suggests what is needed is better quality food, and better designed transport, houses and energy systems rather than more. This is at odds with dominant political worldviews and will be fiercely opposed by those who benefit from the current system (Maxton, 2015). Political sensitivity makes even NGOs reluctant to challenge growth (Lorek and Fuchs, 2013).

The transition away from a growth centred economy will be politically difficult. "Our tie to perpetual growth is a contingent aspect of how we have organized ourselves economically, not an eternal law to which we must submit

to avoid misery." (Evans, 2012). One measure that can help convince people of the benefits of degrowth is the adoption of alternative measures of well-being to help overcome the political addiction to growth (Lorek and Fuchs, 2013).

While there is still a wide gap between the radical ideas of degrowth proponents and how to bring these into mainstream practice (van der Bergh, 2011) far more work is needed by mainstream economists to demonstrate how the current economic model of growth is compatible with ecological and environmental limits and human welfare and survival.

Buen Vivir

Buen Vivir, Spanish for "good living" or "living well", is a concept with many elements of degrowth. This is a transformative programme that has gained ground in South America since the mid-2000s (Salazar, 2015). It is based on the concept of collective well-being or good living and has already been incorporated into the constitutions of Ecuador and Bolivia (ibid).

The Preamble of the Ecuadorian Constitution states: "We decided to construct a new form of citizen co-existence, in diversity and harmony with nature, to reach 'el buen vivir, el sumak kawsay'." Following its constitutional adoption in 2008, sumak kawsay ("collective good living" in the indigenous *Quicha* language) was taken up in a National Plan for Good Living 2009-2013 (ibid).

The new constitution was approved in 2008 after a referendum, with 64% of votes in support (Berros, 2015). Buen Vivir rejects market globalism and free market environmentalism and is based on a biocentric approach. It is critical of current methods of extraction for natural resources, including mining and hydrocarbon exploitation, industrial-scale agriculture, forestry and fishing (Salazar, 2015).

Beyond GDP: alternative indicators of success

Given the problems with GDP, a number of alternative indicators of success have been proposed to help shift societies away from a narrow focus on growth:

The Genuine Progress Indicator (GPI): Developed in the US in the late 1990s (Evans, 2012). Unlike GDP, GPI is reduced by pollution, resource depletion, crime, and other detrimental aspects of economic activity. It is basic double-entry bookkeeping (Havens, 2014). GPI also takes into account the distribution of income, the amount of leisure time and the value of household labour (Evans, 2012). The US state of Maryland has incorporated GPI into state measurements of well-being (Havens, 2012) and has actively implemented policies to encourage the increase of GPI. The media in Maryland also now regularly report on changes in GPI (Kubiszewski, 2014).

Gross National Happiness: Developed by the Kingdom of Bhutan, the concept covers non-economic aspects of well-being, including psychological well-being, health, education, time use, cultural diversity and resilience, good governance, community vitality, ecological diversity and resilience, and living standards (GNH website). The Gross National Happiness Index is a single number index developed from 33 indicators in the aforementioned categories (ibid).

A similar World Happiness Index ranks 156 countries by happiness levels, with Denmark the happiest country in 2015 (Helliwell et al., 2016). The report found that for countries which single-mindedly pursued economic development to the neglect of social and environmental objectives, "the results can be highly adverse for human well-being, even dangerous for survival. Many countries in recent years have achieved economic growth at the cost of sharply rising inequality, entrenched social exclusion, and grave damage to the natural environment."(ibid)

National Well-being Index: since 2012 the UK government has collected data on personal well-being which shows this has been improving over the last five years (ONS, 2016b). The government reports on indicators for aspects of life that matter to people including personal well-being, relationships, health, economy and the environment (ibid).

Indicators of national success: The New Economics Foundation has proposed five headline indicators of national success based on good jobs, well-being, environment, fairness and health (Jeffrey and Michaelson, 2015). While improvements have been seen in some areas since 2009, inequality has worsened, the proportion of people in decent, secure jobs has fallen and carbon emissions are a cause for concern (ibid).

The Human Development Index (HDI): This was based on the 'capability approach' developed by India's Nobel Prize winning economist Amartya Sen and is a composite statistic of life expectancy, education, and per capita income indicators. It was created to emphasise that people and their capabilities should be the ultimate criteria for assessing the development of a country, not economic growth alone.

The Human Development Index (HDI) is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and having a decent standard of living (UNDP website). Comparing the Gross National Income (GNI) per capita rankings and the HDI rankings of countries can reveal much about the results of national policy choices. Gabon, with a GNI per capita of $16,367, has a GNI rank of 68, but an HDI rank of 110 – the same as that of Indonesia whose GNI per capita is only $9,788.

UN Sustainable Development Goals (SDGs): A set of 17 SDGs, or Global Goals, offer a universal framework for economic, social and environmental advancement. While there is a lack of funding for implementation, and they rely upon the traditional economic system based on growth rather than structural policy reform (Esquivel, 2016), the goals do represent a laudable blueprint for global society to work towards. It is suggested that tackling climate change will only be possible if the SDGs are met, and the SDGs will only be met with extremely ambitious action on climate change (CDKN, 2015).

While in 2015 the UK ranked fifth in the world in terms of GDP (World Bank, 2015), it was ranked 23rd in terms of World Happiness (Helliwell et al., 2016) and 14th in terms of Human Development (UNDP website), revealing much about national priorities.

7.5.5 Reversing neo-liberalism: new business and ownership models

To reverse the effects of neo-liberalism, there needs to be a return to business and ownership models that balance environmental and social benefits with economic returns. While traditional business models define success through returns to shareholders and an increase in a firm's valuation, new business models are often based on broader environmental and social objectives and can help the transition to zero carbon.

New business models

Alternative business or ownership models can offer a huge opportunity for stakeholders to demand responsible behaviour, such as disclosure of carbon risks in investments and other environmentally beneficial actions (Transforming Finance, 2016).

It is also possible to design models of ownership and financing to improve inclusivity. For example, Brixton Energy, a renewable energy co-operative, used crowdfunding to finance a solar array in a social housing estate in Brixton and offered residents of the estate a lower minimum investment threshold (£50) compared to outside investors (£250) (Johnson and Hall, 2014).

The Transition Network defines Transition enterprise as "a financially viable trading entity that fulfils a real community need, delivers social benefits and has beneficial, or at least neutral, environmental impacts." (REconomy website). Examples of such enterprises include the Big Lemon in Brighton which offers bus and coach services using recycled waste oil, or GroCycle which grows Oyster mushrooms from local waste coffee grounds and has significantly reduced the energy required for cultivation (Transition Network, undated).

New energy supply models

In the energy sector the dominance of the 'Big Six' energy supply companies makes it hard for new renewable energy generators or suppliers to enter the market. Crucial to making renewable energy projects financially viable is the price renewable generators receive for their energy. Traditionally, this has been achieved through a power purchase agreement with an existing supplier, typically one of the Big Six energy companies. Whilst the price was not a good one, subsidies such as the Feed-in Tariff made these arrangements viable. With the reduction in subsidies, the price paid for the electricity generation is more important. Various new models are being developed that can allow renewable energy generators to get a better price.

Alternatives ways for new energy suppliers to enter the energy market include:

- Becoming a fully licensed energy supplier.

- Forming a partnership with an existing licensed energy supplier and taking responsibility for some operational aspects of the supply business.

- Entering into a 'White Label' arrangement where an existing energy supplier markets the community or local aspect of energy supply whilst still controlling all operational issues (Platt et al., 2014).

However, all of these models may either be administratively complex and time consuming, and/or may not extract the best deal for energy due the involvement of another existing energy supplier. The ideal model for small/distributed generators is to be able to sell directly to customers in a way that minimises administrative complexity.

Models are being developed that may allow this. For example:

- Energy Local, working with Community Energy Wales, are developing a 'farmers market' for electricity that would allow communities to buy electricity directly from local renewable suppliers. This system requires the community buying the energy and the community energy scheme to be on the same grid (connected to the same substation). It also needs an agreement with an existing licensed supplier (likely to be one of the smaller suppliers). It is estimated that a 100kW micro-hydro scheme could retain £25,000 a year within the local community using this system (Blake, 2016).

- To address the dominance of the Big Six energy companies, the energy market regulator Ofgem has tried to make it easier for small generators to sell directly to end users through a simplified licensing arrangement known as 'Licence Lite' (Ofgem 2009 in Platt et al., 2014). Yet, six years after it was introduced,

no generator has managed to make this work, suggesting that the level of complexity remains restrictively high. However, the Greater London Authority (GLA) is currently attempting to be the first organisation to get the licence (GLA, 2015). If successful, the GLA intends to purchase locally produced energy from heat, waste and renewable sources and supply large local consumers, such as Transport for London, at preferential rates (Platt et al., 2014).

With all the above models, the process will be difficult and complex for the pioneers but can become easy and more straightforward for those that follow.

Stories for Change

Chris Blake

Founding director of The Green Valleys Community Interest Company (CIC) and TGV Hydro

You can argue that perhaps energy is the defining commodity of the last 200 years. Where we get it from, who owns it, how it's distributed and how it's used is crucial to our social structure and civilization. Having it local, municipal, socially owned, as it has been in the past, could be very liberating.

The Green Valleys Community Interest Company was set-up by community members in and around the Brecon Beacons National Park in 2009. We aim to inspire and support communities to work together to reduce carbon emissions, generate income and deliver social and environmental benefit . TGV Hydro is owned by The Green Valleys CIC and offers a full design, permissions and construction service for small-scale hydroelectric systems. We make micro-hydropower a practical reality for landowners and community groups across Wales.

The Green Valleys Community Interest Company (CIC) and TGV Hydro

"We've designed and built about 40 micro-hydro schemes across Wales, about a third of which are community owned. The projects raise awareness about renewable energy, together with energy saving attitudes and initiatives. They can build community cohesion, they don't always, but they can.

When Feed-in Tariffs were generous, a project could generate green energy and create a community fund. That financial incentive has been cut substantially and all but the very best schemes on the most attractive sites don't really work anymore, so the industry is grinding to a halt.

We don't have a very clear energy strategy in the UK. We certainly don't have one that works in favour of either renewables or distribution generation. The Conservatives took up a very strong anti-on shore wind and renewables stance, which they implemented. They've got a pretty clear policy towards nuclear and gas which never quite gets stated, because it's not that popular. But the consequence therein is the reduction of support for all renewables. Half of the UK's 35,000 employees in the solar industry have been made redundant.

To go from centralised carbon-burning generation to decentralised renewable generation requires a substantial multi-decade investment in changes in the distribution grid. You could argue economically that's one of the reasons to stick with centralised generation, but if you're generating electricity next to where you're using it, it's more of a robust system.

I'm currently working on a project to get more money for the local electricity we generate. At the moment, electricity from renewable generation can gain between 4 and 5p per unit. 4 years ago, micro-hydro schemes were getting 20p for generation tariff in addition. That's been cut to 8p and will go to zero effectively. Smaller and distributed schemes are not economic at that level of support. So if they can't get more generating tariff, can you get more for export? Can you directly sell that electricity to other people locally? Can you get 7-8-10p a unit?

While that may be possible, it's complicated. It's taking a lot of effort and negotiation and determination. Offgem regulation and distribution grid charging mechanisms are the key issues. The way the market was privatised in the early nineties has put an emphasis on short-term savings. It could be argued it has kept

electricity bills cheap, but it's preventing strategic solutions from being realised.

Electricity supply is basically multinational, often foreignowned. Anybody who buys electricity – that money is leaving the community, and leaving the country in most cases. Under the local energy supply models that we're working on, half the electricity can be supplied locally. You don't have to have that many people using the system to increase the amount of money in the local economy. In areas of rural Wales where I'm based, areas of enormous deprivation: very low average incomes, poor services, fuel poverty – if we can keep local services running and operating, you create a better community for everybody."

http://www.thegreenvalleys.org

Public ownership

Another alternative to traditional business models is public ownership or renationalisation, which increases the democratic control of investment and can mean that money goes towards social good rather than purely profitseeking enterprises.

Rather than settling for part-ownership of renewable energy schemes for some members of the community, broader public ownership may be required for systems that exploit the UK's common resources. This is particularly the case for technologies such as offshore wind or tidal energy, which are not likely to be delivered by community-scale projects or tied to particular communities.

The 'We Own It' campaign calls for a publicly owned and controlled energy system based on a combination of national, regional and local public ownership (WeOwnIt, 2016). This includes a publicly owned grid which would allow renewable energy projects to get connected to the national grid at a reasonable cost, and better deliver the necessary investment and improvements in the electricity grid (WeOwnIt, 2016).

Alternatively, in Germany there is public investment in the grid, which is seen as being in the common good (Blake, 2015).

Taking the railways back into public ownership could save £1 billion a year, which could be used to lower fares and improve services (Taylor and Sloman, 2012). This could be done in a step by step approach with minimal cost to the public purse, involving acquisition of franchises as they expire or as companies fail to meet franchise conditions (ibid). Elsewhere in Europe, between 80% and 100% of passenger train services and the majority of rail freight (except in the Netherlands) are provided by the public sector (ibid). Surveys suggest that two-thirds of the public across the political spectrum support bringing the UK railways back into public ownership (Yougov, 2013b).

Municipally owned companies

Some local authorities, such as Nottingham City Council and Bristol City Council, have adopted the innovative approach of becoming fully licensed energy suppliers (see case study below), supporting local renewable schemes and those in fuel poverty in their local communities.

CASE STUDY: *Robin Hood Energy*

(Pastor-Vicedo, 2016; Robin Hood Energy website)

What is Robin Hood Energy?
Robin Hood Energy (RHE) is a non-profit, local authority owned energy company established by Nottingham City Council. Launched in September 2015, it is the first company of this kind set-up for many years, although Bristol Energy has since been launched by Bristol City Council. RHE has its own supply licence and offers gas and electricity to residential and business customers nationwide.

Why was it set-up?
The main drive behind the company was to tackle fuel poverty though greener energy is also part of its objectives. It is currently offering a low tariff to customers on pre-payment meters, generally those in the worst fuel poverty, and replacement of pre-payment meters with smart meters. Being non-profit allows it to reinvest all surplus revenue back into the company. Staff don't receive bonuses and its directors are not paid a salary, which keeps overheads down. Currently, RHE uses energy generated locally and also buys in gas and electricity from the market, some of which is issued with Renewable Obligation Certificates (ROCs).

What were the barriers?
Breaking into the energy market is difficult for small suppliers. The Council considered alternative approaches including Licence Lite (where Councils can partner with existing suppliers for the more costly aspects of a licence) and White Label (where Councils can partner with an existing supplier to offer gas and electricity using its own brand). However, they wanted more control that only a full licence could give them. The licence was a significant investment for the Council, though the full amount is commercially confidential.

How were the barriers overcome?
Political will was very important. Nottingham is politically stable and the Council has a strong energy tradition, with the largest district heating scheme in the country, private wire (for the university and arena), and large numbers of solar panels installed in social housing. The Council had been engaged in the energy market for a long time and had a good understanding of what was not working. They had previously tried working with a switching site but found this hadn't been entirely successful in reaching their target customers with pre-payment meters.

The Council also learnt lessons from Enviroenergy (the Council owned non-profit company that runs the district heating). This has been running for about 10 years, although RHE is on a much bigger scale. By keeping the set-up of RHE in-house, rather than outsourcing to consultants, they kept costs down and allowed teams in the Council – finance, legal, marketing – to benefit from upskilling.

What have been the results so far?
RHE are still in a settling-in period, but customer take-up so far has been promising. Under their licence condition they need to comply with the Renewables Obligation but have also voluntarily taken out a licence for FITs (which only the larger suppliers are required to do) as they wanted to support small-scale renewable schemes.

Can it be replicated elsewhere?
RHE offers councils that wish to enter the energy market a white label partnership. This allows councils to sell energy to their residents without incurring all of the operational costs of a licensed energy supply company. RHE believe political will is essential, and are happy to advise other councils, who they view as partners.

Ways in which the UK electricity market could rapidly transform to a low carbon system have been examined in a major interdisciplinary study involving nine universities. 'Realising Transition Pathways' analysed historical energy transitions and social, behavioural and technical drivers of electricity supply and demand, as well as modelling different scenarios. The project looked at three pathways to a low carbon future by 2050 – a centrally coordinated pathway, a market-led pathway, and a civic-led 'Thousand Flowers' pathway. In the latter, by 2050, distributed generation forms 50% of final electricity demand (Barton et al., 2015). Renewable (biogas) community/micro CHP, onshore wind, solar PV and offshore wind are the bulk of the energy mix. This transition would require a step change in civic participation and the creation of Municipally Owned Energy Service Companies (MO-ESCOs) who purchase electricity from local energy supply organisations.

Municipal control and ownership of transport infrastructure can also be beneficial to the low carbon transition. Uniquely in mainland Britain, London controls the bus network through a franchise system rather than a deregulated service, which gives it much more control. As a result, London bus services have improved and passenger numbers have risen. Over half of all bus trips in England are now in London, and between 1985/86 and 2014/15 bus patronage increased by 105% in London compared to a decline of 37% in England outside of London (DfT, 2015f).

There are also twelve local authorities in Britain that still have municipally owned bus operators, which can reinvest profits to enhance the service rather than paying dividends (Taylor and Sloman, 2016). The largest of these, Lothian Buses in Edinburgh, has high levels of customer satisfaction and recently returned £5.5 million profit to the public purse (We own it website). Other municipal operators include Reading Buses, which was 'Operator of the Year' in 2015, and Nottingham City Transport, which has the highest passenger satisfaction rating of any

English operator (Transport Focus, 2015a).

In Europe, many bus services are municipally operated, and in France there are examples of municipalities which have shifted from franchising private or public-private operators to running the bus services themselves due to the need to cut costs (Taylor and Sloman, 2016).

In recognition of the problems with the deregulated bus system, the UK Government has introduced a new Bus Services Bill, intended to make it easier for local transport authorities to franchise networks of bus services and give Local Transport Authorities the powers to plan, develop and regulate bus services. This includes offering passengers simpler, integrated Oyster-style ticketing and guarantees on service quality (Urban Transport group). The Bill is generally welcomed by transport campaigners who see it as an opportunity to improve services, though have criticised a clause restricting councils from running their own bus services (We Own It website).

Community ownership

In addition to public or municipal ownership of energy there is huge scope for community ownership. Compared with other countries, such as Denmark and Germany the proportion of community or public energy ownership in the UK is extremely low (see case studies, right).

***CASE STUDIES:** Community or public ownership of energy supply and distribution*

- In Germany, around half of renewable energy capacity is owned by citizens either as individuals, in co-operatives and similar community groups, or as community shares (ILSR, 2013). There is also an increasing trend towards bringing energy supply and distribution networks into public ownership through 'Stadtwerke' (municipal energy companies owned by the local authority) or through local co-operatives (Julian, 2014).

- In Denmark, around three-quarters of wind turbines in the country are under some form of community ownership and 'Right to Invest' legislation requires developers to offer 20% ownership of wind projects to local communities (Dunning, 2014).

- Perhaps surprisingly, in the United States around a quarter of all electricity sold is generated by co-operatives or public power utilities (RAP, 2011). By contrast, in the UK in 2014, community energy was only 0.3% of electricity generating capacity (DECC, 2014a).

The UK Government's Community Energy Strategy was launched in 2014 (DECC, 2014a). It aims to encourage communities to pursue their own energy projects and to get involved in the ownership of commercially developed renewable energy projects. The strategy learns from the Community and Renewable Energy Scheme (CARES) in Scotland and the Ynni'r Fro programme in Wales.

The Shared Ownership Taskforce (RenewableUK, 2014) and Community Benefits Protocol (RenewableUK, 2013) aim to ensure that communities benefit from renewable energy developments in their area. Published in 2014, the Shared Ownership Taskforce report includes details of the voluntary Shared Ownership Framework. It recommends that: "Commercial project developers seeking to develop significant renewable energy projects (in other words above £2.5m in project costs) for the primary purpose of exporting energy onto a public network should offer interested communities shared ownership." (RenewableUK, 2014)

Under the Community Benefits Protocol, developers in England with qualifying projects commit to provide community benefits of £5,000 a year per MW of installed capacity (RenewableUK, 2013). This money can be spent on things such as village halls or solar panels. However, when this is placed in the context that a 1.5 MW turbine could generate revenue of around £500,000 a year (Renewables First, 2015), it does not seem so generous and may be considered more a community handout than genuine community energy.

To overcome resistance to specific renewable energy projects at the local level, it is suggested that communities must have a greater stake in renewable energy projects in their area. An ongoing survey of attitudes to renewables finds that around 80% of people believe renewable energy developments should provide direct benefit to the communities in which they are located (DECC, 2016d). Interestingly, though, motivations for interest in community energy schemes are not just about individual financial gain. They also include local economic development, creation of jobs, community development, democratic participation, environmental education and environmental concerns (Hargreaves et al., 2013; Seyfang et al., 2013).

Public and community ownership means more public engagement with clean technologies and more people with a financial stake in renewable energy, both of which can help to reduce public opposition and build support for clean technologies (Murray, 2014). Research suggests that public acceptance for renewable energy is easier to achieve if it is matched with high levels of individual ownership (Smedley, 2013).

In Germany, the widespread ownership of renewable energy is considered vital in the positive public attitude to the country's energy transition, known as 'Energiewende' (see box below), whilst in Denmark laws require that communities are

offered partial ownership in wind farms (Buchan, 2012; Murray, 2014). In the UK, the policies that encourage community energy projects and see that communities have a stake in, or benefit from, energy projects, need strengthening, particularly as subsidy cuts have made it much more difficult to fund community energy projects. There has been an 80% drop in new community energy companies forming following cuts in government support (Pratt, 2016).

Energiewende

Launched in 2010, 'Energiewende" is Germany's 'Energy Transformation' to replace fossil fuels and nuclear with renewable energy, to cut greenhouse gas emissions by 40% by 2020 and 80% by 2050, to ensure that renewables contribute 80% of Germany's energy by 2050, and to reduce energy consumption by 20% by 2020 and 50% by 2050.

Energiewende embraces micro-generation and micro-ownership – also known as a 'prosumer' model. Over 50% of renewable energy capacity is owned by individuals or farmers in Germany – the Big Four energy companies own just 6.5% (according to 2010 figu es). This in turn is causing the big utility companies to reassess their role. Rather than continuing to rely on business as usual, they are significa tly ramping up investment in biomass plants, offshore wind and large-scale photovoltaic plants. In addition, some utility companies are becoming service providers, changing their portfolios to stay in business (Smedley, 2013).

Alternative ownership models for appliances

New ownership models for individuals could also help with the uptake of zero or low carbon appliances, by helping to balance higher capital costs with lower running costs:

- Many electric vehicle (EV) suppliers are now offering long-term financing options, and options to lease the car or the battery at monthly costs of less than a conventional car, while electric car clubs have been established in Oxford and Milton Keynes allowing local residents and businesses to hire electric cars or vans by the hour (Low Carbon Oxford North). Other models could include shared ownership or pay-as-you-go schemes similar to mobile phones (Tran et al., 2012). Uptake can also be supported by non-financial measures such as free parking and use of bus lanes (Element Energy, 2013).

- New models of appliance ownership could be explored where the service of, the service of being able to wash clothes, for example, is paid for but appliances are not owned by the user. This type of model allows Energy Service Companies, who have access to both information and finance, to make optimal decisions based on whole-life costs.

Local economies

Many communities have wealth extracted from them by distant ownership. The flow of money out of a local economy weakens it. When money is spent with local businesses it tends to recycle around the community, having a multiplier effect. The New Economics Foundation estimates the cycle to be three to four times before the currency is exchanged back to the pound (NEF, 2002). Local economies tend to be stronger and more vibrant economies, and 'local' is often more sustainable in environmental terms.

There are many methods in which local economies can be developed and supported. Local currencies, local loyalty cards and small business clubs all help create a more local economy. Other physical economies (time and 'things') can only be done on a local level:

Local currencies: Totnes, Lewis, Bristol and Brixton have set-up their own currencies. In practice these are like a voucher and can be used in a wide range of local businesses, supporting them by encouraging people to spend money within a local community. Each currency is accepted differently, some can even be used to pay the local council or utility companies. Hull Council have even created their own digital currency.

Local loyalty cards: Independent Birmingham is one local loyalty card scheme that offers an alternative to a local currency with potentially similar benefits but less administration. Local loyalty cards can also provide a more visual sign of local presence.

7.6 Politics and governance

Tackling climate change and getting Britain to zero carbon faces some momentous hurdles: the inertia of the fossil fuel and other high carbon systems (carbon lock-in), the power of vested interests, an unsustainable economic system based on growth, and a lack of political will to tackle all of the above.

Many of the changes needed to move swiftly to zero carbon will also require new or strengthened legislation and policy and greater accountability for achieving zero carbon targets. Stronger political action on climate requires increasing the visibility of climate change amongst the electorate, showing that more people are concerned and providing workable solutions.

The stability of the fossil fuel status quo is such that determined and innovative methods of unsettling the consensus are needed. The transition from a fossil fuel-based energy system is a political struggle, one that cannot be simplistically viewed as amenable to technologically innovative and win-win solutions (Barry et al., 2015).

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To achieve a transition to zero carbon means regulation of those interests that subvert democratic control, and greater transparency and accountability in governance. There are existing tools that can be used to hold those who govern us to account and to challenge the influence of vested interests. Ultimately, broad social movements must be built with a collective identity that challenges the status quo and the power of vested interests.

Lessons from history: Powerful vested interests can be overcome

Astonishingly, at the turn of the 19th century three-quarters of the world's population was estimated to be held in bondage against their will in slavery or in serfdom (Forsythe, 2009). Although millions of people are still enslaved and trafficked illegally oday, the fact that slavery is not legal anywhere in the world is a legacy of the enormous success of the political movement against slavery. This movement had to overcome a policy inextricably linked with the economic system and the powerful vested interests of the slave owners (Huzzey, 2015). The abolition movement had to concede to 'buying off' the West Indian slave owners with approximately £30 million (equivalent to £1 billion today) in compensation from the British government (ibid). While the UK criminalised the international slave trade in the early 1800s, the 1833 Slavery Abolition Act, which banned slave ownership, was a result of popular campaigning based on moral claims rather than insider lobbying (ibid).

One of the key mechanisms for the success of the UK abolition movement was the fact that groups with significa t and ingrained theological and political differences were still able to unite on various moral principles, such as human dignity or the shame of colluding with brutality, illustrated by the famous image 'Am I not a Man and a Brother?' (Turley, 1991; Huzzey, 2016). The popular movement utilised emotional appeals, moral principles, petitions and boycotts to build political will for change.

7.6.1 Overcoming vested interests: shareholder action and divestment

Overcoming vested interests is not a simple process: modern economies have been built on fossil fuel and other high carbon systems, the financial resources of the various industries are enormous and their political influence often deeply entrenched. However, as the box above shows, campaigners in the past have managed to overcome powerful interests against all the odds.

As well as mass social movements, discussed later, an effective way to challenge the power of fossil fuel companies and other vested interests is to mobilise the power of investors. Transparency on the amount of lobbying by the fossil fuel industry and disclosure of the risks posed by climate change are important for investors in those companies. In recent years, there has been an increasing number of shareholder resolutions demanding information on the scope and spend on climate change lobbying (PRI website).

For example, in May 2016 the Church of England filed a shareholder resolution urging ExxonMobil to disclose the impact of climate change policy on its business which, although defeated was supported by institutional investors with more than $6 trillion of assets (Church of England, 2016). However, at the same meeting, 81% of shareholders rejected a resolution to limit global warming to 2°C. As a result, campaigners have started a petition to get the Church of England to drop their policy of 'robust engagement' and divest from ExxonMobil and other oil and gas companies on the basis that engagement is not working (Fossil Free UK, undated).

In 2015, the charity ShareAction, which runs shareholder campaigns, mobilised thousands of campaigners to email the French oil and gas corporation Total to demand they pull out of the trade group BUSINESSEUROPE, which waters down EU climate legislation (Phillips, 2015). While Total did not pull out of the trade body the campaign secured a commitment for increased disclosure of Total's lobbying activities and support for progressive policies within such trade bodies (ibid).

There is also a fast growing international divestment movement calling for organisations, institutions and individuals to end their financial support for the fossil fuel industry via pension funds and other investments. Led by coalitions of students, faith groups, environmental groups and trade unions, the fossil fuel divestment movement aims to remove the legitimacy of the fossil fuel industry, in a similar way to campaigns against tobacco or apartheid in South Africa (Fossil Free UK, undated).

There are indications that these campaigns are also causing some reputational damage to the fossil fuel industry (Ansar, 2013). In April 2016, it was estimated that over 500 organisations worldwide had divested over $3.4 trillion, including the

Church of England, British Medical Association, Glasgow University and the Environment Agency (Fossil Free UK website). There are also active campaigns targeted at a large number of universities and Local Authority Pension Funds.

There is growing evidence that not only are fossil fuels a serious financial risk (the 'carbon bubble'), but that funds that have divested perform better (Collinson, 2015). Many UK pension funds are seriously exposed to the carbon bubble (Weyzig et al., 2014). Fossil fuel companies risk wasting up to $2 trillion (£1.3 trillion) of investors' money in the next decade on 'stranded assets', projects or resources left worthless by global action on climate change and the surge in clean energy (Carbon Tracker Initiative, 2015). For example, Aviva Insurance has around £300 billion in assets, and plans to divest from around 40 companies with more than 30% of their revenues deriving from coal where they consider they are not making sufficient progress towards the engagement goals (Aviva, 2015). Aviva is also investing £2.5 billion in renewable power and energy efficiency over the next five years to avoid what its Chief Executive describes as "eye-watering financial risks" (Clark, 2015).

The view from pensions and insurance policy holders is also changing. One stated that "I have considered the size of my pension for many years, but now I am also considering the type of world that will exist in 30 years when I take it out. What do I want that world to look like?" (APPG:LTG, 2016). While the motives of pensions investors and insurers are mixed, their interest in climate risks could be a valuable part of the solution to climate change, potentially encouraging their divestment from fossil fuels and other unsustainable industries.

Many of the divestment campaigns have a 'divest to reinvest' element, which advocates using the funds invested in fossil fuel companies to reinvest in socially and environmentally beneficial projects, such as low carbon and renewable schemes or social housing. For example, Greater Manchester, West Yorkshire, South Yorkshire, Merseyside and West Midlands have joined an initiative to use their investment funds to make 'impact investments', committing £152 million to projects that have an economic impact as well as positive social and environmental outcomes (Investing For Growth, undated). Nottinghamshire Pension Fund is investing up to £1.5 million in a community solar energy farm (Nottingham Energy Partnership, 2016).

The Environment Agency Pension Fund has done thorough research to develop their investment strategy and are keen to work with industry and academics on how to better integrate climate change into investments (Environment Agency Pension Fund, 2015).

There are a number of organisations that can provide information for

fund managers on climate change and alternative investments – these include Share Action (Share Action website) and Investing for Good (Investing for Good website).

7.6.2 Increase transparency of lobbying and prevent revolving doors

In response to the failure of the *Transparency of Lobbying, Non-party Campaigning and Trade Union Administration Act 2014* to improve transparency of lobbying of government ministers and civil servants, the campaigning group Spinwatch have called for the following (Cave, 2013):

1. A robust register that covers all lobbyists.

2. Lobbyists to reveal sufficient information (who they are lobbying, what they are lobbying about and how much they are spending).

3. The register to be financed by the public purse rather than through registration fees.

Government Ministers and departments should be required to publish information on the number of times they meet with industry-related groups as well as interest groups representing consumers and other members of the public (Shapiro, 2012).

Other countries have more comprehensive and robust registers of lobbyists that the UK could learn from:

- The US has a register with a much higher degree of transparency, which includes quarterly reports from lobbyists and financial disclosure (US House of Representatives website).

- The Canadian register also has a high level of detail (though not financial disclosure), with monthly reports from lobbyists and readily accessible information organised by subject (Office of the Commissioner of Lobbying of Canada website). Canada, with half the population of the UK, has over 5,000 lobbyists registered (ibid) compared to a little over one hundred in the UK in March 2016, one year after the register was set-up (ORCL website).

- Ireland's lobbying register is also much more comprehensive than the UK's and covers direct and indirect communications with a wide range of public officials (Lobbying Ireland website).

The current system to control 'revolving doors' through the independent advisory public body, the Advisory Committee on Business Appointments (ACOBA), also needs to be strengthened. Specifically, there needs to be a legal requirement on Ministers and civil servants to consult ACOBA, and controls on former Ministers and civil servants who have joined industry for

the purpose of lobbying their former departments (Cave, 2016).

Greater transparency in the regulatory process will not totally eliminate but can start to address the problems of regulatory capture.

7.6.3 Build political will and cross-party support

Building the political will to support urgent action on climate change is essential. Political will is a slippery concept yet some researchers have managed to define it in terms of four conditions (Post et al., 2010):

1. A sufficient set of decision-makers to support a policy.

2. With a common understanding of a particular problem on the formal agenda.

3. Committed to supporting a particular policy.

4. With a commonly perceived effective policy solution.

This definition helps to identify where the shortcomings in political will lie so that tactics for creating or building it can be developed (Post et al., 2010).

Build cross-party support

To build greater cross-party support on climate change requires breaking the 'climate silence'. If a significant proportion of voters don't view climate change as relevant or important to them and their families, this will translate into a lack of cross-party support for policy and action. The agenda setting function of the media, discussed in section 6.2, means that politicians are worried about, or pay attention to, those issues that garner the most headlines. This re-emphasises the importance of good communications campaigns that can help get climate change back onto the political agenda.

Climate change needs to be seen as a cross-party rather than a party political issue, and not as a narrow environmental issue but one that impacts all sectors, including health and economy. Politicians also need to understand our fundamental dependency on nature (Willis, 2013).

One of the challenges for most political parties is accommodating the radical responses required by climate change action into their political thinking, which is influenced by their political cultures (Hoppea and Wesselinkb, 2014). To help achieve this, politicians (like all of us) need to talk about climate change with people that they trust (Willis, 2013; Marshall et al., 2015). Climate communicators have suggested connecting with those on the centre-right by framing climate change in language that resonates in terms of narratives (for example, localism, energy security, the green economy and the good life) and values (for example, pragmatism and stewardship) (Marshall et al., 2015).

Similarly, action on climate change can be encouraged within conservative thinking by an emphasis on increased resource productivity, support for entrepreneurs and innovation, while social democrats can look at ways to increase civic input to improve decision-making on infrastructure renewal (Green Alliance, 2014).

One suggestion for effective communication with those on the centre-right is to bring in climate communicators who share centre-right values, or who can identify arguments that will resonate with people who share these values, for example, business or faith leaders (Marshall et al., 2015).

Using social justice or the case for moral action can also help develop a shared narrative used by multiple actors and groups. Different faith groups, for example, may have different ways of talking about climate change but the narrative they use has common elements. The role of faith groups in the UK could be extremely valuable, given the unity in statements on climate change, the relatively high level of public trust in the clergy and the numerous examples of faith communities engaging with action on climate change at a political and individual level (see section 7.1.5). In 2015, over 30 representatives of the main faith groups in the UK signed the Lambeth Declaration recognising the need for urgent action on climate change (Churchcare website).

> *The impact of climate change is something about which all people of faith are concerned. We need to work together in order to find our responses to some of the most significant moral issues facing the world. We want to encourage our politicians to keep Britain committed to taking a global lead on climate change.*
>
> Bishop Nicholas Holtam
> (Church of England, 2015)

Various Parliamentary Groups and Select Committees make an important contribution to cross party working and support for action on climate change. For example:

All Party Parliamentary Climate Change Group (APPCCG): A coalition of businesses, parliamentarians and organisations from the third and public sectors informing government policy-making on climate change adaption and mitigation (APPCCG website).

All Party Parliamentary Group on Limits to Growth: A group of parliamentarians for cross-party dialogue on economic growth in a time of environmental and social transition (APPGLG website).

Parliamentary Renewable and Sustainable Energy Group (PRASEG): A cross-party group of UK politicians and senior industry stakeholders to promote sustainable energy issues in Parliament and the wider political community (PRASEG website).

Environmental Audit Committee: A House of Commons Committee that audits the policies and programmes of government departments and non-departmental public bodies against sustainable development and environmental protection targets (EAC website).

The submission of representations on enquiries to Select Committees is a good opportunity for NGOs, academics and industry bodies with an interest in promoting policies to counter climate change to present evidence and influence MPs. Individuals can also hold their representatives to account and inform them about climate change issues by writing to their local councillors and MPs or inviting them to local events on climate change. MPs and Councillors of any political party respond to the concerns of their constituents and if their mailbags and inboxes show that voters are concerned about climate change they will be more likely to support action, particularly if those concerns are framed appropriately.

Build political will and public support

Consistent political support is vital for the transition to a zero carbon future. For example, one study systematically investigated the factors shaping energy system changes in Brazil, Sweden and the USA over the past 50 years (Hultman et al., 2012). It found that a strong national commitment to new technologies, including consistent and sustained policies, were a common feature of successful transformations. While market forces were important, pricing policies actually followed rather than led the policy development.

As the discussion in section 6.6.3 has shown, there are many reasons why politicians may be unwilling to commit to action, even when they are aware that an issue is urgent and important.

Practically speaking, an understanding of the many influential factors working on politicians and decision-makers can help by identifying the 'windows of opportunity' for change (Rickards et al., 2014). Possible strategies include an 'inside track' based on direct relationships with politicians to understand their constraints, an 'outside track' by social movements, and an intermediate 'middle out' approach demonstrated by shareholder activism, which combines the influence of insiders with the independence of outsiders (ibid).

The fear of political failure and unwillingness to act can be addressed by increasing the visibility of climate change amongst the electorate, showing that more people are concerned and providing workable solutions. Politicians are more likely to make innovative policy decisions if there are strong public views on an issue, visibility of failure is low, and if voters perceive that the problem could have been predicted or averted (Howlett, 2014). Providing clear evidence that the problem can be avoided and solutions do exist gives politicians no place to hide and undermines the various blame avoidance strategies (Bache et al., 2015).

Political risk can also be reduced by bundling climate policies with complementary policies with co-benefits – for example health, cleaner air and reduced congestion (Bailey and Preston, 2014). Demonstration of success through pilot projects with the private sector and civil society can also help to overcome opposition and misperceptions, and help avoid policy deadlock (ibid).

Faced with a deluge of urgent issues to address, politicians also need help to negotiate possible solutions. It is suggested that giving politicians a 'blueprint' for action on climate change is similar to giving instructions for a flatpack wardrobe without the parts: politicians need hand-holding through the practical process of sourcing and assembling the parts and the people (Willis, 2013). Political leadership is a risky business and politicians need to be attuned to public opinion. While politicians have a leadership role, they need to bring people along with them. It doesn't pay to be so far ahead of their constituents that they lose connection with their voters and leave them behind (ibid).

Decreasing opposition to policy change, increasing the willingness of the public to accept change, or building popular support for policy are critical to allowing government to pass policy without fear of recrimination. Within the current system there are ways that a community can be better engaged, and schemes that provide a stream of benefits to the community or are community initiated are likely to be better supported by the community. There are a number of ways in which popular support for policy change can be built in various sectors, and lessons can then be applied to other areas. Clear communication of the benefits of the initiative and involvement of a wide range of stakeholders seems to be key. Examples include:

Food: There are many factors involved in the purchase of food. Decisions are both subconscious and conscious, and price and marketing sway customer choices. However, studies have shown that health is an important consideration and can have a bearing on purchasing decisions. Understanding the benefits of low meat diets has been shown to increase the willingness of the public to accept and support policy intervention, regardless of whether or not this changes purchasing habits

at an individual level. In this regard, increasing public awareness is, therefore, considered to be the first step in making any significant changes to the food system (Wellesley et al., 2015).

Transport: Experience from the introduction of congestion charging in the Swedish cities of Stockholm and Gothenburg shows some of the ways to win public and political support and provides a number of useful lessons that can be applied elsewhere (Hysing and Isaksson, 2015). These cities implemented permanent congestion charges in 2007 and 2013 respectively. Stockholm's proposal was subject to high levels of political conflict but criticism was managed by the promise of a referendum after a pilot. An effective communications and consultation process during the pilot, alongside the provision of more public transport, helped deliver a majority vote for the charge in the referendum (ibid). By contrast, in Gothenberg a largely top-down process made little effort to engage the public but there was broad cross-party political as well as business support for a charge as part of a package of regional transport investment (ibid).

The introduction of economic disincentives like the Nottingham Workplace Parking Levy (WPL) is rare outside the public sector due to the sensitivity from an industrial relations point of view, with some describing it as "more emotive than pay" (Rye and Ison, 2005). Opposition can be fierce until a charge is introduced, after which it dies away rapidly (ibid). This suggests that good communications and political resolve are needed for measures that are clearly in the public interest, as was seen with the introduction of seatbelts or the ban on smoking. Keeping the charges low, income-related and applied with few exemptions; making sure any exemptions have clear and transparent criteria; and ring-fencing the funds for travel improvements are all measures that can help increase acceptability (ibid). The success so far of Nottingham's WPL in terms of raising funds for essential public transport infrastructure would suggest this is an option more councils should consider.

Energy: The Danish island of Samso was 'the world's first' 100% renewable energy island (Spear, 2014). The pitch was made many times for renewables on their island to meet all the community's needs but was repeatedly rejected. It was only via discussion with different groups involved that change began to happen. Once farmers became interested in a new income stream, plumbers would be able to set-up district heating, and electricians could install photovoltaics (PV). Once the community was part of it they supported the project. Analysis of how renewable energy gets portrayed in the media found that jobs and employment tended to be associated with positive coverage, so it is important that these positive economic benefits are communicated (PIRC, 2011).

7.6.4 Build mass social movements

Broad and deep political support is needed for decisive urgent action. At least 20 leading international climate change researchers and policymakers identified mass social movements as one of the key drivers for action on climate change (Wiseman et al., 2013). Individual issue groups are generally not strong enough on their own to bring political pressure to bear, and, therefore, join forces with others to create meaningful change. Some have suggested that climate activists must link up with other movements such as civil rights, feminism and indigenous sovereignty to have any chance of success (for example, Klein, 2014).

> *Only mass social movements can save us now. Because we know where the current system left unchecked is heading.*
>
> Naomi Klein, 2014

Less than 1% of Americans actively took part in the Civil Rights Movement and indeed most successful movements for social change involve between 1% and 5% of people (Compassionate Revolution website). Change is possible with just a small proportion willing to take a stand (ibid). Throughout history, progressive thinkers and radical voices have challenged and helped overturn systems of injustice such as slavery, colonialism, dictatorships and apartheid.

Build coalitions

The history of past social movements shows that coalition building plays an essential part in creating a sufficient base of support. Recognition of how climate change intersects with social issues like health, poverty and inequality creates opportunities for building coalitions. Coalitions are often formed in response to political opportunities and threats and can come together for single events or form more formal enduring alliances.

The Campaign Against Climate Change brought 20,000 people onto the streets of London for their grassroots Time to Act demonstration in March 2015. As part of a wider coalition the group helped organise the People's March for Climate, Justice and Jobs in November 2015, with an estimated 70,000 turnout (Campaign Against Climate Change website). Such protest actions are not only ways to raise awareness of issues and influence decision-makers through the media, but are important ways in themselves in which groups develop a collective identity and help build a movement (Taylor and van Dyke, 2003).

Successful examples of coalition building include:

- The Green Alliance, Oxfam, NEF (Johnson, 2008) and the Baring Foundation (Smerdon, 2009 and 2013) broadened the range of organisations involved in climate change outside the environmental movement, including those working with the elderly, refugees, and youth and children. Mapping winners and losers is an important step in any campaign. Identifying those who stand to win from action on climate change, and lose from lack of action, helps to bring onboard new allies and coalition partners.

- A coalition of around 30 Welsh NGOs from different sectors worked successfully over a three-year period to enact the groundbreaking Well-being of Future Generations Act. This shows the value of larger NGOs, who have the capacity and resources to develop and argue for innovative solutions, working with smaller NGOs from different sectors who can lobby for change. The ultimate success of the campaign, which was based on a positive message, effective cross-sector working and a high level of ambition, is a powerful source of hope.

- In 2015, a coalition of 21 leading environmental, transport and health organisations combined to urge political action on active travel (Sustrans, 2015).

- The 'Feeding the 5000' event by food waste campaigners, Feedback, which serves up which serves up a delicious feast for 5000 people made out of food that would have gone to waste, brings together a coalition of organisations that offer the solutions to food waste, pushing the issue up the political agenda and inspiring new local initiatives against food waste (Feedback website).

- The failure of the Copenhagen Climate Conference in 2009 and the hijacking of the Warsaw Climate Conference in 2013 by industry interests led to the formal setting up of a coalition of more than 130 organisations from civil society, labour unions, associations of international solidarity, faith groups, NGOs defending human rights and the environment and social movements (Coalition Climate 21 website). By framing the issue as 'climate justice' the movement took on wider ethical, social and political issues, supported by a broader range of groups concerned about environmental and social justice, poverty, equality, workers' rights and historical responsibilities for climate change. A central tenet of climate justice is that the most vulnerable people suffer the worst impacts of climate change.

Many successful mass social movements have relied on a social basis for collective action. For example, the US civil rights movement was anchored in black churches while the labour movement was heavily supported

CASE STUDY: *Sexual orientation and emissions reduction*

US conservation organisation, Rare, organises environmental pride campaigns around the world, informed by the LGBTQI movement and private sector advertising techniques. Tapping into the 'power of pride' has become a marketing opportunity; this has been used by the City of Detroit, which recognised the regenerative impact of LGBTQI neighbourhoods in Chicago and Boston. Subsidies were offered to attract LGBTQI settlement in downtown locations. This tactic also drew on the rural-to-urban migration, which is characteristic of LGBTQI people who are keen to escape sparsely populated areas in favour of cities boasting dense pockets of like-minded communities (Aldrich, 2006). The 2014 Gay Games in Ohio was considered a pilot project in the alignment of sexual orientation and environmentalism, with a comprehensive sustainability plan that highlighted environmental stewardship as one of three objectives. The volunteer-run organisation OUT for Sustainability promotes LGBTQI engagement with environmental issues.

by trade unions. The trade union movement with its historical mission to ensure jobs, rights and social equality, coupled with effective mobilisation and organisational skills, makes them a powerful force in the climate movement. With the tagline 'There are no jobs on a dead planet', the trade unions have been instrumental in promoting climate jobs through their 'One Million Climate Jobs' pamphlet (Campaign Against Climate Change, 2014), as well as organising marches and divestment campaigns and lobbying government.

Diversity in the movement

If the urgency of the zero carbon message is to be heard by all – let alone popularised – it must seek to represent everyone across mainstream society, which means that diversification is essential. Embracing diversity offers an opportunity to identify and implement appropriate effective solutions to address the environmental challenges we face today. Reaching out to those who feel alienated by society, and exploring how their lives could improve exponentially by embracing low carbon living, offers huge potential to influence and create political change. Seeking out human diversity to attain the zero carbon goal embraces more and different types of people to engage and collaborate, bringing new perspectives, experiences and ideas. It also means developing bespoke initiatives to engage with different groups, as shown in the case study, left.

Lessons from history: Forge collective identity

There are lessons from past social movements on how to mobilise people and build successful coalitions whilst acknowledging differences. One common element from the Indian Freedom struggle, the US Civil Rights movement and the Philippine People Power Revolution was that they all helped forge a sense of collective identity and ownership, so the movements became self-directing and provided a unifie alternative to the status quo (Delina et al., 2014).

While the women's suff age movement in the late 19th and early 20th centuries is often thought of as a unified campai n to seek votes for women, there was a lot of dissent between the many different groups, with some suggesting moderate reform and others adopting more radical positions (Richardson, 2016). Societies were formed across the political spectrum, with some adopting more militant tactics while others worked with the male political establishment (Richardson, 2016). However, they were all unified on the issue that women should be able to vote and, as well as civil disobedience, used a wide variety of methods including processions, pageantry, cartoons, theatre, literature and petitioning to increase women's visibility and push their case (ibid).

The campaign for gay rights in the UK in the early 1970s forged some productive coalitions, including those with the Trade Union Congress and striking miners (Delap, 2016). The AIDS crisis from 1984, and the hostility of the Thatcher governments, brought lesbian women and gay men together in a credible lobby movement (ibid). Despite many setbacks, this lobbying, together with wider cultural changes and grassroots campaigns, has helped promote change (ibid).

Forging collective identity

It is important to note that most historical movements for change were not unified campaigns with agreed strategies but often a fractious mixture of moderate and radical groups with different tactics (Childs, 2016). Coalitions are difficult to organise and maintain due to ideological differences, organisational competition and lack of networks. However, forging a sense of collective identity and finding common values is important, as the box below shows.

Thus, collective identity can happen even when there are differences in worldview. Finding synergistic strategies that can inspire different worldviews around common action is important. For example, there is increasing unity from the different religions on climate change, and many faith groups and interfaith coalitions have expressed their concern about the impacts and issued statements and declarations in keeping with their theology (Interfaith Power and Light website).

Lessons from history: 'Stop the Child Murder'

Despite being renowned as a cycle-friendly nation, the Netherlands had a fairly similar history of bike use as the UK up to the 1970s, with bikes being the predominant mode of transport in both countries before World War II then falling into widespread decline during the 1950s and 1960s as the popularity of the car increased. In the early 1970s the UK and Dutch transport policies diverged significa tly.

In the Netherlands in the early 1970s, deaths by motor vehicles reached record levels, with around 3,300 people killed, of whom 450 were children in one year. This included the child of a respected journalist who wrote a series of articles about child safety, the first headline 'Stop de Kindermoord' (Stop the Child Murder), suggesting children should be taken to school by bus to protect them from road traffic. However, campaigners agreed that reducing road danger at source was the best way to tackle the rise in road deaths and a powerful campaign 'Stop the Child Murder' was launched.

This highly emotive issue brought mass support for change, with many marches involving parents and children, managed for maximum media exposure. This led to support for policies promoting people-friendly streets, shared space and home zones known as 'woonerven' (London Cycling Campaign website).

Overcoming setbacks

Overcoming public cynicism and disillusionment with politics and political action is not easy, particularly when governments ignore or overrule popular opinion or local concerns. Yet, all political and social movements face setbacks and require determination over many years to succeed. Even apparent failures have led to change: for example, the mass protests against the Iraq War in 2003 didn't stop the war but did eventually lead to the Chilcot enquiry, and made politicians think much more carefully about military intervention. Even traditional methods of advocacy, such as petitions and responses to consultations, can be very effective. For example, half a million submissions to a consultation for plans for national airport expansion in 2003 with the message 'don't expand until you have got on top of climate change' put policymakers under significant pressure, delaying plans for several years (Buhr, 2012).

Yet, radical changes in society can occur within a few years as a result of political movements. As the box above shows, an emotive mass social campaign focused on child safety was the catalyst behind a major shift in Dutch attitudes, fostering political support for measures to improve road safety and promote cycling. This has transformed the way the Dutch plan their transport infrastructure and towns and cities. In the UK over 2,000 children were killed or seriously injured on the roads in 2014 (DfT, 2015g) but surprisingly this has not provoked the same mass outrage.

Many activists in social movements experience discouragement in the face of inevitable opposition and setbacks, and there is a danger of widespread burnout. However, this is a typical stage for all social movements and it is suggested that activists can form political and personal support groups, adopt nonviolence, adopt empowerment models of organisation and leadership, and move from being protesters to social change agents (Moyer, 1987). Successful social movements also require different roles, including:

- Reformer or advocate – someone who lobbies for policy change.
- Citizen or helper – someone who takes practical steps or develops projects.
- Change agent or organiser – someone who organises other people.
- Rebel – someone who agitates for change (Lakey, 2016).

It is suggested that any of these roles can help or hinder, depending on whether the role is played positively or negatively (ibid).

More radical voices and direct action

It is argued by some that too much faith is placed in the ability to influence policy from the inside and an outsider role can better highlight the problems with the current process of decision-making

and policy development (Bailey, 2016). There is some evidence that disruptive or innovative forms of protest can be more effective (in the context of welfare reform) than more institutional or moderate forms of advocacy (Bailey, 2014; Barry, 2016). This is because participants involved in more institutional forms of advocacy are more likely to (reluctantly) accede to measures they oppose, and their activities are more easily ignored by policymakers than more radical protests (Bailey, 2014).

It is suggested that radical voices can help shift the 'window of political possibilities' and make more transformative policies acceptable (Lyons, 2013). Possible strategies to shift the 'window' of debate include: rebuilding the capacity for grassroots organising; cultivating 'unusual suspects'; framing positions differently; and organising those people who stand to lose (ibid).

Lessons from history: The role of radical campaigners

'Deeds not words' was the motto of the Women's Social and Political Union (WSPU), one of the many groups fig ting for women's suff age in the early 20th century, who adopted the well-known militant tactics of the suff agettes (Richardson, 2016). An escalation in tactics saw dramatic protests including the death of Emily Wilding Davidson in 1913, who 'threw' herself (or fell) under the King's horse on Derby Day (Richardson, 2016). Increasingly radical approaches were a response to the state brutality waged against campaigners, but fi mly cemented the issue of suff age on the public and political agenda (ibid).

However, this type of violent activity polarised opinion even amongst suff agists as well as the public. Less well known was the non-violent civil disobedience inspired by Ghandi, with women's groups set-up to boycott tax and a mass campaign to refuse to complete the 1911 census form (ibid). After her arrest, Christabel Pankhurst interrupted court proceedings to state: "We cannot make any orderly protest because we have not the means whereby citizens may do such a thing; we have not a vote, and so long as we have not votes, we must be disorderly." (ibid)

More radical campaigners, particularly in communities outside London and amongst women, were influe tial in pushing the debate and uniting public opinion against slavery. For example, Elizabeth Heyrick campaigned in Leicester for a sugar boycott, attempting to galvanise support for immediate rather than gradual abolition (Huzzey, 2016). Her 1824 pamphlet said: "The West Indian planters have occupied much too prominent a place in the discussion of this great question…The abolitionists have shown a great deal too much politeness and accommodation towards these gentlemen…Why petition Parliament at all, to do that for us, which… we can do more speedily and effectually for ourselves?" (The Abolition Project, undated). While the sugar boycott failed, her campaigning, supported by women's associations, helped shift the call to an immediate ban.

Drawing on 40 years of social research, Radical Thinktank have identified effective mechanisms and practical strategies to enhance political participation and mobilisation (Hallam, 2015):

Conditional commitment: Where a person commits to act on the basis that a critical mass of others do the same, for example, joining a protest.

Personalisation: Using social networks or face–to-face canvassing to mobilise people, as people are influenced by others, especially friends and members of their in-group.

Political struggles: Non-violent mechanisms of effective political confrontation.

Open space/deliberative mechanisms: Used for recruitment and empowerment. Mobilisation is rarely a wholly conscious, rational process but depends on emotion and social norms. Open discussion groups that allow people to talk freely and interact with others can be more empowering than providing information and traditional top-down leadership.

A number of grassroots campaign groups are using these strategies to challenge the status quo and draw attention to climate change. Some groups also engage in non-violent direct action or civil disobedience, which can involve personal risks, to expose actual or potential environmental destruction.

For example, Reclaim the Power, a grassroots organising network for direct action on environmental, economic and social justice issues, occupied EDF's West Burton gas-fired power station for seven days in 2012 and have organised mass action camps against fracking at Balcombe, Sussex and near Blackpool (Reclaim the Power, 2015).

A group of 13 people, 'the Heathrow 13', also risked prison sentences for briefly occupying Heathrow to protest at possible airport expansion (McVeigh, 2016). While such actions are controversial and deliberately provocative, there are good historical precedents, and it can be argued that such actions are reasonable, proportionate and necessary to prevent the much greater risks from climate change (ibid).

However, there are also dangers in disruptive direct actions in the way they are perceived by the public. Rebels can generate drama that motivates the undecided to take the issue more seriously and to side with the movement, but potentially can choose tactics that are so self-marginalising that the undecided lend their support to the power-holders. Such actions are usually negatively framed by the media, and while they may receive significant coverage, this can be counter-productive by provoking hostile reactions (Gavin, 2010).

If the tactics are too extreme they could end up boosting support for the opposition (Lakey, 2016). Protestors at the 2009 G20 Summit in the US learned ways to avoid being demonised by

the press as had occurred at previous summits; they did this by engaging the mainstream press and doing door-to-door outreach to build local support and humanise the protestors (Staggenbourg, 2015).

As with all social movements, the climate movement is a broad and heterogeneous network of people and organisations. Lessons from history suggest coalitions of different groups with different tactics, some moderate some more radical, are necessary for change (Childs, 2015).

7.6.5 New and strengthened legislation and policy to address climate change

The importance and value of legislation to mitigate climate change needs to be properly communicated to counter the prevailing anti-regulation discourse. Despite the ideological shift away from regulatory controls and the practical constraints of developing new legislation, it is imperative that new legislation is enacted and existing laws are strengthened where necessary.

All sectors need new or strengthened legislation and policy to enable a transition to a sustainable future, including:

Energy: Continuous and ambitious ratcheting-up of mandatory efficiency standards would drive the improved efficiency of appliances.

It has been suggested by the Centre for Sustainable Energy (Roberts, 2015) that the current Energy Company Obligation Scheme, which runs until 2017, should be extended and focused on reducing the average energy use of the energy supplier's customers. This would provide finance for the most cost effective retrofit measures and would have the additional benefit of making lower energy consumption households more attractive to energy suppliers.

Lower consumption households may then be rewarded with lower prices, in contrast to the current situation where these customers tend to pay more per unit of energy than high energy demand customers. However, it could be argued that the energy suppliers are not best placed to manage a subsidy scheme for domestic energy efficiency as it is not in their financial interest or organisational purpose to reduce energy use, and they are not highly trusted by the public.

Buildings: Analysis by the UK Green Building Council confirms that it would be entirely possible to deliver the Zero Carbon Homes policy at scale and at reasonable cost (UKGBC, 2015). Both the UK Green Building Council and the Committee on Climate Change, along with many others, are calling for the Zero Carbon Homes policy to be reinstated (Committee on Climate Change, undated).

Building Regulations should make provision so the buildings are future-proofed to allow the installation of such technologies in the future. The assessment and minimisation of life cycle emissions should be incorporated into mandatory Building Regulations requirements.

Steadily increasing minimum energy efficiency standards for all buildings are needed (Boardman, 2012). This would act as an MOT test for buildings, normalising the concept that buildings, like vehicles, must meet certain standards, met when a building is rented, bought or sold, significantly renovated, or otherwise after a certain amount of time has elapsed. This would allow major retrofits to be done at appropriate times, such as when people move or renovate their homes, minimising disruption. Loans on preferential terms could be provided to allow costs to be spread over time.

France has made a move in this direction by setting minimum requirements for all existing buildings as part of the French Transition Plan (MESDE, 2015). Under this system, all homes consuming annually more than 330kWh per square metre of floor area must be retrofitted by 2025. From 2030, homes that have not been refurbished to a sufficient standard cannot be sold. Although the targets and dates of implementation are less ambitious, the application of the system to all buildings is groundbreaking.

Transport: The Netherlands demonstrates greater levels of ambition – from 2025 all new buses will be zero emissions and electricity used by the new vehicles must be generated by renewable sources such as solar panels or wind turbines (Government of the Netherlands, 2016). UK cities could emulate this approach, which could also reduce air pollution and support a UK electric vehicle industry.

Food: The government has the ability to impose regulatory sustainability guidelines for school meals and any menus designed by caterers that it contracts to deliver food in places such as hospitals and council offices (Cumberlege et al., 2015). It could also introduce regulatory mechanisms on the food industry in order to make reaching sustainability targets more of a priority.

Stories for Change

Agamemnon Otero

Chief Executive Officer, Repowering London

We work with local authorities, national government, energy companies and developers – we exist within the broken system. Hopefully we get people to move from one system to the next so, instead of breaking the shell, we make the new shell while working in the old. It's transformation.

Repowering London is a not-for-profit o ganisation that specialises in co-producing community energy programmes with community groups and local authorities. We support communities to deliver, own and manage renewable energy projects that provide benefits to the citizens that surround them. So far, Repowering London has installed 236 kWp[1] of community owned renewable energy, with an approximate saving of 55 tonnes of carbon dioxide per annum.

Repowering London

"Creating a co-operative empowers people to have a say, doing it with some device like solar panels, or a wind turbine, or a waste plant makes sense to them to invest in. Include them in the ownership, and the practical elements of how to build it, and they have a more profound understanding of how it works.

Our training offers a forty-week, London living wage programme that goes through how money works: finance, the IT, technical, legal, marketing, PR elements of setting up and owning a renewable energy co-operative, and that's for 14 to 24 year olds.

When you say finance, you're providing understanding around "How does money work in my community?" Technical, you're saying: "What would it look like to have solar panels on my roof? How does electricity work in my house?" When you say legal, you're asking: "What gives me the right to put it on my roof and how am I protected so I don't lose it?" Marketing is: "What will be the representation of our community? Let's draw it, let's vote on it." And finally, "How are we going to tell that story? Are we going to knock on doors? Are we going to holler from the rooftop?" By asking those questions, you're saying: "Your voice means something, your actions have an impact". At the end, we help them with soft skills and CVs, and placing them in work.

For the adults on the same programme there'll be a mentoring programme, which is unpaid, and they become directors or supporters and decide where the money goes, and have a real sense of ownership. Then there's a programme for out of work engineers. So that's the offer to the people and it follows a pedagogy. The final stage is that they go on the roof and install the panels.

You engage people and provide what they want – not what you think they want. People want to be warm, to be safe, they want to invest in their family and friends and have something to believe in that provides opportunity and in the end well-being, because they don't want a way out of their estate, they want a way into society."

1. kWp = kilowatt peak, a measure for peak output under ideal conditions

http://www.repowering.org.uk

Amend and tighten CCA and improve accountability for targets

The Climate Change Act (CCA) needs to be amended to enshrine the net zero emissions target in accordance with the Paris COP21 agreement; this will mean tighter carbon budgets, which are currently set at the 'minimum' necessary to meet the existing 80% reduction target (Committee on Climate Change, 2016b). This represents a substantial increase in ambition and will almost certainly require radical emission cuts in sectors such as aviation, agriculture and heat.

Existing loopholes in the CCA that allow some emissions to not be properly accounted for also need to be closed. The contribution of emissions from the 'traded' sectors, which includes the power sector, needs to be properly included in the CCA to cut carbon emissions in real terms rather than just on paper.

As well as changes to the CCA there needs to be improved accountability at all levels for meeting the targets. In 2012 the Committee on Climate Change warned: "There is currently a significant risk that local authorities will not develop and implement sufficiently ambitious low-carbon plans, following the removal of the national indicator framework." (Committee on Climate Change, 2012)

In its place the CCC called for the introduction of a statutory duty on local authorities to draw up low carbon plans with ambitious emission reduction goals (for example, 20% reduction by 2020 across buildings, transport and waste) (ibid). Policies could then be developed and monitoring undertaken to ensure that the ambition is achieved. This recommendation remains to be implemented, but is even more necessary four years on.

Targets need to be applied very carefully as these can often be unhelpful if they are arbitrary and not applied in the right way. While targets are unpopular amongst politicians, local government actors agree that meaningful targets focus attention and help politicians make the necessary difficult decisions (Bache et al., 2015). However, any statutory duty on local authorities to reduce carbon will need to be accompanied by sufficient increases in local authority budgets to support implementation.

New legislation to comprehensively protect the planet and future generations

It is proposed that a new generation of environmental laws which comprehensively protect the planet and biodiversity is needed because even if all the current environmental laws at international, national and local level were enforced, this would still not stop climate change or biodiversity loss (Thornton, 2015).

There are calls to have ecocide ('causing or permitting harm to the natural environment on a massive scale') recognised internationally as a crime (Higgins et al., 2013). In 2010, a proposal for an International Law of Ecocide was submitted to the UN, via

an amendment to the Rome Statute providing the 'missing fifth crime against peace' (ibid), the Statute having established four core international crimes in 2002 that could be taken to the International Criminal Court (ICC): genocide, crimes against humanity, war crimes, and the crime of aggression.

In the proposal, ecocide was defined as "the extensive damage to, destruction of or loss of ecosystem(s) of a given territory, whether by human agency or by other causes, to such an extent that peaceful enjoyment by the inhabitants of that territory has been severely diminished" (ibid).

Thus, a Law of Ecocide (whether committed during or outside of wartime) is recognised as a crime of strict liability (without intent) and creates a legal duty of care for nations to act before damage occurs, as well as to provide assistance to countries at risk (ibid). During times of war it is already a crime to cause environmental damage where the impact is severe (ibid). However, during peacetime mass destruction or loss of ecosytems is not a crime; "our world has normalised the daily ecocide caused by the practices that drive economies as they currently function" (ibid). There is an active campaign to help make ecocide a crime (Eradicating Ecocide website).

The Welsh Well-being of Future Generations Act provides a 'visionary and holistic approach' to tackling climate change (Corbyn, 2016). The Act requires public bodies in Wales to put the long-term well-being of people, nature and future generations at the centre of decision-making (see case study below). Resulting from a three-year campaign by a coalition of 30 non-profit organisations, the then Welsh Natural Resources Minister Carl Sargeant described the bill as a "game changer", saying that Wales was the first country to introduce legislation of this kind (Shankleman, 2015). While the Act has shortfalls, for example, the targets cover only public bodies, it is nonetheless a significant achievement.

There is no legal reason why a similar Act cannot be introduced in Scotland, Northern Ireland or for the UK as a whole, and the NGO coalitions would likely be similarly supportive. In some ways it may be easier elsewhere as there were genuine legal problems in making the case in Wales due to the limited nature of its devolved powers (Meikle, 2016). The effectiveness of the Act in holding the government to account on decisions that could increase emissions and impact future generations has still to be proven.

CASE STUDY: *Well-being of Future Generations (Wales) Act*

(Meikle, Pers. Comm. 2016)

What is the Well-being of Future Generations Act?
This is a groundbreaking piece of legislation passed by the Welsh Government in 2015 concerned with improving the social, economic, environmental and cultural well-being of Wales. The Act places a duty on public bodies to act in accordance with a sustainable development principle and make sure that any decisions take into account the possible impact on people in Wales in the future. The Act establishes a statutory Future Generations Commissioner (whose role is to support the sustainable development principle in the Act), and Public Service Board for each local authority area to work collaboratively to improve the well-being of their areas (Welsh Government website).

How and why was it introduced?
The idea for the Bill originally came from Welsh Minister for the Environment, Jane Davidson, in response to separate criticisms from WWF and the Wales National Audit Office that the Welsh Government had failed to make adequate progress on sustainable development. The Bill was a commitment in the Labour Manifesto for the 2011 elections. WWF, who were keen to see the Bill become law, convened a meeting of the third sector in 2011. To their surprise there was support for the Bill across a wide diversity of groups, and a coalition of the willing was formed (Sustainable Development Alliance website). This Alliance of 20-30 groups from across all sectors, worked tirelessly over four years to get the Bill into law.

What were the barriers?
Political and legal barriers: When it was first proposed it was expected to take a year to get the Act passed. In the end, it took four years as Ministers realised the far-reaching significance of the Bill. This is thought to be one of the first laws of this type that sets duties on public bodies both taking into account the international impact and national impact of decisions on future generations. The Bill raised many legal questions and challenges. There were several setbacks for the Alliance when key parts of the Bill were removed or watered down, but they refused to compromise.

Logistical barriers: The Alliance, chaired by WWF, was a large and diverse group of organisations, many of whom had never worked together and had diverse objectives and capacities. Over the four years, four different Ministers led on the Bill, adding to the difficulties for the Alliance but providing new opportunities for change also.

How were they overcome?
Effective campaigning and lobbying: The Alliance was very good at agreeing

key objectives and red lines at meetings but then organising themselves into core groups and working parties for the detailed tasks. There was a high level of commitment to the process from all of the members and even if some of the smaller groups lacked capacity, they all contributed in their own ways. Government feedback to the Alliance was that the cross-sectoral support had been very important in getting the Act passed.

Positive messaging: The feedback from politicians over what made the campaign so effective was that it was a positive, consistent and coherent campaign over four years. The Alliance deliberately went for positive messaging, for example 'Wales can be the best in the world', which encouraged politicians to be ambitious. In turn, the politicians liked working on something positive for a change.

Hard legal work: With Friends of the Earth and WWF providing legal support that other groups lacked, the Alliance also hired top barristers to develop the case to put to government. When the government argued something wasn't legally possible, the Alliance's legal team were able to find evidence, solutions and examples from other parts of the world to counter those arguments.

What have the results been?

The Act only came into effect on 1 April 2016 and it is being phased in so it is still too early to see any results on the ground. Symbolically, however, the Act is a huge step for Wales, marking a high level of ambition. The Alliance recognises that it is a process involving massive cultural change, and it will take time for the impacts to be felt. However, the Act does have some real teeth. The Commissioner has a very influential role and the Wales Audit Office will also audit all public bodies, leaving any public body whose actions threaten to increase the likelihood of climate change open to Judicial Review.

7.6.6 Improve citizen access to legal remedies

Despite nearly three decades' worth of international treaties and other legal instruments, there is a large gulf between the stated aims of countries to reduce emissions and their practical action on the ground. This inertia of implementation has led to a number of grassroots collectives suing their governments for environmental negligence in order to force necessary change at an adequate pace.

It is expected that over time, as the physical and social impacts of climate change manifest themselves, there will be more litigation and regulation on climate change, though perhaps not expressly about it (for example, a case on flooding may not necessarily

mention climate change even if that is the root cause) (Ruhl, 2015). Legal scholars and practitioners agree that climate change is increasingly an issue for the courts to deal with and cannot be left solely to intergovernmental negotiation or executive action (Hadjiyianni and Minas, 2015).

"Courts can force countries to adopt effective climate policies. Court cases are perhaps the only way to break through the political apathy about climate change.... It is just a matter of applying existing law.... Judges with the courage to give a ruling on this will one day be applauded, whereas those who don't will eventually be tarred and feathered." Jaap Spier, Advocate-General to the Dutch Supreme Court, 8 April 2015, in Dutch newspaper Trouw (Urgenda website).

In March 2015, the Oslo Principles of Climate Change Obligation were launched by an international Expert Group on Global Climate Obligations. The principles state that, "While all people, individually and through all the varieties of associations that they form, share the moral duty to avert climate change, the primary legal responsibility rests with States and enterprises." (Oslo Principles, 2015)

There is a very real possibility in the US of class action lawsuits, similar to those taken against the asbestos and tobacco industries, against companies that have deliberately distorted information about climate risks (Nuticelli, 2015; Evans 2015b). A US Senator, Sheldon Whitehouse, supported by climate scientists, called on the US Department of Justice to launch a RICO (Racketeer Influenced and Corrupt Organizations Act) investigation into fossil fuel corporations, citing as precedent the long legal war against tobacco companies (Whitehouse, 2015; Shukla et al., 2015).

In November 2015, the New York Attorney General announced an investigation into ExxonMobil focused on whether statements made to investors about climate risk were consistent with the company's own research and how big a role the company played in directing campaigns of denial (Gillis and Krauss, 2015). A total of 17 US Attorney Generals are now investigating whether fossil fuel companies misled investors on climate change risks (Volcovici and Lynch, 2016). A separate enquiry into the world's biggest private sector coal producer, Peabody Energy, resulted in an agreement that the company would make more robust disclosures to its investors about the financial risks it faces from climate change (Krauss, 2015). Less than six months later, the company filed for bankruptcy.

There have also been several landmark legal cases where citizens and organisations have taken their governments to court on climate change, many of them using human rights legislation to push for greater action:

- In June 2015, campaign group Urgenda Foundation and 886

co-plaintiffs in the Netherlands won a landmark case against the Dutch state (Urgenda, 2015). For the first time in history, human rights law was used to compel a national government to take precautionary steps to combat climate change. The previous commitment to reduce emissions by up to 17% by 2020, compared to 1990 levels, was declared illegal, based on the Dutch constitution and international treaties, and replaced with a target of 25%. Practical implications of the ruling are that the Netherlands must accelerate measures that are already in place, such as expanding renewable energy systems, reducing gas extraction, and closing coal mines. Urgenda coined the term 'crowdpleading' to describe the power of class action. While the Dutch government is appealing the decision, it does not dispute the importance of mitigating climate change and is reviewing the effectiveness of its policies (De Graaf and Jans, 2015). The case is inspiring other environmental NGOs in Norway, Belgium and other parts of the world to bring similar claims (ibid).

- In Belgium, 9,000 plaintiffs have signed up to Klimaatzaak (literally, 'climate case'), calling on the Belgian government to achieve a 40% reduction in greenhouse gas emissions by 2020 – a proportion which was proposed but rejected in the Dutch Urgenda case. The case is expected to be heard towards the end of 2016 (Darby, 2015).

- In another high profile case a farmer from Pakistan successfully sued the national government for failing to implement its own climate change policy. In September 2015, the Lahore High Court cited constitutional and international principles in a ruling that created a Climate Change Commission of named individuals from various Ministries, NGOs and technical experts and set out the timetable for their recommendations to be published (Wentz, 2015 and Thornton, 2015).

- The Commission on Human Rights of the Philippines is currently examining the role of the world's 50 biggest fossil fuel companies in contributing to climate change, and subsequent human rights violations. The investigation was prompted by petitioning from a group of entities, including local typhoon survivors, Amnesty International, Greenpeace Southeast Asia and the Union of Concerned Scientists. The petition stated that, "climate change interferes with our fundamental rights as human beings, hence, we demand accountability of those contributing to climate change." (Sabillo, 2015)

- In April 2016, in a landmark class action case, it was ruled that the Oregon-based plaintiffs (21 children aged 8 to 19 years old), had the legal right to sue the US government for environmental negligence (Alec L. v. McCarthy, 2011). The federal

climate lawsuit – known as 'Kids v. Global Warming' – was filed in partnership with WildEarth Guardians and Our Children's Trust. The central premise of the case was based on the ancient Roman Public Trust Doctrine (popularised in England through Magna Carta in 1215), requiring state protection and maintenance of survival resources for future generations. Citing the fifth and ninth amendments to the US constitution, the accusation is of "violating their constitutional rights to life, liberty and property, and their right to essential public trust resources, by permitting, encouraging, and otherwise enabling continued exploitation, production, and combustion of fossil fuels". The District Court Judge heard oral arguments on the 13th of September 2016 and the case is expected to be under review until mid-November 2016. Similar litigation is underway in Massachusetts, Washington and New Mexico, with numerous other cases pending (Our Children's Trust website).

- In a landmark case of 2010, Grainger plc v. Nicholson, the UK Employment Tribunal held that an individual's beliefs about climate change were capable of being a 'belief' for the purposes of the legislation governing discrimination on grounds of religion or belief. This law came into force in December 2003 and prohibits discrimination or harassment in the workplace by reason of any religion or belief. Significantly, the term 'belief' is defined as 'any religious or philosophical belief'.

The Urgenda case has parallels with a successful Judicial Review case in which the UK Supreme Court ordered the UK government to comply with the nitrogen dioxide limits (an air pollutant but also an indirect greenhouse gas) provided for in the EU Air Quality Directive (Warnock, 2015). There is potential for similar legal action (by the same appellant, the charity ClientEarth) under the UK's 2008 Climate Change Act if the government fails to get back on course to meet its targets to cut carbon emissions by 80% by 2050 (Le Page, 2015).

The UK needs to improve the ability of citizens to go to court to enforce the law as a way of holding governments and corporations to account. The high cost and difficulties of NGOs and citizens in the UK to bring legal cases through Judicial Review and other means discussed in section 6.6.5 contrasts with many other countries. There needs to be further reform of costs to make Judicial Review less prohibitive for claimants, and of the right to sue polluting companies, similar to that which already exists in the USA, China, and other EU countries (Thornton, 2015).

Chapter 8:

Conclusions

8. Conclusions

Climate change is a complex and challenging problem. The global consensus of science clearly shows that we need to get to net zero carbon, and a wide range of detailed scenarios and real life practical projects demonstrate that we already have the tools and technologies we need to get there. But we cannot and will not solve it with technical solutions alone.

More than anything, the barriers to change are psychological, social, economic and political. Overcoming them will require multiple perspectives and approaches from different sectors, organisations and disciplines, working together where possible. Despite the many seemingly intractable barriers, there are equally many reasons for optimism. Our research has uncovered dozens of innovative and inspiring ideas from around the world. This report identifies specific actions, examples and stories that demonstrate how these barriers can be overcome, to provide a positive vision for the future. It doesn't claim to be comprehensive or provide all the answers; there is a clear need for more detailed work from much better resourced organisations.

Many of the solutions are interlinked and the report highlights their commonalities and synergies. It is not a blueprint for action but we hope it provides a useful overview of the issues to stimulate discussion about what needs to be done. Equally importantly, we hope the examples of action on the ground will inspire others to act.

A great many of the barriers to change are common to all sectors and need to be tackled at a broader societal level.

Changing worldviews and values

- At the root of the problem of climate change is a belief we are separate from nature and from each other. Increasing exposure to nature helps increase a sense of connection and concern for nature. This in turn can foster more sustainable behaviour as well as improving well-being. Fostering worldviews that are based on concerns for other humans, other species and future generations is part of the necessary transformation.

- Values like honesty, responsibility, social justice and helpfulness need to be promoted to strengthen public commitment for action on climate change, rather than values based on wealth, status and power, which weaken it.

- Excessive and disposable consumerism can be countered through reducing the working week as well as promoting the sharing economy and the circular economy. This helps address the ecological limits of our consumer society and increases happiness and well-being.

- Faith groups play a major role in shifting worldviews. The main global religions show increasing unity on climate change, promoting ecological stewardship and climate justice.

- Many people are now looking to spiritual practice outside organised religion to provide depth, meaning and connection in their lives. For example, meditation and mindfulness can foster greater compassion, while spiritual activism can support social and political change.

- Arts and culture are also a catalyst for change, using the imagination to bring to life different futures and to challenge the status quo. They can engage people collectively to shift values towards community and collaboration.

Communication

- There is a need to rethink and regulate the kinds of advertising that fuel desire for ever more consumption and promote values counter to acting on climate change.

- The creativity of the marketing industry can be harnessed in ways that are helpful. For example, promoting action on climate change or products and services that make people's lives better.

- The prevailing silence on climate change in the media and public life can be broken through the use of stories and images that offer hope and solutions. Fear appeals showing the real world impacts of climate change should be used sparingly as action is better promoted by showing the positive benefits of mitigation.

- A lack of media coverage can be addressed by the use of alternative and social media, using humour or shocking facts for maximum impact. Undue corporate influence on the media and misinformation or greenwash can also be countered by clever alternative communications.

- Significant media bias, for example, equal balance given to climate sceptics, needs to be challenged head on by regulators, climate scientists, activists and the public.

- Concentration of media power, giving media owners a disproportionate influence over public information and opinion, needs to be addressed through regulation.

Psychology and behaviour

Insights from psychology and other disciplines can be used to promote helpful behaviour changes in diets, the way we travel, how we heat and power our homes and action generally on climate change.

- Positive stories of collective action can create solidarity and connection, countering feelings of helplessness and encouraging and empowering people.

- Information that highlights the links between specific actions and their effects is most effective in motivating change.

- The power of social influence can be harnessed in approaches that use peer pressure to make helpful, zero carbon behaviours the norm.

- Climate change can be made psychologically closer and more urgent by emphasising local as well as distant impacts. Use of positive emotions, such as hope and pride, can also be motivating.

- Habitual behaviour can be more easily addressed during transition moments, such as changing jobs or moving house.

- While individual behaviour change is important, it should not be seen in isolation from the changes that are needed at social, industrial and governmental levels. Behaviour change programmes can be better targeted to influence co-operative behaviour and social action and tackle more damaging behaviours.

Overcoming carbon lock-in

- The stability of the fossil fuel system, known as carbon lock-in, can be challenged by practical, positive and innovative solutions, particularly at a local level where there is more flexibility to experiment.

- While many of these local projects are relatively small, they normalise sustainable behaviours, empower people and help expand the range of political choices.

- Small groups often lack the skills and resources to scale up or spread their innovative ideas, making the role of intermediaries very important. Government support for low carbon communities is needed, with a stable long-term strategy and resources to support replication and scaling up.

- There is a need to make zero carbon alternatives as attractive and convenient as possible, for example, by making walking and cycling safe or combining energy works with general home repairs and improvements.

- Effective planning support is essential to develop zero carbon communities, with good planning policies helping to reduce car dependency and promote renewable energy and green buildings. Planning control needs to be given back to communities, and planning authorities allowed to push for higher standards.

- Local government are important drivers of a zero carbon future through delivery of housing, transport, energy and waste. Despite severe funding cuts, many local councils and cities have developed innovative policies and projects, such as setting up their own energy supply companies, large-scale zero carbon or climate-positive developments, and sustainable food systems.

Economics and finance

- There needs to be a reversal of the prevailing and demonstrably failed economic model of neo-liberalism with its emphasis on supposedly free markets. In its place a co-operative, fair, enriching, resilient and sustainable economic vision should be developed, encouraging business and ownership models that prioritise environmental and social benefits as much as economic returns.

- Removing the massive subsidies currently given to fossil fuels and making fossil fuel and high carbon alternatives pay the full societal or external costs through taxation will help level the playing field for zero carbon alternatives. This could be delivered through a carbon tax, congestion charging and workplace parking schemes, and taxes on unhealthy foods and frequent flyers.

- There needs to be a move away from a narrow focus on growth and GDP, which are partial and inappropriate measures of determining success.

- Financing is also needed for many zero carbon measures, including investment in renewable energy, retrofit measures in buildings and investment in sustainable transport infrastructure and services. This can

be facilitated by local and municipal banks and a growth in citizen finance. Low and zero interest 'pay as you save' loans could be provided for energy efficiency measures using successful examples from around the world to remodel the failed Green Deal.

- There is enormous scope for more community ownership, particularly of energy supply and distribution, which has been achieved through law in Denmark.

- Taking key assets like the railways or national grid back into public ownership can ensure the necessary transition takes place and profits are reinvested for the public good rather than being distributed to shareholders.

Politics and governance

- The transition from a fossil fuel-based energy system is a political struggle.

- The undue influence of powerful vested interests on the regulatory process needs to end. The current law on transparency of lobbying is not fit for purpose and needs to satisfy international principles. The rules to prevent the problem of 'revolving doors' also need to be tightened.

- The influence of fossil fuel companies can be challenged through shareholder action and divestment campaigns which cause reputational damage and avoid financial risks for investors. This money can then be beneficially reinvested.

- Climate change needs cross-party political support, which can be built by framing communications appropriately or using trusted communicators. Submissions to parliamentary Select Committees or direct communication with MPs and local councillors can help to build support.

- Stronger political action requires increasing the visibility of climate change amongst voters, showing that more people are concerned. Providing clear evidence that workable solutions do exist gives politicians no place to hide.

- Mass social movements, based on coalitions of a broad range of groups, are needed to build political support. The intersection with social issues such as health, poverty and inequality and reaching out to those who feel alienated by society creates opportunities for building coalitions. Forging a sense of collective identity and finding common values is important, as well as overcoming inevitable setbacks. Disruptive forms of protest are also needed to shift the window of political possibility and challenge the status quo.

- New and strengthened legislation and policy are needed. For

example, reintroducing legislation for zero carbon homes as well as mandatory minimum energy standards for all existing buildings. Despite government preference for deregulation or self-regulation, most voluntary approaches have performed poorly.

- The Climate Change Act needs to be amended to enshrine the net zero emissions target and to close existing loopholes that exclude emissions from the power sector. There also needs to be a better system of accountability at all levels otherwise even the existing and inadequate 80% by 2050 reduction target may not be met.

- Comprehensive new laws to protect the planet and future generations, such as an international law on ecocide, are needed.

- Legal access for NGOs and citizens needs to be improved. Proposals to make Judicial Review, an important check on public powers, more expensive and difficult need to be dropped. There could be a right to sue polluting companies, similar to that which already exists in many other countries.

Final thoughts

Getting to zero carbon will require radical system change. Our hesitation to believe that this is possible is, in itself, one of the key barriers to achieving that shift. Yet, history shows that radical social and technological changes within a few years are possible. This should not be seen as burdensome or a return to the past, but as one of the most exciting opportunities in human history. Isolated, stressful, consumer-focused lifestyles can be replaced by a sense of connection with community and nature, delivering enormous benefits in physical health and psychological well-being.

Our 'postcards from the future' paint a picture of life in the UK that is not unrecognisable from today: we still live in the same communities, many of us in the same houses as today but these are more comfortable with no draughts; we eat significantly less meat and dairy but are healthier for it; and we walk, cycle and use electric cars or public transport so our neighbourhoods are cleaner and quieter. We buy and consume less 'stuff' but things are built to last and we share more. We spend more time in the natural world or with friends and family and are happier.

The overarching headline is that we need to do this together. We must join up research and action across disciplines, borders and scales and link research to real life projects. It will take many of us pulling in the same direction to enable change to happen, and each and every one of our actions can contribute to making a zero carbon future happen.

> *We need to engage in whatever actions appeal to us. There is no act too small, no act too bold. The history of social change is the history of millions of actions, small and large, coming together at certain points in history and creating a power which governments cannot suppress.*
>
> Zinn (2003)

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