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# Tackling the Climate Emergency

## Policy Paper 139

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## Summary

### ***Liberal Democrat key priorities for tackling the climate emergency:***

- Set ambitious targets for reducing UK greenhouse gas emissions by 75 per cent by 2030 and to net zero by 2045 at the latest.
- Carry out an emergency programme of action to reduce greenhouse gas emissions from all UK buildings to near-zero by 2030, cutting fuel bills and ending fuel poverty.
- Accelerate the development of renewable power, reaching at least 80 per cent of electricity generation by 2030 and more thereafter.
- Encourage the rapid take-up of electric vehicles by ending the sale of new diesel and petrol cars and small vans by 2030.
- Plant 60 million trees a year to remove carbon from the atmosphere, and improve health and the rural and urban environment.
- Stop Brexit and work closely with the UK's European and global partners to raise global climate ambition.
- Decarbonise finance and investment, requiring companies and financial institutions to implement climate targets.
- Integrate climate objectives into the heart of national and local government, establish Citizens' Climate Assemblies and set up a Just Transition Commission to ensure no one loses out.

Humanity is staring down the barrel of a gun. Unless urgent action is taken to reduce emissions of greenhouse gases, the world will suffer the worst impacts of climate breakdown. This includes an increase in storms and hurricanes, flooding from higher rainfall and rising sea levels, more frequent and more dangerous heat waves and droughts, longer and more damaging wildfires, the spread of insect-borne diseases, the destruction of habitats and the extinction of species, and major damage to agriculture, with consequent food shortages and rising prices. Climate breakdown will cause increasingly costly damage to social and economic well-being and to nature, a huge and permanent growth in the numbers of refugees fleeing their homes and the possible collapse of poor countries with weak governance most exposed to the impacts.

For these reasons the UK must reduce its emissions of greenhouse gases to net zero as fast as possible, with any remaining emissions balanced by removing carbon dioxide from the atmosphere.

Setting a target date for net zero emissions is essential but by itself is not enough. Credible action to achieve the target is more critical, and the precise target date for achieving net zero is less important than urgent action to set the economy on the path towards it. We would therefore:

- Carry out an emergency ten-year programme of action to reduce greenhouse gas emissions from buildings and power generation – the most cost-effective options – to near-zero, reducing UK greenhouse gas emissions by 75 per cent by 2030.
- Establish a framework for accelerating reductions in other sectors – transport, industry and land use – and for removing carbon dioxide from the atmosphere, aiming to reach net zero emissions by 2045 at the latest, with interim targets of 75 per cent by 2030 and 93 per cent by 2040 (all subject to revision should faster progress prove possible) – in compliance with the international targets to limit climate change set by the Paris Agreement of 2015.
- Ensure that the net zero objective is built into decision-making by national and local government, businesses, investors, communities and households, rewarding rapid progress towards net zero and encouraging behavioural change in patterns of living, working, travelling and eating.
- Create a Just Transition Commission to advise on how to deliver a net-zero economy that works for everyone, and Just Transition Funds to support development in those regions and communities most affected by the transition.
- End the use of fossil fuels in the UK economy, including banning fracking and the opening of new coal mines and pits, and replacing fossil fuels with renewable energy.

## **Timeline for action for a Liberal Democrat government**

### ***First hundred days***

- Legislate to set ambitious targets for reducing UK greenhouse gas emissions: by 59 per cent (from 1990) by 2025, 75 per cent by 2030 and 93 per cent by 2040, reaching net zero by 2045 at the latest.
- Put in place the framework for an emergency ten-year programme of action to reduce greenhouse gas emissions from buildings and power generation to near-zero by 2030.
- Stop Brexit and begin working closely with the UK's European and global partners to raise global ambition, develop zero-carbon technologies and increase aid funding to help developing countries reach net zero.
- Begin the phase-out of fossil fuels in the UK economy by banning fracking and the opening of new coal mines and pits.
- Ensure that climate objectives are a top priority for central government, including appointing a cabinet-level Chief Secretary for Sustainability in the Treasury, creating a new Department for Climate and Natural Resources and introducing a requirement on all public bodies to report on the extent to which climate risks pose a threat to their ability to fulfil their responsibilities.
- Introduce an emergency climate budget, including an investment programme in zero-carbon infrastructure for power, heat, transport, industrial carbon capture and storage (CCS) and afforestation, the establishment of a new Green Investment Bank to steer private investment into these sectors and proposals to green the taxation system to make polluters pay and reward progress towards net zero.
- Incorporate climate objectives into the heart of UK diplomacy.

### ***First year***

- Create a Just Transition Commission to advise on how to deliver a net-zero economy that works for everyone, and Just Transition Funds to support development in those regions and communities most affected by the transition.

- Legislate to create a statutory duty for each principal local authority to set a Zero-Carbon Strategy, including local and community power generation, home energy retrofits and local transport and land use plans, with an accompanying major decentralisation of powers and resources.
- Establish a national Citizen's Climate Assembly to improve public engagement, tasked with debating every aspect of climate policy and delivering recommendations to government and stimulating public debate.
- Start an emergency ten-year programme to reduce energy consumption from all the UK's buildings, cutting emissions and fuel bills and helping to end fuel poverty, including providing free retrofits for low-income homes and piloting a new subsidised Energy-Saving Homes scheme.
- Introduce a programme to accelerate the deployment of renewable power generation, aiming initially to reach a generation capacity of at least 80 per cent renewables by 2030 (including any increase in electricity demand for transport, heat and industry).
- Promote decentralised and community energy, including setting a target of more than half of households and businesses sharing in the renewable energy revolution by 2030, including requiring all new homes to be fitted with solar panels.
- Encourage the rapid take-up of electric vehicles by legislating to end the sale of new diesel and petrol cars and small vans, including hybrids, by 2030 and ban their use on public roads by 2045, and accelerating the installation of charging points.
- Put in place a programme to convert the rail network to ultra-low-emission technology (electric or hydrogen) by 2035.
- Reduce the need for car travel by increasing investing in public transport and amending the National Planning Policy Framework to promote sustainable transport and land use.
- Reform the taxation of international flights to target the most frequent flyers, place a moratorium on the development of new runways (net) in the UK and introduce a zero-carbon fuels blending requirement for domestic flights.

- Legislate to ban non-recyclable single-use plastics within three years and aim to initiate negotiations on an international agreement to reduce the production and consumption of plastics.
- Provide infrastructure funding to accelerate the introduction of industrial carbon capture and storage.
- Prioritise climate change mitigation in agricultural support systems, including measures to increase soil carbon, tree planting and woodland creation.
- Establish programmes to increase UK forest cover, by planting an additional 60 million trees a year, and to restore peatlands.

***Remainder of first Parliament***

- Regulate financial services to encourage green investments, including requiring all companies registered in the UK and listed on UK stock exchanges to disclose their level of climate risk and make provisions for the costs associated with meeting targets compliant with the Paris Agreement.
- Foster the development of regional industrial innovation clusters, increasing support for Innovate UK and the Catapult Centres, and fund large-scale technology innovation missions.
- Develop a zero-carbon skills strategy to tackle any skills gaps that could hinder progress.
- Implement zero-carbon education and public engagement strategies to ensure everyone understands the urgency of the climate crisis and is able to participate in decision-making over the options to tackle it.
- Triple support through the UK's International Climate Fund for climate-related development spending and end support from UK Export Finance for fossil fuel-related activities.
- Introduce a zero-carbon standard for all new buildings by 2021, rising to Passivhaus standard by 2025.
- Adopt a zero-carbon heat strategy, including reforming the Renewable Heat Incentive, requiring the phased installation of heat pumps in homes and businesses off the gas grid and taking a decision on the

appropriate mix of zero-carbon technologies – electric heat pumps, hydrogen and hybrid solutions – within three years.

- Develop smart grids, storage solutions and interconnectors to other countries' electricity grids to guarantee security of supply and to improve the management and balancing of the system.
- Work with industry to introduce resource productivity and circular-economy models.
- Develop a National Food Strategy to promote the production and consumption of healthy, sustainable and affordable food.
- Support research and innovation for negative emissions technologies, particularly Direct Air Capture and Carbon Storage (DACCS), and introduce a funding system to reward delivery.

# 1 Facing the climate emergency

## 1.1 Meeting the challenge

1.1.1 Humanity is staring down the barrel of a gun. Human activities, mainly the burning of fossil fuels, are causing global temperatures to rise, which in turn is driving the largest change in the climate in Earth's history. The current rate of global warming is at least ten times faster than any other over the last 65 million years. In each of the last three years, 2016–18, the average global temperature has reached more than 1°C above pre-industrial levels, and on current trends the world is on track for at least a 3°C rise by the end of this century. The last time carbon dioxide concentrations reached current levels was in the Pliocene era, three million years ago, when Arctic summer temperatures were 14 degrees higher than they are today.

1.1.2 The climate breakdown that would result from current trends would unimaginably and dramatically alter our world. The impacts include an increase in storms and hurricanes, flooding from higher rainfall and rising sea levels, more frequent and more dangerous heat waves and droughts, longer and more damaging wildfires, the spread of insect-borne diseases, the destruction of habitats and the extinction of species, and major damage to agriculture, with consequent food shortages and rising prices. Climate breakdown will cause increasingly costly damage to social and economic well-being and to nature, a huge and permanent growth in the numbers of refugees fleeing their homes and the possible collapse of poor countries with weak governance most exposed to the impacts.

1.1.3 The UK will see hotter drier summers, milder wetter winters, rising sea levels and more extreme weather events. Flooding will become more frequent and more severe, devastating communities and damaging the economy; rising sea levels will increase destruction from storm surges. Hotter summers and heat-related deaths will become more frequent, as most private and public buildings (including hospitals) are not built to cope with heatwaves; the summer of 2018 – the joint hottest on record – caused an estimated 1,000 extra deaths. Wildfires will become more common and more extensive, water supplies will come under pressure and habitats and wildlife will suffer. Although the UK is better placed to adapt to climate change than many other countries, it will not escape global impacts such as

rising food prices, the spread of diseases and the rise in numbers of refugees.

## **1.2 Government is failing to act**

1.2.1 In Paris in December 2015, world leaders agreed to hold ‘the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels’. As the UN’s Intergovernmental Panel on Climate Change (IPCC) concluded in October 2018, limiting global warming to 1.5 °C would carry substantial benefits, limiting the damage and giving people and ecosystems more room to adapt and remain below risk thresholds. The further the climate warms above 1.5°C, the greater the chance of catastrophic impacts.

1.2.1 Reaching the 1.5°C target would require global emissions of carbon dioxide (the main greenhouse gas) to fall by 45 per cent from 2010 levels by 2030 and to reach net zero by 2050, with any remaining emissions balanced by removing carbon dioxide from the atmosphere. For other greenhouse gases (methane, nitrous oxide and a range of synthetic fluorinated chemicals), net zero would need to be achieved by the mid-2060s. Yet the most recent assessment of the gap between national climate plans and the scale of reductions necessary to achieve the Paris targets at lowest cost ‘is alarmingly high’. Current pledges cover only a third of the emissions reductions needed to stay well below 2°C, let alone 1.5°C. The most recent estimates show that global emissions of carbon dioxide reached an all-time high in 2018, having increased by 3 per cent from 2017 and by 52 per cent from 1990.

1.2.2 The UK cut its greenhouse gas emissions by 44 per cent from 1990 to 2018, but it is not on track to meet its existing target, set in the 2008 Climate Change Act, of a reduction of 80 per cent by 2050, or any of its interim targets from 2023 onwards. Most of the reduction to date has been achieved by phasing out the use of coal in power generation, a process which is now almost complete, together with some improvements in energy efficiency and waste management and an increase in electricity generation from renewable sources.

1.2.3 Between 2010 and 2015 Liberal Democrats in coalition laid the foundations for further progress, including securing resources for

renewable power and heat, supporting community energy schemes and establishing the Green Investment Bank. But most of this was scrapped by the Conservative administrations after 2015, and as a result almost no progress has been made in reducing emissions from buildings, surface transport, aviation or land use.

1.2.4 Carbon dioxide, the main greenhouse gas, is only removed slowly from the atmosphere, by processes which can last hundreds of years. Every day in which the government fails to act thus magnifies the impacts of the climate breakdown, adds to the costs of addressing it and threatens the collapse of not just environmental systems but economic, financial and social frameworks. This is increasingly clear to the British public; a recent poll by Opinium found 63 per cent agreeing with the statement: 'We are facing a climate emergency', and a YouGov poll found 24 per cent putting the environment among their top issues facing the country, about the same level as the economy and immigration. School climate strikes and the Extinction Rebellion actions have helped to raise the profile of the issue further. Yet still the government is failing to put in place measures adequate to meet the crisis, and Britain's dysfunctional political system, paralysed by Brexit, lets them get away with it.

### **1.3 Grasping the opportunity**

1.3.1 Acting now gives the country longer to find cost-effective solutions and more time to test new technologies, policies and approaches. The radical changes in policy and approach that are needed will also bring major benefits to health, well-being and economic prosperity and the chance of reducing inequality. Improving home energy efficiency will cut energy bills and end the scourge of fuel poverty. Replacing petrol and diesel cars with electric vehicles will reduce air pollution and improve standards of health. Improving the efficiency of power generation and industrial processes will reduce dependence on natural resource imports and improve the competitiveness of the UK economy. Ending highly intensive farming will revive Britain's increasingly depleted soil and help to stem the rapid decline in numbers of insects, birds and other animals. Building on Britain's potential to be a world leader in renewable energy, zero-carbon transport and green finance will create jobs, exports and prosperity across the country.

1.3.2 This is not to say that the necessary measures will be easy. They will require massive investment in new infrastructure, technology and research; major shifts in markets, creating winners amongst innovative companies and losers amongst companies slow to adjust; and changes in behaviour from all levels of government, all sectors of industry, all communities and all households. They will require fundamental reform of Britain's chronically short-termist, over-centralised and fundamentally dysfunctional political system. And they will require wholesale commitment from Britain's citizens.

1.3.3 But there is huge potential: just look, for example, at the astonishingly fast fall in the costs of renewable power in recent years, driven by the innovation and economies of scale stimulated by government action and the development of global supply chains. The cost of offshore wind, for example, fell by more half in just two years, from 2015 to 2017, partly thanks to the new support framework introduced by Liberal Democrat ministers. If we get the policy framework right, and display the necessary political will and determination, we can unleash the ingenuity and innovation of the British people. We can find new ways of doing things that not only combat climate change but also revive the economy and improve health, well-being and prosperity right across the country.

1.3.4 But the time we have left to do this is now very short. We are the last generation that can tackle effectively the climate emergency.

## 2 The Liberal Democrat approach

*Key proposals – tackle the climate emergency by:*

- Carrying out an emergency ten-year programme of action to reduce greenhouse gas emissions from buildings and power generation – the most cost-effective options – to near-zero, reducing UK greenhouse gas emissions by 75 per cent by 2030.
- Establishing a framework for accelerating reductions in other sectors – transport, industry and land use – and for removing carbon dioxide from the atmosphere, aiming to reach net zero emissions by 2045 at the latest, with interim targets of 75 per cent by 2030 and 90 per cent by 2040 (all subject to revision should faster progress prove possible) – in compliance with the international targets to limit climate change set by the Paris Agreement of 2015.
- Ensuring that the net zero objective is built into decision-making by national and local government, businesses, investors, communities and households, rewarding rapid progress towards net zero and encouraging behavioural change in patterns of living, working, travelling and eating.
- Creating a Just Transition Commission to advise on how to deliver a net-zero economy that works for everyone, and Just Transition Funds to support development in those regions and communities most affected by the transition.
- Ending the use of fossil fuels in the UK economy, including banning fracking and the opening of new coal mines and pits, and replacing fossil fuels with renewable energy.

2.0.1 Concern for the environment is a core Liberal Democrat value. As the preamble to our party's constitution states, 'We believe that each generation is responsible for the fate of our planet and, by safeguarding the balance of nature and the environment, for the long term continuity of life in all its forms.' It is clear that the UK must reduce its contribution to global climate change as fast as possible; we believe that net zero greenhouse gas emissions can be reached within a single generation, by 2045 at the latest.

2.0.2 While setting a target date for net zero emissions is essential, by itself it is not enough. Because of the long lifetime of carbon dioxide in the atmosphere, urgent action to reduce emissions in the short term is more critical, and the precise target date for achieving net zero is less important than urgent action to set the economy on the path towards it. We therefore propose an emergency programme of action to reduce emissions from buildings and power generation – the most cost-effective options – to near-zero by 2030. At the same time, the framework for accelerating reductions in other sectors – transport, industry and land use – and for removing carbon dioxide from the atmosphere and storing it underground need to be put firmly in place. We believe that these measures will enable UK emissions to be reduced by 75 per cent by 2030 and by over 90 per cent by 2040. The table below compares the government’s existing targets for the five-yearly carbon budgets (currently set out to 2028–32) with ours.

#### *Greenhouse gas targets*

	<b>Carbon budget reduction target from 1990 baseline</b>		
<i>Year</i>	<i>Original Climate Change Act</i>	<i>Amended Climate Change Act</i>	<i>Liberal Democrat proposal</i>
2008–12	25% (met)		
2013–17	31% (met)		
2018–22	37% (on track)		
2023–27	51% (not on track)		59%
2028–32	57% (not on track)		75%
2040			93%
2045			100%
2050	80%	100%	

2.0.3 The Liberal Democrats are the only main party to take this approach. The Conservatives have rolled back many of the measures Liberal Democrat ministers put in place during the coalition; they have blocked onshore wind, ended the feed-in tariff for microgeneration and supported fracking and airport expansion. Although they have now

accepted the case for net zero by 2050, their policies are failing to meet even the current, less ambitious, target of an 80 per cent reduction. As the independent Committee on Climate Change (CCC) reported in July 2019, over the previous year the government had delivered just one of the 25 critical policies recommended the year before in order to get the UK's emissions reductions back on track. Labour at least appears to recognise the scale of the climate crisis, but their own ideological obsessions, particularly with nationalising the energy companies, inhibit real progress. And both parties support Brexit, which would fatally undermine the international cooperation which is so vital to success.

2.0.4 These are ambitious targets, requiring a massive and complex effort to accelerate the deployment of zero-carbon infrastructure, vehicles and products, develop and commercialise new technologies and change behaviour. It cannot be achieved only by government; we aim to set free the innovative talents of scientists, engineers, industrialists, investors, farmers, communities and households by creating frameworks that reward rapid progress towards net zero. Nevertheless, we recognise that achieving the targets set out above will be immensely challenging.

2.0.5 Although by 2017 total UK greenhouse gas emissions had fallen by 40 per cent compared to the baseline year of 1990 (including the UK's share of international transport), many of the 'easy' options are now close to being exhausted. Replacing fossil fuels in power generation and upgrading building insulation are the only options through which to reduce emissions very substantially over the next ten years. Other sectors are more difficult. In transport, for example, the take-up of electric vehicles is increasing rapidly but from a tiny base; less than 1 per cent of cars registered in the UK are electric, and a recent survey by the Transport Research Laboratory suggested that only one in four people would consider buying a fully electric car in the next five years – yet we need the entire fleet to have changed by 2045. There is currently no cost-effective means of reducing emissions from aviation other than by flying less.

2.0.6 We do not know the most cost-effective route to zero-carbon heating, but whether it is electric or hydrogen it will require every household to change its boiler and associated equipment over the next 25 years. Heavy industry will need to retrofit, or completely replace, its plant and equipment. Every farmer will need to change their methods of farming. Consumption of meat and dairy products will have to fall. We will

need to achieve a rate of tree-planting across the UK higher than has ever been managed before, and sustain it year after year. And all this will still not be enough; we will have to rely on technologies to remove carbon dioxide from the atmosphere, most of which are currently not even at pilot stage. Underpinning all this we will have to reform the country's regulation and frameworks for finance and investment, skills, innovation and industrial support, and reshape the institutions of British government, central and local.

2.0.7 There is a limit to how fast these massive changes can be achieved. The innovation cycle, from invention to development to demonstration to commercialisation, takes time; accelerating it too much risks investing in less effective and more costly solutions. Forcing the early retirement of equipment, or vehicles, or appliances like boilers, is costly; in general it is better to introduce zero-emission solutions when the equipment would be replaced anyway. And in implementing the necessary measures, people have to be convinced of the urgency of the crisis and the need for change. The earlier the net zero target, the more the need for compulsion rather than persuasion, and the greater the likelihood of resistance, such as the *gilets jaunes* riots in France in 2018 or the tanker drivers' strike in the UK in 2000.

## 2.1 An emergency programme for rapid emissions reductions

2.1.1 We support the IPCC's conclusion that the world must reach net zero carbon dioxide emissions by 2050, and net zero for all greenhouse gases by the mid-2060s. Indeed, net zero for all greenhouse gases by 2050 has been a Liberal Democrat aim for the UK for over a decade. Given the UK's historic contribution to climate change, as the first country to enter the Industrial Revolution, and given the progress the UK has already made, we believe this target should be brought forward, to 2045 at the latest – and should faster progress prove possible, we would bring the target date forward further. Unlike the Conservatives, we would aim to meet this target without the use of international offsets (paying other countries to reduce their emissions in place of the UK's), since using this route would reduce the pressure to achieve genuine reductions at home. We would also encourage local authorities, communities, companies and institutions to set their own net zero targets – as many are now doing – and it should be possible for many of them to achieve this much earlier than 2045.

2.1.2 In its net zero report in May 2019, the CCC argued that an earlier target date than 2050 was not possible. We believe, however, that the more ambitious date of 2045 is feasible because:

- We believe faster progress in reducing emissions from buildings and power generation is possible with an emergency programme of investment throughout the 2020s.
- We would stop Brexit and avoid undermining Britain's economy just when it needs to undergo a huge economic transformation.
- We would unleash the power and creativity of local communities and decision-makers, finding local solutions to reduce emissions.
- We would pursue more ambitious programmes of international cooperation than this government is capable of, developing new technologies and finding new solutions.

2.1.3 To embed long-lasting progress towards net zero, government must set a comprehensive framework for ambitious climate action, regulating, taxing and providing financial support to create incentives and setting signals for decision-makers, industry, communities and households to act; a combination of the market, industrial innovation and community ingenuity will then deliver solutions – as we have seen, for example, in government support for renewable power generation in recent years, which has fostered competition and driven down costs. Our proposals are set out in Chapter 3 to 6 of this paper, and include:

- Unlocking the innovative power of local decision-makers by giving communities and local government more resources and powers, reforming the institutions of central government to ensure that achieving these aims is embedded in every department and agency, and creating Citizens' Climate Assemblies at national and local level to improve public engagement with the development of climate strategies (Chapter 3).
- Regulation of financial institutions, and taxation, to steer investment towards zero-carbon solutions, both in the UK and amongst the companies for which the UK provides financial services (Chapter 4).
- The development of innovation and skills strategies to support the transition (Chapter 5).

- A new drive towards fostering international collaboration on zero-carbon technologies, embedding the zero-carbon aim in UK foreign and trade policy, and providing development aid to help developing countries reach net zero themselves (Chapter 6).

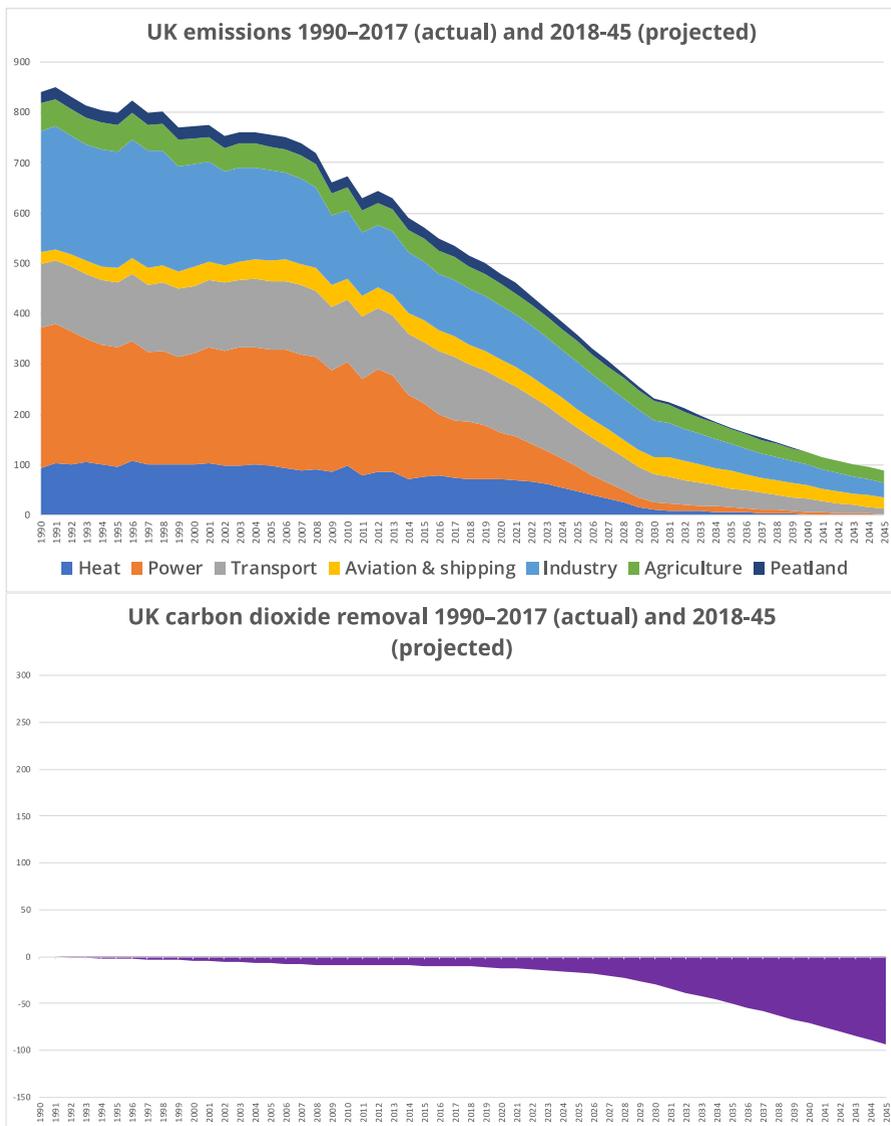
2.1.4 These measures create the enabling environment for the following steps to reduce emissions to net zero by 2045:

- Cutting emissions from the five main emitting sectors in the UK – buildings and power (which offer the fastest opportunities) transport, industry and agriculture and land use – by reducing the demand for energy, particularly in buildings, and accelerating the deployment of renewable energy (Chapters 7–11).
- Since it will be impossible to reduce emissions completely to zero, this must be accompanied by the removal of carbon dioxide from the atmosphere: mainly through a massive programme of tree planting, together with the deployment of technological solutions such as carbon capture and storage (CCS), particularly for industrial processes (Chapter 12).
- Encouragement for behavioural change in patterns of living, working, travelling and eating, creating incentives and providing advice and support for actions that make greener lives cheaper and easier. This includes education in the causes and impacts of and solutions to climate change, both for students and the general public.

2.1.5 The table and graphs below show a feasible route to net zero by 2045 (see the annex for sources); these are the figures we use as targets in Chapters 7–12 of this paper. Several of these chapters also include illustrations of what these targets mean in practice – for, e.g. numbers of houses insulated to high standards, renewable power capacity, numbers of electric vehicles, and so on.

Proposed Liberal Democrat greenhouse gas emission targets by sector

Sector and chapter of paper	Annual emissions (million tonnes carbon dioxide equivalent (MtCO <sub>2</sub> e))				
	Actual		Proposed		
	1990	2017	2030	2040	2045
Buildings (Ch 7)	94	75	10	2	0
Power (Ch 8)	278	113	15	4	1
Surface transport (Ch 9)	128	126	57	25	11
Intl transport, UK share (Ch 9)	24	43	33	27	23
Industry (Ch 10)	241	111	73	41	29
Agriculture (Ch 11)	54	46	37	25	24
Peatland (Ch 11)	24	23	7	1	0
<b>Total without negative emissions</b>	<b>841</b>	<b>536</b>	<b>232</b>	<b>126</b>	<b>89</b>
Negative emissions (Ch 12)	0	-10	-30	-71	-94
<b>Total including negative emissions</b>	<b>841</b>	<b>526</b>	<b>203</b>	<b>55</b>	<b>-5</b>
Reduction from 1990	0%	38%	75%	93%	101%



## 2.2 Delivering a just transition

2.2.1 The benefits of achieving the transition to a net zero economy include not just the fall in greenhouse gas emissions but improved health from better air quality and better heated homes, a healthier local

environment from tree-planting and reformed farming practices and lower consumer energy bills from home insulation. There will also be significant industrial and economic opportunities. The UK is already an effective zero-carbon innovator in areas such as electric motors, electricity distribution and domestic appliances, and has the potential to export other technologies, including zero-emissions vehicles and batteries, and CCS. A study for the CCC concluded that, based on the UK's existing 80 per cent emission reduction target, the low-carbon economy will grow from 2 per cent of UK total output in 2015 to up to 8 per cent by 2030, and 13 per cent by 2050. But the transition must be well managed if these opportunities are to be realised.

2.2.2 More jobs will be created in some areas, such as renewable power generation and associated supply chains, and energy efficiency and zero-carbon heat, but we recognise that jobs will be lost in others, such as the extraction of fossil fuels. We will put the creation of high-quality jobs and employment and investment in skills at the heart of the net zero economy. No community should be left behind.

2.2.3 The poorest people and households are not only those most likely to be affected by climate change but also those least able to adjust to it. Many proposals in this paper, such as the provision of free house insulation to the poorest households, investment in renewable power generation (which is now cheaper than fossil fuels), and substantial improvements in public transport, are designed to tackle this problem, but a comprehensive approach is needed.

2.2.4 We would therefore:

- Create an independent Just Transition Commission to report to Parliament on the costs and benefits of net zero policies and provide advice on how to ensure that the transition delivers high-value employment opportunities and that disadvantaged groups are protected, with the benefits shared fairly between income groups, industries and regions.
- Establish Just Transition Funds to boost development and jobs in those regions and communities most affected by the transition. These funds, devolved to local decision-makers, would leverage inward investment in local businesses, infrastructure, supply chains, training and local zero-carbon energy and energy efficiency projects.

- Identify zero-carbon sectors with the greatest potential for growth, map them against the regions and communities where employment opportunities are most affected by the transition, and develop policies to ensure that people with relevant skills can transfer to new, zero-carbon industries.
- Develop zero-carbon skills and education policies geared at retraining workers most affected by the transition (see Chapter 5).
- Develop a National Food Strategy to promote the production and consumption of healthy, sustainable and affordable food (see Chapter 11).

2.2.5 Communities, households and businesses will be increasingly affected by the impacts of climate change, including storms, floods, heatwaves and wildfires. The current government is comprehensively failing to respond; in July 2019 Lord Deben, the chair of the CCC, suggested that climate change adaptation preparations were being ‘run by the government like Dad’s Army’. This is a crucial area of policy which nevertheless falls outside the remit of this paper; we will put forward policy proposals in the near future.

## **2.3 Ending fossil fuel production**

2.3.1 Most of this paper sets out proposals to accelerate the development and deployment of zero-carbon solutions, involving phasing out the use of fossil fuels for energy: the main source of greenhouse gas emissions. This in itself will bring considerable economic benefits – in 2017 the UK spent £45 billion (gross) on importing fossil fuels, mainly oil and gas, equivalent to 2.2 per cent of GDP – and help to deliver energy independence from autocratic regimes in Russia and the Middle East.

2.3.2 We would underpin this development by banning the opening of any new deep coal mines or open-cast coal pits. Quite apart from the environmental case against them, any new mines and pits risk becoming stranded assets, needing to cease operation before exhaustion if the net zero target is to be met; there is no long-term economic case for them. Similarly, we would ban onshore shale gas and oil wells (fracking). Opening up substantial new gas production from fracking, as the government is attempting to do, would inhibit the adoption of zero-carbon heating (a

sector in which very little progress has been made), as well as causing local environmental damage and disruption.

2.3.3 Meeting the 2045 (or even the government's 2050) target for net zero greenhouse gas emissions will see demand for gas and oil steadily fall. Some gas is likely to be needed as feedstock for the production of hydrogen (see Chapter 7), for industrial heat and possible residual use for power generation (both fitted with CCS) and some oil as feedstock for chemicals and pharmaceuticals. These are best supplied from domestic sources on environmental and security grounds – as well as making the best use of the UK's existing engineering excellence – for as long as possible. The eventual phase-down of production needs to be carefully managed to protect the livelihoods of workers, those involved in the wider supply chain and the prosperity of those communities especially dependent on the industries.

2.3.4 Under the proposals in this paper, job creation in zero-carbon industries such as renewables should exceed job losses in oil and gas, but government policy so far has let too many of these jobs go to overseas competitors. We would implement the UK's G7 pledge in 2016 to end fossil fuel subsidies by 2025, using the revenue from the current substantial subsidies to the oil and gas industry to provide targeted Just Transition Fund support for workers and communities affected by the phase-down of oil and gas production. This would be supplemented if necessary to ensure it remains a strong economic driver even if a temporary global slump in fossil fuels cuts the expected savings.

## **2.4 Costs**

2.4.1 Undoubtedly the transition to net zero will incur costs, to government and business, though the CCC has estimated that the costs of reaching net zero by 2050 would amount to only 1–2 per cent of GDP annually – the same level as their original estimate of the costs of reaching the old target, of an 80 per cent reduction when that target was adopted in 2008. It is quite possible that this will prove to be an over-estimate. The cost of solar photovoltaic (PV), for example, is now less than one-tenth of what it was a decade ago, and wind power less than half, leading to a huge expansion in their use around the world. Not only were these reductions not predicted when countries first set their emissions targets, they were

also the direct result of those targets, which drove demand and innovation in both performance and cost. In turn this allowed those targets to be increased in subsequent years, with further innovation occurring. The entry of China into large-scale renewable energy manufacture has greatly accelerated this cycle.

2.4.2 The implications of our 2045 net zero target for UK public spending will be covered in full when the party publishes its next election manifesto. Most of the necessary up-front costs of investing in renewable energy and new technology can be met from the greatly expanded capital investment programme that we will put forward, including energy efficiency investments; energy storage; national and local power grid infrastructure, including interconnectors, for smart and zero-carbon electricity; pilots for zero-carbon heat solutions; charging infrastructure for electric vehicles; regional CCS clusters; and a national afforestation programme. Our proposals for reforming taxation (see Chapter 4) are mostly revenue-neutral apart from the reform of air passenger duty to target the most frequent flyers (see Chapter 9), which should raise additional resources.

2.4.3 Other areas of additional spending include support to local government to help councils develop and implement Zero-Carbon Strategies (though we will also give local authorities powers to call on new income sources such as workplace parking taxes, vacant property taxes and infrastructure use tolls) and increased funding for innovation, including through Innovate UK and the technology Catapult Centres.

### 3 Unleashing democracy

**Key proposals – unleash democracy by:**

- Legislating to create a statutory duty for each principal local authority to set a Zero-Carbon Strategy, including local and community power generation, home energy retrofits and local transport and land use plans, with an accompanying major decentralisation of powers and resources.
- Ensuring climate objectives are a top priority for central government, including appointing a cabinet-level Chief Secretary for Sustainability in the Treasury, creating a new Department for Climate and Natural Resources and introducing a requirement on all public bodies to report on the extent to which climate risks pose a threat to their ability to fulfil their responsibilities.
- Establishing a national Citizen’s Climate Assembly to improve public engagement, tasked with debating every aspect of climate policy and delivering recommendations to government and stimulating public debate.

3.0.1 Current structures of democracy and government in the UK are wholly unsuited to meeting the climate emergency. Britain is one of the most centralised states in the democratic world; the voices of its citizens are routinely ignored, elections do not deliver a representative Parliament, and power has been progressively stripped away from councils and other local institutions. The saga of Brexit highlights just how dysfunctional the political system is. No wonder British citizens are losing trust in the institutions of government and Parliament.

3.0.2 This is disastrous for environmental policy, which requires long-term frameworks for decision-making, honesty about the challenges and the options facing the country and a broad-based national consensus in order to make difficult choices. Liberal Democrats believe that the climate emergency cannot be tackled effectively without the radical empowerment of local government and local communities, reform of the institutions of central government and greater transparency in decision-making and engagement with the public.

3.0.3 It also requires full cooperation between the UK government and the Scottish and Welsh governments and Northern Ireland executive. In line with Liberal Democrat policy-making, this paper includes proposals for policies which must be adopted at the UK level and in England; similar policies for Scotland and Wales, such as on public transport, housing, agriculture, land use and forestry will be made in those nations. In government we would underpin the UK's ability to meet the climate crisis by establishing a Joint Climate Council of the Nations, enhancing cooperation between the four governments, seeking to agree common frameworks and learning from each other's experiences.

### **3.1 Local government, local innovation**

3.1.1 Local government has a critical role to play in an effective and just transition to a zero-carbon Britain. Many of the solutions to climate change are best tackled locally, with cities, towns and rural communities developing zero-carbon strategies for housing, transport, local energy generation and land use. Innovation often takes place most successfully and visibly at the smaller, local, scale, as Liberal Democrat-run local authorities such as Sutton, South Cambridgeshire and Eastleigh have demonstrated. Local leaders are more trusted than national politicians, and are closer to their residents. They are better placed to promote change with imagination and sensitivity. They are accustomed to forming constructive partnerships with each other and with the many organisations in the private, public and voluntary sectors which need to contribute to change.

3.1.2 Although at the time of writing about sixty councils have declared a climate emergency, in reality local authorities have little formal responsibility or powers in these areas. We would therefore create a statutory duty for all principal local authorities, combined authorities and City Deals to agree their own Zero-Carbon Strategies, applying to the sources of emissions within their own areas, developing a pathway to deliver net zero emissions by 2045 at the latest. Like central government, local authorities would be required to report annually on progress.

3.1.3 We would implement a long-overdue decentralisation of powers to local government to accompany this new responsibility (see Policy Paper 130, *Power for People and Communities*, for more detail). This would include

greater powers over housing and planning, including ensuring that local and regional development plans contribute to the net zero target. Local authorities would have a major role to play in particular in developing and implementing energy efficiency and renewable energy programmes for buildings, and we would also encourage them to set up or expand their own renewable electricity generation capacity. In order to ensure that they can play a major role in developing zero-carbon transport solutions, we would give them powers to run, or to commission and regulate, local bus and tram networks, provide high-quality infrastructure for walking and cycling, and charging infrastructure for electric vehicles, ensure that new housing developments are designed for access to high-quality public transport and introduce ultra-low-emission zones that accelerate the uptake of zero-emission vehicles.

3.1.4 We would ensure that decarbonisation is established as an equal objective to economic growth for Local Economic Partnerships and City Deals. More widely, we would encourage local and combined authorities to establish (or support where they exist already) one or more broad place-based net zero partnerships, bringing together local communities, businesses, educational institutions, civil society and other stakeholders to develop net zero solutions for their localities (the Zero-Carbon Nature Partnerships proposed in Chapter 12 is an example of this approach).

3.1.5 Councils clearly need additional resources to accompany these new responsibilities, and we would provide additional funding from central government for the design, implementation and monitoring of Zero-Carbon Strategies. We would also end the current Council Tax capping regime and give councils enhanced powers to call on new income sources such as workplace parking taxes, vacant property taxes and infrastructure use tolls. We would replace the existing system of business rates with a new tax on the land value of commercial sites, removing the disincentives to invest created by business rates and enabling the state to better capture increases in land value driven by public infrastructure investment. We would give councils enhanced borrowing powers, including for housing and local infrastructure.

## **3.2 Mainstreaming climate policy through central government**

3.2.1 The current structure of central government in Britain is particularly badly suited to addressing the climate emergency. Environmental factors and outcomes are routinely downplayed compared to economic or political priorities. During the coalition, Liberal Democrat ministers ensured that climate objectives were pursued at the highest levels of government; but no such commitment exists today. Conservative ministers have made decisions with major impacts on emissions – such as giving the go-ahead to the third runway at Heathrow – without considering climate objectives, and no mechanism exists to require them to do so. Decision-making is chronically short-termist, the departments responsible for environmental policy are of low political status, and the dead hand of Treasury orthodoxy militates against ambitious action. Radical reform of government is needed, to create a clear voice and leadership for climate policy and to require all government bodies to embed long-term climate thinking in their decision-making.

3.2.2 To strengthen the voice for ambitious climate action inside government, we would:

- Give the Treasury a new, top-level priority to ensure that the economy is sustainable, resource-efficient and zero-carbon, and appoint a cabinet-level Chief Secretary for Sustainability, responsible for coordinating government-wide actions towards this aim, including through a Net Zero Cabinet Committee.
- Create a new Department for Climate and Natural Resources to give a strong climate policy lead by merging the Department for Environment, Food and Rural Affairs with the climate and energy functions of the Department for Business, Energy and Industrial Strategy. The new department would work with other government departments and public sector bodies, and local government, to help them analyse climate risk and draw up climate strategies.
- Appoint a Chief Sustainability Adviser to work alongside the Chief Scientific Adviser and National Security Adviser to enable the Prime Minister to provide consistent leadership on climate change.

3.2.3 So many activities of government are relevant to the zero-carbon transition that procedures need to be devised that require all government

departments and agencies to consider the implications for climate policy when taking decisions and spending money. We would:

- Draw up a clear and consistent set of policy objectives across government, in line with the net zero target, to set the overarching framework to which departments must adhere and to which they can be held to account.
- Rewrite the UK's National Security Strategy (overseen by the National Security Council chaired by the Prime Minister) to set the highest priority on minimising the impacts on the UK's society, economy and environment of climate change and other environmental risks.
- Require all public bodies to report on the extent to which climate risks pose a threat to their ability to fulfil their responsibilities, and to produce a reduction and resilience plan to deal with the likely threats.
- Task the Committee on Climate Change, working with Parliament's Environmental Audit Committee, to produce annual reports not just on the government's overall progress towards the net zero target, but on individual departments' actions, and require each Secretary of State to respond to the report on their department in Parliamentary debates.

### **3.3 A voice for citizens: Citizens' Climate Assemblies**

3.3.1 Citizens must have the opportunity to make their voice heard in the debates over how to reach net zero emissions. Too often, government introduces policies in ignorance of or in opposition to the views of ordinary people; look, for example, at the steps the current government is taking to force fracking on communities that do not want it. Even well-intentioned policies – such the recent decision to ban gas boilers in new homes by 2025 – can seem a shock because government has made no effort to prepare the ground and explain why such steps are necessary.

3.3.2 We would therefore establish a UK-wide Citizen's Climate Assembly to hear evidence and debate the steps the UK should take on climate change. This is modelled on the experience of the Irish Citizens' Assembly which, comprising 100 individuals chosen randomly from the population and varying in age, gender, social class and location, met over twelve weekends between 2016 and 2018. The Assembly succeeded in debating five issues, including climate change, in an honest, open and informed way;

its final recommendations were more radical than the politicians expected. More recently, several UK local authorities have established local climate assemblies, and in June 2019 six select committees of the House of Commons announced their plan to hold a Citizens' Assembly on combatting climate change and achieving the pathway to net zero emissions.

3.3.3 The UK Citizens' Climate Assembly would be tasked with debating every aspect of climate policy and delivering recommendations to government and stimulating public debate. Particular topics they would be asked to consider include the fair sharing of the potential costs of different policy choices, options for improving public debate and engagement and the implications of specific policies, including the choice of options for zero-carbon heat, for aviation and for low-carbon and healthy diets. Parliament would be required to hold a public debate on the Assembly's reports and the government's proposed responses.

3.3.4 We would also encourage local authorities to establish local citizens' climate assemblies along the same model; as noted, some have already done so. These should play a major role in increasing awareness of the urgency of the climate crisis and the likely local impacts, and stimulating debate on potential responses by local authorities, businesses, communities, households and individuals.

## **3.4 Zero-carbon Europe**

3.4.1 This paper is written on the assumption that the UK will not leave the EU, since this is what Liberal Democrats are campaigning for. According to the Green Alliance, 55 per cent of the UK's projected emission reductions by 2030 are underpinned by EU legislation and policies. These include targets for greenhouse gas emissions, renewable energy and energy efficiency, the Emissions Trading Scheme (ETS), product and vehicle standards and limits on industrial emissions and on the production and consumption of hydrofluorocarbons.

3.4.2 The EU's 2030 Climate and Energy Framework sets out further targets for energy performance in buildings, renewable energy, energy efficiency and the preparation of energy and climate plans. The Circular Economy Package contains legislation designed to promote reuse and recycling and minimise resource use. UK membership of the EU internal

energy market, which allows harmonised, tariff-free trading of gas and electricity across Europe through interconnectors, helps to keep costs low for consumers, deliver energy security and accelerate the decarbonisation of the power sector.

3.4.3 This helps to demonstrate just how critical is continued UK membership of the EU. Full UK implementation of these policies and legislation is an essential part of achieving the net zero target at lowest cost – and full UK participation in developing future EU measures is equally essential, both for the UK and the EU. We support the European Commission’s proposal – yet to be approved by member states – for the EU as a whole to meet a net zero target by 2050.

3.4.4 With the UK remaining a key member state, we would press for greater ambition in EU policies and strategies, including steadily higher product and vehicle energy efficiency and emissions standards, continued strengthening of the EU ETS and possible expansion to new sectors, further efforts to accelerate the roll-out of renewable energy, including through interconnectors, and reform of the Common Agricultural Policy to reduce land use emissions.

## 4 Decarbonising finance and industry

*Key proposals – decarbonise finance and investment, and make the UK the green finance capital of the world by:*

- Investing in zero-carbon infrastructure for power, heat, transport, industrial carbon capture and storage (CCS) and afforestation.
- Establishing a new Green Investment Bank to steer private investment into these sectors.
- Regulating financial services to encourage green investments, including requiring all companies registered in the UK and listed on UK stock exchanges to disclose their level of climate risk and make provisions for the costs associated with meeting targets compliant with the Paris Agreement.
- Greening the taxation system to make polluters pay and reward progress towards net zero.

4.0.1 Policy for finance and investment will play a crucial role in achieving the net zero target. While investment in new infrastructure and technologies – energy efficiency, renewable power and heat, zero-carbon transport and industrial processes – has increased, it needs to be massively accelerated in terms of rate and scale. At the same time, existing flows of capital need to be directed towards climate-friendly investments and away from climate-negative activities. This is true not just for UK emissions; the UK’s financial centres currently finance businesses that are responsible for an estimated 15 per cent of global emissions. It makes no sense to hold UK citizens to one standard – net zero by 2045 – and then not expect banks and multinational companies based in or financed through the UK to do the same.

4.0.2 We believe that the UK should aim to become the green finance capital of the world. The country is already a world leader in finance and insurance, and has seen major growth in green assets; the Green Finance Institute, co-funded by the City of London, was established in July 2019. The Bank of England is a founding member of the central banks’ Network for Greening the Financial System and has produced pioneering work to identify financial risks and opportunities from climate change. The Green Investment Bank, established by Liberal Democrat ministers Chris Huhne

and Vince Cable in coalition, was the world's first of its kind; the Conservative government's privatisation of it underlines just how limited is their commitment to ambitious climate policy. The UK is well placed to lead in developing the markets for financial products such as green bonds and green mortgages, and to play a part in global emissions trading markets; as well as reducing emissions, these activities will help to generate employment in the UK financial services sector.

4.0.3 We will direct more support to research and development, innovation and investment in zero-carbon technologies, industries and infrastructure. We will regulate the finance and investment sectors and use taxation to create the right incentives for businesses, communities and households to minimise their impact on the climate.

## **4.1 Accelerating green investment and innovation**

4.1.1 Transforming the UK's power, heating, transport and industrial systems will require major investment in the new infrastructure needed to support private investment in zero-carbon solutions. Liberal Democrats have proposed a significant increase in capital investment, the vast majority of which should be directed towards projects intended to help the UK achieve its net-zero target, including in particular energy efficiency investments in homes and buildings; energy storage, for both electricity and heating and cooling; national and local power grid infrastructure, including interconnectors, for smart and zero-carbon electricity; pilots for zero-carbon heat solutions using hydrogen, biogas or seasonal heat storage; charging infrastructure for electric vehicles; regional CCS clusters; and a national afforestation programme. The National Infrastructure Commission, which advises on investment priorities, should be given an explicit mandate to support the net zero aim. As proposed in Chapter 3, we would decentralise significant infrastructure spending to local councils and combined authorities.

4.1.2 Liberal Democrats have long been committed to protecting the UK's science budget, by continuing to raise it at least in line with inflation and, in the long term, doubling science spending across the economy. However, innovation funding is just as, if not more, important, and needs to be much larger in scale, as does investment in demonstration and deployment. US research suggests that for every \$1 million invested in basic research on

new technology, \$10 million is required to scale it up and \$100 million to move it into large-scale manufacturing. Government therefore needs to increase funding for innovation, including directing more funding through Innovate UK and the technology Catapult Centres established by Liberal Democrats in coalition (see further in Chapter 5).

4.1.3 In its five years before privatisation, the Green Investment Bank successfully steered £15 billion of investment into green projects, including offshore wind, solar PV and waste management, attracting private sector funds by mitigating the higher risk of what were then untested technologies at scale. Although its privatised successor, the Green Investment Group, continues some of this work, its activities are not restricted to UK investments, and its long-term green focus is not guaranteed. We would therefore establish a new Green Investment Bank to steer investment into the priority areas listed in paragraph 4.1.1, with an initial capitalisation of at least £5 billion (compared to £1 billion for the original Bank in 2012) and the ability to raise further capital on the markets. It should include a venture capital arm to support early-stage high-risk projects, particularly from small businesses.

4.1.4 We would aim to green the UK's sovereign bond issuances by issuing a UK Sovereign Green Bond specifically linked to the priority investment areas listed above. Private-sector green bonds, or climate bonds, are growing in volume; though sovereign green bonds are less common, recent years have seen them issued by Belgium, France and Poland, among other countries. We support current proposals to establish a robust common EU standard for green bonds, both private and sovereign, alongside a detailed taxonomy of green investment opportunities; these standards need to ensure at a minimum that all businesses raising green bonds possess a business plan consistent with the targets in the Paris Agreement.

4.1.5 We recognise that the instability of government policy and the perceived risks of investment in zero-carbon activities can often be the biggest barrier to unlocking large-scale, private-sector capital. We would work closely with the investment community to secure their confidence in the policies implementing net zero, and create 'soft infrastructure' through forums and roundtables to understand and manage uncertainties to support the continued flow of capital and identify a pipeline of investable zero-carbon projects.

4.1.6 All areas of government spending need to support the net zero target. We would end the hypothecation of Vehicle Excise Duty (VED) revenue for strategic road network schemes, introduced in the 2017 Budget, and direct it instead to zero-carbon transport investments. We would use public procurement policy to support the purchasing of zero-carbon products, and impose strict environmental criteria on firms bidding for public contracts; we would encourage other public sector bodies, including local government and the NHS, to do the same. We would ask the CCC to scrutinise all areas of government spending for their contribution to the net zero target.

## **4.2 Greening the financial system**

4.2.1 The financial system as a whole is not well geared to supporting the transition to net zero. Its focus on short term profits at the expense of long term stability has been described by Governor of the Bank of England Mark Carney as ‘the tragedy of the horizon’. This is not new. When in coalition Liberal Democrats commissioned the Kay Review to understand the drivers of short-termism and risk-taking in the City and to identify how financial-sector incentives could be better aligned with society’s needs. Some of the answers to the climate challenge can be found within this work: for example, to foster long-termism we would increase an investor’s voting rights the longer they remained with the company, and we would taper the rate of tax for every year an investor kept their share in the business.

4.2.2 The finance sector needs to operate within a framework that steers resources into climate-friendly investments and away from climate-negative activities. In particular, it should avoid supporting investments that may become stranded assets: activities, such as opening up new oil and gas fields or coal mines, which cannot operate in the long term (and therefore will not deliver returns to investors) if the net zero target is to be met. This requires a series of actions by government and financial sector regulators, including in particular ensuring better flows of information about climate risks and green investment opportunities for investors, lenders, insurers and other stakeholders.

4.2.3 We would work with the Prudential Regulation Authority to modify capital requirements on banks, to encourage green investments and to discourage investment in activities which increase emissions. The Bank of

England itself, which has a high exposure to fossil fuel assets, should be required to disclose its climate risk and ensure that its balance sheet is brought in line with the net zero target.

4.2.4 We would encourage banks and other financial institutions to issue more green financial products, including green mortgages (where mortgage interest rates are linked to energy improvements in the property) and green ISAs exclusively for green investments. We would reform fiduciary duty and company purpose rules to ensure that environmental sustainability, together with social considerations such as employee welfare, community benefit and ethical practice, are fully included in all decisions made by company directors and fund managers.

4.2.5 We would introduce measures to improve climate transparency and risk reporting:

- Mandatory disclosure requirements on all companies registered in the UK and all those listed on UK stock exchanges for current greenhouse gas emissions and the projected impact of their business plans, assets and activities on future emissions levels.
- A legal requirement on the same companies to set targets consistent with the targets set in the Paris Agreement, and to report on their implementation. This would be backed up by new climate accountancy rules so that auditors are required to produce Paris-compliant accounts (including writing down non-compliant assets and activities and reporting the cost and value implications of reducing emissions to zero in line with the required pathway).
- New reporting requirements for pension funds and managers to show that their portfolio investments are Paris-compliant.
- New powers for regulators to act if banks and other investors are not managing climate risks properly.
- The creation of a register of low and zero-carbon investment opportunities at all levels of the investment chain, making it easier for everyone, from asset managers to pension fund managers to individuals, to understand the green options available.

### **4.3 Greening taxation**

4.3.1 The taxation system also needs to support the transition to net zero. This includes:

- Widening the list of energy and emissions-saving products enjoying the 5 per cent rate of VAT, adding electric vehicles (replacing the current purchase grant system) and keeping VAT on Solar PV and batteries at 5 per cent.
- Graduating Stamp Duty Land Tax by the energy rating of the property, with proportionate refunds offered to house purchasers if they improve the rating within one year of purchase.
- Encouraging the purchase of higher-efficiency vehicles by reinstating the graduation of VED by fuel efficiency that was scrapped (apart from first-year rates) by the government in 2017.
- Reducing company car tax rates for electric vehicles and increasing them for petrol and diesel vehicles.
- Reinstating the exemption for renewable electricity generation (apart from biomass, which is not zero-carbon) from the Climate Change Levy (the tax on energy paid by businesses). Since the Levy was introduced to reduce carbon emissions, taxing renewables – which the Conservative government introduced in 2015 – makes no sense.
- Increasing the Carbon Price Floor for fossil fuels. Introduced by the coalition government in 2013, this was designed to ensure that the carbon price set by the ETS did not fall too low to inhibit zero-carbon investment; among other things, it helped to drive coal out of power generation. But its level has been frozen since 2014; we would scrap this and increase it year on year. Although the ETS price of carbon is currently above the price floor, it is not guaranteed to remain high, and this move would send an important signal.
- Reforming air passenger duty to target the most frequent international flyers (see Chapter 9).

4.3.2 Proposals are often made for an economy-wide carbon tax in the UK. The combination of the Carbon Price Floor, the Climate Change Levy and road fuel duty already raise the prices of the bulk of fossil fuel use; the proposals that we outline above would tilt the balance further towards

renewables and electric vehicles. However, there remain parts of the economy where carbon emissions are not priced. Given the urgency of the climate crisis, the need for clear economic incentives for the transition to net zero to take place in a cost-effective and equitable way, and the need to raise government revenue for net-zero investments, we would review the potential for the more consistent application of carbon pricing in the UK. No major reform would take place, however, until our energy efficiency policies have been effective in addressing fuel poverty (see Chapter 7).

## 5 Innovation, skills and education to support net zero

*Key proposals – use innovation, skills and education strategies to support the net zero target, including:*

- Fostering the development of regional industrial innovation clusters, increasing support for Innovate UK and the Catapult Centres, and funding large-scale technology innovation missions.
- Developing a zero-carbon skills strategy to tackle any skills gaps that could hinder progress.
- Implementing zero-carbon education and public engagement strategies to ensure everyone understands the urgency of the climate crisis and is able to participate in decision-making over the options to tackle it.

5.0.1 Accelerating innovation – the cycle from invention (of technology or business or organisational models) to development to demonstration to commercialisation – will be key to the transition to net zero. Government must develop an ambitious and strategic innovation policy focused on trialling critical technologies at scale. It must not be inhibited by the fear of failure: not every new technology will succeed, but we do not have the time to test them one by one. A clear forward strategy is needed, set in consultation with scientists and industry, including sectoral targets and roadmaps, all consistent with the overall net zero target, and identifying challenges and bottlenecks, coupled to a strategic science and innovation policy aimed at overcoming them.

5.0.2 We would foster the development of regional industrial innovation clusters, located, for example, around industrial concentrations such as those on the Wirral, Trafford Park or Teesside, as a way of accelerating new developments at scale. We would also encourage small-scale innovation and partnerships to foster the emergence of diverse solutions.

5.0.3 As noted in Chapter 4, we would increase funding for innovation, as well as for science. This would include directing more funding through Innovate UK and the technology Catapult Centres established by Liberal Democrats in coalition, which work with businesses, scientists and

engineers to commercialise new technologies. This would include funding for ‘technological missions’: large-scale innovation missions devoted to the net zero transition, with five-to-ten-year deployment horizons. These could include, for example, a zero-carbon energy storage mission and a zero-carbon industrial materials mission, the latter drawing on UK expertise in the steel sector. We would also establish two new Catapult Centres, on farming and land use (see Chapter 11) and carbon dioxide removal (Chapter 12). We would ensure that UK Research and Innovation (the umbrella body for the research councils), and other major public funding agencies, give a high priority to climate objectives in their evaluation and funding processes.

5.0.4 The net zero transformation will require not just changes in technologies but also in business and organisational models and patterns of employment. These major changes in industry will in turn change the nature, location and necessary skills of some jobs. The Grantham Research Institute has found that around 10 per cent of workers in the UK have skills that could be more in demand in the green economy, while a further 10 per cent, particularly in construction, transport and manufacturing, are likely to need reskilling; together, this means that about 6 million people will be directly affected by the green economy.

5.0.5 Government therefore needs to develop an ambitious zero-carbon skills strategy, working with industry, unions, schools and colleges, to tackle any skills gaps that could hinder progress, for example for designers, builders and installers of energy efficiency and zero-carbon heating, for which demand will increase sharply under our proposals. This will include a major expansion of high-quality and advanced apprenticeships, including advanced apprenticeships, backed up with new sector-led national colleges. It would also include working with the new Green Finance Institute to ensure the financial sector has the skills necessary to make the UK the green finance capital of the world (see Chapter 4).

5.0.6 Young people leave education with an entire lifetime of environmental footprint ahead of them; the education system therefore has a key role in equipping students with the skills and desire to help achieve net zero. We would give students a right to sustainability education, and ensure that climate and wider environmental sustainability skills are embedded at all levels of the educational system, in the national curriculum, apprenticeship programmes, higher education and through

lifelong learning and just-in-time skills training. This will include working with professional bodies, business and qualification agencies to embed appropriate climate change and sustainability skills and understanding in their qualification requirements.

5.0.7 Schools and further and higher education institutions themselves own or manage large estates, which need to become zero carbon, and the process of achieving this aim will itself be an educational opportunity for their students. We are heartened that some have already declared climate emergencies. We would make the adoption and delivery of a climate change and sustainability plan a central feature of public funding for educational providers, generating the expectation that educational bodies will take action on both how they operate and the content of the curriculum.

5.0.8 Wider public engagement is also key to success; if people feel their needs and wishes are ignored in the transition to net zero, the process will fail. We would task the national and local Citizens' Climate Assemblies, and work with the many voluntary sector initiatives such as transition towns, educational institutions and the business sector, to draw up proposals for public engagement programmes, providing information about the need for action and the options open to individuals, households and communities to reduce their impact on the climate.

## 6 Placing climate action at the heart of foreign policy

***Key proposals – place climate action at the heart of foreign policy by:***

- Stopping Brexit and working within the EU for greater climate ambition.
- Incorporating climate objectives into the heart of UK diplomacy.
- Tripling support through the UK's International Climate Fund for climate-related development spending and ending support from UK Export Finance for fossil fuel-related activities.

6.0.1 While the UK is responsible only for about 1 per cent of current global greenhouse gas emissions, as the first country to enter the Industrial Revolution its accumulated historic contribution is much greater. The UK has both the responsibility and the means to exercise a more than proportionate impact on global action on the climate emergency: through setting an example, through supporting international initiatives and through providing climate finance to poor countries.

6.0.2 The need for this is underlined by the open globalised nature of the British economy; many carbon-intensive products – whose associated emissions are recorded in the country of export – are imported to the UK rather than produced here. Although, contrary to popular belief, this is not primarily due to outsourcing of manufacturing to China – more of the UK's consumption-based emissions are imported from Europe than from China, and more is embedded in other sectors, including agricultural imports, than in manufacturing – it nevertheless means that we need to combine our efforts to reduce emissions at home with our efforts to offer leadership and influence emissions reductions in our global partners.

### 6.1 Taking the lead, setting an example

6.1.1 The UK's adoption of a net zero target by 2045 would have a considerable impact internationally, both demonstrating the UK's acceptance of its historic responsibility and showing that the country believes it can be done. As argued in Chapter 2, however, setting the target is not by itself enough: policies to achieve it have to be consistent and credible. Climate objectives need to be at the heart of UK diplomacy; the

aims of the Foreign & Commonwealth Office should include ensuring that new international trade agreements (negotiated through the EU) and bilateral investment treaties fully reflect climate objectives. We would also ensure that the UK puts itself forward for peer review under the Fossil Fuel Subsidy Peer Review mechanism established by the G20, designed to eliminate harmful subsidies – a step which the current government has refused to take.

6.1.2 One blatant example of the government's disregard of climate objectives lies in the activities of UK Export Finance (UKEF), which supports UK exports through guarantees, insurance and reinsurance against loss. As a report of the Environmental Audit Committee in June 2019 concluded, UKEF's support for fossil fuel energy projects has been unacceptably high; between 2013/14 and 2017/18, 96 per cent of its support for energy (£2.5 billion) in low and middle-income countries went to fossil fuel projects. We would end all support from UKEF for fossil fuel-related investments other than those designed to reduce carbon emissions (for example through increasing efficiency in existing installations), and argue for a similar approach to be adopted amongst other national export credit agencies.

## **6.2 Promoting international initiatives**

6.2.1 Setting out on a credible path to net zero would give the UK added weight in international negotiations, both within the EU, with the UK as a key member (as above, we assume that the UK remains in the EU) and beyond, enabling it more credibly to encourage other countries to raise their levels of ambition. This is of particular importance in 2020, when parties to the Paris Agreement will review their climate strategies with the aim of closing the current gap between their commitments and the level of emissions reductions needed to meet the Agreement's targets.

6.2.2 The UK should also push for ambitious climate action in every international forum in which it sits, including the UN Security Council, the G7 and the G20 (which have both focused in particular on phasing out fossil fuel subsidies, currently estimated to be worth \$5.2 trillion world-wide), the International Civil Aviation Organisation and the International Maritime Organisation. The UK should aim to bring together international coalitions for climate action, such as the Green Growth Group within the EU formed by Liberal Democrat minister Ed Davey in the coalition government.

6.2.3 We would aim to launch joint international technology cooperation missions, aiming to combine research and innovation support in particular for the hard-to-treat sectors such as aviation, heavy industry and land use. Building on the UK's and Canada's 2017 initiative in forming the Powering Past Coal Alliance, to phase out unabated coal in power generation, we would propose a global Fossil Fuel Non-Proliferation Treaty, aiming to ensure that a minimum of 80 per cent of global coal, oil and gas reserves are left in the ground rather than burnt. This would create international agreement and obligations to phase out the exploitation of new fossil fuel reserves, replace existing fossil fuel infrastructure with renewables and remove fossil fuel subsidies.

### **6.3 Supporting poor countries**

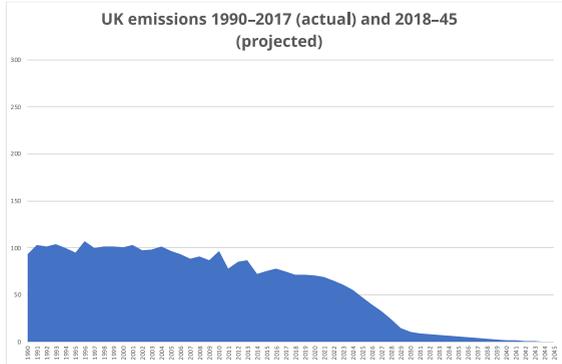
6.3.1 The majority of global greenhouse gas emissions now emanate from developing countries (including emerging economies such as China and India), and emissions from most are still growing. Use of the UK's development aid budget – increased to the UN target of 0.7 per cent of GNI thanks to Liberal Democrats in government – to support climate objectives is therefore essential. The UK has a good record in this area; in 2011 the coalition government established the International Climate Fund, which by 2021 will have seen almost £10 billion invested in climate mitigation and adaptation, making the UK one of the largest climate aid donors in the world.

6.3.2 As an immediate step, Liberal Democrats would triple the size of the International Climate Fund and recruit more staff to manage more projects under its aegis. Cuts in civil service numbers in recent years have forced much climate aid to be disbursed through international funds such as those run by the UN and World Bank; while they have done much good work, they can also be slow and bureaucratic. More broadly, climate considerations need to be integrated more effectively throughout the entire aid budget, as with domestic policy, ensuring that other areas of spend – such as support for agriculture, for example – have positive impacts for the climate. The UK should also argue for more ambitious climate objectives within the multilateral development banks, including the World Bank.

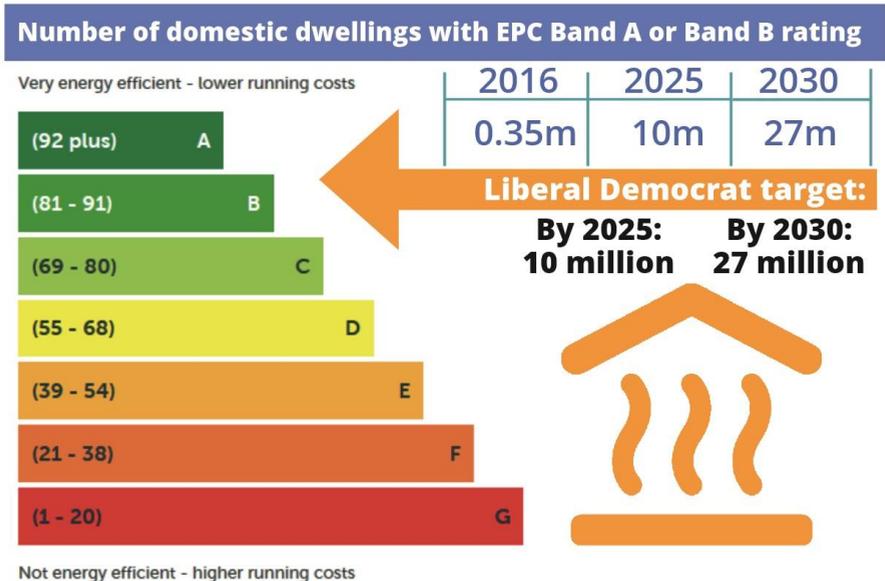
## 7 Decarbonising buildings: energy efficiency first

Heat in buildings: actual 1990–2017 and Liberal Democrat proposals, 2018–45

Emissions (MtCO <sub>2</sub> e)	
<i>Actual</i>	
1990	94
2017	75
<i>Lib Dem proposals</i>	
2030	10
2045	0



What this means for numbers of domestic dwellings insulated to EPC Bands A or B level: actual (2016) and under Liberal Democrat proposals (2025, 2030)



**Key proposals – decarbonise buildings by:**

- Carrying out an emergency ten-year programme to reduce energy consumption from buildings, cutting emissions and fuel bills and helping to end fuel poverty, including providing free retrofits for low-income homes and piloting a new subsidised Energy-Saving Homes scheme.
- Introducing a zero-carbon standard for all new buildings by 2021, rising to Passivhaus standard by 2025.
- Adopting a zero-carbon heat strategy, including reforming the Renewable Heat Incentive, requiring the phased installation of heat pumps in homes and businesses off the gas grid and taking a decision on the appropriate mix of zero-carbon technologies – electric heat pumps, hydrogen and hybrid solutions – within the next three years.

7.0.1 Relatively little progress has been made in reducing emissions from the energy used for heating and cooling in buildings. This is mainly due to Britain’s notoriously poor standards of building insulation and an ageing housing stock, coupled with a heavy reliance on fossil fuels, mainly gas, for residential and commercial heating.

7.0.2 We believe that with a massive programme of investment, these emissions can be reduced to near-zero by 2030. Our top priority is to reduce the demand for energy use by improving standards of energy efficiency in both existing buildings and new build – not only reducing emissions but cutting energy bills, generating employment, improving health (the cost to the NHS of conditions exacerbated by poor housing is currently estimated to be £1.4 – 2.0 billion per year in England alone) and ending the scandal of fuel poverty that currently affects about 4 million households. Our second priority is to set a pathway for the nation-wide adoption of zero-carbon heating solutions, whether through electric heat pumps, hydrogen, biogas or hybrid solutions.

## **7.1 Reducing emissions, cutting fuel bills**

7.1.1 Liberal Democrats in coalition made a determined effort to increase the scale of energy retrofits by introducing the Green Deal, a system through which households repaid the costs of the retrofit through the savings on their energy bills. But the system was excessively bureaucratic

and the Treasury required too high an interest rate on repayments, so take-up of the finance package was very low. Even so, 1 million homes were insulated, funded mostly by householders. The Conservative government axed the scheme in 2015, but have put in place nothing to replace it – with the result that home insulation rates have fallen, with only 123,000 lofts or walls insulated in 2017, 5 per cent of the rate in 2012. They also scrapped the zero-carbon homes standard for new houses due in 2016; this would have required insulation and onsite renewable energy generation to reduce emissions to net zero. We know, however, that we can make progress; between 2004 and 2015 the average consumption of gas in British homes fell by 37 per cent and electricity by 18 per cent due to better insulation, more efficient gas boilers and improved standards for lighting and other products.

7.1.2 As an urgent priority, government must put in place an extensive and comprehensive scheme to cut energy consumption by retrofitting existing buildings; four out of every five homes British people will be living in in 2050 have already been built. This is our top priority for action because it is the most cost-effective option available to reduce emissions and because it contributes to climate justice, reducing household bills and improving quality of life especially for those in fuel poverty. We would introduce a new Green Buildings Act setting the following targets:

- All homes of low-income households (social, rented or owner-occupied) to reach at least Energy Performance Certificate (EPC) Band B by 2025.
- All other homes and non-domestic buildings to reach EPC Band B by 2030.

7.1.3 We endorse the campaign for '30 by 30' – 30 million homes and non-domestic properties insulated by 2030. We recognise that EPC Band B is an ambitious aim, but if a lower level is targeted we believe buildings would require further retrofits later in order to reach net zero emissions. We would review the EPC system to improve its accuracy and work with industry to establish and run a Retrofit Hub as a technical centre of excellence, to facilitate the sharing of knowledge and guidance between clients, industry and consumers, and to provide a forum for engagement with the national retrofit programme. This is of particular importance for the third of British homes with solid rather than cavity walls, which are in

general more costly to insulate; innovation and economies of scale should deliver falling costs.

7.1.4 The investment needed to realise this energy saving potential generally pays for itself over time, but some households are too poor to be able to afford it. We would use the capital infrastructure budget to provide fully subsidised retrofits for low-income owner-occupiers and for social housing, and funds for improvements in public buildings, including schools, universities, hospitals and local authority buildings. We would scrap the current cost cap on the improvements private landlords are required to undertake to raise their properties to the minimum levels required for renting. We would require commercial leases to include targets for improvement in energy performance.

7.1.5 An estimated £7.5 billion is spent every year on home improvements in the UK, but relatively little is dedicated to energy efficiency. To encourage owner-occupiers and landlords to invest in energy-saving measures, we would pilot a new Energy-Saving Homes scheme to discover what system of incentives (financial and non-financial) work best. This would include subsidised lending rates and the option of placing the repayments as charges against the value of the dwelling at the point of sale or inheritance. We would graduate Stamp Duty Land Tax by the energy rating of the buildings, with a refund offered to house purchasers if they improve the rating within a year of purchase, a period during which new home-owners often undertake improvements.

7.1.6 We would require information on properties for sale or rental to include data and estimates for actual energy bills alongside the energy rating. Planning permission and building regulations for any extensions to existing buildings would require improvements in the overall energy performance of the property. We would encourage mortgage lenders to offer lower interest rates to buyers improving the energy rating of their buildings and introducing other climate-related measures such as flood resilience or passive shading to avoid overheating.

7.1.7 We believe local authorities are best placed to facilitate the national retrofit programme. Our Green Buildings Act would give them the necessary powers and responsibilities, including identifying all buildings, domestic, commercial and public, needing to be improved, putting in place community energy saving plans, working with the private sector, and

reporting annually on progress made. Savings can often be made by carrying out retrofits street by street, and this also provides encouragement to other home-owners on those streets to join in. The necessary infrastructure funding would be decentralised to local councils and combined authorities. Just as important is monitoring compliance with the new building standards; local authorities would be given new powers to inspect standards and where necessary require improvements.

7.1.8 New-build homes and non-domestic buildings must be built to the highest standards. Our Green Buildings Act would specify that:

- All new homes and non-domestic buildings to be built to the zero-carbon standard (where as much energy is generated on-site through renewable sources, such as wind or solar PV, as used), and without connection to the gas grid, by 2021.
- The energy demand component of the zero-carbon standard to rise to Passivhaus standard by 2025; this uses design standards and high levels of insulation and products to reduce demand for heating and cooling to near zero.

7.1.9 We would also encourage the greater use of wood in construction, as a far more environmentally sensitive material than brick or concrete (see Chapter 12). Any increase in the initial costs of the buildings would be more than offset by lower running costs. In any case, the house-building industry already appears to be making excessive profits; in January 2018 the building firm Persimmon awarded bonuses worth £500 million to its top 140 staff, including £110 million to its Chief Executive.

7.1.10 Energy saving comes not only from improved building insulation; improvements in energy performance standards for products and appliances have played a substantial part in reducing UK energy demand to date. The current framework is largely set by EU directives on Ecodesign, Energy Labelling, Energy Performance of Buildings and Energy Efficiency, the last of which establishes a headline EU-wide target of a 32.5 per cent cut in energy use by 2030. We would work within the EU to strengthen this framework over time. We would also reverse the government's planned abolition of enhanced capital allowances for the Energy Technology Product List, the government-managed list of energy-efficient plant and machinery.

## **7.2 Decarbonising heating**

7.2.1 Alongside reducing the demand for energy for heating, fossil fuels must be replaced with zero-carbon sources; 85 per cent of homes in the UK currently use gas for heating and cooking. Unlike in the power sector, however, zero-carbon heating solutions have so far been very slow to develop at scale. The Renewable Heat Incentive, introduced by Liberal Democrats in coalition, has helped to deliver more support, but still less than 5 per cent of heat for buildings is provided from renewable sources – and this is mostly biomass, which, depending on the feedstock used, is not necessarily zero-carbon. It is a serious failure of the current government that it is still has no plan for decarbonising UK heating systems, and no large-scale trials for viable alternatives have yet begun. The government’s announcement in March 2019 that gas boilers will be replaced by low-carbon heating systems in all new homes built after 2025 is welcome, but this is just one small part of the necessary solution; we would bring this deadline forward to 2021.

7.2.2 There are two main alternatives to the current reliance on gas. Electric heat pumps are slowly gaining market share, but a wholesale switch to this technology would require substantial investment in the electricity system. In addition, the cost of installing heat pumps in 80 per cent of homes is estimated to be in the region of £200 billion. Hydrogen, produced either from fossil fuels (which would therefore require CCS) or from electrolysis of water, is a less tested technology and would also require substantial investment. The existing gas grid could be adapted to carry it, however (the replacement of iron mains with polyurethane pipes will be complete by 2030 in any case), and it might be possible to retrofit rather than replace boilers to use it. This option would also require additional power capacity to produce the hydrogen, together with seasonal storage facilities. Renewable gas, such as biogas generated from waste, should also be encouraged, though the availability of the feedstock will be too limited for nationwide adoption. There may also be a role for district heating systems, particularly in new developments and densely populated urban areas.

7.2.3 It is not clear what the least-cost solution will be – probably a mixture of all of these options, including hybrid heat pumps using hydrogen during the coldest weather, or different solutions in different regions – but a national approach must be adopted very soon if the UK is to

achieve net zero. Liberal Democrats would therefore adopt a Zero-Carbon Heat Strategy as an urgent priority, including short-term cost-effective 'quick wins' for residential and non-residential buildings:

- A requirement for the phased installation of heat pumps in homes and businesses that are off the gas grid, and the phase-out of new installations of oil-fired boilers.
- A requirement that all new gas boilers be hydrogen-ready by 2021 at the latest, and funding for the large-scale development of hydrogen manufacture, storage, transport and use.
- The replacement of the Renewable Heat Incentive system of payments for units of heat generated with a capital grant for the installation of heat pumps in existing properties.
- A renewable heat requirement on energy suppliers to increase biogas generation and injection into the gas grid (up to around 5 per cent of current gas demand) and to use renewables (e.g. solar thermal and heat pumps) in heat networks.
- Encouragement for the development of zero-carbon heat networks in heat-dense urban areas.

7.2.4 We would aim to take the long-term decision on the balance between the different options in decarbonising heating within the next three years. We would establish a Zero-Carbon Heat oversight and delivery agency to direct support for the further development of electric and hydrogen technologies, as well as potential hybrids, and district heat networks, and to run local pilot schemes to see how the various options perform at scale. Lessons of the transitions to North Sea gas, renewable electricity and high-speed rail must be learnt to ensure that this huge national infrastructure project with significant impact on the daily lives of every citizen is undertaken based on clear evidence with strong societal support. The Citizens' Climate Assembly would be fully involved in the development of the Zero Carbon Heat Strategy.

7.2.5 Government support would be made available for innovation funding, infrastructure for hydrogen transport and storage, and new equipment in low-income households. Local authorities would be given the responsibility, as part of their Zero-Carbon Strategies, to develop combined energy efficiency and zero-carbon retrofit programmes (which, as the

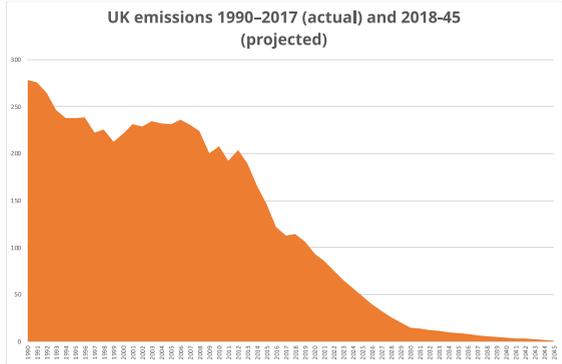
Energiesprong whole-house retrofits in the Netherlands, also currently being implemented in Nottingham, have demonstrated, can be cost-effective), working with local residents and businesses to develop the optimum outcomes for their communities, including district heating systems where appropriate. This would also involve the provision of information and advice to householders on the available choices; currently the general public has a low awareness of the need to move away from gas heating and what the alternatives are.

7.2.6 Selling heat as a service rather than fuel for boilers should provide suppliers with a commercial incentive to heat homes as efficiently as possible, while also offering a new route to market for zero-carbon technologies. We welcome the pilot heating service introduced in February 2019 by Bristol Energy, with government backing, through which customers pay the company not for units of energy, but for a 'Heat Plan' that sets a home heating schedule hour by hour, room by room, using a smart heating control system to tailor the plan to the customer's individual home and lifestyle choices. We would provide co-funding for more and larger-scale pilots.

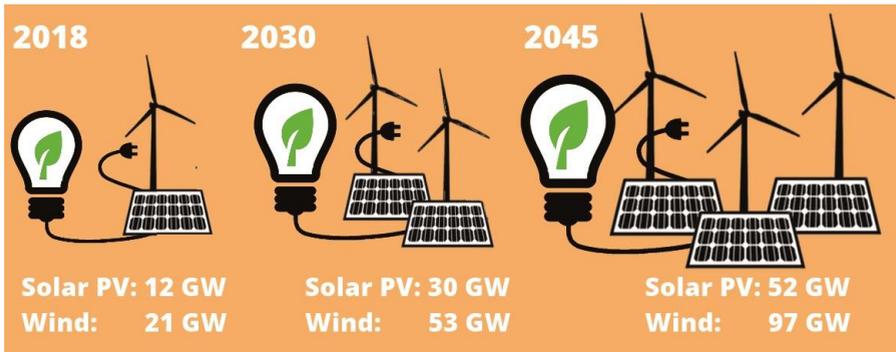
## 8 Decarbonising power

Power: actual 1990–2017 and Liberal Democrat proposals, 2018–45

Emissions (MtCO <sub>2e</sub> )	
<i>Actual</i>	
1990	278
2017	113
<i>Lib Dem proposals</i>	
2030	15
2045	1



What this could mean for solar PV and wind power capacity in gigawatts (GW): actual (2018) and under Liberal Democrat proposals (2030, 2045)



**Key proposals – decarbonise power by:**

- Accelerating the deployment of renewable power generation, aiming initially to reach a generation capacity of at least 80 per cent renewables by 2030 (including any increase in electricity demand for transport, heat and industry).
- Developing smart grids, storage solutions and interconnectors to other countries' electricity grids to guarantee security of supply and to improve the management and balancing of the system.
- Promote decentralised and community energy, including setting a target of more than half of households and businesses sharing in the renewable energy revolution by 2030, including requiring all new homes to be fitted with solar panels.

8.0.1 Britain has built its decarbonisation progress to date upon a foundation of low-carbon power. By 2017 emissions from electricity generation had fallen by 60 per cent from 1990, while at the same time security of supply was maintained and average energy bills had fallen. The initial reduction was mainly due to the replacement of coal by gas, but Liberal Democrats in coalition built on previous governments' support for renewables to deliver a new system – 'contracts for difference' – which has both given long-term certainty to investors and helped to drive down the costs dramatically. The costs of offshore wind, for example, fell by 50 per cent between the first two auctions for contracts for difference, in 2015 and 2017 – the result of what the CCC described as 'clear goals, ambitious strategy and well-designed policies'.

8.0.2 Along with heat in buildings, the power sector offers the best option for rapid reductions in emissions over the next ten years. There is little scope left for the replacement of coal, however, which contributed only 2 per cent of electricity generation in 2018 and is due to be phased out entirely by 2025. Renewables provided 34 per cent of electricity in 2018; under current policies this is due to rise to 47 per cent by 2025 but, with government caps on spending, to remain at that level for at least a further five years. This is not consistent with the UK's existing climate targets, let alone net zero, so deployment must be accelerated sharply.

8.0.3 We would set a target of 80 per cent renewable electricity by 2030, to be achieved through further decarbonisation, decentralisation and

digitisation. The improvements in buildings and product energy efficiency standards discussed in Chapter 7 are also critical in terms of reducing demand, particularly as overall consumption will increase with increasing take-up of electric vehicles and electric heating and possibly electricity for carbon dioxide removal technologies (see Chapter 12). Among other outcomes, this would substantially reduce the need for imports of natural gas (currently the main fuel for power generation), improving the UK's balance of payments and reinforcing energy security and independence.

## **8.1 Decarbonising power**

8.1.1 The current system of contracts for difference is working well and we would retain it. These provide a guaranteed long-term price for power generated, thereby reassuring investors that they will earn a return on the high upfront costs of installation; as private contracts, they are also immune to interference by any future government (unlike, for example, a carbon tax). Contracts for difference also provide an effective mechanism to subsidise less mature renewable technologies, as well as ensuring that more mature forms of generation – onshore and offshore wind and solar PV – can be delivered at the lowest cost to consumers through subsidy-free contracts. We would help to speed up planning for renewable schemes, allow all technologies to bid for future contracts and encourage further renewable power purchase agreements with major private-sector consumers. We would provide additional support by reinstating renewables' exemption from the Climate Change Levy (apart from biomass, which is not zero-carbon) and increasing the Carbon Price Floor (see Chapter 4).

8.1.2 The UK has established itself as a global leader in offshore wind, which will be the dominant source of UK zero-carbon power in the future; about 40 per cent of global offshore wind capacity is currently situated off UK coasts. The cost of new offshore wind has fallen by 50 per cent since 2015 and it is now one of the lowest cost options for new power in the UK – cheaper than new gas and nuclear power. The sector already supports thousands of highly skilled jobs and could generate tens of thousands more. We would accelerate development by requiring the Crown Estate, which licenses offshore developments, to set more ambitious targets for their offshore wind leasing rounds.

8.1.3 Although solar PV and onshore wind are now the cheapest ways to generate electricity and are continuing to fall in price, they are currently constrained by Conservative prejudice. Estimates suggest that between them they could provide 20 per cent of current levels of power generation; this would also cut energy bills (by an estimated £50 per household per year from current prices), treble the number of jobs supported by the onshore wind sector to 31,000 and boost exports. We would scrap planning restrictions on onshore wind in England.

8.1.4 We would continue the system of reserving different pots of funding for contracts for advanced technologies, which allows greater support to be given to less mature options such as tidal barrages, tidal stream and wave power. Tidal barrages in particular have the potential to deliver as much as 10 per cent of UK power generation and, unlike wind and solar, are entirely predictable sources; they also enjoy long lifespans, of over 100 years.

8.1.5 Biomass power would be excluded from future contracts. Current government support for biomass has led to the UK consuming a quarter of global production of wood pellets, mostly imported from North America, often produced from harvesting whole trees, which raises carbon levels in the atmosphere for decades or centuries. Existing biomass contracts would be restricted to feedstock which minimises the impact on the climate, such as sawmill wastes, which if not used would rot and quickly release carbon into the atmosphere.

8.1.6 Nuclear power provided 17 per cent of UK electricity in 2018; this is projected to fall to 11 per cent by 2025 as existing plants are withdrawn from service. Current government forecasts see the contribution of nuclear rising thereafter even though confidence in the nuclear industry has now largely collapsed. Of several new stations envisaged a few years ago, just one, Hinkley Point C, now looks likely to be completed, though it is already years behind schedule and will probably be delayed even further. Quite apart from the long-term costs of decommissioning and disposal and storage of waste, nuclear is an unusual technology in seeing its costs rise over time, instead of fall, as has been the case with renewables; it therefore has a high need for government subsidy. While we would of course respect existing contracts, we believe that there is currently no economic or environmental case for the construction of any further nuclear stations in the UK.

8.1.7 The increasing deployment of renewables will require the concomitant development of smart grids, storage solutions and interconnectors to other countries' electricity grids, to guarantee security of supply and to balance the system, allowing the UK to access the zero-carbon power of other countries and to export any surplus zero-carbon power of its own. The cost of battery storage is currently falling very quickly, with long-term storage, for weeks or months, becoming more feasible (and the increasing take-up of electric vehicles will in effect provide additional capacity). Storage through pumped hydropower (where water is pumped back up slope when excess power is available, to be released and generate hydroelectric power when demand is greater) also has considerable scope, particularly in Norway, reinforcing the case for greater investment in interconnectors, leading ultimately to a North Sea grid connecting several countries. Tidal barrages also have potential to act as storage. Other possible solutions, such as liquid air, are undergoing trials. Greater government support, through innovation funding for storage technologies and capital infrastructure spending for interconnectors, will be necessary.

8.1.8 The capacity market is the back-up system for 'keeping the lights on', offering contracts – mainly so far for old coal, gas and nuclear plants – for providing power when mainstream generators cannot meet demand for any reason. However, in November 2018 the current system was ruled to have breached EU state aid rules. The requirement for reform creates the opportunity to establish a clean flexibility market, allowing bidding in by storage, interconnectors, all renewable technologies and demand-side response mechanisms, through which electricity users contract to reduce their own use in times of excess demand. There is also likely to be a need for back-up thermal power stations using gas (plus CCS to capture the carbon emissions; see Chapter 10), biogas generated from waste, or hydrogen (see Chapter 7).

8.1.9 National planning and regulation of the decarbonisation process requires close cooperation between the National Infrastructure Commission, National Grid and the energy regulator Ofgem, together with the new Regional Energy Partnerships we propose (see below). We would ensure that the remits of all of them, and those of other relevant agencies such as the Crown Estate, are amended to give a high priority to net zero objectives. Greater integration of activities will be needed to ensure that

individual and community-scale electricity generation, interconnection, storage and demand-side response all work together to deliver decarbonisation and security of supply and ensure that supplies of hydrogen are sufficient to meet the needs of power, heating, transport and industry. We need a whole-system approach to ensure we meet this challenge effectively and efficiently and we would therefore review the need for a single ‘energy system architect’ to ensure coordination and clarity of purpose as new infrastructure, particularly networks, are planned and built; if this role cannot be filled by existing organisations we would create a new agency.

## **8.2 Decentralising power**

8.2.1 Distributed power generation creates value for every electricity consumer: it defers the need for grid upgrades, it lowers transmission costs and it provides system flexibility. We will accelerate moves towards a decentralised electricity system, with more small-scale, localised generation supported by energy storage, interconnection and demand response. This will not only help to increase total capacity and improve resilience, it will foster a sense of community and individual ownership, which will be an important part of building a social consensus behind the net zero target. We would build on Britain’s first community energy strategy, introduced by Ed Davey, Liberal Democrat Secretary of State for Energy and Climate Change in the coalition, and set a target of more than half of households and businesses sharing in the renewable energy revolution by 2030, either through installations in their own home or business, or through sharing in community investments. Local authorities across the UK should set targets for locally owned energy, as the Welsh government has done.

8.2.2 As explained in Chapter 3, we would encourage local authorities, acting by themselves or in combination, to develop renewable electricity generation and storage as part of their Zero-Carbon Strategies, alongside energy efficiency and zero-carbon heat and transport solutions. These could, for example, create local energy markets, provide energy to business or housing developments through power purchase agreements, develop local smart grids and feed into the national grid. We would clarify the processes through which Neighbourhood Plans can identify sites suitable for renewable power and heat generation. We would provide support to local authorities to build, own and operate domestic solar PV on suitable

homes in fuel poverty, cutting bills for their occupants and returning the investment at a reasonable long term interest rate.

8.2.3 We would provide tax incentives for community energy projects, give community co-operatives the right to develop on suitable publicly owned buildings and publicly owned land, and invest in local grid upgrades to carry the new dispersed capacity. We would encourage household renewable energy by removing current policy barriers that discourage homes with solar PV from installing battery storage and smart meters, and scrapping the government's current plans to raise VAT on solar panels and batteries from 5 to 20 per cent. We would use building regulations to ensure that small-scale generation and storage technologies are required in new housing stock (see Chapter 7).

8.2.4 The government struck a major blow against microgeneration by scrapping the feed-in tariff in 2018 without any revised system in place; the Smart Export Guarantee now to come in from 2020 is not an adequate replacement. In the short term we would ensure that any microgeneration not in receipt of the feed-in tariff is eligible for the Smart Export Guarantee and set a minimum unit floor price for payments. We would consult on a long-term replacement which rewards distributed flexibility and guarantees income in a simple, non-bureaucratic way.

8.2.5 Coordination of these dispersed forms of power generation will be necessary. We would encourage local authorities to act as 'brokers' to create a more level playing field for home-owners and communities to sell energy. We would establish Regional Energy Partnerships (where possible as an agency of combined local authorities or City Deals) to ensure coordination of local, community and regional projects, acting as integrators of individual and community-scale electricity generation, interconnection, storage and demand-side response. We will require Ofgem to ensure that the costs of electricity distribution and transmission infrastructure are allocated efficiently and fairly between consumers and generators across the country, recognising the need to connect new generation.

### **8.3 Digitising power**

8.3.1 We welcome the rapid advances in digital technology, including smart meters and smart appliances, which offer the promise of a smart

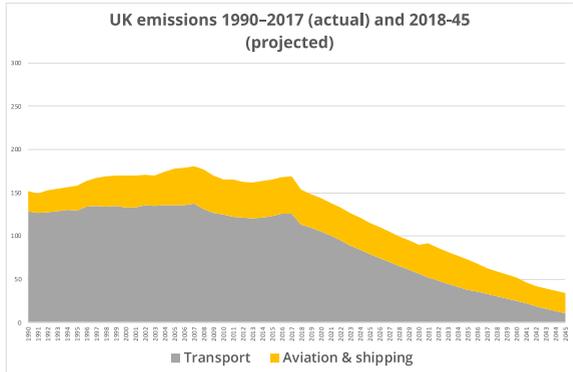
grid, optimising the process of matching supply with demand throughout the day. This will become ever more important as take-up of electric vehicles increases; with smart charging, the average street could charge about 60 such vehicles, but without it the street connections could need upgrading after less than ten chargers are installed. The smart meter roll-out, however, has been mismanaged by the current government; we would ensure smart meters can survive changes in suppliers, give information on sources of demand and offer the opportunity to use off-peak energy at differential prices. With citizens' consent, smart meters could be integrated into whole-house energy retrofits, and new build, involving energy efficiency improvements and, possibly, the provision of heat and electricity as services.

8.3.2 We would investigate energy trading structures to ensure that they work for consumers and penalise market abuse, and introduce regulation of blockchain energy trading operations to protect consumers from speculation. We would ensure that data and privacy protection requirements on energy companies are rigorously enforced, and introduce measures to protect against the misuse of data generated from digital solutions.

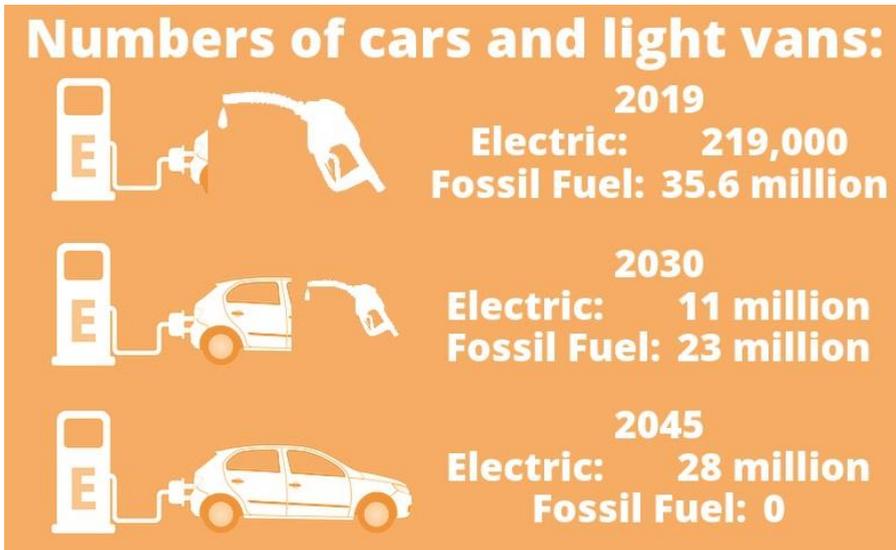
## 9 Decarbonising transport

Transport (surface and aviation and shipping, UK share): actual 1990–2017 and Liberal Democrat proposals, 2018–45

Emissions (MtCO <sub>2e</sub> )		
	Surf	Av / sh
<i>Actual</i>		
1990	128	24
2017	126	43
<i>Lib Dem proposals</i>		
2030	57	33
2045	11	23



What this means for numbers of cars and light vans, electric and fossil fuelled: actual (mid 2019) and under Liberal Democrat proposals (2030, 2045)



**Key proposals – decarbonise transport by:**

- Encouraging the rapid take-up of electric vehicles by ending the sale of new diesel and petrol cars and small vans, including hybrids, by 2030, banning their use on public roads by 2045, and accelerating the installation of charging points.
- Converting the rail network to ultra-low-emission technology (electric or hydrogen) by 2035.
- Reducing the need for car travel by investing in public transport and amending the National Planning Policy Framework to promote sustainable transport and land use.
- Reforming the taxation of international flights to target the most frequent flyers, placing a moratorium on the development of new runways (net) in the UK and introducing a zero-carbon fuels blending requirement for domestic flights.

9.0.1 Surface transport was the largest emitting sector in the UK in 2017, with 24 per cent of total greenhouse gas emissions; this volume has hardly fallen since 1990. The UK's share of international aviation and shipping emissions has risen by almost 80 per cent since 1990. The credibility of the UK's strategy to tackle the climate emergency depends on reversing these trends. To achieve the net zero target by 2045, emissions from surface transport will need to fall to near zero, and the UK will also have to contribute towards efforts to reduce emissions from international transport.

9.0.2 Our major immediate priority is to reduce mileage from existing internal-combustion-engine vehicles, and to set a date for replacing them with zero-emission alternatives: mainly electric cars but with possible roles too for hydrogen fuel cells, particularly for heavy goods vehicles. By itself, however, this will not be enough. We recognise the arguments of the research consultancy Transport for Quality of Life, and other organisations, that volumes of road traffic will need to fall by 20–60 per cent, depending on factors such as the speed of the switch to electric vehicles and how fast the electricity powering them is decarbonised (the figures for numbers of cars in the illustration above assume a 20 per cent fall in car miles by 2045). We therefore need to improve public transport and use planning policy to reduce the need for car use.

9.0.3 As well as cutting greenhouse gas emissions, these measures would have major benefits for health and well-being. Air pollution, of which the main source is petrol and, especially, diesel vehicles, contributes to 40,000 premature deaths a year and costs the NHS £15 billion; more than 4.5 million children in the UK are growing up in areas with toxic levels of air pollution. Noise levels would also be reduced, and imports of oil would fall.

## **9.1 Ending internal combustion**

9.1.1 Despite a growing take-up of electric vehicles, the phase-out of petrol and diesel vehicles is happening too slowly for our immediate climate objectives. In addition, the average car has an on-road lifespan of around 15 years, which means that sales of new internal combustion vehicles must end as soon as possible, and the last generation of such vehicles must be subjected to incentives towards minimal usage. To this end we would:

- Argue for an EU-wide emissions limit of 75 g/km for average new cars and vans by 2025 (which is effectively a financial signal for car-makers to move beyond internal combustion).
- End the sale of new diesel and petrol cars and small vans, including hybrids, by 2030, and ban their use on public roads by 2045.
- Require all buses, taxis and private hire vehicles licensed to operate in urban areas to be zero-emission by 2030.
- Replace the government's own current vehicle fleet with ultra-low emission vehicles (electric vehicles or hybrids) by 2022, and encourage the rest of the public sector, including local authorities and the NHS, to set their own targets.
- Legislate to require all autonomous vehicles to be zero-emission.

9.1.2 A crucial factor governing the take-up of electric vehicles is the availability of charging points. We would triple the government's commitment to provide £200 million for three or four years from 2019. We would encourage local authorities to install street charging points in lamp-posts and install rapid-charging points in suitable locations such as service stations, public car parks and supermarkets. We would use the new powers the government now has to standardise plug sockets and charging infrastructure, and simplify means of payment. Our proposals for the

accelerated deployment of renewable power (see Chapter 8) account for the need to additional generation to charge the vehicles' batteries, though much of this can be delivered overnight, when other demands are lower; indeed, storage in vehicle batteries will provide a valuable element of flexibility to a grid more dependent on renewable sources.

9.1.3 We would further encourage the transition by reforming transport taxation. This includes:

- Reducing company car tax rates for electric vehicles and increasing them for petrol and diesel vehicles.
- Reinstating the graduation of VED by climate emissions, thereby encouraging the purchase of higher-efficiency vehicles.
- Replacing the Plug-In Car Grant for electric vehicles (currently capped in terms of the number of vehicles) with the lower VAT rate of 5 per cent for all such vehicles.

9.1.4 The UK's transition to net zero must not be built at the expense of poor communities. At present, electric vehicle batteries require minerals such as cobalt, lithium and nickel that are mainly sourced from developing countries, where miners often work in appalling conditions, where abuses of labour and health and safety rights are common and there are serious impacts on the local environment; sometimes revenue from the minerals funds armed groups. We would aim to use the market power of the EU to require all such minerals imported to be produced to high ethical standards, including the use of due diligence requirements on industry, traceability and certification of minerals and audits of working conditions. We would also argue for mandatory requirements on refiners and importers to supply steadily increasing volumes of recycled minerals.

9.1.5 We would end regulatory support and subsidies for transport biofuels produced from food crops such as palm oil or soybean oil, whose impacts on land use almost always result in a net increase in carbon emissions. Support for biofuels would be restricted to waste products such as tallow or used cooking oil, which in fact are the main UK feedstocks; this support would be phased out over time as electric vehicles capture an increasing share of the market.

9.1.6 Heavy goods vehicles are more difficult to decarbonise than cars and light vans. Battery technology is not yet suitable, though on-road

charging systems may develop; hydrogen fuel cells may provide the best option, though other technologies are undergoing trials. International coordination of emissions standards and road pricing will be needed, but one absolute requirement is that taxation of HGVs must be related to emissions from each vehicle.

9.1.7 The further electrification of the rail network has an important role to play in reducing transport emissions, for both passengers and freight; hydrogen-fuelled trains are also likely to play an important role. We would devote capital infrastructure funding to accelerating rail electrification, restore twin-track lines to major routes and proceed with HS2, Northern Powerhouse Rail, and Crossrail 2, including developing a high-speed network stretching to Scotland – all of which expands the network and allows for more rail traffic. We would shift more freight from road to rail by electrifying lines leading from major ports. We would aim to convert the entire rail network to ultra-low-emission technology (electric or hydrogen) by 2035.

## **9.2 Reducing the volume of traffic**

9.2.1 Since carbon dioxide has a warming impact for around a century, what is emitted over the next decade by the still largely fossil-fuelled car fleet has to be reduced, which means that cutting overall volumes of traffic will be as important as replacing internal combustion engines. The best options for reducing volumes of traffic are usually found at local level, and this outcome would be a key element of local authorities' Zero-Carbon Strategies. We would give them new powers to invest in local public transport, including integrating community-based transport, taxis and private hire vehicles as part of the public transport network, particularly in rural areas. They would also be encouraged to invest in active travel initiatives such as walking and cycling. This would be supported through the Local Sustainable Transport Fund, originally set up by Liberal Democrat ministers in coalition.

9.2.2 We would incentivise employers to develop workplace travel plans, including the provision of company mobility services instead of company cars, as a means of reducing the number of cars – particularly single-occupancy cars – used for commuting. We would work with local authorities to limit the growth in the use of vans and light goods vehicles to

deliver packages; their replacement by electric vehicles and bicycle deliveries should be encouraged, as well as freight consolidation and the role of rail and bus stations as collection hubs. We would encourage the development of car-sharing schemes, car clubs and autonomous vehicles for public use.

9.2.3 Planning policy should reduce the need for car use and ensure that new housing developments are designed for access to public transport. We would amend the National Planning Policy Framework to provide local authorities with clear expectations for the provision of sustainable transport and greater access to goods and services in new housing developments. We would stipulate that new developments should, as a rule, take place in locations that are or can be well served by public transport, and that they should be designed to give priority to walking and cycling and to reduce the need to travel by motorised transport; this is likely to involve integrating traffic-calming measures into the initial design. Such an approach to planning would be a win/win/win situation, with reduced emissions, more housing, and greater quality of life. We would give local authorities powers to ensure that developers contribute to local infrastructure and services in new developments, including equipping them with electric vehicle charging points, in houses or on streets, as appropriate.

9.2.4 The main measure to be taken at the national level is significant investment in public transport, expanding the rail network, halting the decline of bus services and investing in trams and light rail. We would also review pricing structures for public transport to identify better ways to encourage people not to use their cars, for instance for family travel, school runs and part-time commuting. We would also focus on improving multi-modal interchanges, such as 'park and cycle', so journeys by climate-friendly transport are not rejected simply because of a difficult interchange between two modes of transport.

### **9.3 Decarbonising aviation and shipping**

9.3.1 Emissions from aviation and shipping are difficult to reduce, with incremental rather than transformational reductions expected, and the options available to governments to reduce emissions unilaterally are limited. Without further action, however, emissions will increase

significantly, with demand projected to at least double by 2050. Emissions from aviation are particularly harmful given that they are emitted high in the atmosphere; the figures used in international greenhouse gas accounts under-estimate their warming impact by a factor of at least two.

9.3.2 Domestic and international aviation emissions, especially from departing flights, should continue to be included in the EU Emissions Trading Scheme. We would pursue international cooperation to drive further improvements in aircraft fuel efficiency, the use of advanced biofuels manufactured from waste and non-food crops and research into more advanced technologies such as synthetic electrofuels and electric and hybrid planes. For domestic flights in the UK we would introduce a blending requirement for sustainable alternatives to kerosene, progressively increasing it over time.

9.3.3 Given the long lifespan of aircraft, however, by themselves these steps will be insufficient to curb the growth in aircraft emissions. We would therefore accompany them by ensuring that no net increase in runways across the UK takes place; if a new one opens, an existing runway would have to be closed. We also remain opposed to any expansion of Heathrow, Gatwick or Stansted and any new airport in the Thames Estuary. We would prioritise increasing access to airports by public transport and require airports to introduce schemes to discourage access by car and to ensure that all airport service vehicles are ultra-low emission by 2025.

9.3.4 Even these measures will be insufficient, however unless rising demand is restrained. Flying is treated extraordinarily leniently under the UK's (and many other countries') taxation system: there is no tax on jet fuel, and plane tickets are zero-rated for VAT. Compared to road transport, and after deducting revenue from air passenger duty, this is equivalent to a subsidy of about £7 billion a year. Furthermore, flying is heavily concentrated among certain groups; over half the UK population do not fly at all in an average year, and 15 per cent of flyers take over 70 per cent of flights. The strongest predictors of frequent flyer status is ownership of a second home abroad and high income.

9.3.5 We would therefore reform air passenger duty for international flights to target the most frequent flyers. The duty level would be set at

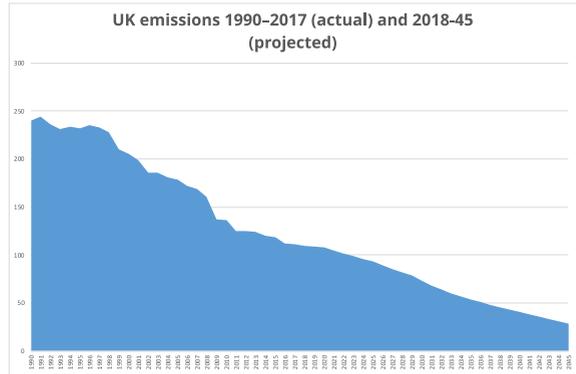
zero for the first flight and increase progressively for each subsequent flight in a given year. (A possible scenario, proposed by the New Economics Foundation in 2015, is £20 for the second flight, £60 for the third, and so on, reaching £420 by the ninth flight.) Everyone currently flying would still be able to afford to fly for occasional holidays, or for family reasons, but wealthy frequent flyers would pay more; this system is therefore more progressive than simply increasing tax on all flights (as France is now proposing, with an additional eco-tax on external flights). Set at the rates above, this would raise twice as much revenue as air passenger duty, reaching an estimated £7 billion a year over time; levels could be adjusted according to observed impacts. Various administrative issues would need to be addressed; HMRC would need access to the data currently collected by the Home Office on international passenger movements, and airlines would need to record customers' passport numbers at the point of ticket sale rather than, as now, before boarding.

9.3.6 Slightly more options exist for shipping, which contributes about a fifth of the UK's share of international transport emissions. We welcome the government's recent announcement that ships ordered from 2025 onwards for use in UK waters must have zero-emission capabilities; but ships have long lifespans, and existing vessels will remain in operation for many years. The International Maritime Organisation's target of reducing total annual emissions by at least 50 per cent by 2050 compared to 2008 levels is welcome but inadequate. This initially involves 'slow steaming' (and we commit to enforce any speed limits agreed at IMO level) and mandatory energy efficiency requirements, and in the longer term other options such as low-carbon and zero-carbon fuels. This is an area where international collaboration in research and innovation should be pursued. We would also support efforts to introduce carbon pricing into international maritime transport and explore the option of requiring minimum emissions standards as a condition of ship insurance. We would also legislate to require ships to connect to onshore supplies of electricity when in port to avoid the use of diesel fuel to generate power.

## 10 Decarbonising industry

Industry: actual 1990–2017 and Liberal Democrat proposals, 2018–45

Emissions (MtCO <sub>2</sub> e)	
<i>Actual</i>	
1990	241
2017	111
<i>Lib Dem proposals</i>	
2030	73
2045	29



### Key proposals – decarbonise industry by:

- Working with industry to introduce resource productivity and circular-economy models.
- Banning non-recyclable single-use plastics within three years and initiating negotiations on an international agreement to reduce the production and consumption of plastics.
- Providing infrastructure funding to accelerate the introduction of industrial carbon capture and storage.

10.0.1 The industry sector comprises manufacturing, construction, water and waste management, refining and energy extraction. Its emissions include not just those from energy use, e.g. for steel or chemicals manufacture, but also from industrial processes such as cement and chemical production and from the use of synthetic gases such as hydrofluorocarbons. By 2017 emissions from industry had fallen by 54 per cent since 1990, mainly because of improvements in energy efficiency and waste management and the continued decline of UK manufacturing.

10.0.2 Further reductions are possible through improved energy efficiency, supply chain optimisation and the application of circular economy principles, all helping to minimise waste; the use of hydrogen and electricity for industrial heat, where practicable; and the development of

CCS at scale. This will leave a residue of emissions from particularly hard-to-treat areas, which will need offsetting through carbon dioxide removal (see Chapter 12).

10.0.3 A clear policy framework and forward strategy will be needed, set by government in consultation with scientists and industry, including sub-sectoral targets and roadmaps consistent with the overall net zero target and identifying challenges and bottlenecks, coupled to a strategic science and innovation policy aimed at overcoming them (see Chapters 4 and 5). Funding would be provided through an expanded Clean Growth Fund, supporting innovation in zero-carbon and resource-efficient technologies and energy efficiency accelerator programmes and the large-scale deployment of CCS and hydrogen manufacture and transport.

## **10.1 Industrial efficiency and the circular economy**

10.1.1 Most of the proposals for reducing demand for energy in buildings set out in Chapter 6 are just as relevant to businesses as to households, particularly to the vast majority of them outside the manufacturing and raw materials processing sectors. The existing framework to promote energy efficiency by larger energy users include voluntary sector-wide Climate Change Agreements to reduce energy use and emissions and the new Energy Savings Opportunity Scheme (ESOS), which makes it mandatory for large businesses to undertake assessments of energy use and energy efficiency opportunities. We would accelerate progress by increasing the frequency of ESOS assessments from every four years to every year and by making the implementation, not just the identification, of short-term-cost-effective energy-efficiency measures mandatory. We would provide funding for the Energy Saving Trust and Carbon Trust to expand their capacity to work with business to reduce energy and resource use, and set more ambitious forward targets for the next set of Climate Change Agreements.

10.1.2 Considerable scope exists to reduce emissions further by improving resource productivity through better design of products and processes, aiming to achieve the 'circular economy': maximising recovery, reuse, recycling and remanufacturing and minimising resource use and emissions. A 2016 study from Centre for Industrial Energy, Materials and Products found that such measures could save an additional 62–100 MtCO<sub>2</sub>e over the period 2013–32, and a 2019 paper from Green Alliance

found that improvements in resource efficiency could be worth £10 billion in additional profits to manufacturers every year. We would accelerate the implementation of the EU Circular Economy package in the UK, including by enacting a Resource Efficiency and Zero Waste Act; this would set out legally binding targets for reducing the net consumption of key natural resources (using the model of the Climate Change Act), introduce incentives for businesses to improve resource efficiency, and promote better product design to improve repairability, reuse and recycling.

10.1.3 Plastics, nearly all of which are made from fossil fuels, are a source of greenhouse gas emissions at every stage of their lifecycle, from production to refining to disposal. At current rates of production, by 2050 plastics will be responsible for up to 13 per cent of the total global carbon budget. Liberal Democrats are committed to reducing the use of plastics in the UK, including banning non-recyclable single-use plastics within three years, requiring businesses and organisations that use them to introduce alternatives, particularly in packaging, and initiating negotiations on an international agreement to reduce their production and consumption.

10.1.4 If waste cannot be reused, recovered or recycled, it can be a valuable energy source, for biogas and power generation. We would include criteria for waste-to-energy systems in Local Development Plans and Minerals and Waste Plans, helping to divert waste from landfill to incineration with energy recovery (also helping to reduce landfill emissions) and food waste to anaerobic digesters.

## **10.2 Fuel switching and carbon capture and storage**

10.2.1 Energy-intensive and emission-intensive industries face greater challenges in reducing their impact on the climate, either because they need high temperatures not achievable by electric power or because their processes themselves emit carbon dioxide. Industries such as iron and steel, refining, and cement and chemical manufacture will need where feasible to adopt new net-zero-emissions processes, replacing fossil fuels with electricity (where possible) or hydrogen, and increasing recycling rates, e.g. for steel. Some pilot projects are already under way in these sectors (though not always in the UK), but they are likely to require a complete rebuild of key assets such as blast furnaces for steel and kilns for cement

production. This will require significant government infrastructure support; we would also pursue close international cooperation.

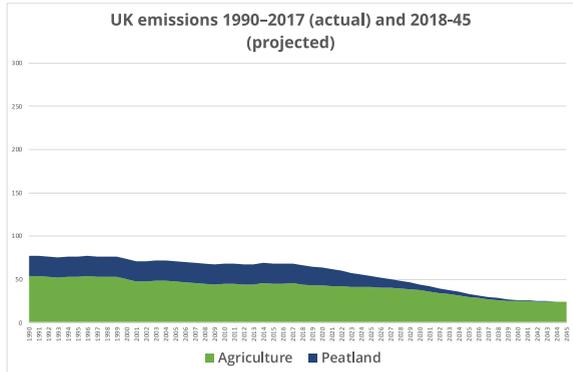
10.2.2 It will not be possible to eliminate carbon emissions completely, however, so equally important is the deployment of industrial CCS. Britain is well placed to become a world leader in CCS, with a considerable basic research base and an estimated one third of Europe's carbon dioxide storage capacity, in abandoned hydrocarbon fields and saline aquifers in the North and East Irish Seas. The Conservative government's neglect of this opportunity is one of the many failures of their climate policy.

10.2.3 Working together with business, we would provide funding to accelerate the deployment of industrial CCS, and commit to funding the necessary infrastructure for carbon collection pipelines and storage, focusing on industrial clusters such as those around refineries, chemical plants and iron and steel furnaces. These regional clusters could also feature hydrogen manufacture from natural gas and CCS-equipped thermal plants supplying back-up power to the grid. This would bring benefits of scale in collecting and transporting the captured carbon dioxide, as well as providing opportunities for the supply of waste heat from high-temperature processes to local homes and businesses. As discussed in Chapter 12, we would develop a market for emissions credits for carbon captured and stored through CCS.

## 11 Decarbonising agriculture and food

*Agriculture and peatland: actual 1990–2017 and Liberal Democrat proposals, 2018–45*

Emissions (MtCO <sub>2</sub> e)		
	Ag	Peat
<i>Actual</i>		
1990	54	24
2017	46	23
<i>Lib Dem proposals</i>		
2030	37	7
2045	24	0



### **Key proposals – decarbonise agriculture and food by:**

- Prioritising climate change mitigation in agricultural support systems, including measures to increase soil carbon, tree planting and woodland creation.
- Developing a National Food Strategy to promote the production and consumption of healthy, sustainable and affordable food.

11.0.1 After transport, agriculture has been the weakest sector for emissions reductions since 1990, and progress has essentially flatlined since the mid 2000s. Only 10 per cent of agricultural emissions are from the use of fossil fuels to power farming equipment and heat farm buildings; the remaining 90 per cent stems from methane (from the digestive systems of cattle and sheep, and waste and manure management) and nitrous oxide (from the use of nitrogen fertiliser, both organic and chemical, and returns from animal grazing and crop residues incorporated into soils).

11.0.2 These are difficult sources to address without significant shifts in diet, but the agriculture sector nevertheless needs to contribute to the net zero target. If the current trend to eating less meat accelerates, the sector

will be able to contribute more. Farmers also have a key role to play in contributing to measures designed to remove carbon from the atmosphere such as forestry and peatland restoration; this is considered separately in Chapter 12. (Emissions from peatland are included in the figures above (though they are currently excluded from national greenhouse gas accounts) but in the long term the UK's peatlands should become a carbon sink, removing carbon from the atmosphere.)

## **11.1 Farming**

11.1.1 The government's current approach to emissions from agriculture essentially depends on voluntary measures by the farming sector, which has clearly failed. The National Farmers Union is more ambitious, calling for net zero from the sector by 2040. In practice there is substantial scope for the introduction of regenerative agricultural approaches, through which farming systems enrich soils (thereby increasing carbon uptake and storage), as well as increasing biodiversity, improving watersheds and enhancing ecosystem services. This approach can also offer increased yields, resilience to climate instability and higher standards of health for farming communities, as it reduces the use of agrochemicals.

11.1.2 The new Environmental Land Management System planned by the government for UK agriculture outside the EU's Common Agricultural Policy in principle provides a good basis for policies to lower emissions, and its approach should be adapted to the UK's CAP implementation, assuming the UK stays within the EU. It would need to be accompanied by a comprehensive system of incentives, however, and Liberal Democrats would therefore prioritise climate change mitigation in the list of public goods supported, including measures to increase soil carbon, tree planting and woodland creation. Farm payments would be geared increasingly to support measures to reduce emissions, including from agricultural machinery, buildings and livestock.

11.1.3 We would introduce much stronger regulation, along the lines proposed by the Stacey review of farm regulation and inspection published in December 2018; this would include setting interim targets and introducing an effective monitoring and evaluation framework (currently lacking), including measurements of soil carbon. We would also introduce a

compulsory and transparent register of land ownership, including information held by the state about the condition of the land.

11.1.4 There is currently little on offer in terms of advice and support to help farmers adapt to a zero-carbon industry and to benefit from its opportunities. We would support research and innovation in the sector, including creating a new Farming and Land Use Catapult innovation centre. This would include support for agro-forestry, hydroponics, low impact and precision farming and organic farming, and means to reduce methane emissions (for example by improvements in animal husbandry) and nitrous oxide emissions, including creating a national nitrogen balance sheet to inform reductions from nitrogen fertiliser use. It would also help farmers to reduce their own energy usage (e.g. from more precision farming techniques) and to develop renewable energy schemes, including 'Farm Power' schemes to supply energy locally to neighbours and communities.

11.1.5 In the longer term, the possibility of extensive 'rewilding' of peatlands, heathland, native woodlands, saltmarshes, wetlands and coastal waters can make a significant contribution to carbon sequestration, with additional benefits such as flood mitigation, water quality improvement, and enhancement of wildlife. Our forthcoming paper on natural environment policy, scheduled for debate in 2020, will examine the scope for redirecting some agricultural subsidies to this approach.

## **11.2 Food**

11.2.1 Food consumption is one of the drivers of climate change, not just through emissions from UK farms, but also through imports of foodstuffs particularly associated with deforestation, such as palm oil, soy and cocoa; world-wide, clearance for agriculture is the main driver of global forest loss. A long-term approach to food consumption is needed, combining education, persuasion and incentives. There are, however, major potential benefits as well as climate mitigation. As the EAT-Lancet Commission reported in early 2019, doubling consumption of fruits, vegetables, nuts and legumes, and halving consumption of foods such as red meat and sugar would have major positive impacts not just on greenhouse gas emissions but on standards of health, and accordingly on incomes and health budgets. This is increasingly recognised by the public, with some projections suggesting that 25 per cent of the population will be vegetarian

by 2025, a doubling of the proportion today. Meat substitutes are gradually appearing on the market, and the UK has an opportunity to be a world leader in their production and consumption.

11.2.2 We would accordingly introduce a National Food Strategy to promote the production and consumption of healthy, sustainable food, and reduce the consumption of unhealthy, unsustainable food, particularly red meat and sugar. This would focus especially on working with schools to empower children and young people as citizens and consumers. Crucially, the strategy must aim to ensure that healthy and sustainable food is also affordable.

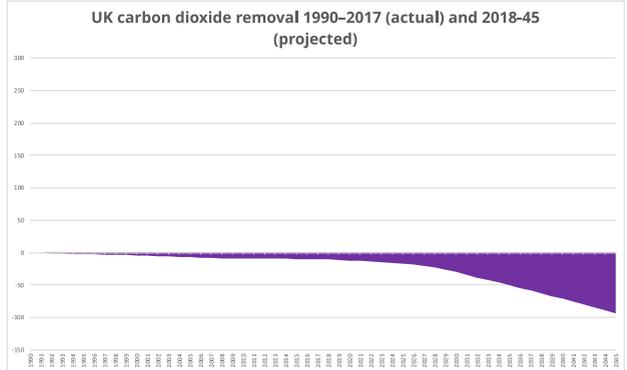
11.2.3 We will work with food manufacturers to reduce the climate impact of their products, drawing on the experience of reductions in salt from government interventions where public health bodies helped industry to collectively reformulate products on a voluntary basis, but with the fallback of regulation if necessary. We would also work with existing food assurance schemes to explore how zero-carbon commitments could be incorporated into their approach; if no progress could be made we would introduce a new scheme. We would use public procurement policy to grow the market for sustainable food and, where appropriate, locally sourced products. The public sector is a major purchaser of food and catering; we would set annual targets for central government public-sector bodies to significantly reduce the climate and health impacts of their food consumption, and encourage local government and the NHS to do the same.

11.2.4 Food waste – which accounts for a third of all the food bought – is a major source of greenhouse gas emissions. We would implement the food waste hierarchy, which gives priority to (in order): avoiding waste; redistributing or reusing food; composting or anaerobic digestion to produce renewable energy. This would be backed up with a target for zero-carbon food waste to landfill, building on existing good practice by Liberal Democrat councils, including financial support for innovation by local authorities. We would encourage retailers to invest in reducing their suppliers' food waste, and introduce reporting requirements for large retailers and food producers to publicly report on food waste through their operations, with transparent benchmarking of progress.

## 12 Removing carbon from the atmosphere

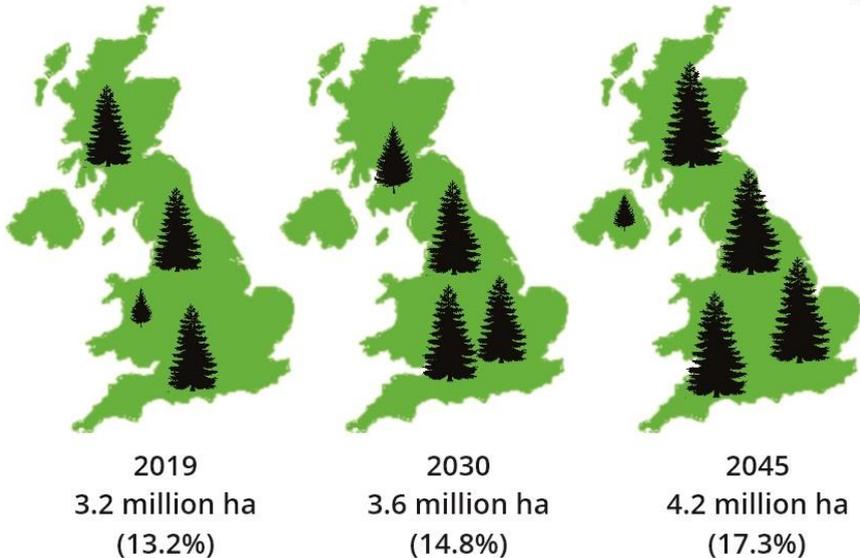
Carbon dioxide removal: actual 1990–2017 and Liberal Democrat proposals, 2018–45

Emissions (MtCO <sub>2e</sub> )	
<i>Actual</i>	
1990	0
2017	-10
<i>Lib Dem proposals</i>	
2030	-30
2045	-94



What this means for UK woodland area: actual (2019) and under Liberal Democrat proposals (2030, 2045)

### Carbon removal: UK Woodland (area and % of total land area)



**Key proposals – remove carbon from the atmosphere by:**

- Increasing UK forest cover by planting an additional 60 million trees a year, and by restoring peatlands.
- Supporting research and innovation for negative emissions technologies, particularly Direct Air Capture and Carbon Storage (DACCS), and introducing a funding system to reward delivery.

12.0.1 Full implementation of the proposals set out in this paper would still leave the UK with about 90 MtCO<sub>2</sub>e emissions by 2045, mainly from the hard-to-treat sectors: aviation, industrial processes and agriculture, with small residual emissions from power, heat and surface transport. Ways must therefore be found to remove carbon dioxide from the atmosphere, reducing the UK's net emissions to zero by 2045. Our top priority is natural climate solutions – forestry and peatland restoration – but by themselves these will not be enough, and technological solutions must also be developed. A range of options are under consideration for capturing and storing carbon dioxide; various projects have been proposed but none are yet operating at commercial scale.

12.0.2 Since all these options will take years to bring fully into operation, it is urgent that work starts now. We would provide innovation support for development and pilot projects and establish a new Catapult Centre for carbon dioxide removal solutions to accelerate existing work by UK researchers. We would also fund the necessary CCS infrastructure (see Chapter 10), and deliver financial support through buying credits for carbon reductions, whether from woodland, peatland and soil, or technological solutions, ideally through an auction system similar to that used for contracts for difference in the power sector. In the longer run we would incorporate this in an emissions trading scheme including agriculture and land use. There should also be scope for redirecting current agricultural subsidies to support carbon sinks such as woodland and peatland (see Chapter 11).

## 12.1 Nature-based solutions

12.1.1 The best options are the ones that already remove and store carbon: primarily growing trees and protecting peatlands (which are massive stores of carbon); these measures also bring benefits for habitats

and wildlife, and can provide local employment in managing and harvesting woodlands. For decades successive governments have failed to act in these areas; the UK is one of the least densely forested countries in Europe, and the pace of tree planting has declined dramatically in recent years, from 30,000 ha/year in the late 1980s to less than 7,000 ha/year in 2016/17 in England. The UK's peatlands, which should act as a carbon sink, are in fact a source of emissions – only 4 per cent of upland peat bogs are in good condition.

12.1.2 A major national programme of protecting and expanding natural carbon sinks must be developed as a matter of urgency. As in other areas, while central government needs to set the overall framework and provide regulatory and financial incentives, the implementation of real change must be led at a local level. We would transform the Local Nature Partnerships established when Liberal Democrats were in government into Zero-Carbon Nature Partnerships, working with farmers and land managers to audit and map natural capital and carbon sink provision in their area and identify priorities for investment. We would reverse the weakening of the planning system, ensure planners have the skills and resources to support overall carbon reduction targets and place stronger duties on National Park Authorities to create and protect carbon sinks. Britain's peatlands are currently excluded from national greenhouse gas accounts, we would include them and introduce stronger regulation and inspection. We would also end the use of peat in horticulture.

12.1.3 Restoring and expanding forests is the best option for carbon removal, as trees fix carbon in living biomass and forest soils for decades or centuries. The UK should aim for a tree planting rate of at least 40,000 ha/year, adding extra woodland of about two-thirds the size of the New Forest each year – though including not just major afforestation initiatives like the Northern Forest but also planting trees in urban areas and on farms (agro-forestry). We recognise that this rate (equivalent to at least 60 million new trees a year) would be historically unprecedented in the UK, but it would still only increase UK forest cover to less than 20 per cent by 2045, against a European average of about 35 per cent. The measures we would propose to achieve this, and ensure that additional benefits for leisure, health, biodiversity and wood-based industries are delivered, will be included in the forthcoming Liberal Democrat paper on natural environment policy, scheduled for debate in 2020.

12.1.4 We would aim to grow demand for the use of wood products, particularly in construction, replacing high-carbon materials such as brick, concrete and steel. Modern ways of working with wood, using engineered products such as cross-laminated timber, are enabling the construction of timber buildings up to 14 storeys high, which, since they are mostly prefabricated off-site, are also cheaper and speedier to erect than concrete or brick buildings. We would work with architects and the construction and forestry industries, and amend building regulations, to promote the take-up of wood, including through marketing and awareness campaigns, annual awards for best practice in wood in construction and using national and local government procurement policy.

## **12.2 Technological solutions**

12.2.1 Many of the options put forward by the IPCC, CCC and others depend on the combination of bioenergy with CCS (BECCS) – burning biomass, either wood or fast-growing crops (which are assumed to be carbon-neutral since they have absorbed carbon while growing) for energy, capturing the emissions and burying them underground. In reality, however, the collection, processing and combustion of biomass is never completely carbon-neutral, and often the best thing to do with forests is to let them grow and absorb carbon, managing them for conservation (e.g. taking out dead trees, coppicing to promote growth, etc.) but otherwise leaving them alone. We believe BECCS could have a role if the feedstock is restricted to categories, such as sawmill wastes or harvesting residues, which would otherwise rot and emit their stored carbon to the atmosphere relatively quickly, and fast-growing energy crops.

12.2.2 Other solutions being piloted include direct air capture and carbon storage (DACCS – the absorption of carbon dioxide directly from the atmosphere using chemicals); enhanced weathering (spreading silicate minerals across soils to increase soil alkalinity, which increases the absorption of acidic carbon dioxide); zero-carbon concrete (using magnesium silicate or oxide in cement instead of carbonate, which allows for the potential absorption of carbon dioxide over the concrete's lifecycle); and biochar (storing carbon through partially combusted organic matter (char) by burying it in topsoil). All have advantages and disadvantages, but at present DACCS appears to have the most promise; it will, however, require considerable investment in further renewable power generation.

12.2.3 This is a priority area for research, development and demonstration projects, preferably at the international level to maximise resources and collaboration. We would aim to launch a global coalition of countries prepared to devote resources to the development of these and similar technologies.

## **Annex: sources**

The figures used for the graphs and illustrations throughout the paper have been adapted from the following sources:

- *A Vision for Britain: Clean, Green and Carbon Free* (Culmer Raphael and Iken Associates, for the Liberal Democrats, September 2017)
- *Keeping it Cool: How the UK can end its contribution to climate change* (Vivid Economics for WWF UK, November 2018)
- *Net Zero: The UK's contribution to stopping global warming* (Committee on Climate Change, May 2019)
- *Final UK greenhouse gas emissions national statistics 1990–2017* (BEIS, 2019)
- *Future Energy Scenarios* (National Grid, July 2019)

## **Tackling the Climate Emergency**

### **Policy Paper 139**

This paper has been approved for debate by the Federal Conference by the Federal Policy Committee under the terms of Article 8.4 of the Federal Constitution.

Within the policy-making procedure of the Liberal Democrats, the Federal Party determines the policy of the Party in those areas which might reasonably be expected to fall within the remit of the federal institutions in the context of a federal United Kingdom.

The Party in England, the Scottish Liberal Democrats, the Welsh Liberal Democrats and the Northern Ireland Local Party determine the policy of the Party on all other issues, except that any or all of them may confer this power upon the Federal Party in any specified area or areas.

The Party in England has chosen to pass up policy-making to the Federal level. If approved by Conference, this paper will therefore form the policy of the Federal Party on federal issues and the Party in England on English issues. In appropriate policy areas, Scottish, Welsh and Northern Ireland party policy would take precedence.

## **Working Group on Climate Policy**

Note: Membership of the working group should not be taken to indicate that every member necessarily agrees with every statement or every proposal in this paper.

Duncan Brack (Chair)

Sian Reid (Vice Chair)

Chris Bowers

Paul Burall

Katie Critchlow

Lynne Featherstone

Alyssa Gilbert

Philip Good

Fiona Hall

Richard Hebditch

Pippa Heylings

Mark Hinnells

Susan Juned

Catherine LeGrice-Mack

Keith Melton

Alex Meredith

Mark Petterson

Edward Robinson

Alessandra Rossetti

Philip Sargent

Neil Stockley

Frances Toomey

Andrew Warren

Christine Willmore

### **Staff**

Christian Moon

Ed Molyneux

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