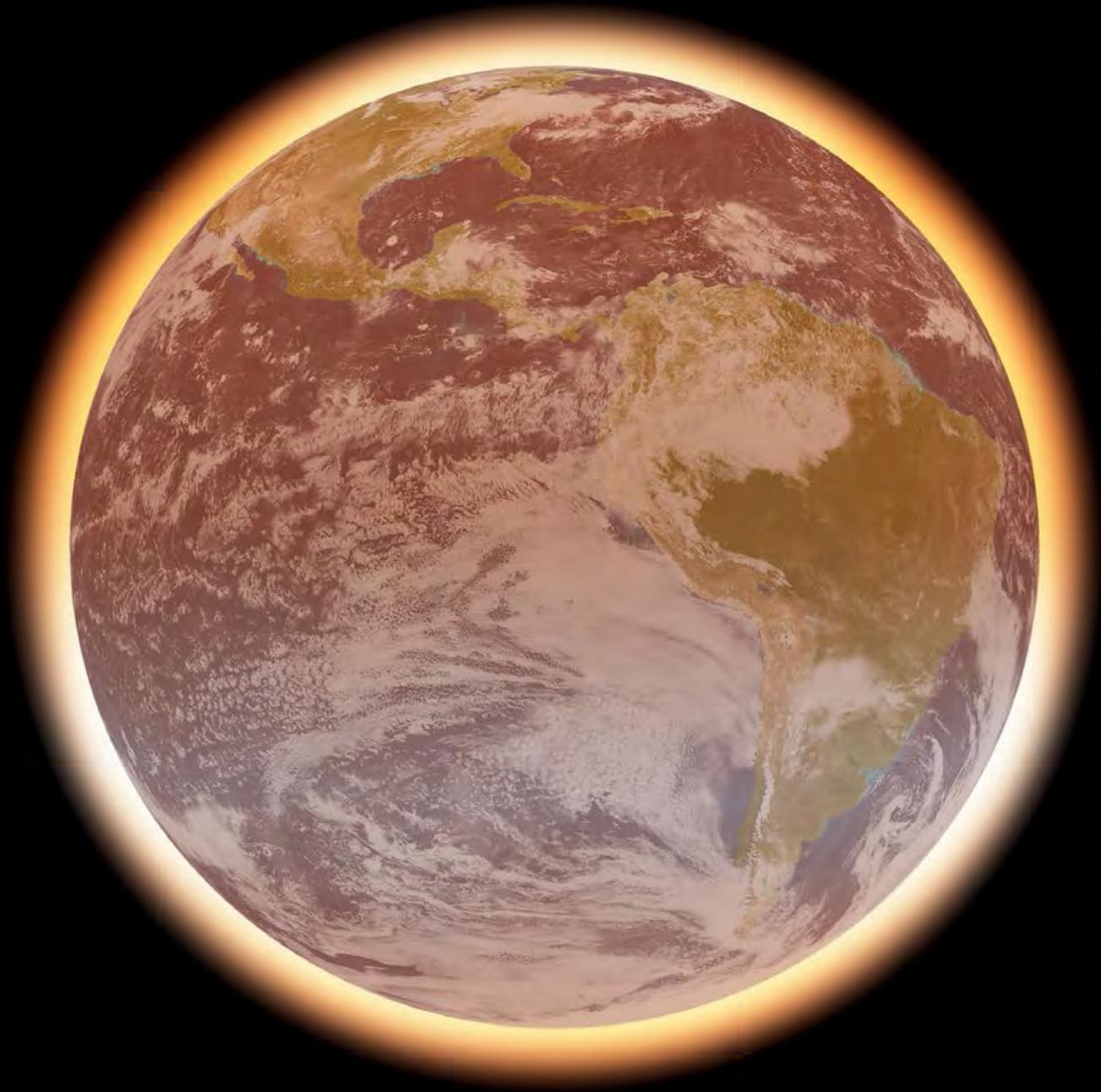




HM Government



Paris 2015

Securing our prosperity through a  
global climate change agreement

“I believe man-made climate change is one of the most serious threats that this country and this world face.”

*David Cameron, UK Prime Minister, February 2014<sup>1</sup>*

“Climate change is a fact. And when our children’s children look us in the eye and ask if we did all we could to leave them a safer, more stable world, with new sources of energy, I want us to be able to say yes, we did.”

*Barack Obama, US President, January 2014<sup>2</sup>*

“Time is running out and with each passing month, year and decade the ecological debt of future generations is mounting higher and higher.”

*Narendra Modi, Prime Minister of India, December 2010<sup>3</sup>*

“Fostering a sound ecological environment is vital for people’s lives and the future of our nation. Smog is affecting larger parts of China and environmental pollution has become a major problem, which is nature’s red-light warning against the model of inefficient and blind development. We must strengthen protection of the ecological environment and resolve to take forceful measures to complete this challenging task... We will declare war against pollution and fight it with the same determination we battled poverty.”

*Li Keqiang, Chinese Premier, March 2014<sup>4</sup>*

“Are we willing to let another decade slip away, standing idly by as the world’s most vulnerable countries and people, including my own, fight a losing battle against the king tides and typhoons of a warmer world? Or will we instead stand together and say we are ready to embrace a carbon-free future, and to do it today?”

*Christopher J. Loeak, President, Republic of the Marshall Islands, July 2014<sup>5</sup>*

“Don’t get left behind. Don’t be on the losing side of history... Let us take advantage of the opportunities presented by climate action and lay the foundations for a more prosperous and secure future for all.”

*Ban Ki-moon, UN Secretary General, May 2014<sup>6</sup>*

# Contents

Ministerial foreword	2
Executive summary	5
Chapter one: Avoiding climate bust – the case for action	10
Chapter two: UK climate action – the benefits of action	24
Chapter three: Global progress since Copenhagen – more action urgently required	35
Chapter four: To Paris 2015 and beyond – the action we need	47
Glossary	61
Endnotes	62

# Ministerial foreword



Our climate is changing – we are already feeling the impact with more extreme weather events and shifting climate patterns. These changes are being driven by human activity. If the world carries on the same course then many countries will suffer the consequences – flooding, coastal erosion, desertification, food and water shortages, the migration of millions of people fleeing the most affected regions. The risks don't just relate to our environment and ecosystems, but to the health of communities and the economic and political stability of many countries. In a worst case scenario, the results would be globally catastrophic.

We know that the risks will become more severe as the temperature increases. We also know that the longer we wait to take action, the harder and more expensive it will be to change course. So we need to see action now. The governments of the world have agreed that we should limit global warming to a maximum of 2°C above pre-industrial levels so we can avoid the worst climate change impacts. The UK already has legally binding targets to reduce our emissions up to 2050, and these are in line with the 2°C limit. But climate change is a global threat. Just as all countries will be affected by climate change – regardless of their own levels of greenhouse gas emissions now or in the past – all must participate if we are to solve the problem.

Many countries and businesses are already making changes that will result in lower emissions. They are motivated by energy security, efficiency, health and sustainability concerns, as well as the risks and costs of climate change itself. And these changes are making a difference. But the action we are seeing across the world is not enough to keep us within the 2°C limit. We need a mechanism to increase ambition and provide confidence that we are all moving in the same direction.

Next year in Paris in December we have the opportunity to put this in place. The world will come together to forge a deal on climate change that should, for the first time ever, include binding commitments to reduce emissions from all countries. The right deal also has the potential to

kick-start a transition to a low-carbon future at the global level. With all countries participating, according to their evolving responsibilities and capabilities, we will move towards a level playing field that opens up new markets, brings down costs, and unlocks the investment we need.

Success in Paris will mean safer and healthier lives for people across the world and for future generations. It will also create economic opportunities. That is why the UK business community is so overwhelmingly in favour of a deal. They want the certainty, clarity and confidence it would bring so that they can get on with making the low-carbon transition a reality. UK businesses are already at the forefront of the green economy revolution. A deal would lead to further investment opportunities at home and abroad, and increase the size of the low-carbon goods and services sector worldwide.

There have been opportunities in the past. The 2009 climate talks in Copenhagen did not meet the world's expectations. This understandably caused a loss of confidence in the international process. Countries have learned from this experience.

Preparations started in 2012 and last year it was agreed that countries would put emission reduction targets on the table well in advance of Paris, indeed the major economies will do so in early 2015. For the last few years, too, leaders and ministers around the world have invested much more time in

listening and understanding the positions of their counterparts, and exchanging ideas and expertise. This collaboration bodes well for Paris.

The wider conditions for taking action on emissions have changed too.

It has become even clearer that changing the way we produce and use energy makes sense for the economy. Across the world, people are rolling out energy efficiency measures in their factories and homes, not solely, even principally, for environmental reasons, but because it saves money. Similarly, countries and communities realise that, by diversifying their energy supplies to include low-carbon options, they can reduce their dependence on fossil fuels, and their exposure to the economic consequences of volatile prices. Cleaner energy also cuts air pollution and so brings other benefits too, most notably significant health improvements.

At the same time, the price of low-carbon alternatives like solar power and onshore wind has fallen, often faster than predicted, and investment in renewables is growing. The barriers to taking action are getting lower.

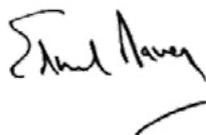
Perhaps most importantly, and partly because of growing awareness of the impacts, there is increasing political will among the big emitters to tackle climate change. We are seeing this through both their domestic action, and their approach to the international negotiations. This brings vital momentum to a deal in Paris next year.

In the US, President Obama has proposed in the Clean Power Plan to cut carbon emissions from electricity generation by 30% by 2030. China, driven partly by concerns about air pollution, has committed to cutting the proportion of energy it gets from coal and has set up pilot carbon markets and low-carbon zones. India's new Prime Minister, Narendra Modi, has a strong track record of supporting low-carbon development from his time as Chief Minister of Gujarat, presiding over major renewables projects. He has now committed to expand solar energy to help provide electricity to 300 million Indians without any currently. There is momentum within the EU to agree a strong climate and energy package in October this year. The UK is pushing hard for at least a 40% reduction in the EU's domestic emissions by 2030 compared to 1990 levels, and for the EU to go even further in the context of an ambitious global deal.

While the risks of climate change are huge, the economic opportunities from a transition to a low-carbon future are huge as well. A deal in Paris next year is the best chance we have to reduce and manage the risks of climate change and to unlock these opportunities.

I am proud that the UK is at the forefront of efforts to secure a deal. I am also proud of our practical partnerships with countries across the world to share expertise on reducing emissions and building resilience to the effects of climate change, including in some of the poorest and most vulnerable countries in the world.

Paris will not be the end of our journey. But it can be a turning point that future generations point to as the moment when the world came together and moved decisively towards a safer, healthier and more prosperous future.



**Rt Hon Edward Davey MP**  
Secretary of State,  
Department of Energy & Climate Change



“ For any climate change agreement to be lasting and successful it must result in long-term prosperity for the planet. The move to a green economy offers a great opportunity, but to be fully realised it requires world leaders unite to provide certainty, clarity, and confidence.

The UK is a global leader in developing cost effective policies and innovative technologies so that growth and decarbonisation can now be seen as both sides of the same coin – Paris 2015 is a singular opportunity for generations across the world to share in that future.”

*Ms Amber Rudd MP,  
Parliamentary Under Secretary of State for Climate Change,  
United Kingdom, September 2014<sup>7</sup>*

# Executive summary

In 15 months, the world will gather in Paris to secure a legally binding, global climate change agreement with emission reduction commitments from all countries for the first time ever. It will require courage, determination and ingenuity to deliver, building on years of hard work. It is not just governments who want an agreement; there is widespread support from businesses, NGOs and campaign groups, both in the UK and internationally. A Paris 2015 agreement will create the vital framework the world needs to keep the global goal of limiting average global temperature increases to below 2°C within reach, and avoid the worst impacts of climate change.

A global climate agreement is unquestionably in the UK's and the entire global community's, interests. The prospects of securing a successful global climate agreement next year have never been better. This document explains why. It considers:

- the latest climate science on risks and impacts, many of which we are already seeing today;
- the benefits of low-carbon action for our prosperity, security and well-being, showcasing many leading businesses in the UK who are already realising the commercial gains of climate action;
- the gap in global emission reduction efforts to date which only a global agreement can close;
- the recent progress in global climate action, demonstrating that whilst much more is needed a global climate agreement is now within reach;
- the path to an agreement in Paris and beyond, what a successful agreement looks like, and how to deliver it.

## Chapter one Avoiding climate bust – the case for action

The recent assessment from the Inter-Governmental Panel on Climate Change (IPCC) demonstrates the **overwhelming scientific evidence that climate change is happening and that it is extremely likely that man-made emissions of greenhouse gases (GHGs) are the dominant cause:**

- Average global temperatures have risen by 0.85°C since 1880 and we are already seeing the effects. In many regions rainfall patterns have changed, glaciers are shrinking, corals are declining and some species have become extinct.
- Without significant and sustained global action, climate change poses great risks to human health, global food security, and economic development.
- We cannot undo the warming from past emissions but we can control the levels of future warming in the decades to come.
- Depending on how we act now, average global temperatures could be limited to under 2°C or rise by 4.5°C or more by the end of this century, relative to pre-industrial levels.
- Even warming of 2°C will see considerable impacts in some areas. Increases of 4°C or more are expected to lead to much greater and wider impacts.

**Climate change will impact the UK directly:**

- Extreme weather events already cause significant costs and disruption to UK businesses;
- Increasingly frequent and severe flooding is expected, damaging properties and infrastructure, causing loss of earnings and disrupting supply chains;
- The UK is also vulnerable to the predicted rise in the incidence of heat waves, storms and gales.

**However, perhaps the greatest risks and costs to the UK will be felt indirectly:**

- Rising food prices and potential shortages of certain foodstuffs due to crop damage and losses from increasing water scarcity and extreme flooding in critical food producing areas;
- Rising costs of materials and goods due to the impact of extreme weather on critical infrastructures and supply chains in mineral-rich and industrialising regions;
- Loss of trade and earnings as climate change impacts on our key trading partners;
- Growing regional instability, insecurity and health risks, especially in the poorest areas, which are expected to be hit hardest from, for example, coastal flooding, land loss and heat waves.

Acting now gives the world a fighting chance of limiting the average global temperature rise to 2°C.

**But acting now also makes good economic sense:** delaying climate action will mean having to cut global emissions further and faster in the future, through more aggressive and interventionist policies, which will result in greater costs for households and businesses. **Delaying action is a false economy.** We need to spread the effort and costs of tackling climate change over time by acting early and consistently.

However, the UK cannot tackle climate change alone. Every country, regardless of its emissions, will be impacted by climate change. Keeping the world on course for the 2°C goal is a huge global challenge. We need a global response, and we need it now.

## Chapter two

### UK climate action – the benefits of action

There is a strong UK political consensus that climate change is a major threat to our future prosperity, security and well-being, so we must play our full part in meeting the 2°C goal. But action to tackle it must go hand-in-hand with securing long-term and sustainable growth. In the UK we are developing the necessary cost-effective policies, tools, technologies and businesses to deliver this.

But if we are to limit emissions at scale, ensure the transition is cost effective, and that countries are not disadvantaged by taking action, this transition needs to happen globally. A global agreement on climate change in Paris next year can underpin this transition by:

- Providing the policy confidence needed for international investment in low-carbon infrastructure and innovation, and energy efficiency;
- Ensuring that action is cost-effective, at the scale necessary, creating a more level playing field and securing future economic prosperity for all;
- Setting the world on a low-carbon pathway, and avoiding locking us into a high-carbon, high-cost future.

**The UK is taking action to build a competitive, low-carbon and resilient economy:**

- **The Climate Change Act (2008):** The world's first long-term, legally-binding national framework for reducing emissions, setting five-year carbon budgets to cut UK emissions by 80% by 2050.
- **The Green Investment Bank (GIB):** Committed £1.4 billion since 2012–13 helping to mobilise £4.9 billion of funding for the UK's green economy.
- **Low-carbon Electricity Market:** Market reforms in the Energy Act 2013 are creating the world's first low-carbon electricity market. UK renewable electricity generation has doubled since 2010 reaching almost 20% so far this year and attracting a record of nearly £8 billion of investment last year.

- **A range of other instruments and policies** are in place to decarbonise our economy cost-effectively, from EU fuel efficiency standards, to building regulations, to demand-side energy policies.

### **The UK is taking action to unlock opportunities in the low-carbon economy:**

- **In energy:** The UK is the top global investment destination for offshore wind. We are on course to build the first UK nuclear power station for over 40 years. Our low-carbon energy sector could support 250,000 jobs. Britain is ranked 3rd globally for carbon capture and storage (CCS) research, with projects in development in Aberdeenshire and North Yorkshire.
- **Low-carbon SMEs and innovation:** The UK's low-carbon small business sector is booming. Low-carbon SMEs dramatically outperform their peers for exports and job creation.
- **Energy and resource efficiency:** Energy efficiency is the most cost-effective way to cut bills, improve living standards and lower emissions. According to the Carbon Trust, typical rates of return on energy efficiency investments are over 40%, much higher than typical business investments.

### **Climate action can be consistent with strengthening our energy security and improving our quality of life**

- The UK is rated the most energy secure country in the EU, and fourth in the world as a whole. But global demand for energy is increasing and the UK's oil and gas import dependence is expected to rise. The policies that we enact to deal with climate change and reduce emissions are part of the solution to these risks.
- Lowering emissions will help reduce health problems for example, from air pollution. Protecting 'carbon sinks', such as forests and woodland, will boost biodiversity and ecological health, provide shade and help to cool urban areas, and improve mental health and wellbeing. This in turn can deliver multiple economic benefits.

But the economic benefits of a global climate agreement will not be monopolised by the West – far from it. **A Paris 2015 agreement will create huge economic opportunities around the world:**

- Developing countries could attract billions in new foreign direct investment, and develop their own domestic low-carbon business sectors;
- Emerging and developing countries can develop a 21st century economic development model, avoiding the political, social and economic costs of the old carbon-intensive development path.

## **Chapter three Global progress since Copenhagen – more action urgently required**

**The world has moved on from questioning whether climate change exists.** Climate change is almost universally recognised as a serious threat to global prosperity, security and well-being. The world is not asking *if* we need to tackle climate change, but *how*. Over 90 countries, covering 80% of global emissions, have pledged to cut their emissions by 2020 under the Copenhagen Accord.

However, **we are now playing catch-up.** By 2020, global emissions are on track to be well above the cost-effective pathway to 2°C. This emissions reduction 'gap' is likely to be between 8 and 12 Gt of CO<sub>2</sub>e and will only grow without action to tackle them.

Further effort at all levels in the period up to 2020 and beyond will be vital. However, **progress seen since 2009 has been considerable and does mean that a global agreement is now within reach.**

First, **national climate change legislation and carbon pricing mechanisms are spreading:**

- Almost 500 climate laws have been passed in 66 of the world's largest emitting countries.
- About 40 national and over 20 sub-national jurisdictions are now putting a price on carbon and the number of national or regional carbon markets is increasing steadily.

Secondly, we are seeing **real progress on the ground, including from the largest emitters:**

- **EU:** Set to over-achieve on its 20% emission reduction by 2020 and, this October, is expected to confirm a domestic GHG target for 2030 of at least 40%.
- **US:** On track for emissions cuts of 17% by 2020 on 2005 levels, has proposed robust new regulations for existing power plants and a raft of other federal, state and city level actions.
- **China:** Sees emission reductions as being in its national interest, for air pollution, efficiency and resource security reasons. China is embedding climate action within its five-year plans and is already the world's largest non-fossil fuel energy producer.
- Many other countries across the world are showing leadership in reducing emissions.

Thirdly, the acceleration in global climate action has stimulated **important technological and financial advances:**

- Renewables costs have fallen at an extraordinary pace over the last decade. In 2013, net investments in new renewables capacity exceeded those for the fossil fuel sector for the fourth consecutive year, and China invested more in renewables than fossil fuels for the first time.
- The financial sector is increasingly developing low-carbon financing, tools and instruments as the investment community responds to the increase in global climate action.
- 'Low-carbon' is no longer a niche sector – it is a booming business, driving down costs and making low-carbon growth a cost effective option for more and more countries.

Finally, we have **learned a lot about the climate architecture needed and a global agreement is now within reach:**

- We have learned much more about how to finance action internationally, including through the Climate Investment Funds which have informed the design of the Green Climate Fund.
- Our understanding about how to accurately and effectively account for the emissions reductions that countries make has been honed over many years.
- We have learnt how a global climate agreement could be structured to bring all parties on board while retaining credibility and trust among them.

## Chapter four To Paris 2015 and beyond – the action we need

**We need a new global agreement.** Paris in 2015 presents the opportunity to agree, for the first time ever, a legally binding deal in which all 195 countries in the UNFCCC take on commitments to reduce their emissions. The UK is at the forefront of helping to shape and deliver this agreement. We have much to do before Paris and challenging negotiations ahead, with key milestones over the next 15 months. Paris will not be the end of the road, but it can be a huge step forward on which we can build further in future years.

**We need a global climate agreement to:**

- Drive-up ambition levels across all parties, steering the world back toward the 2°C path;
- Trigger the economies of scale and level of investment needed;
- Reinforce confidence and trust that all countries are acting in line with their commitments;
- Ensure that support is in place for those whose need it, and to help all countries, especially the world's poorest and most vulnerable to develop climate resilience.

**The UK's vision of a successful global climate agreement includes three key components:**

### i **Ambitious and fair commitments from all countries to reduce emissions**

The new agreement should involve:

- Credible and fair emission reduction commitments from all countries, keeping the 2°C goal within reach. Commitments should reflect a range of factors – such as GDP, mitigation potential and contributions to past and future climate change. Some countries can make rapid reductions now. Others need to start slowly while some will need their emissions to grow before they fall.
- The most advanced economies making the most ambitious commitments, reflecting their responsibilities and capacities. For the G7 and others this should be consistent with their existing pledge to cut aggregate emissions by at least 80% by 2050. That's why the UK is pushing the EU to set a benchmark early, by

agreeing a domestic GHG target of at least 40% by 2030 this October.

- Sufficient ambition from other major economies and other G20 members. In 2020, Chinese emissions will be larger than the EU and US's combined while non-OECD countries will be responsible for over two thirds of global emissions.
- Recognition of the real opportunities for the poorest countries to slow their rate of emissions increase by moving to low-carbon development pathways, given the appropriate support.
- helping to do this including through our £3.87 billion International Climate Fund;
- Ensuring that all countries work to mobilise climate finance according to their respective capabilities – such as formulating low-carbon development strategies, implementing policies to encourage climate investment or mobilising domestic and international public and private climate finance;
- Secure a critical mass of countries ready to pledge to the Green Climate Fund by the Lima COP.

All UNFCCC countries have agreed to bring forward their emission reduction contributions well in advance of Paris. We would expect the advanced and emerging economies to come forward in the first quarter of 2015, up to 10 months ahead of the Paris COP, so everyone can see what is on the table. The UK is helping to provide support to a number of countries to prepare their emission commitments through several international organisations.

## **ii Tracking progress, building trust, and facilitating increased ambition in the future**

Ambitious commitments alone are not enough. Parties need to be sure that they will be met. So the new agreement must include a legally-binding rules-based system to track progress towards commitments. The agreement must also include regular reviews to allow countries to raise their ambition as confidence grows, technology advances, costs fall and national circumstances change.

## **iii Providing support to those who need it, and helping all countries, particularly the poorest and most vulnerable, to develop climate resilience**

Climate change will hit the poorest countries the hardest, as they have the least capacity to adapt, and women and girls within those communities are particularly vulnerable to being marginalized. Yet these countries often have the most cost-effective mitigation options, but few resources to exploit them. So mobilising finance to help adaptation and mitigation in developing countries is essential by:

- Ensuring developed countries meet their commitment to jointly mobilise \$100 billion a year, from various sources, by 2020. The UK is

## **The path to Paris and beyond: the UK's role**

Looking ahead, there is a huge amount of work still to be done to secure a successful Paris 2015 agreement. And the story will not end in Paris. Much of the really hard work will begin as we focus on putting the agreement into practice, and increase our ambition further at regular reviews, in order to meet our global below 2°C goal.

**Above all else, we need the political will to secure a new agreement in Paris.** That's why the UN Secretary General has organised a Climate Summit of world leaders this month in New York; why the UK is pushing the EU to agree an ambitious 2030 emissions reduction target this October; and why the messages coming from the US and Chinese leadership on the prospects of an agreement are so important and encouraging. Working together, across the political spectrum and throughout 2015, our leadership and determination will help deliver in Paris next year.

# Chapter one

## Avoiding climate bust – the case for action

“ If I said to you there’s a 60% chance your house might burn down, do you want to take out some insurance? You take out some insurance. I think we should think about climate change like that. Scientists are giving us a very certain message. Even if you’re less certain than the scientists it makes sense to act both in terms of trying to prevent and mitigate.”

*David Cameron*

*UK Prime Minister, November 2013<sup>8</sup>*



The recent assessment from the Inter-Governmental Panel on Climate Change (IPCC) provides overwhelming scientific evidence that climate change is happening and that it is extremely likely that man-made emissions of greenhouse gases (GHGs) are the dominant cause. Acting now gives the world a fighting chance of limiting the average global temperature rise to 2°C. But acting now also makes good economic sense: delaying climate action will mean having to cut global emissions further and faster in the future, through more aggressive and interventionist policies, which will result in greater costs for households and businesses.

**Global temperatures are increasing and we are already seeing the impacts**

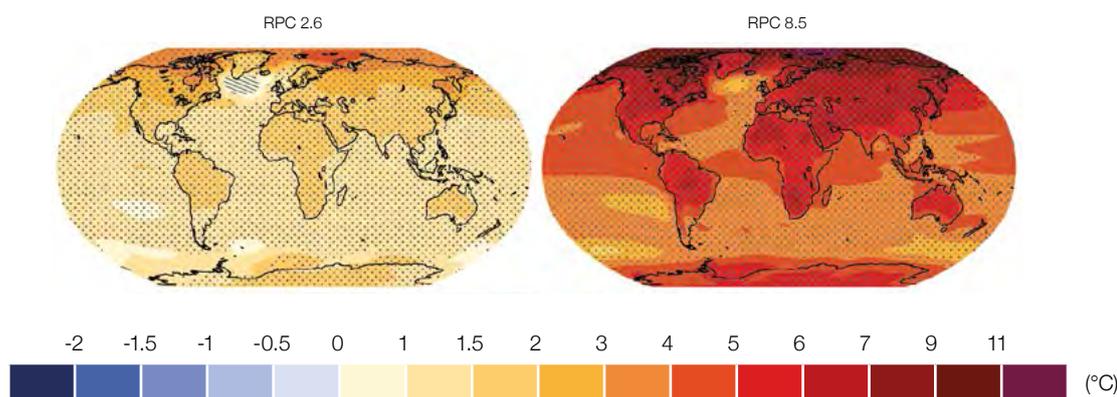
**1.1** The climate is changing and there is little doubt that humans are the dominant cause. Without significant and sustained global action to reduce GHG emissions, climate change will have increasingly harmful effects in the decades and centuries to come. We cannot undo the warming from past emissions but we would quickly see the benefit of rapid global emission reductions: our action or inaction today will substantially affect the magnitude of climate change in the coming decades and beyond.<sup>9</sup>

**1.2** The average surface temperature of the Earth has risen by 0.85°C since 1880 and most of this since 1950. With immediate and ambitious mitigation action warming could be limited to under 2°C, however if emissions continue to rise this could lead to temperature rises of around 4.5°C or more by the end of this century, relative to pre-industrial levels. These are global average changes; some areas of land will see much

greater levels of warming, as illustrated in figure 1. Measurements of historic temperature change indicate the long-term rates of global warming associated with warming of 4.5°C or more are faster than those experienced over the last 2000 years. Such a projected rate of warming over the 21st century would be unprecedented in the experience of modern human society and likely to present a major adaptation challenge.

**1.3** With a temperature increase of just 0.85°C, we are already seeing effects, including sea level rise, loss of snow cover, sea ice and glaciers, and changing rainfall patterns. We also know that some recent extreme weather events were made more likely by climate change. For example, the 2003 summer heat wave in Europe, which may have led to as many as 70,000 deaths,<sup>10</sup> was made more than twice as likely.<sup>11</sup> The storm surge from Hurricane Sandy, which led to an estimated \$60 billion of damage, was also made twice as likely.<sup>12</sup> Extreme weather events are likely to become more frequent and severe with future increases in temperature.

**Figure 1: Changes in average surface temperature 1986–2005 to 2081–2100 for an ambitious mitigation scenario (RCP2.6) and a continued emissions growth scenario (RCP8.5) (Source: IPCC)<sup>13</sup>**



**As warming increases so will the likelihood of severe, pervasive, and irreversible global impacts**

**1.4** Without large reductions in GHG emissions, many types of extreme weather events are very likely to become more frequent and severe in the coming decades. Other impacts on the environment, society and the economy will be exacerbated in many regions of the world and new risks are likely to emerge. Figure 2 illustrates a recent assessment undertaken by the IPCC into changes in a number of cross-cutting risks with increasing temperatures. The study found that:

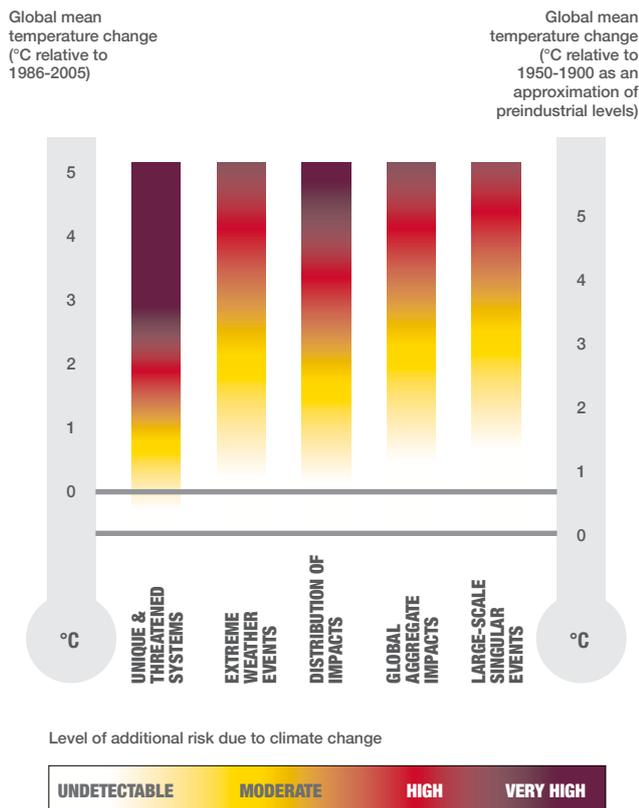
- The **impacts** from climate change, such as water availability, are often uneven and the impact is generally more severe for disadvantaged people and communities. This effect is already apparent through regional differences in impacts on crop production and will become severe and widespread at very high levels of warming.
- Some **unique and threatened systems**, including ecosystems and cultures are

already at risk. For example, the Arctic and coral reefs are subject to severe and widespread risks such as rapid loss of sea ice and mass death of corals with warming of more than 2.5°C above pre-industrial levels.

- **Global aggregate impacts**, such as on biodiversity and the global economy would become severe and widespread with warming of 4°C or more.
- **Large-scale singular events** include irreversible changes, such as sea level rise from ice-sheet loss, the risk of which is high when the temperature increase exceeds 3°C. Sustained high temperatures would lead to the gradual loss of the Greenland ice sheet over a millennium or more, contributing up to 7 metres of global mean sea level rise.

**1.5** There will be limited benefits from warming in certain sectors and regions, particularly at lower levels of warming. However, without reductions in GHG emissions, the overall long-term global impacts are expected to be overwhelmingly negative.

**Figure 2:**  
**As the temperature increases, the risks and impacts grow<sup>14</sup>**



“ The world has made a great deal of progress in tackling child mortality in recent decades. Climate change would reverse this progress, as families are increasingly impacted by floods and droughts in many places we work. Securing a meaningful and ambitious deal in 2015 is critical to achieving the end of preventable child mortality and extreme poverty.”

Justin Forsyth, CEO  
Save the Children, September 2014<sup>15</sup>

**1.6** Poor people and communities tend to be the most vulnerable to climate change due to the direct impact on their livelihoods, health and homes. They also generally have a lower capacity to adapt or protect themselves. Even within societies, there is an uneven exposure and vulnerability of individuals to the risks of climate change. For example, women and girls from poorer communities are likely to be more vulnerable as they may be marginalized (see box on page 13). Climate change is likely to exacerbate poverty in most developing countries, prolonging existing and making new poverty traps.

## The impact of climate change on women and girls

Women and girls face disproportionate impacts of climate change, as they have the least access to assets, farm the most marginal lands, have least access to water, and are at most risk of losing what little they have when resources are scarce because their tenure claims are weaker.<sup>16</sup>

However, women are not just victims of climate variability, but can be active agents of change.

In pastoral communities in Kenya and Ethiopia building resilience to drought, with a particular emphasis on empowering women to become agents of change, has helped communities better manage the risks associated with the 2005–08 drought cycle by generating income, preserving assets and enhancing food security.<sup>17</sup>

Improving women's capacity to adapt is critical in improving the resilience of communities. Women produce between 60 and 80 percent of the food in most developing countries and are responsible for half of the world's food production.<sup>18</sup> If they had the same access to resources as men, their yields could increase by 20–30%, lifting 100–150 million people out of poverty.<sup>19</sup>

Alongside this, climate resilient low-carbon development can reduce the impacts of climate change, improve health and improve the opportunities for women and girls, through jobs and entrepreneurship in new sectors which aren't constrained by traditional ideas of men's and women's roles. Rural electrification in Guatemala and South Africa, for example, increased female employment by 9%, and in India women trained to maintain solar installations have benefited from better incomes and higher status within their communities.



Some of future risks across a range of sectors which are particularly sensitive to climate change, and which pose significant threats to society. Higher levels of warming lead to greater risks across these sectors and could lead to significant impacts over the next few decades and towards the end of the 21st century. The UK will experience many of these impacts directly or indirectly.<sup>20</sup>



“ Even here in the UK, we have seen how vulnerable farming is to extreme weather events. Global action on climate change is essential, through an international agreement which takes agriculture into consideration and which is based on strong scientific evidence. I know that our farmers are already taking action to reduce their emissions through a Greenhouse Gas Action Plan and by exporting low-carbon energy to other sectors of the economy.”

**Meurig Raymond, President, National Farmers Union, September 2014<sup>21</sup>**

- **Climate change-related impacts are already reducing crop yields in some parts of the world**, a trend projected to continue as temperatures rise further, leading to large risks to global and regional food security. Crops affected include staples such as wheat, maize and rice. Climate change is also projected to increase price volatility for agricultural commodities.
- **Changes in farming practices, such as using new crop varieties can help farmers adapt to the impacts of climate change, but there is a limit to what can be managed.** For regions closest to the equator, this will be increasingly difficult at temperature increases of 3°C or more. Yields of maize and wheat will begin to decline with 1–2°C of local warming in the tropics. Temperate maize and tropical rice yields will be significantly affected with warming of 3–5°C.
- **On a global scale, projected impacts on fisheries and aquaculture are negative**, with displacement of stocks already observed. Rising temperatures and acidification of the oceans are partly to blame for the rapid decline of coral reef ecosystems which risks the potential collapse of some coastal fisheries.



Impacts on livelihoods and incomes



Impacts on health



Impacts on security

“ Oxfam is gravely concerned by the impacts of climate change on poor people’s access to food, as it is already reducing yields of key crops and making prices more volatile, harming those on lowest incomes first and foremost. On current trends, there will be 25 million more malnourished children by the middle of the century. Without urgent new commitments to action, climate change threatens to roll back decades of progress in the fight against poverty and hunger.”

**Mark Goldring,**  
Chief Executive Officer, Oxfam,  
September 2014<sup>22</sup>

- **Climate change impacts are projected to slow down economic growth and make poverty reduction more difficult.** Economic activity and jobs will be disrupted by the effects of climate change on specific sectors, but also by its effects on the infrastructure that helps the entire economy to function. In poor countries, in particular, there is evidence that higher temperatures have wide-ranging effects, reducing both agricultural and industrial output.<sup>23</sup>
- **Rural livelihoods are particularly at risk,** including from insufficient access to drinking and irrigation water, reduced agricultural productivity and loss of ecosystems and the services they provide for livelihoods.

“ Climate change will pose challenges to the health of populations and individuals, and to health services and health workers in all countries. As nurses, who are at the front line of delivering care around the world, we urge global leaders to secure the health of everyone now and in the future. They can do this by pushing for an effective and ambitious climate change deal in 2015 through the UNFCCC, complemented by a strong post-2015 sustainable development framework.”

**Dr Peter Carter,** Chief Executive and General Secretary of the Royal College of Nursing, September 2014<sup>24</sup>

- **Climate change is projected to have a range of effects on human health, including;** increased deaths, disease and injury from heat waves, floods, storms, fires and droughts; changes in ranges of some infectious diseases; increased malnutrition in poor regions and increased respiratory diseases.
- **The combination of high temperature and humidity in some areas for parts of the year is projected to compromise normal human activities,** including growing food or working outdoors under high-emissions scenarios.

“ [Climate change] is probably the most likely thing...that will cripple the security environment, probably more likely than the other scenarios we all often talk about.”

**US Navy Admiral Samuel Locklear,** Commander of U.S. Pacific Command, March 2013<sup>25</sup>

- **The pressures caused by climate change will place additional burdens on economies, societies, and governance institutions around the world.**<sup>26</sup> Changes such as sea level rise and extreme events pose major challenges to vital transport, water, and energy infrastructure. Some states are already experiencing major challenges to their territorial integrity, including those which are highly vulnerable to sea level rise.
- **These pressures act as ‘threat multipliers’,** aggravating conditions such as poverty, environmental degradation, political instability and social tensions.<sup>27</sup> Competition for access to resources such as food, water and fish stocks could escalate regional tensions, particularly in fragile states.<sup>28</sup>

## There will be global economic implications

“ I got it wrong on climate change – it’s far, far worse...Looking back, I underestimated the risks. The planet and the atmosphere seem to be absorbing less carbon than we expected, and emissions are rising pretty strongly. Some of the effects are coming through more quickly than we thought then.”

Lord Stern, January 2013<sup>29</sup>

- 1.7** There will be economic costs from adapting to climate change, and from the losses associated with unavoidable impacts. The costs will accelerate with increased warming, as impacts become more severe and harder to adapt to. Large scale, potentially abrupt and irreversible changes associated with crossing tipping points would also add significantly to the costs. The Stern Review considered a wide range of risks and found that not taking strong action on climate change is equivalent to losing up to 20% of GDP now and forever.<sup>30</sup> Subsequent studies have shown that even small risks of large scale climate change can justify strong mitigation action.<sup>31</sup>
- 1.8** The IPCC AR5 recently reviewed existing cost estimates for lower levels of warming and concluded that with “recognized limitations, the incomplete global annual economic losses for additional temperature increases of around 2°C are between 0.2 and 2.0% of income. However, existing studies struggle to reflect all the risks and uncertainties and the IPCC warns that costs “are more likely to be higher than lower than this range, and that losses will accelerate with greater warming.”

## The UK will experience the impacts directly

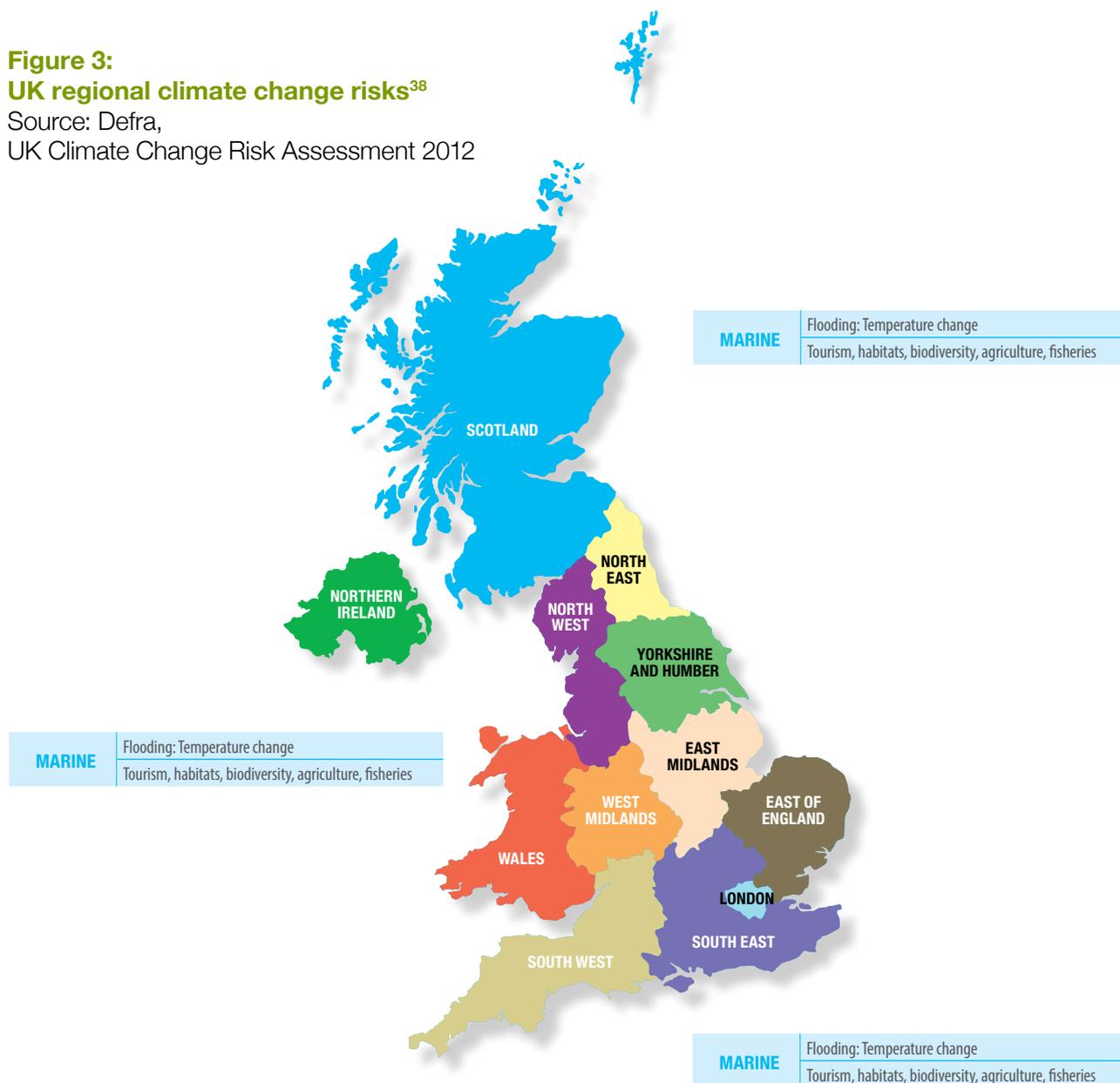
“ If bits of your land are falling into the sea, you’re quite concerned about climate change and its effect. To look after the special places we love as a nation, we have to adapt to a rising sea level and changing shoreline. And we need to do everything we can to reduce carbon emissions, including building renewable schemes that work with the landscape.”

Helen Ghosh, Director General, National Trust, September 2014<sup>32</sup>

- 1.9** In the UK, climate change is a serious risk. We are vulnerable to extreme weather including severe winters, heatwaves, storms, gales and flooding from rivers and the sea. This affects our economy, our livelihoods and our health. Evidence is emerging that climate extremes in the UK have become more likely as a result of historic emissions. Preliminary results published since the 2013–14 winter storms, for example, suggest the chance of a very wet winter in southern England has increased by 25%.<sup>33</sup> The UK Government has announced record levels of investment in capital improvement projects with a further £2.3 billion of public money to be invested in new flood defences over the next six years to tackle the threat of further flooding in the UK.<sup>34</sup>
- 1.10** An increasing risk of flooding is a serious threat to the UK.<sup>35</sup> It brings risks for people’s homes and well-being. It also affects emergency services, and the operation of critical infrastructure, such as transport, energy and water supply systems. Whilst warmer winters may lead to health benefits, hotter summers would bring health risks. The heatwave during the summer of 2003 resulted in over 2,000 additional deaths across England and Wales,<sup>36</sup> and has been estimated to have cost £500 million to the economy.<sup>37</sup>

**Figure 3:**  
**UK regional climate change risks<sup>38</sup>**

Source: Defra,  
UK Climate Change Risk Assessment 2012



KEY	Most significant climate change effects
	Key consequences and receptor

<b>SCOTLAND</b>	Flooding, temperature change Tourism, habitats, biodiversity, agriculture, fisheries
<b>NORTH EAST</b>	Flooding, marine and coastal change Seaside industries, natural heritage
<b>YORKSHIRE AND HUMBER</b>	Flooding, sea level rise Humber estuary, habitats, urban areas, industry, infrastructure, vulnerable groups
<b>EAST MIDLANDS</b>	Flooding, sea level rise, summer aridity Agriculture and food security, energy infrastructure, Peak District
<b>EAST OF ENGLAND</b>	Water resources, aridity, sea level rise, flooding Large population affected by water supply deficits, agriculture and food security, biodiversity
<b>LONDON</b>	Flooding, overheating, water availability Business disruption/cost to financial services, health risks, workforce productivity, transport, vulnerable groups

<b>SOUTH EAST</b>	Flooding, overheating, water availability Transport networks and hubs, urban heat
<b>NORTHERN IRELAND</b>	Water availability and aridity, water quality, flooding Water supply deficits, agriculture and food security, species and habitats
<b>NORTH WEST</b>	Flooding, summer heat Urban areas, industry, tourism, Lake District
<b>WEST MIDLANDS</b>	Flooding, water resources Large population affected by water supply deficits, transport and other infrastructure
<b>WALES</b>	Flooding, sea level rise, water resources, heat Tourism, coastal change, agriculture, business, biodiversity
<b>SOUTH WEST</b>	Flooding, heat, coastal change Tourism, coasts, moorlands, elderly people

## The economic impact of flooding in the UK

“ Businesses are already feeling the financial impacts of being forced to close and refit premises due to flood or storm damage costing tens of millions of pounds. Businesses form the backbone of our economy, we can't afford to be awash with floods – because we aren't only piling up sandbags, we are piling up costs – and neither are good. To give ourselves the best shot at success and stability – we need the decision makers in Paris next year to agree and come up with a plan for all the world's global economies to urgently decarbonise.”

Sir Ian Cheshire, Group Chief Executive Kingfisher, September 2014<sup>39</sup>

The economic damage from flooding of residential and non-residential properties in 2012-13 is estimated to have been between £200 million and £277 million across England and Wales. The cost of other major impacts, such as disruption to transport and infrastructure, and indirect impacts

on communities, businesses and the local economy, are much less certain. These can only be given in very broad terms, but could make the total economic impacts as much as about £260 million to £620 million. Were it not for flood defences, many more properties would have been flooded and the economic impacts would have been much greater. The economic benefit of protecting properties, based on estimates of properties protected during specific flood events, is estimated to have been at least £3 billion, and up to around £7.5 billion if wider and indirect benefits are included.<sup>40</sup>

The winter of 2013-14 was the wettest on record with over 7,800 homes and nearly 3,000 commercial properties flooded. About £14 million has been made available to help communities recover and to meet the costs of protecting lives and properties in the future.<sup>41</sup> These are significant impacts and are likely to get bigger if climate-driven changes to extreme weather events increase the frequency of flooding.



**1.11** Climate change is expected to increase the risk of interruption and financial loss to business in the UK. Research by the Carbon Disclosure Project found that 70% of companies and their suppliers who responded believe that climate related risks have the potential to negatively affect their revenue significantly.<sup>42</sup> The main risks to business from climate change are likely to come from flooding, and the disruption of supply chains reliant on goods sourced in the UK and from overseas. Disruption to infrastructure services due to climate change also presents a risk to business.<sup>43</sup>

### How the UK is building resilience to climate change impacts<sup>44</sup>

The National Adaptation Programme (NAP) report published by Government in 2013 is the main framework through which we are building resilience to the impacts of our changing climate. The report was co-created with those sectors most likely to be affected and where there is the most urgent need for action: built environment, infrastructure, healthy & resilient communities, agriculture & forestry, natural environment, business and local government. It sets out a wide range of actions by government, business, councils and civil society to address the most significant climate risks we face as a country and was informed by the UK's first Climate Change Risk Assessment (CCRA), published in 2012.

Individual businesses, councils and other organisations are also assessing how climate change will affect their assets, services and local communities. Government is working to support this work through initiatives such as the Climate Ready Support Service delivered by the Environment Agency. The service has developed a wide range of support materials, for example a toolkit to help local health and social care practitioners take account and manage the health risks from flood and heatwave events, guidance for business on how to promote supply chain resilience, and training for SMEs and business advisors. Recognising the importance of local action, Government also works closely with councils who have a pivotal role to play including the Local Government Association's Climate Local initiative.

### The UK will also be affected by the wider global impacts

“ Sustainability is arguably the world's most significant contemporary market failure. Some of the worst-case scenarios coming out of the IPPC are deeply concerning with potentially profound implications on the valuation of the companies listed around the world. Left unchecked, issues arising from unsustainable development would affect the calculations underpinning the insurance products that our industry provides, potentially rendering significant proportions of the economy uninsurable.”

Mark Wilson, Group Chief Executive, Aviva, September 2014<sup>45</sup>

**1.12** The UK will be affected by climate change impacts in other parts of the world. Some of these could be an order of magnitude greater than threats from domestic climate impacts. Globally, production of certain foodstuffs is concentrated in a few countries. One study has found that in the next 10–15 years extreme weather events, exacerbated by climate change, are likely to increase the volatility of food prices and cause disruption of supply.<sup>46</sup> Our ability to source food from a variety of countries less exposed to these impacts, and from domestic production, will help protect the security of the UK's food supply by spreading risks and keeping prices competitive.

## Climate resistant business models

**UK businesses are also moving to sustainable business models to enable them to become increasingly resistant to climate shocks.**

### Asda

ASDA has found that 95% of its fresh produce will be affected by changes in the climate. It believes that it can only thrive as a business if it appropriately manages the dependencies of its global supply chains on water sources. The company is partnering with stakeholders to improve water management for suppliers and communities. For example, it worked with an important citrus supplier in Morocco to convert existing sprinkler practices to drip irrigation; this resulted in a 60% reduction in water usage. By adding automation to the system, this reduction was increased to 76% in total. In the UK, ASDA has partnered with Linking Farming and the Environment (LEAF) and the brewing company Molson Coors UK to produce easy-to-use guidance for farmers on water saving techniques.<sup>47</sup>

### Nestlé UK and Ireland

Globally, the food industry is one of the sectors most affected by climate change. As the world's biggest food company, Nestlé takes the risks very seriously and is focusing on mitigation and adaptation to make its business more resilient. Nestlé UK and Ireland is developing climate adaptation plans for each manufacturing site. These include a full analysis of key vulnerabilities like heat stress, cold stress, flooding, drought and extreme storms, and a number of actions to reduce the risks. Interactive workshops were held during their development to bring together the knowledge of cross-functional teams. Nestlé plans to replicate the Nestlé UK and Ireland adaptation approach in other factories around the world.

One specific example is the Tutbury site in Derbyshire, which produces Dolce Gusto coffee. Nestlé has invested £420 million in the factory over the past six years, and nearly 1,000 people work there, 50% of whom live within a five-mile radius of the plant. However, the area has experienced increasing incidents of major flooding. To tackle this, Nestlé UK contributed £1.65 million to a new £8.7 million flood defence project, completed in late 2013. Now, over 1,600 homes and businesses are protected from the River Dove and Nestlé has been able to expand its coffee operations there, creating over 400 new jobs.

## Unilever

Unilever is one of the world's leading suppliers of food, home and personal care products with sales in over 190 countries totalling €49.8 billion in 2013. The company believes that, left unchecked, climate change has the potential to become a significant barrier to its growth strategy. As scarcity and volatility continue to increase prices of raw materials, businesses will see increased pressure on profit margins, reducing growth and their ability to invest.

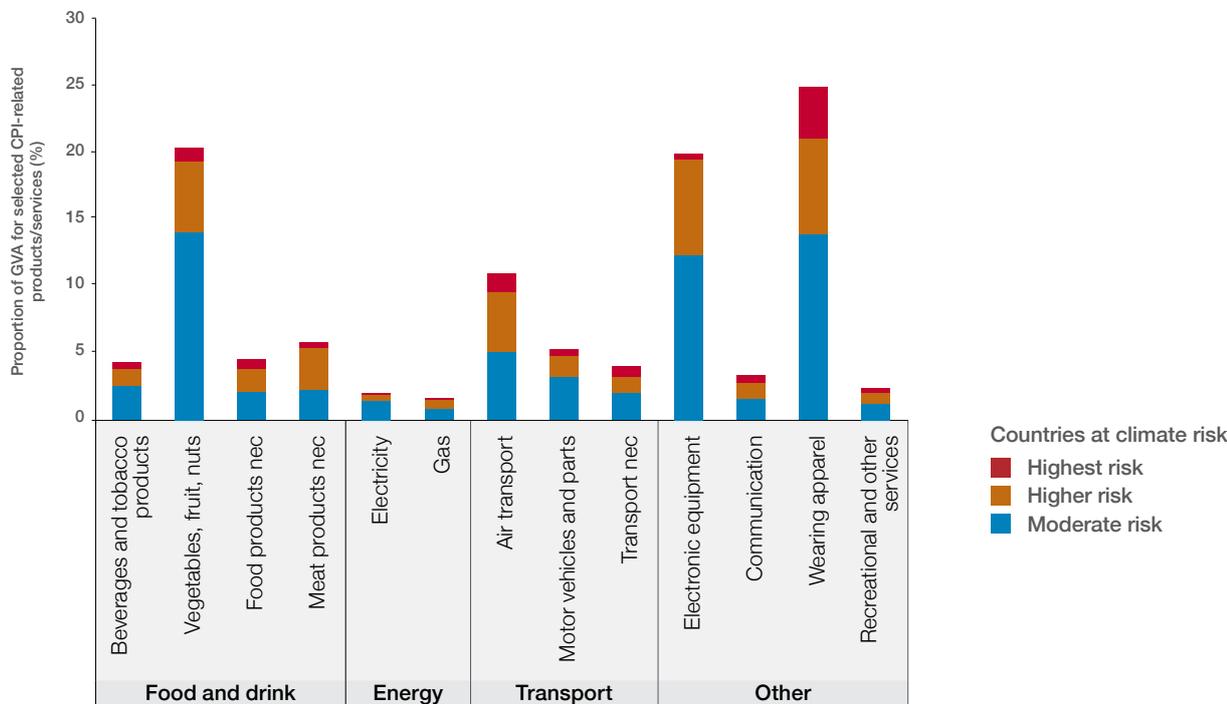
Unilever's ambition is to double the size of its business, whilst reducing its overall environmental footprint (including sourcing, consumer use and disposal) and increasing its positive social impact. The company is committed to sourcing all its agricultural raw materials sustainably by 2020, and decoupling its growth from its environmental impact. Through the Unilever Sustainable Living Plan, it has found that it can drive business growth, competitive advantage, and differentiation while also reducing costs.

The company is already seeing the effects of climate change on its bottom line. Climate change will also affect Unilever's customers. Seven of Unilever's biggest markets are already categorised as water scarce. In India it is predicted that there will be water availability gaps of 45% to 90% by 2020. This affects farmers' crops, but also people's ability to wash their clothes or clean their houses as they would like. Unilever is developing new products that require less water, allowing people to adapt to environmental changes, and the company to remain profitable in a changing world.

- 1.13** The amount of UK investment abroad is significant and exposes UK investors and the insurance industry to damages to physical and financial assets from climate-related events in other parts of the world. Other sectors at risk include clothing and electronic equipment. Flooding in south-east Asia in 2011 led to global shortages of hard discs and motor vehicle components, affecting the UK's motor manufacturing sector and the economy as a whole. Climate change will increase the effects of impacts like these.<sup>48</sup>
- 1.14** The UK is an importer of goods and services and so is exposed to climate risks beyond those directly facing the UK. Figure 4 shows, for a number of goods and services consumed in the UK, the proportion of inputs which are sourced from countries ranked comparatively highly in terms of climate change exposure or vulnerability by a number of independent indicators. The results echo the findings of previous studies by highlighting the exposure and vulnerability of the clothing and agricultural sectors. Inputs to electronic equipment are also sourced from countries likely to be at comparatively high risk of climate change impacts.

**Figure 4:**  
**Sectors of the UK economy are exposed to climate change risks overseas**

Source: CCC ASC/University of Leeds<sup>49</sup>



Notes: The figure shows the percentage of the total GVA for goods and services consumed in the UK arising in countries assessed as being more exposed or vulnerable to climate impacts than others. The goods and services listed are intended to align with those included in the calculation of the Consumer Prices Index (CPI). Together the goods and services shown form about 20% of total GVA from UK consumption. The risk assessment for countries is based on a number of indicators (see main text). Countries have been ranked according to their average 'risk' score, and then divided into quintiles. The share of total GVA generated in the countries at highest risk (5th quintile), higher risk (4th quintile) and moderate risk (3rd quintile) are shown. Adjustments to some regions were made to reflect similarities in their average risk score. For example, the four advanced Asian economies of Hong Kong, Japan, Singapore and South Korea were aggregated to a group as they consistently were within the first quintile of countries at risk, unlike other Asian economies. As an example, the figure shows that approximately 12% of total GVA for electronic equipment bought in the UK is generated in countries which are assessed as being at moderate risk of climate impacts (ie. in the third quintile of all countries). 'nec' means 'not elsewhere classified'.

**Acting now gives the world a fighting chance of avoiding substantial climate change impacts; delaying action is a false economy**

“ At Nestlé, we understand that manufacturing and distribution models need to evolve as climate change increasingly impacts supplies of materials, energy and water. We work with partners across government, business and society to address this challenge. One of our main areas of focus has been to create Climate Change Adaptation Plans for all UK factories, which will be replicated in more Nestlé factories in other countries in future.”  
 Fiona Kendrick, CEO, Nestlé UK and Ireland, September 2014<sup>50</sup>

**1.15** In light of the scientific evidence, and the likely human and social impacts, in 2010 the world signed up to a goal of limiting global warming to an average of no more than 2°C above preindustrial levels.<sup>51</sup> While warming of 2°C will not avoid all impacts from climate change, this goal was set to reduce of the risk of major damage to ecosystems, food security and economic development, globally and regionally threatened societies, and destabilisation of the climate system.

**1.16.** Taking action to keep warming to within 2°C would avoid substantial climate impacts including reduced crop yields and the number of people exposed to river flooding and water stress. A recent study showed that an ambitious mitigation scenario that gives

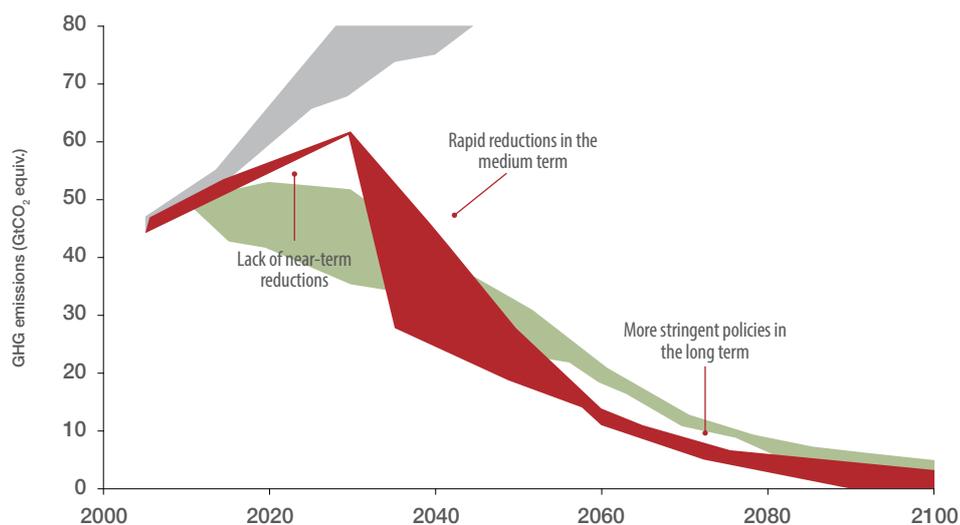
a 50% chance of remaining below a 2°C temperature rise target reduces impacts by 20–65% by 2100 relative to a ‘business-as-usual’ scenario with warming of 4°C, and can delay impacts by several decades.<sup>52</sup>

**1.17** The IPCC has estimated that cumulative CO<sub>2</sub> emissions from human activities need to be limited to around 1 trillion tonnes of carbon since the beginning of the industrial revolution if we are to have a likely chance of limiting warming to 2°C. We have already emitted more than half of this and, on the current trajectory of growing fossil fuel emissions, will have reached this limit within 20–40 years. As shown in figure 5, delaying will require faster, further and more costly emission reductions in the future and could require greater reliance on untested technologies. Delay will also mean locking in more high carbon investments and failing to incentivise the development and associated cost reductions of low-carbon technologies which are required to minimise mitigation costs.

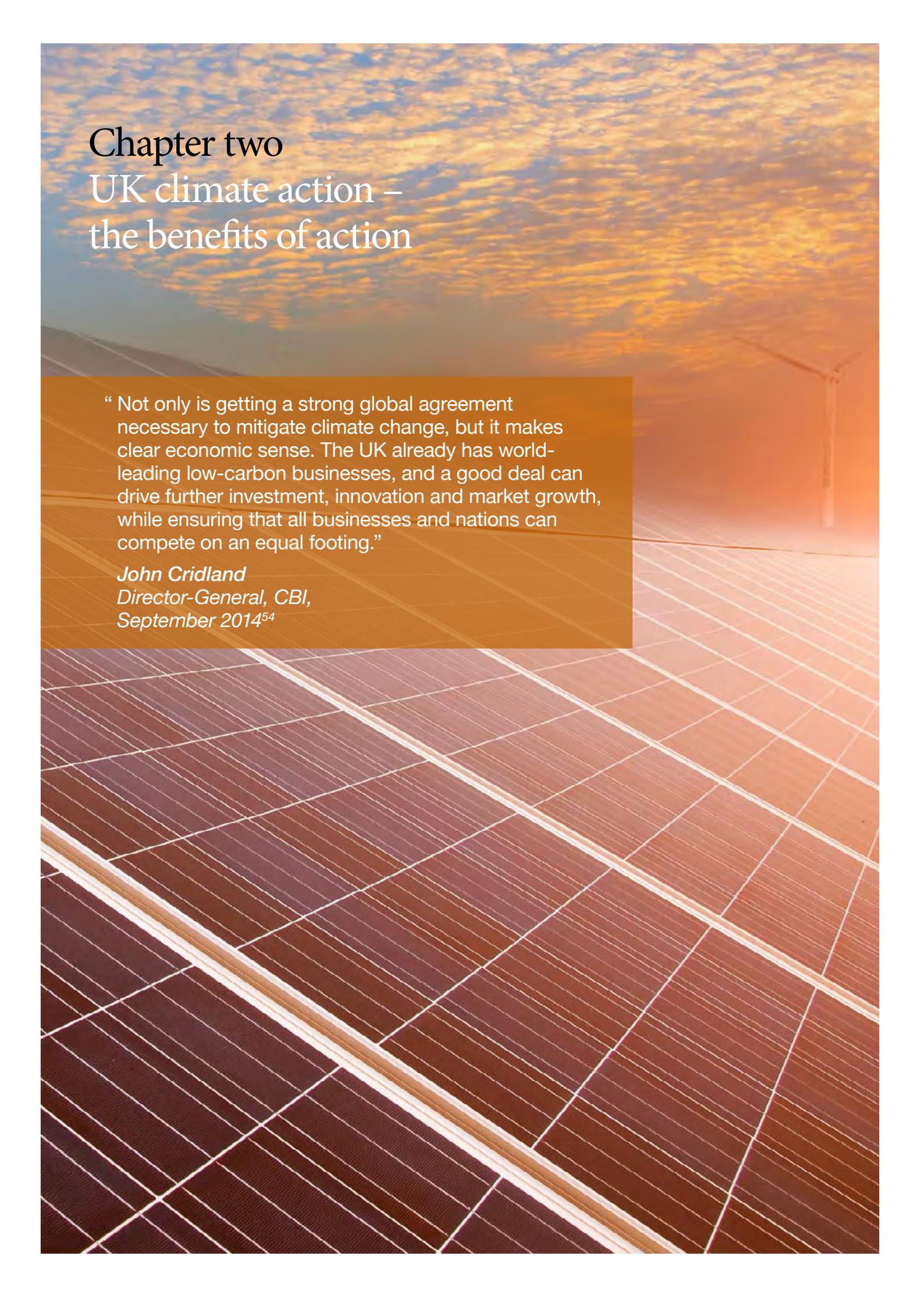
**1.18** Acting now also makes good economic sense: delaying climate action will mean needing to cut global emissions further and faster in the future, using more aggressive and interventionist policies, with greater costs for households and businesses. Delaying action is a false economy. We need to spread the effort and costs of tackling climate change over time by acting early and consistently. Nevertheless, the UK cannot tackle climate change alone. Every country, regardless of its emissions, will be impacted by climate change. Keeping the world within a 2°C carbon budget is a huge global challenge. We need a global response, and we need it now.

**Figure 5:**  
**Comparison of early and late action emission trajectories**

Source: Ampere project<sup>53</sup>



GHG emission pathways necessary to stay within the budget for limiting warming to 2°C above pre-industrial levels. The optimal emission pathway with immediate action is shown in green and the emission pathway needed if strong international action is delayed until 2030 is shown in red. The emission pathway with no climate policy is shown in grey.



## Chapter two

# UK climate action – the benefits of action

“ Not only is getting a strong global agreement necessary to mitigate climate change, but it makes clear economic sense. The UK already has world-leading low-carbon businesses, and a good deal can drive further investment, innovation and market growth, while ensuring that all businesses and nations can compete on an equal footing.”

*John Cridland*  
*Director-General, CBI,*  
*September 2014<sup>54</sup>*

There is a strong UK political consensus that climate change is one of the greatest threats to our future prosperity, security and well-being; and action to tackle it must go hand-in-hand with securing long-term and sustainable economic growth. In the UK we are developing cost-effective policies, tools, technologies and businesses to deliver this. A prosperous and thriving green economy can generate the investment, innovation, skills and entrepreneurship needed to transform our products and services. This will help us develop cleaner technologies, and capture new international markets, allowing us to reduce emissions and capitalise on the opportunities. There are wider benefits of taking climate action too – to our energy security and our quality of life. But a low-carbon transition will be most cost-effective, and deliver maximum benefits, if all countries act together. A Paris 2015 agreement can reduce emissions and create huge economic opportunities for the UK and around the world.

### **Decarbonisation and securing long-term prosperity go hand-in-hand**

- 2.1** There are strong arguments for taking international action now. It will avoid burdening future generations with the more significant costs and impacts, described in chapter 1. It will make economies more resilient to resource pressures by mitigating environmental risks and improving energy efficiency, which also saves money. And it will bring wider benefits, in terms of health, energy security and biodiversity.
- 2.2** Taking climate change action now can also help to secure long-term and sustainable economic growth. A low-carbon economy can generate the investment, innovation, skills and entrepreneurship needed to transform our products and services, developing cleaner technologies, and capturing new international markets. These opportunities for green growth and job creation are not only from conventional ‘green sectors’ such as low-carbon energy generation and environmental products, but also in other sectors such as transport, retail and telecommunications, as these sectors innovate to develop low-carbon alternatives.
- 2.3** But despite this action at home, if we are to limit emissions at scale, ensure the transition is cost effective, and that countries are not disadvantaged by taking action, this transition needs to happen globally. A global agreement on climate change in Paris next year can underpin this transition by:
- Providing the policy confidence needed for international investment in low-carbon infrastructure and innovation, and energy efficiency;
  - Ensuring that action is cost-effective, at the scale necessary, creates a more level playing field and secures future economic prosperity for all;
  - Setting the world on a low-carbon pathway, and avoid locking us into a high-carbon, high-cost future.
- 2.4** Within the EU, we have already seen UK businesses enjoy the benefits of a global climate agreement on a regional scale: a more level playing field, economies of scale and higher investment certainty. A new global climate agreement in 2015 can multiply these benefits by: creating a booming global low-carbon market for UK low-carbon goods and services; driving down technology costs further and faster to the benefit of consumers and businesses; and helping reduce global competitiveness distortions, especially for energy intensive companies.
- 2.5** In this chapter, we set out how the UK is taking action to reduce emissions across the economy; how we are working with businesses to unlock the opportunities of a low-carbon economy and manage the costs of transition; and how this action is contributing to our energy security and to our quality of life. But these opportunities and benefits are not exclusive to the UK; a Paris 2015 agreement can create opportunities across the world.

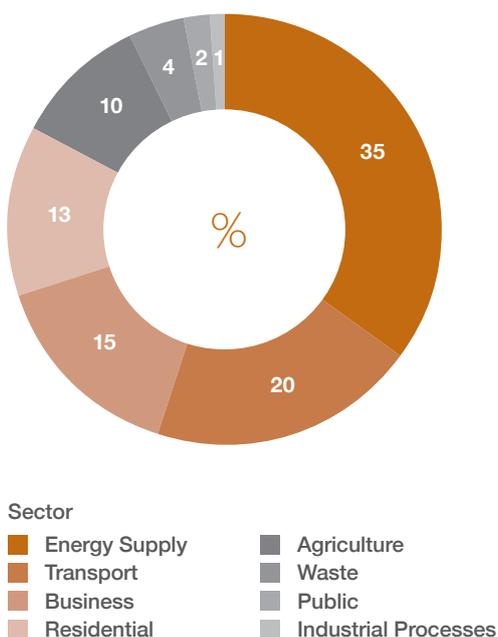
**The UK is taking action to build a competitive, low-carbon and resilient economy**

“ We believe that climate risks can be successfully managed and that the transition to a net-zero emission economy can be delivered in ways that create new business opportunities, with manageable costs.”  
**Prince of Wales’s Corporate Leaders Group, The Trillion Tonne Communiqué<sup>55</sup>**

**2.6 The UK’s strong action at home is based on our commitment to the 2°C goal.**

The Climate Change Act 2008, which was passed with cross-party consensus, put in place the world’s first long-term legally-binding national framework for reducing emissions. It commits the UK to reducing its emissions by at least 34% by 2020 and 80% by 2050 from 1990 levels, and meeting a series of carbon budgets on the way. These targets, based on the advice of the independent Committee on Climate Change, reflect the UK’s fair contribution towards the international goal to limit global warming to no more than 2°C above pre-industrial levels.<sup>56</sup>

**Figure 6: Percentage of UK greenhouse gas emissions by sector in 2012**



(Source: DECC Statistics.<sup>57</sup>  
 This excludes land use, land use change and forestry)

**2.7 We are taking action across sectors –**

including energy, transport, our homes and workplaces, and industry (figure 6 shows the breakdown of emissions per sector in 2012). We are also building the right framework for business to invest in low-carbon infrastructure and technologies, encouraging green entrepreneurship, and helping business and consumers to become more energy efficient and save on their bills. That is why the UK has a comprehensive policy mix which is cutting emissions across all sectors:

- **Low-carbon investment:** In 2012 we launched the **Green Investment Bank**, the world’s first investment bank dedicated to greening the economy. Since 2012–13 the bank has invested in 33 projects over 200 locations around the UK, directly committing £1.4 billion and helping to mobilise £4.9 billion of funding into the UK’s green economy.<sup>58</sup>
- **Secure, low-carbon energy:** Through the Energy Act 2013, we set the framework for the world’s first low-carbon electricity market. Power generation is the largest contributor to UK emissions so decarbonising the sector is critical. We are also stimulating investment to meet the triple challenge of delivering an electricity system which is reliable, affordable and that meets climate targets. Electricity generation from renewables in the UK has doubled since 2010 and reached almost 20% for the first time in the first quarter of 2014.<sup>59</sup> 2013 was a record high for renewables investment, with almost £8 billion invested across the range of renewable technologies.<sup>60</sup> The UK is the clear world leader in offshore wind and has more installed capacity (3.8 GW) than any other country, supporting 18,300 jobs.<sup>61</sup>
- **Transport** is the second largest contributor to UK emissions, with most of these coming from road usage. EU fuel efficiency regulations supported by the UK ensured that a car sold in 2013 used 11% less fuel,<sup>62</sup> equivalent on average to a

saving of 15 pence per litre, or £600 over five years for the average motorist. The Government is also promoting the uptake of ultra-low emission vehicles (ULEVs) which cost as little as 2p per mile to run. The UK Government's comprehensive support for ULEVs programme was an important factor in Nissan's decision to build the world's bestselling electric car, the Nissan Leaf, in Sunderland<sup>63</sup> as well as BMW's decision to build their super-efficient engines for the i8 plug-in hybrid at Hams Hall in the Midlands.<sup>64</sup> These vehicles are exported to Europe and support many hundreds of jobs both at the assembly plants and the associated supply chains.

- **Buildings and homes.** Building regulations are one of the main instruments available to reduce climate changing emissions and reduce energy costs for homeowners and businesses. Improved regulations have already saved millions of tonnes of CO<sub>2</sub> and recent changes are projected to deliver savings of £16 million per year to business and around an average of £200 to home owners on their energy bills.<sup>65</sup> The Government wants to go further and remains committed to all new homes being zero carbon from 2016.<sup>66</sup>

**2.8 We are investing in technologies to reduce emissions.** Fossil fuel power stations currently provide around 60% of the UK's electricity<sup>67</sup> and these energy sources will remain an important part of the UK's energy mix during the transition to a low-carbon economy. In the longer-term, carbon capture and storage (CCS), should ensure fossil fuels can play a role in a decarbonised energy sector. The UK is ranked third globally in the field of CCS research, closely behind the US and China.<sup>68</sup> The UK also has two commercial scale CCS projects in development at Peterhead in Aberdeenshire and The White Rose in North Yorkshire. Plants with CCS have the potential to be cost competitive with other low-carbon generation options by the early 2020s.<sup>69</sup>

### Shale gas

Shale gas is a new potential energy resource that could play an important part in the UK's energy mix during the transition to a low-carbon economy – boosting our energy security, jobs and growth, as they have done in the US. It also has great potential to displace significant amounts of coal as an energy source in the UK and globally to reduce global emissions. An international climate change deal that sets limits on GHG emissions would help to ensure that new energy sources, such as shale gas could play a role in reducing global emissions.

**2.9 We are also taking action to manage the costs of the low-carbon transition.** The transition to a low-carbon economy can bring risks for the competitiveness of some sectors. Energy is a relatively small share of costs for many businesses that trade internationally, but for some energy intensive industries (EIs) such as steel, cement and chemicals, energy forms a significant proportion of a company's costs. They are therefore much more sensitive to policies that aim to reduce emissions and have legitimate concerns that they will be disadvantaged by stringent climate policies if their competitors operate in countries with less ambitious climate targets than the UK.

**2.10** The Government has put in place a package of measures to ensure that EIs manufacturing in the UK remain competitive during the transition to a low-carbon economy, helping to mitigate the impact of policies for the industries most exposed to competitiveness risks.<sup>70</sup> A global agreement is particularly important for these sectors, as it will help reduce economic distortions and create a more level playing field across countries.

### 2.11 UK action is underpinned in many areas by EU regulation and cooperation.

The EU Emissions Trading System (EU ETS), for example, puts a price on greenhouse gas emissions and places a cap on emissions from electricity generation and the main energy-intensive industries. The aim is to reduce emissions through financial incentives on business and consumers to drive take up of least cost abatement. It covers about 1,000 UK installations representing about half UK CO<sub>2</sub> emissions. Other emissions, from the non-ETS sectors, are limited by an EU effort share decision agreed in 2008.

**2.12** EU level co-operation can also reduce costs through joint support for innovation in low-carbon technologies including those within the EU's Strategic Energy Technology Plan, where the key objectives are competitiveness, including cost reduction, security of supply and sustainability. The EU also has considerable indirect power – e.g. through setting product and vehicle emissions standards, which can influence both EU and wider markets.

### The UK is taking action to unlock opportunities in the low-carbon economy

“ Moving towards a low-carbon, greener economy can create skilled jobs and boost investment. But one nation cannot tackle climate change alone. It's vital that a decisive global UN deal, backed by all nations and civil societies, is struck in Paris in December 2015.”  
Frances O'Grady, TUC General Secretary, September 2014<sup>71</sup>

**2.13** A thriving low-carbon economy brings opportunities; stimulating the investment, innovation, skills and entrepreneurship needed to transform products and services and develop cleaner technologies, and creating green growth and jobs. The Government and businesses are working in partnership to unlock these opportunities.

**2.14** In the power sector, the UK's electricity market reforms alone have the potential to support up to 250,000 jobs in low-carbon electricity generation by 2020.<sup>72</sup> Development consent has been granted for the UK's first new nuclear power station since 1995, at Hinkley Point in Somerset. This investment

**Figure 7:**  
**Summary of potential of innovation up to 2050 for all TINA technologies (cumulative, discounted)<sup>77</sup>**

It is shown as the leading central estimate followed by a low to high range in brackets.

Technology	Cost reduction potential for UK	Value creation potential for UK
Bioenergy	£42bn (£6–101bn)	£19bn (£6–33bn)
Carbon Capture and Storage	£22bn (£10–45bn)	£8bn (£3–16bn)
Domestic Buildings	£16bn (£4.5–37.5bn)	£1.7bn (£0.6–3.7bn)
Electricity Networks	£4.4bn (£2–8.6bn)	£5.1bn (£3–7.9bn)
Electricity Storage	£4.6bn (£1.9–10.1bn)	£11.5bn (£3.4–25.7bn)
Heat	£30bn (£14–66bn)	£6bn (£2–12bn)
Hydrogen for Transport	£35.7bn (£0–88.7bn)	£20.2bn (£0–48.1bn)
Industrial Sector	£20.3bn (£14.4–26.9bn)	£3.9bn (£1.5–6.5bn)
Marine – tidal stream	£1.2bn (£0–2bn)	£0.3bn (£0–1.3bn)
Marine – wave	£1.6bn (£0–3bn)	£0.9bn (£0–3bn)
Non-domestic Buildings	£12.6bn (£3.9–23.8bn)	£1.7bn (£0–5.3bn)
Nuclear Fission	£5.7bn (£2–14.5bn)	£7.2bn (£1.5–13bn)
Offshore Wind	£45bn (£18–80bn)	£18bn (£7–35bn)

## UK low-carbon SMEs

**“ Many small firms rely on exporting to emerging markets so an ambitious global agreement in Paris 2015 would help to unlock further opportunities in areas like low-carbon R&D, products and services, energy efficiency, and innovation in renewable energy technology. Small businesses are driving growth, so any deal must ensure that the UK remains a competitive place to do business, ensuring that affordable, resilient and innovative sources of energy are available to all.”**

**John Allan, National Chairman, Federation of Small Businesses (FSB), September 2014<sup>78</sup>**

SMEs are playing a leading role in driving low-carbon job creation, revenue growth and innovation. UK SMEs in the low-carbon sector are outperforming their peers in other fields. For instance, around 45% are already exporting, compared to a benchmark of around 20% for SMEs as a whole, and they are more likely to have expanding workforces than the average SME. Low-carbon SMEs that export to overseas markets are more than twice as likely to have increased their revenues in the last two years compared to SMEs across all sectors. They are also more innovative.<sup>79</sup>

### Exporting low-carbon goods – Xeros

Founded in 2006 in Sheffield, Xeros has developed a new and unique way of cleaning textiles. Using millions of reusable and recyclable polymer beads (developed by Xeros' scientists in partnership with BASF) to agitate and absorb dirt and stains, the Xeros system saves around 80% of the water, up to 50% of the energy and up to 50% of the detergent used in traditional aqueous-based washing systems. Xeros is already being used by hotel groups, spas and industrial laundries. The company is working on a domestic washing machine, and exploring applications for the bead cleaning system in other areas like leather production.

This year, Xeros won an Edison Award for green innovation and was named University Spin-Out of the Year at the New Energy & Cleantech Awards. Xeros employs over 40 people and rising, in the UK, the US and China. Launched last summer in the US, Xeros is making inroads into the top five global hotel groups there, and creating significant wider interest, especially in water-stressed regions.

### Improving energy efficiency – Sentec

Sentec is the Cambridge-based developer of technology for the low-carbon sector, working on smart grids, smart meters, smart buildings and electric vehicle infrastructure. By using Sentec's technology in products that both directly save energy and support behaviour change, households can reduce their electricity consumption by around 48%.

Over 15 million products incorporate Sentec's technologies, and over 70% of its revenue comes from outside the EU. Over the last three years, Sentec has grown at an average of 20% per year. Founded in 1997 and employing around 50 people, Sentec has benefited as consumers have become more interested in energy efficiency and companies realise there is demand for smarter products. Sentec's developments have the potential, as this market emerges, to deliver billions of dollars of growth to their clients' businesses. However, in fields such as smart grids, which require high levels of investment over the long-term, consumer behaviour change is not enough. The company has found that long-term policy stability is needed to encourage significant investment in infrastructure.

### Low-carbon innovation – Ceres Power

Ceres Power has developed Steel Cell, a unique metal fuel cell technology which converts natural gas or hydrogen into electrical power and heat. Fuel cells have been used for decades in space programmes, and are now making commercial headway globally for prime power, warehouse operations and the home power market. Product manufacturers are testing the Steel Cell as a cost effective, robust solution with mass production capability.

For a UK home using mains natural gas, the Steel Cell has the potential to reduce its carbon footprint by 25% and save £700 per year. This technology would also maintain its advantages if the gas grid decarbonises.

The Steel Cell is now being tested by global companies in Japan and Korea, with developing interest in the US. Growing commercial interest has allowed Ceres to grow from 54 to over 84 engineers, scientists, technicians and senior staff. Ceres has recently opened an office in Japan.

would be worth £16 billion and could support 25,000 jobs. In April 2014, eight renewable energy projects were awarded contracts providing up to £12 billion of private sector investment and supporting up to 8,000 jobs.<sup>73</sup>

- 2.15** On carbon capture and storage (CCS), the CCS industry calculates that the Gross Value Added benefits in the UK are in the region of £2–4 billion per year by 2030 with a cumulative market value of £15–35 billion. This value could increase if the UK were to take a share in the global CCS market which the International Energy Agency has projected could reach 964 GW by 2050, creating a global market worth over £100 billion, much of it in developing countries.<sup>74</sup>
- 2.16** Low-carbon innovation across the economy can ensure the UK is at the frontier of the technologies of the future. The UK can capitalise on its specific needs and advantages. Our shallow seas and strong winds have helped make the UK the world leader in offshore wind – a key renewable technology of the future – and the most attractive location in the world to invest in it.<sup>75</sup> This technology currently provides enough clean energy to power over two million homes.<sup>76</sup> Further investment in innovation, as illustrated in figure 7, has the potential to drive technology improvements and economic benefits, by delivering cost reductions and generating new economic value.

**“ At BT we use the power of communications to make a better world. Not only do we drive efficiency through our own operations, we provide products and services that enable customers to become more efficient and save millions of tonnes of carbon as well. We believe that a shared goal for business and government will help build a sustainable future for our customers and society.”**

Gavin Patterson, CEO BT, September 2014<sup>80</sup>

## **The private and public sector are capitalising on energy efficiency, cutting costs and helping consumers to reduce their carbon footprint**

### **Increasing energy efficiency – IKEA Group**

IKEA believe that climate change is a significant threat to our global economy, but also an opportunity for innovation and economic growth. As part of its People & Planet Positive sustainability strategy, the company aims to produce as much renewable energy as the total energy it uses in buildings by 2020. IKEA has committed €1.5 billion towards this goal, and has already invested in over 200 wind turbines and 650,000 solar panels. Since 2010 it has saved €40 million through energy efficiency measures in stores and distribution centres. The company sees these measures as good for business, as well as for the future of the climate.

IKEA is also determined to make living sustainably at home affordable and attractive for its customers. As part of this, IKEA is converting its entire lighting range to LED bulbs, which use 85% less energy and last 20 times longer than traditional bulbs. IKEA sold 22 million LED products in 2013 and since then has halved the price of one of its most popular LED bulbs. This resulted in a tenfold increase in sales of that product, enabling many more people to make the switch and save money on their energy bills. Starting in the UK, IKEA has also begun selling home solar systems in partnership with energy company Hanergy, enabling customers to generate clean electricity and cut their household bills.

### Enabling customers to reduce their carbon footprint – BT

BT is one of the world's leading communications services companies, operating in more than 170 countries worldwide. It has reduced its own carbon emissions in the UK by 81% since 1997, well ahead of its target of an 80% reduction by 2016. This has been achieved through measures such as migrating customers to newer and more efficient networks, implementing a building energy management system, and retiring over 2,300 servers. This saved BT £25 million last year. Around 6,000 staff in 24 countries have volunteered to be "Energy Saving Champions", and are helping to reduce the company's everyday energy consumption. Alongside this, all of the company's electricity in the UK is sourced from renewables.

As well as reducing the company's carbon footprint, BT also helps customers to reduce their own emissions. Their Net Good initiative aims to save customers three times as much carbon as the business's carbon footprint by 2020. BT services that reduce emissions include high speed internet access, tele- and video-conferencing that help avoid travel, and smart city pilot projects to investigate more efficient use of transport, water and energy. Over the last year the carbon abatement measured from BT products and services has grown by 27%, and this now equates to £3.1 billion of revenue.

### Energy efficiency saving the NHS money

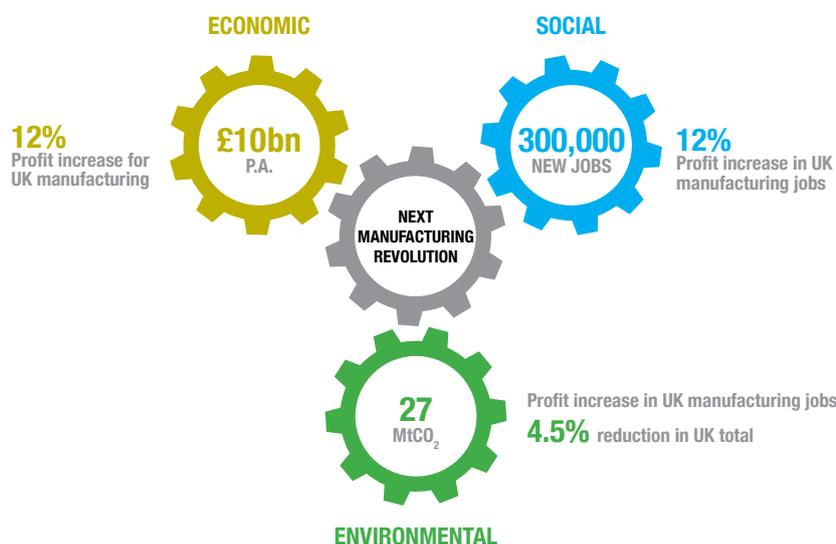
Emissions from the NHS represent 31% of England's public sector emissions, and 3% of England's overall emissions.<sup>85</sup> Carbon reduction within the NHS has resulted in better quality services, better patient experiences and has saved money. 'Operation TLC' (Turn off – Lights out – Close doors), a pilot project at Barts Health NHS Trust hospitals, encouraged 15,000 staff to turn off equipment when not in use, reducing excessive heat and noise.

Staff were also encouraged to switch off lights, which helped promote sleep and reduce light pollution, and close doors, which improved patient safety, increased privacy, and helped regulate room temperatures. These actions led to patients getting better sleep in a quieter, darker environment. It also reduced energy usage and resulted in savings of £105,000 and 800 tonnes of carbon (tCO<sub>2</sub>e) in the first year. It was estimated that if extended across the NHS, it could save as much as £35 million a year and over 200,000 tCO<sub>2</sub>e.<sup>86</sup>

**2.17** Alongside this, increasing energy efficiency also provides a cost effective way to reduce bills, enhance business productivity, improve living standards and cut carbon emissions. The energy efficiency sector supports over 100,000 jobs in the UK and is a growing market globally.<sup>81</sup> The Government's demand side energy policies are estimated to save £20 billion for households and businesses from their fuel bills in 2020.<sup>82</sup> Carbon Trust analysis of a sample of businesses showed significant

returns at a rate of over 40% for investment in energy efficiency measures, compared to 10–15% returns from more typical business investments.<sup>83</sup> By saving money, energy efficiency also produces wider positive economic outcomes, such as allowing spending on energy to be redirected to other economic sectors.<sup>84</sup> Increasingly, the private and public sector are introducing initiatives to capitalise on the benefits of energy efficiency (see box above on this page).

**Figure 8:**  
**Tri-benefits from the next manufacturing revolution<sup>87</sup>**



**2.18** Other measures – from reducing waste and optimising packaging to rethinking transport choices – can also save money and emissions, and create jobs. A recent study found that a range of measures by businesses to improve resource efficiency – including in energy use – could improve profitability for UK manufacturing by £10 billion a year, support over 300,000 jobs and reduce the UK’s total GHG emissions by around 4.5% (see figure 8).

**The UK’s action is consistent with strengthening our energy security and will improve our quality of life**

“ Action on climate change is a key driver for innovation and renewal. We are becoming energy independent by investing in renewable energy and efficiency, cutting emissions in our supply chain, and enabling people to live more sustainably at home. All parts of society have a role to play, but policy leadership is crucial to accelerate change. A global agreement to tackle climate change and strong national commitments will unlock the innovation and investment needed in society for the transition to a sustainable and prosperous future.”  
 Peter Agnefjäll, President and CEO, IKEA Group, September 2014<sup>88</sup>

**2.19** Measures to diversify our energy supply to low-carbon sources will also help to improve our energy security and our quality of life. The UK is rated the most energy secure country in the EU, and fourth in the world as a whole.<sup>89</sup> But global demand for energy is rising. Primary energy demand, for example, is expected to rise by 47% and global electricity demand by 89% over the next 25 years.<sup>90</sup> The IEA projects continued rises in fossil fuel process and price volatility – and this is being driven by dramatically increasing demand from emerging economies.<sup>91</sup> With indigenous production projected to decline and with broadly flat demand for oil and gas, the UK’s net oil and gas import dependence is expected to rise from just under a half in 2013 to an expected two thirds by 2025.<sup>92</sup>

**2.20** The policies that we enact to deal with climate change and reduce emissions are part of the solution to these risks. By improving our domestic and industrial energy efficiency and increasing the proportion of indigenously produced, lower carbon energy, we reduce our exposure to volatile global markets and spikes in global fossil fuel prices. This was also recognised by the G7 Energy Ministers when they agreed that climate change policy forms a vital part of the jigsaw to improve energy security.<sup>93</sup>

**2.21** Many activities, especially transport and energy generation, contribute to both global climate change and local air pollution (see box below). Optimising climate change policies can result in air pollution improvements, which could yield additional benefits of around £24 billion from now to 2050.<sup>94</sup> And the earlier we act, the greater the health benefits. These can be realised through actions such as promoting ultra-low-carbon vehicles, renewable sources of electricity which do not involve combustion, energy efficiency measures, and reducing agricultural demand for nitrogen. Increased walking and cycling can also reduce obesity and cardiovascular disease.

**2.22** Protecting 'carbon sinks', such as forests and woodland, contributes to preserving biodiversity by providing more priority habitat for woodland wildlife. It also provides shade to help to cool urban areas and improves mental health and wellbeing. Woodland creation contributes to net greenhouse gas emissions reduction through sequestering carbon dioxide in forest biomass. In addition, forests can alleviate flooding and help to improve water quality. Timber processing and the planting and management of woodland can boost the rural economy.<sup>95</sup>

### **Air pollution, climate change and health**

Air pollution and the greenhouse gases that contribute to climate change share many common sources. For example the burning of coal to produce electricity causes emissions of both greenhouse gases and air pollution.<sup>96</sup> Industry, transport, agriculture and domestic heating are also often major sources of both GHGs and air pollutants. For example in China, the health problems caused by air pollution, particularly from coal burning, are becoming a source of serious concern. A recent study published in the Proceedings of the National Academy of Sciences (PNAS) showed that smog pollution in China's northern cities reduces life expectancy by an average of 5.5 years compared to citizens living in southern cities.<sup>97</sup>

Air pollution has significant health and biodiversity impacts in both the developed and developing world. Within the UK, the Committee on the Medical Effects of Air

Pollutants (COMEAP) estimated that airborne anthropogenic particles led to mortality equivalent to 29,000 deaths, similar to a shortening of average life expectancy by 6 months,<sup>98</sup> and leading to an economic impact of around £16 billion yearly (in the range £9 to £19 billion).<sup>99</sup> At least 68% of UK habitats sensitive to nitrogen exceed their critical load for nutrient deposition, while 49% exceed that for acid deposition,<sup>100</sup> putting at risk achievement of our biodiversity targets.<sup>101</sup>

People living in low and middle income countries disproportionately experience the burden of outdoor air pollution. The greatest burden from air pollution arises in low- and middle-income countries in the WHO Western Pacific and South-East Asia regions.<sup>102</sup> The latest estimates reflect the developing evidence on its health impacts which have detected the more significant role that air pollution plays in cardiovascular illness and premature deaths.



## A Paris 2015 agreement can create opportunities around the world

“ An ambitious global deal is in everyone’s interests and makes economic sense. Delaying action now will only increase the cost of action later. Transitioning to a low-carbon economy will be good for growth, innovation and jobs. A meaningful global deal will encourage investors to seize the opportunity to contribute to a low-carbon future.”

Donald MacDonald, Chairman, Institutional Investors Group on Climate Change (IIGCC), September 2014.<sup>103</sup>

**2.23** The UK contributes less than 1.5% of global carbon emissions.<sup>104</sup> This does not mean the UK should sit back. Our leadership and credibility provides the opportunity to be at the forefront of the global shift to low-carbon. We can play an important role through our domestic action, and sharing our innovative policies, expertise and tools with others. For example, our International Climate Fund is supporting poverty reduction by helping countries adapt to climate change, take up low-carbon growth, and address deforestation. We are also helping governments around the world – including China, India and Brazil – to build “2050 Calculators”, simple energy models that aid policy planning by allowing users to explore all the options available to decarbonise their economies.<sup>105</sup> And we are developing a Global Calculator to help more people to understand and debate what could be done to increase our global standard of living and avoid the worst effects of climate change – understanding that is critical in reaching an agreement.

**2.24** Importantly, the benefits of a global climate agreement will not be monopolised by the West – far from it. A Paris 2015 agreement will create huge opportunities around the world to enhance energy security, energy efficiency, health and sustainability. It will encourage innovation and investment:

- Developing countries could attract billions in new foreign direct investment, and develop their own domestic low-carbon business sectors;
- Emerging and developing countries can develop a 21st century economic development model, avoiding the political, social and economic costs of the old carbon intensive development path.

**2.25** In short, a global climate agreement should not be a threat but provide an incredible opportunity to kick-start a new era of sustainable economic growth, from Africa, to Asia, to Latin America.

## Chapter three

# Global progress since Copenhagen – the action we need

“ At this point in time, the issue before the world is not about why climate change is a threat and who is to blame for it. The most important matter before us now is about how to adapt and how to mitigate climate change effects... What nations are required to do is to muster political will and raise their collective ambition to achieve a carbon neutral world in the second half of the century. Africa, too, has no choice other than join hands to adapt and mitigate the effects of climate change.”

*H.E. Dr. Jakaya Mrisho Kikwete  
President of Tanzania,  
June 2014<sup>106</sup>*



The world has moved on from questioning whether climate change exists – it is almost universally recognised as a serious threat to global prosperity, security and well-being. The world is not asking if we need to tackle climate change, but how. Over 90 countries, covering 80% of global emissions, have pledged to cut their emissions by 2020 under the Copenhagen Accord. However, we are now playing catch-up. By 2020, global emissions will be well above the cost-effective pathway to 2°C and will only grow without action to tackle them. Further effort at all levels in the period up to 2020 and beyond will be vital. However, it is wrong to claim that nothing is happening – there has been some significant progress since 2009. First, national climate change legislation and carbon pricing mechanisms are spreading. Secondly, we are seeing real progress on the ground, including from the largest emitters. Thirdly, the acceleration in global climate action has stimulated important technological and financial advances. Finally, we have learned a lot about the climate architecture required. Whilst much more action is needed to meet the below 2°C goal, this progress means a global agreement is now within reach.

### **The world has made progress but we are now playing catch-up**

**3.1** Climate change is almost universally recognised as a serious threat to global prosperity, security and well-being, as set out in chapter 1. Since the climate talks in Copenhagen in 2009, over 90 countries, covering over 80% of global emissions, and the majority of the world's major economies, have pledged action to reduce emissions by 2020.<sup>107</sup> Even if countries only reduce emissions in line with the most conservative scenario, the world will be emitting 3–4 Gt CO<sub>2</sub>e less than it would otherwise have done,<sup>108</sup> equivalent to the total annual emissions of India and Japan combined.<sup>109</sup>

**3.2** 38 countries have also taken legally binding quantified emission reduction commitments under the Kyoto Protocol, the first internationally legally binding agreement made under the UNFCCC, which came into force in 2005. It sets very high standards of accounting for emissions which provides assurance on its environmental impact. Its first phase ran to 2012, and a number of countries have decided to enter a second commitment period to 2020. The EU has committed to reduce emissions by 20% by 2020 on 1990 levels in accordance with this Protocol.

**3.3** Despite this action, there will still be a gap in 2020 between the world's current emissions and the emissions level needed to avoid dangerous climate change cost-effectively. UNEP estimate that the size of the gap in 2020 will be between 8 and 12 Gt of CO<sub>2</sub>e,<sup>110</sup> depending on whether countries meet the high or low ends of their Copenhagen Accord pledges, and on the stringency of the rules they use to count emissions (see figure 9). This gap is more than the entire yearly emissions of the US at the low estimate, and the entire yearly emissions from China at the high.<sup>111</sup>

**Figure 9:**  
**Gap between current pledges and emission level needed in 2020 for a medium or likely chance of meeting 2°C goal** (source: UNEP GAP report, 2013)

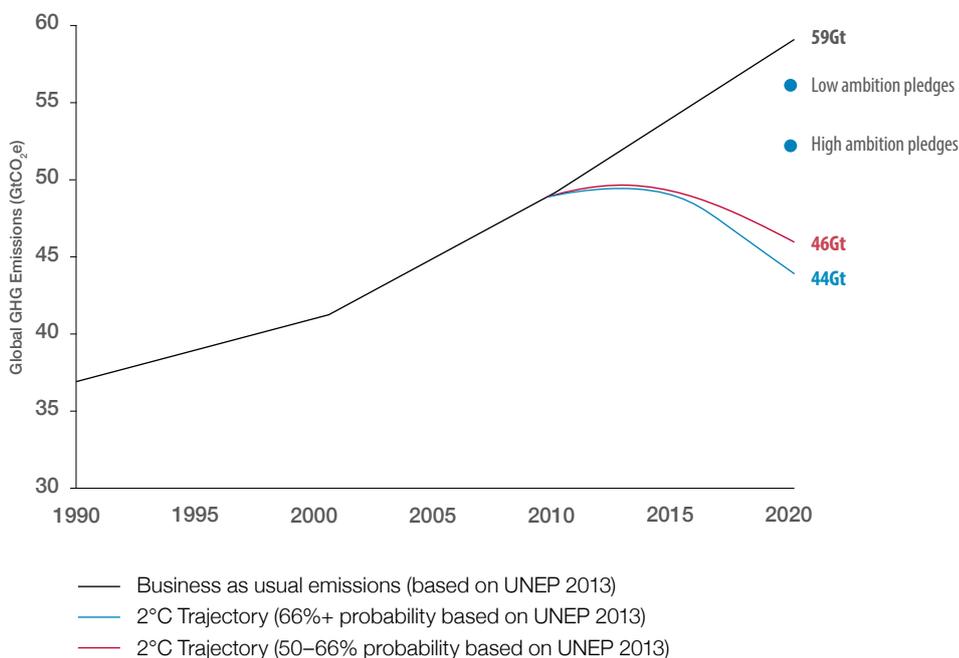


Figure 9 shows the gap between the Copenhagen Accord pledges and the emissions level in 2020 consistent with 2°C. UNEP's Gap Report 2013 included a detailed analysis of the feasible emissions pathways that would lead to a 50–66% probability of limiting the global temperature rise to 2°C above pre-industrial levels. The red line in figure 9 represents the median point of those pathways. The Gap Report also estimated the emissions level in 2020 consistent with a greater than 66% probability of limiting temperature rise to 2°C, which is represented by the blue line.

### Further effort in the period up to 2020 will be vital

**3.4** Further international effort in the period up to 2020 is therefore vital. Delaying additional global action will increase the speed with which the world needs to reduce emissions later to keep within the 2°C limit and increase the overall costs of mitigation in the medium- to long-term. It would also require an unprecedentedly rapid roll-out of low-carbon energy technologies, earlier retirement of carbon-intensive infrastructure, and is more likely to rely on using technologies which are either not yet proven at scale or are controversial in some places.

**3.5** Raising mitigation ambition is critical and the technical potential exists to close the gap. A number of sources have been identified as areas where the world could achieve

further emissions reductions, including: energy efficiency and renewable energy; fossil fuel subsidy reform; addressing short-lived climate pollutants such as methane and some HFCs; and addressing deforestation.<sup>19</sup>

**3.6** Much more investment is also needed. The International Energy Agency (IEA) indicates that at least \$4.8 trillion of additional investment is required by 2035 in the energy sector alone (on top of the \$48 trillion needed to deliver current investment requirements), to finance the global low-carbon transition and limit warming to 2°C.<sup>112</sup>

**3.7** We need to make the most of these areas for emission reductions and look at how actors from different sectors can work together – at all levels – to scale up ambition. This is increasingly recognised within the UNFCCC. We are seeing a new way of working

with negotiators, experts, international organisations, private sector actors, funding bodies, and sub-national entities discussing best practice from around the world and how to accelerate implementation of the most promising policies. Political momentum will need to play a big part, if we are to raise levels of ambition.

- 3.8** However, whilst more action at all levels is needed to close the emissions gap, the global progress since Copenhagen is considerable and accelerating. It has laid solid foundations for taking further action up to 2020 and has put a global agreement, to come into effect from 2020, within reach.

### National climate change legislation and carbon pricing mechanisms are spreading

- 3.9 National climate change legislation** drives domestic action by providing confidence about governments' policy intentions, which incentivises investment and innovation. Eight countries passed new flagship legislation in 2013<sup>113</sup> and the momentum is shifting from industrialised countries to developing and emerging markets.<sup>114</sup> GLOBE International figures show that almost 500 climate laws have been passed in 66 of the world's largest emitting countries.<sup>115</sup> In 2012 Mexico followed the UK to become the second country in the world to pass a comprehensive climate change law. It is now implementing this through a robust set of policies, including federal, state and municipal level climate action plans.<sup>116</sup>

- 3.10** We have seen **progress in carbon pricing**. Carbon markets – one form of pricing – have the potential, under the right conditions, to reduce the costs of emissions reductions by up to 70%.<sup>117</sup> About 40 national and over 20 sub-national jurisdictions are now putting a price on carbon<sup>118</sup> and the number of national or regional carbon markets is increasing steadily (see figure 10).<sup>119</sup> The EU ETS is the world's largest carbon trading system. South Korea has passed legislation to introduce a national emissions trading scheme planned for 2015. China has launched pilot carbon markets in two provinces and five cities and has committed to a national emissions trading scheme before 2020. In the US

around a quarter of the total population is in states covered by 'cap and trade' schemes.<sup>120</sup>

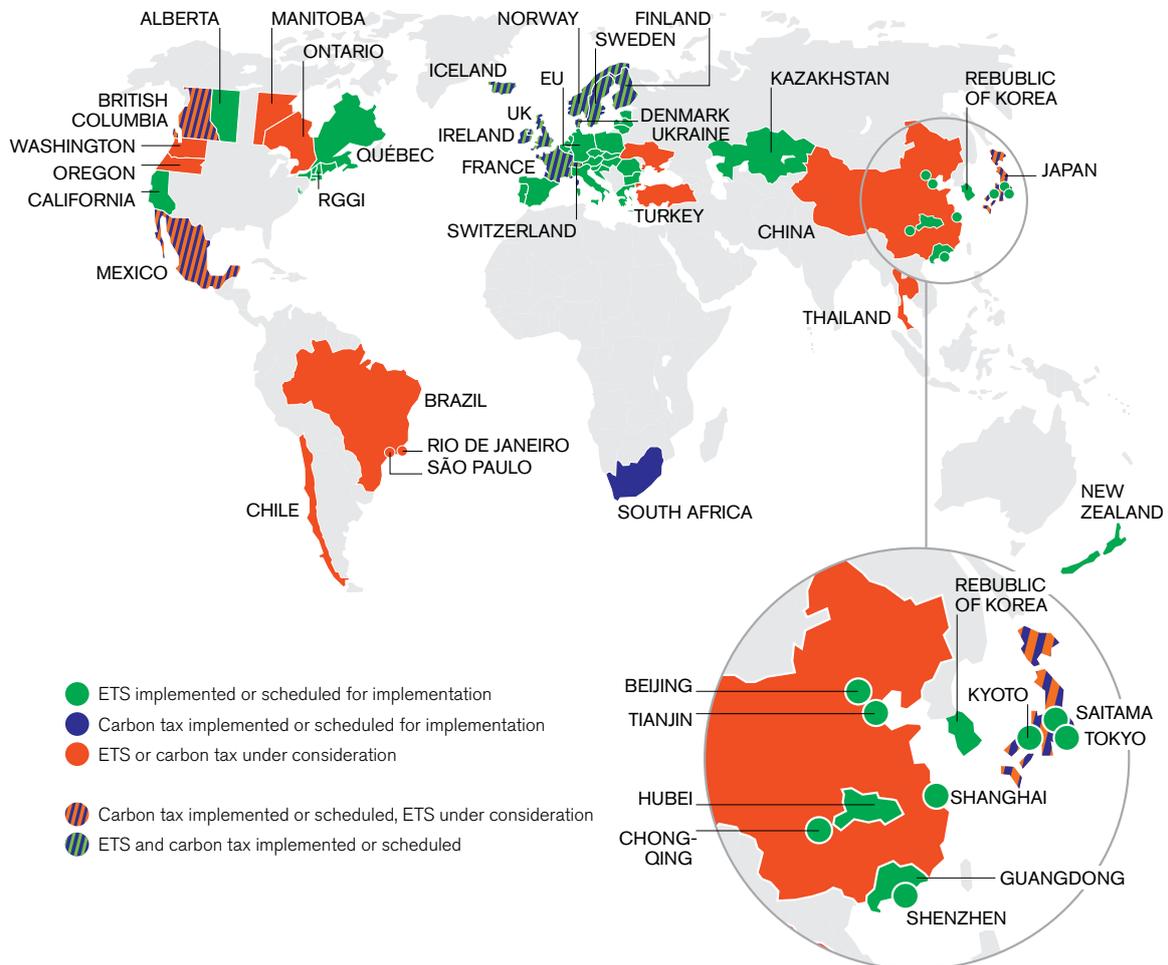
### European Union Emission Trading System (EU ETS)

The EU ETS is the world's largest carbon trading system and sets an example for other emissions trading schemes being developed worldwide. It was introduced in 2005 and currently covers over 11,000 installations across the EU. It has operated well from a technical perspective, with accurate recording of emissions, robust monitoring, reporting and verification and proportionate enforcement. The EU ETS is an important pillar of the UK's strategy for meeting our 2050 emissions reduction target.

A number of factors, such as overlapping EU policies to drive emissions reductions or the drop in industrial production during the economic downturn, have resulted in low demand for allowances, and therefore a weak carbon price, which is currently reducing incentives for low-carbon investment. The UK has long pushed for reform to strengthen the EU ETS so that it can help bring forward the investment needed now to meet our long term emissions reductions targets cost effectively.

To stimulate the debate on EU ETS reform, we published the UK's vision for the future of the EU ETS in July 2014.<sup>121</sup> This sets out the UK's current thinking on EU ETS reform and our priorities for its evolution beyond 2020. We are focused on three key areas: tackling the surplus of allowances which is depressing the low-carbon investment signal; protecting sectors at risk of competitive disadvantage; and improving efficiency while cutting unnecessary red tape. We want to see an effective and efficient EU ETS ready to link to other suitable systems across the world, as the foundation of a global carbon market.

**Figure 10:**  
**Countries and regions across the world have developed mechanisms for pricing carbon**  
 (© 2014, International Bank for Reconstruction and Development/The World Bank)<sup>122</sup>

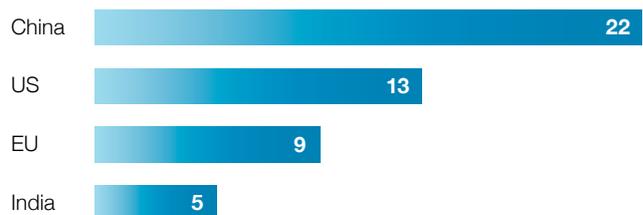


**We are seeing real progress on the ground, including from the largest emitters**

“ Everyone from slum dwellers in Lima to shoppers in Paris want their children to grow up in a world safe from the apocalypse of runaway climate change. And leaders are listening. From the US taking on king coal to India betting big on solar, momentum is building toward a world powered by 100% clean energy. We need a global deal and process that keeps up the pressure and ratchets up national commitments.”

Ricken Patel, Chief Executive Officer, Avaaz, September 2014<sup>123</sup>

**Figure 11:**  
**The world’s four biggest emitters (percentage of global GHG emissions in 2011)**  
 (Source: WRI, CAIT 2.0. 2014. Includes emissions from Land Use, Land Use Change and Forestry)



**3.11** The **EU** is on track to meet its commitment for the second phase of the Kyoto Protocol by reducing its emissions by 20% in 2020 compared to 1990 levels. The EU now expects to exceed this and to deliver a reduction of up to 24% by 2020.<sup>124</sup> The region has reduced its emissions continuously since 1990, despite a growing population and economy. The Climate and Energy Package has been instrumental in driving forward policies throughout the EU, and many member states are taking additional, voluntary, action. The EU's per capita emissions are lower than those of Australia, Canada, Japan, the US and the Russian Federation.<sup>125</sup> EU action has helped unlock early investment needed for immature renewable technologies and contributed to a significant increase in the size of the global renewables market. This scaling up of the industry has in turn contributed to driving down the costs of key technologies like solar PV (see figure 13) and onshore wind.

**3.12** The **US** pledged a 17% cut in 2020 emissions compared to 2005 levels, as part of the Copenhagen Accord. In June 2014 the federal government published proposals that are expected to cut carbon emissions from existing US power plants by 30% by 2030 compared to 2005 levels.<sup>126</sup> These form the centrepiece of President Obama's 2013 Climate Action Plan (CAP), which sets out a range of executive measures to tackle climate given that Congress did not approve ratification of the Kyoto Protocol and is unlikely to pass comprehensive climate legislation in the short term. The CAP also makes commitments on vehicle emissions standards, better appliance and building efficiency standards, and on prohibiting the most harmful hydrofluorocarbons.<sup>127</sup> Additionally, action at state and city level is significant and increasing. More than 20 states have set energy efficiency targets and more than 30 have set renewable energy

targets. 15 States, producing 31% of US emissions have adopted 2050 emissions targets, including California, Florida and New York, which have each committed to reduce GHG emission by 80% on 1990 levels by 2050.<sup>128</sup> The Regional Greenhouse Gas Initiative in the Northeast US covers one-fifth of the nation's GDP, while California's cap and trade program covers an additional one-eighth and is second in size globally to the EU ETS. Early action on the CAP commitments combined with the widespread shift away from coal to relatively cheap domestic shale gas, energy efficiency, and state actions suggest the US is likely to meet its 2020 target.

**3.13** **China** overtook the US as the world biggest emitter in 2006 and its emissions continue to increase. This reflects China's strong economic growth over the last decade, and an energy sector dominated by coal use. It has traditionally had relatively low emissions per capita, but these are expected to exceed those of the EU by 2015.<sup>129</sup> However, in the past two years, driven in part by crippling air pollution, the new Chinese leadership has made an "energy revolution" a key part of its political platform.<sup>130</sup> It has set tough new targets on coal consumption. It is already the world's largest investor in renewable energy<sup>131</sup> and has pledged to increase the share of non-fossil fuels in primary energy consumption from 9.8% in 2013 to 15% by 2020.<sup>132</sup> China has launched seven carbon market pilots and is carrying out in-depth analysis on an economy-wide peaking date. China recognises that many of its top priorities, including energy security, sustainable growth and addressing environmental pollution are consistent with reducing emissions. China is on track to meet its Copenhagen Accord pledge to reduce the carbon intensity of its economy by 40–45% by 2020 compared with 2005 levels.<sup>133</sup>

**3.14 India** is the fourth largest emitter globally but has very low emissions per capita, reflecting both its large population and high levels of poverty. Other countries recognise its need to grow substantially. Despite this, India made a Copenhagen Accord pledge to reduce the emissions intensity of GDP by 20–25% by 2020 compared to 2005 and is on track to meet it.<sup>134</sup> India has made energy efficiency a priority, with on-going initiatives aiming to reduce GHG emissions by 99 million tonnes per year.<sup>135</sup> Its policy to improve industrial energy efficiency – the Perform, Achieve and Trade Scheme – is the first of its kind in an emerging economy. Almost one-third of new power generation capacity up to 2017 will be from renewables, doubling the existing renewable energy capacity of 30 GW.<sup>136</sup> Over £100 billion investment is being made in two Dedicated Freight Corridors to shift freight transport to rail from roads, resulting in huge GHG savings per year by 2030. India has also recently established a National Adaptation Fund to support those vulnerable to the impacts of climate change – for example, one study found that shifts in monsoon patterns are already having a negative impact on rice yields.<sup>137</sup>

### Many other countries across the world are showing leadership in reducing emissions

**3.15** It is not only the richest or the biggest emitters who are taking action. As well as China and India, many other countries, at various different stages of their economic development, have taken action. Brazil, home to the world's largest tract of virgin rainforest, equivalent in size to the EU, has been an exemplar in taking action and is on track to meet its target of reducing deforestation by 80% by 2020.<sup>139</sup> Other major economies such as Indonesia, Mexico, South Korea, and South Africa have all agreed ambitious cuts as part of their Copenhagen pledges. Costa Rica aims to be fully carbon neutral by 2021. Chile and Colombia have put impressive plans in place. Small island states such as the Marshall Islands and the Federated States of Micronesia, some of the most vulnerable countries to the impacts of climate change, are also taking action. Many other countries have made pledges to manage their

emissions. A prominent example is Ethiopia which is committed to building a climate-resilient green economy and it aims to achieve carbon-neutral middle-income status before 2025.<sup>140</sup>

#### Low-carbon growth in Gujarat<sup>138</sup>

Under his tenure as Chief Minister of Gujarat, India's Prime Minister Narendra Modi undertook wide-ranging economic and policy reforms, proving that economic growth and low-carbon growth can go hand-in-hand. Key achievements include:

- Gujarat delivered energy to most of its population. Between 2001 and 2008 Gujarat's net electricity generation increased by 28.8% whilst its carbon intensity reduced by 4.2%, compared to national equivalents of 37.3% and 0.9% respectively.
- As a result Gujarat is now one of the few states in India to have surplus electricity (with supply exceeding demand by around 20%) with hugely increased wind and solar generation as well as near universal energy access.
- A dedicated solar policy was launched in 2009, support for wind increased (from 2% to 10% to tap the 10,000MW of wind potential along Gujarat's coast) and transmission losses were reduced by 15%.
- Government offices and street lighting switched to efficient lighting to improve energy efficiency.

## Protecting and restoring forests

“Tropical forests are home to three quarters of all plants and animals. Yet deforestation not only destroys wildlife directly but it gives rise to more greenhouse gas emissions than the EU, causing climate change that further harms the natural World. Embedding measures aimed at halting deforestation in the new global deal will address these two major threats to nature at the same time. The RSPB strongly supports such action.”

Mike Clarke, Chief Executive, RSPB, September 2014<sup>141</sup>

Protecting and restoring forests is vital to long-term economic and social development, improving local livelihoods and protecting biodiversity. Stopping deforestation enhances climate resilience, contributing to GHG mitigation and keeps the global 2°C goal in reach. However, the pressure on forests continues to grow, increasingly driven by expansion of large-scale commercial agriculture, and around 13 million hectares of rainforest are lost per year – an area roughly the size of Greece. Addressing deforestation is a priority for the UK’s

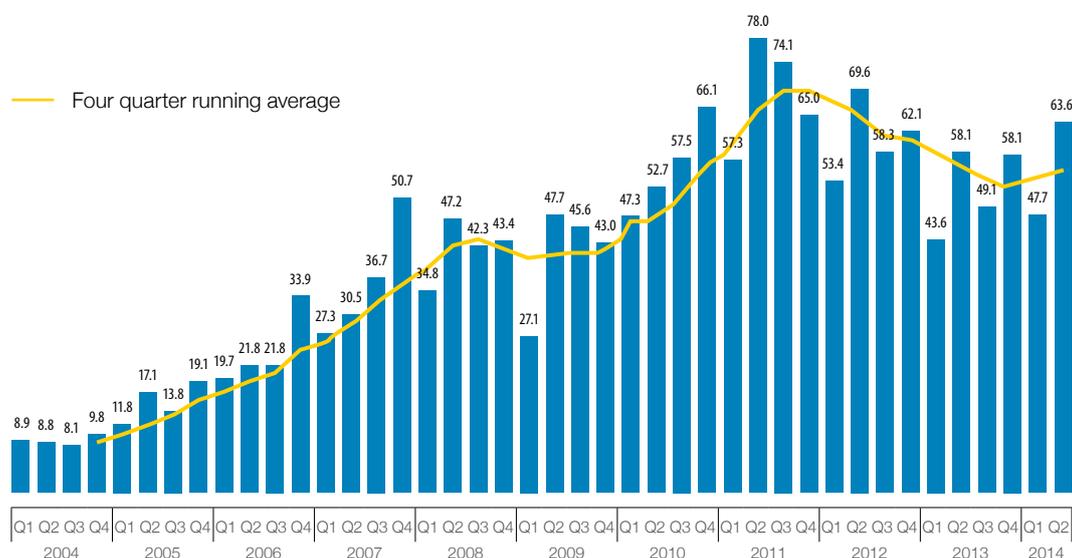
International Climate Fund, with over £397 million deforestation-related spend over the last 3 years, and more in the pipeline.

The Cancun Agreements recognised the importance of efforts to curb deforestation, and since 2010, a number of initiatives have been launched to support forest nations create enabling environments and reward actions that lead to measured, reported and verified emission reduction. Over 50 countries are now developing national REDD+ strategies.<sup>142</sup>

In addition, the Consumer Goods Forum, a global alliance of 400 companies with global sales of \$3 trillion, has pledged to eliminate deforestation from supply chains by 2020. As a result, there is strong private sector interest in working with such initiatives like the BioCarbon Fund’s Initiative for Sustainable Forest Landscapes (ISFL)<sup>143</sup> providing additional incentives to jurisdictions that implement policies to meet zero-deforestation goals.<sup>144</sup> The ISFL public-private partnership approach will combine results-based finance with private sector expertise, knowledge and capital to incentivise transformational change at the landscape level.



**Figure 12:**  
**Growth in renewables investment (\$bn) 2004–2014**  
 (Source: Bloomberg new Energy Finance)



Note: Total values include estimates for undisclosed deals. Excludes corporate and government R&D, and spending for digital energy and energy storage projects (reported in annual statistics only).

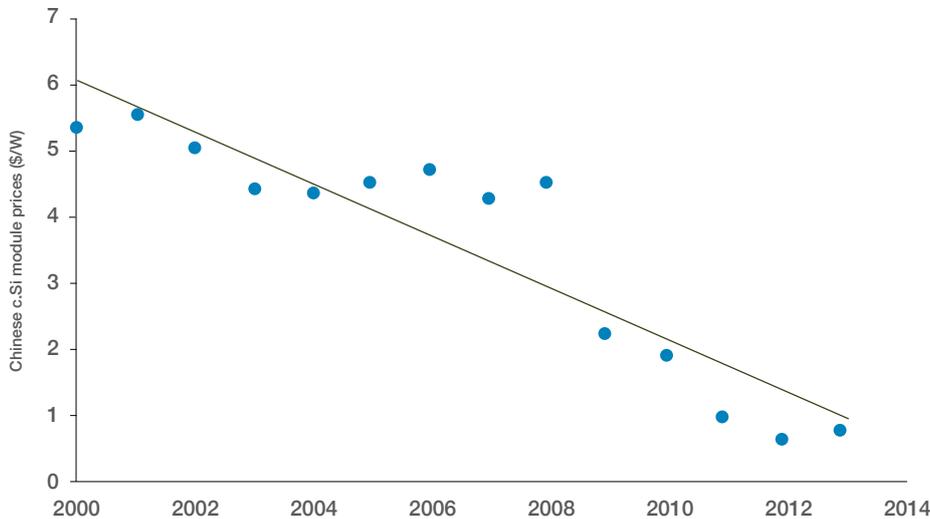
### The acceleration in global climate action has stimulated important technological and financial advances

**3.16 Global investment** trends show the low-carbon transition picking up pace. The last decade has seen a dramatic growth in clean energy investment (see figure 12). The global recession had an impact but latest figures show investment picking up. Considering only net investment in new power capacity, renewables outpaced fossil fuels for the fourth year running in 2013.<sup>145</sup> The same year, China invested more in renewable power capacity than fossil fuels, and for the first time, invested more than all of Europe combined.<sup>146</sup>

**3.17 The price of renewable technologies is falling.** Globally, average prices for solar photovoltaic panels have fallen 80% since 2008 (see figure 13), while wind turbine prices, a more mature technology, have fallen by 27% on average since 2009.<sup>147</sup> Across the world, an increasing number of wind and solar power projects are being built without public financial support. Businesses are increasingly turning to renewables to reduce their energy costs while increasing the reliability of their supply.<sup>148</sup> Many cities and towns are further advanced than national governments in having policies, plans and targets in place for renewable energy.

**Figure 13:**  
**Change in Chinese module prices since 2000**

(Source: Bloomberg New Energy Finance)



### 3.18 Low-carbon is no longer a niche sector.

There is a rapidly increasing market for “green bonds”, revealing a growing demand for such products and greater financial market participation in the green economy. There is a need to ensure strong market integrity and the private sector is taking initial steps in this regard. For example in 2014 Bank of America, Merrill Lynch, Citi, Credit Agricole and JP Morgan came together to create the Green Bonds Principles and 25 banks now support the Principles and related governance.<sup>149</sup> Institutional investors also increasingly recognise the need to factor climate risks into their portfolios to ensure long-term growth and sustainability. There is growing demand for information on companies’ environmental footprint, and exposure to environmental risks.<sup>150</sup>

“ I firmly believe that understanding and incorporating climate change into future modelling has become essential for anyone making long-term financial commitments, be that investing in infrastructure, housing or indeed policy.”

John Nelson, Chairman of Lloyd’s of London, May 2014<sup>151</sup>

### We have learned a lot about the climate architecture needed and a global agreement is now within reach

3.19 The UK remains committed to meeting its fair share of \$100 billion of public and private international finance per year from 2020. The lessons we are now learning from the Climate Investment Funds (CIFs) and other climate programmes put us in a much stronger position to do this effectively and have increased the ability of countries to absorb this support. The recent Independent Evaluation of the CIFs identified where things have worked well (e.g. balanced representation between developed and developing countries; government ownership of investment plans; the scale of funding mobilised) and where things could be improved further (e.g. length of time required to take decisions; better planning for replication and transformation). Lessons such as these are now feeding into the design of the Green Climate Fund.

### How UK climate finance is mobilising private finance

Significant amounts of private investment will be key to achieving a sustainable, low-carbon transition. This is why the UK is also supporting projects through the International Climate Fund that will catalyse private investment and help build a sustainable market for low-carbon investment.

#### Climate Public Private Partnership (CP3):

The UK will invest £110 million as an anchor investor in two commercial private equity funds, to directly invest in energy efficiency, renewable energy, and clean tech inventions in developing countries.<sup>152</sup> One of the funds – the IFC Catalyst Fund – has achieved a final fund size of US\$417.75 million, including \$50 million from the State Oil Fund of the Republic of Azerbaijan, \$65 million committed by a German pension fund and \$5 million from an Australian pension fund.<sup>153</sup> This makes the Catalyst Fund one of the biggest private equity funds that focuses on investments both in climate and energy in emerging economies and is a successful example of how public money can contribute to mobilising institutional investment into the climate area.

**Get Fit Uganda:** With a £35 million UK Contribution, Get Fit will support the development and completion of small-scale on-grid renewable energy projects in Uganda, to

both avoid an energy shortfall and promote private sector investment. It is expected that Get Fit will support at least 125 MW of additional installed capacity from at least 15 small scale renewable projects and deliver greenhouse gas savings of between 1–10 million tonnes of CO<sub>2</sub>. It is expected to support at least 3,000 jobs. It does this through topping up the existing Feed-in-Tariff for renewables and providing capacity building support to the Ugandan Energy Regulatory Authority. The project will also facilitate World Bank guarantees to project developers. Get Fit aims to demonstrate to private sector developers that investment in renewable energy in Uganda is financially attractive. The project also aims to demonstrate to developing countries that an effective regulatory regime and cost-reflective tariffs will bring in investment in renewables. Get Fit represents a partnership between the governments of the UK, Germany and Norway as well as the European Union.

#### Global Climate Partnership Fund (GCPF):

The UK has invested £30 million into the GCPF which provides finance for energy efficiency and small scale renewable energy projects in developing countries. Public money provides a risk cushion to leverage in private investment to increase finance available to small and medium enterprises (SMEs) and households.



**3.20** We know that the levels of investment needed for the low-carbon transition cannot be met by public finance alone and it is vital we work in partnership with the private sector to design these instruments and projects that will work. The UK has set up the Capital Markets Climate Initiative to ensure input from the private sector into International Climate Fund project development. In June, the UK hosted the London Clean Energy Finance Summit which brought together over 140 delegates from across the clean energy investment chain, including project developers, investors from the City of London and Ministers from various countries to discuss opportunities for investment in low-carbon projects. The Summit also launched a new public-private partnership – the Global Innovation Lab for Climate Finance – to design the next generation of climate finance instruments and catalyse private investment in low-carbon projects and infrastructure in developing countries.<sup>154</sup>

**3.21** We have also developed over time in the UNFCCC a range of institutions, mechanisms and rules which help us understand better the type of framework that might be needed for the world to effectively limit its emissions. For example, the Warsaw Framework for REDD+, progress on market mechanisms, the Warsaw International Mechanism for Loss and Damage and the monitoring, reporting and verification (MRV) regime, to name just some. However, some of these do not necessarily reflect well evolving economic realities, or engage all actors and drive comprehensive action on the ground. Further, some have been developed around particular issues and sectors and will need to be brought together in a coherent way, and updated for the new economic realities of countries. For example, with Kyoto Protocol (KP) accounting rules, we have built an MRV and accounting regime that has demonstrated it is possible to track progress towards commitments. And these have demonstrated that robust accounting rules are necessary to allow international trading, giving confidence to carbon market participants and investors. However, we don't want to recreate the KP accounting system. The Kyoto system will not be appropriate in the context of the 2015 Agreement as it only puts targets on developed countries

and is designed to manage only one type of target (a carbon budget). So the challenge is to build a regime that is flexible enough to accommodate a spectrum of commitment types while being environmentally robust and taking into account a varying range of national circumstances and capabilities.

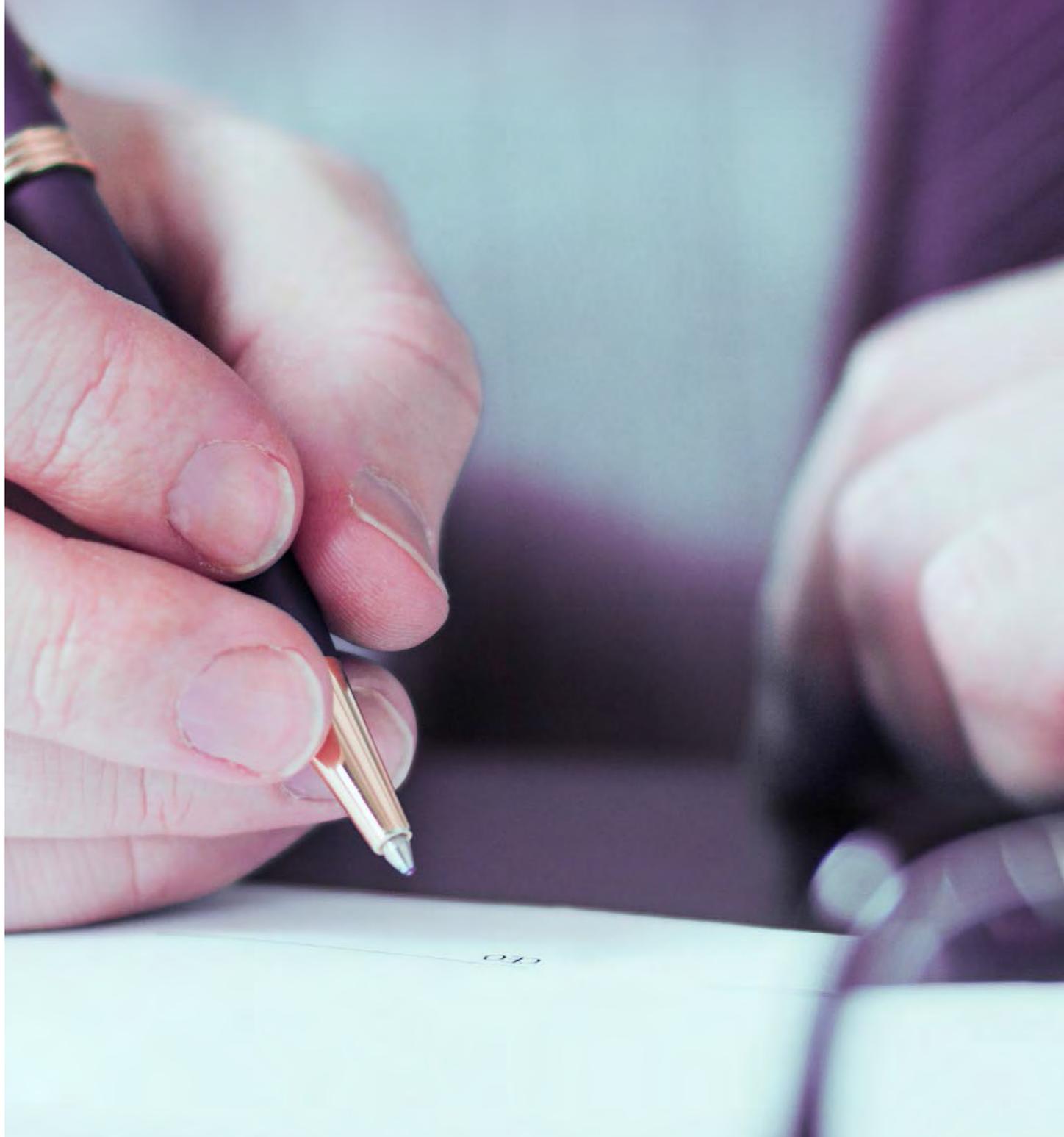
**3.22** But there is one lesson that stands out above all others. Broad participation is vital. No single subset of countries can solve this problem alone and if major emitters remain outside, those inside may feel less obliged to stay the course. **Looking beyond 2020, we need an agreement which encourages stronger ambition and adherence to targets by bringing all countries on board and by providing clear rules that encourage transparency and create confidence that others are acting.**

#### Climate action in other international fora

Countries are currently negotiating a new global development framework for the post-2015 period in the UN to succeed the current UN Millennium Development Goals (to be agreed in September 2015). The priority for this should be poverty eradication. As we know the poorest will be hit first and hardest by climate change: by promoting low emission, climate resilient sustainable development pathways by all, the post-2015 development framework can ensure lasting poverty eradication and shared global prosperity. It can also drive genuine mitigation and adaptation action on the ground, which would, in turn, help countries meet the emissions reductions commitments they take on within the UNFCCC regime.

Countries also recognise the need to address the international aviation and maritime sectors. Emissions from these sectors combined represent about 5% of global GHG emissions. Therefore, progress on tackling emissions needs to be made in the International Civil Aviation Organization (ICAO) and International Maritime Organization (IMO), respectively. In both sectors the UK is actively working, through its representation in ICAO and IMO, to ensure that any measures introduced are environmentally robust and in line with necessary emissions targets.

Chapter four  
To Paris 2015 and beyond –  
the action we need



“What we need is an agreement that’s ambitious – because that’s what the scale of the challenge demands. We need an inclusive agreement – because every country has to play its part. And we need an agreement that’s flexible – because different nations have different needs. And if we can come together and get this right, we can define a sustainable future for your generation.”

*Barack Obama, US President, June 2013<sup>155</sup>*

“Climate change affects the world’s poorest and most vulnerable first and most severely. This is a global problem that requires a global solution and the UNFCCC is the only process we have to come to such a global, ambitious, and equitable solution.”

*Richard Miller, CEO, Action Aid, September 2014<sup>156</sup>*

“Businesses continue to play their part in addressing climate change through investment in research and low-carbon technologies. But to unlock further opportunities and support the level of investment required, we need a more level playing field and greater certainty. A comprehensive global agreement that includes all major nations will help to deliver this.”

*John Longworth, Director General, British Chambers of Commerce (BCC), September 2014<sup>157</sup>*

“The time for political posturing on climate change is over. Governments must take concrete steps or be held to account. This means that all major emitting countries need to transition rapidly out of fossil fuels and into renewable energy; we need to conserve forests; and we need plans and resources for adaptation to the impacts of climate change, insofar as this is possible.”

*Sam Smith, Leader of the WWF Climate and Energy Initiative, September 2014<sup>158</sup>*

“2015 is a crucial year for efforts to deliver a global climate change agreement. Governments must put aside their entrenched positions and take bolder steps. Companies like Siemens have the solutions to tackle climate change. But a global agreement is critical to give more certainty to businesses to scale up investments, innovation and technologies at the necessary speed to build the low-emissions societies we need.”

*Juergen Maier, Chief Executive Siemens plc, September 2014<sup>159</sup>*

Climate change is a global problem and it needs a global solution. Emissions and their effects – both warming and increased extreme weather events – do not respect country borders, meaning no one country or subset of nations can tackle this threat alone. The UNFCCC is the only forum with the legitimacy and coverage to deliver the global response that is needed, and in Durban (2011) the world agreed that a new global agreement on climate change should be reached at the Conference of the Parties in Paris in December 2015. It is not just governments who want this deal, there is widespread support from businesses, NGOs and campaign groups, both in the UK and internationally. As a result, we have the opportunity to agree, for the first time ever, a legally binding deal in which all 195 countries in the UNFCCC take on commitments to reduce their emissions. Paris will not be the end of the road, but it can be a huge step forward on which we can build further in future years. It is an opportunity we must seize.

**The UK believes that a successful agreement in Paris will be one that reflects countries' current economic realities, stage of development and future opportunities and which:**

- **Delivers ambitious and fair commitments from all countries to reduce emissions;**
- **Tracks progress, creates trust, and facilitates increased ambition in the future;**
- **Provides support to those who need it, and it helps all countries, particularly the poorest and most vulnerable, to develop climate resilience.**

**We are working actively with countries across the globe to achieve this vision. In the 15 months before Paris, we have challenging negotiations ahead and important milestones to help us deliver the new agreement. The timeline sets out the key steps on the road to Paris:**

### **Timeline**

#### **23 Sept 2014 – UN Secretary General Leaders' Summit**

Key moment for leaders from government, finance, business and civil society to showcase their action to tackle climate change and build momentum towards reaching an ambitious agreement in 2015 with countries' contributions coming forward in early 2015.

#### **October 2014 – European Council**

The UK is pushing for EU Leaders to agree to a domestic emissions reduction of at least 40% by 2030 at October Council.

#### **1–12 December 2014 – COP in Lima**

Progress negotiations on the process for countries to submit their contributions well in advance of Paris and on the elements of a draft negotiating text, while recognising pledges to the initial capitalisation of the new Green Climate Fund.

#### **Quarter 1 2015 – contributions brought forward**

The UK expects the advanced and other major economies to come forward with their contributions in the first quarter as agreed in Warsaw. The three largest emitters, China, the US and the EU, are set to meet this deadline.

#### **Starting in April – period of assessment**

The UK expects a period of assessment to ensure that the international community can understand what countries have brought forward, and assess whether commitments are individually and collectively ambitious enough to keep us on track for 2°C.

#### **June 2015 – Bonn**

In line with UNFCCC rules, a draft text of the new agreement will be considered, as will countries' contributions to the new agreement.

#### **December 2015 – Paris**

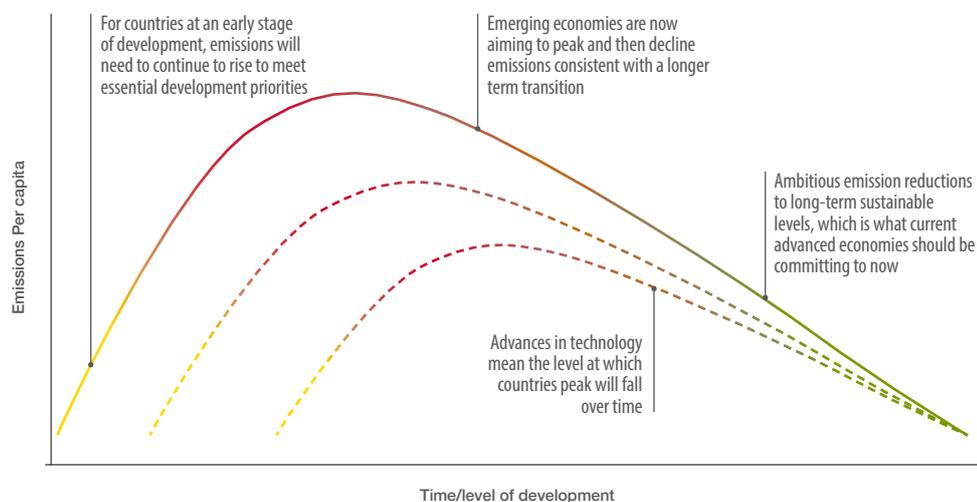
Agreement secured.

## The UK's vision for the 2015 Agreement

### Ambitious and fair commitments from all countries to reduce emissions

- 4.1** Our vision of a successful agreement is one that keeps the internationally agreed objective on addressing climate change – to limit the average global temperature increase to below 2°C relative to pre-industrial levels – within reach. It should capture emissions reductions from all sectors, promote the use of carbon markets and action to prevent deforestation, and help drive the global transition to low-carbon economies and development pathways; supported by the rollout of new and cheaper low-carbon technologies in all countries
- 4.2** UNEP estimates that global GHG emissions were around 50Gt CO<sub>2</sub>e in 2010. If countries meet only the low end of their existing pledges, emissions are expected to rise to 56Gt by 2020. To maximise our chances of meeting the below 2°C goal, (and thus avoiding dangerous climate change) global emissions will need to peak and then fall to around 41Gt by 2030.<sup>160</sup> This 15Gt reduction between 2020 and 2030 is a big undertaking – equivalent to 28 times the annual emissions of the UK, more than twice those of the US and greater than the current annual emissions of China.<sup>161</sup> We believe that it is not insurmountable, with the appropriate policies in place and if all countries act. If commitments in Paris only take us part of the way, the UK is pushing for a regular process to review commitments against the science, with a view to ratcheting up ambition as confidence and experience increase, and as technology costs continue to fall.
- 4.3** The agreement should send a clear signal on where the global community is heading. The key requirement is that countries commit to reduce emissions during the 2020s. The EU and others are proposing a target date of 2030, whilst others are proposing a focus on 2025. Some countries are also calling for a collective longer term goal to direct our efforts further, and we welcome this debate. In the UK, we have already committed to at least an 80% reduction by 2050 (on 1990 levels) and the EU has set a similar goal.
- 4.4** The UK wants commitments from all countries to reduce their emissions – but this does not mean that all commitments will be the same. They will vary in type (e.g. economy wide targets, energy intensity targets, sectoral targets) and in the level of ambition. All countries will ultimately need to make the transition to a low-carbon economy, but the 195 countries in the UNFCCC are at very different stages in their development, and their economic situations are evolving rapidly. Countries will need to make the low-carbon transition in a way that reflects their national situation, the opportunities available to them, and both their relative past and future contributions to climate change.
- 4.5** The more advanced economies are already in a position to make rapid reductions in their emissions, while continuing to drive economic growth. Other major and emerging economies are now aiming to hit peak emissions in the near future, and are preparing for the long term transition to an advanced, low-carbon economy. The least developed countries, which currently have very low per capita emissions, face rising emissions into the future, which are needed to meet their basic development needs. However, advances in, and lower costs of, low-carbon technology mean developing countries will increasingly be able to move straight to a low-carbon economy, and so peak at a lower level than would otherwise have been the case, whilst still avoiding the negative impacts of old carbon intensive technologies.

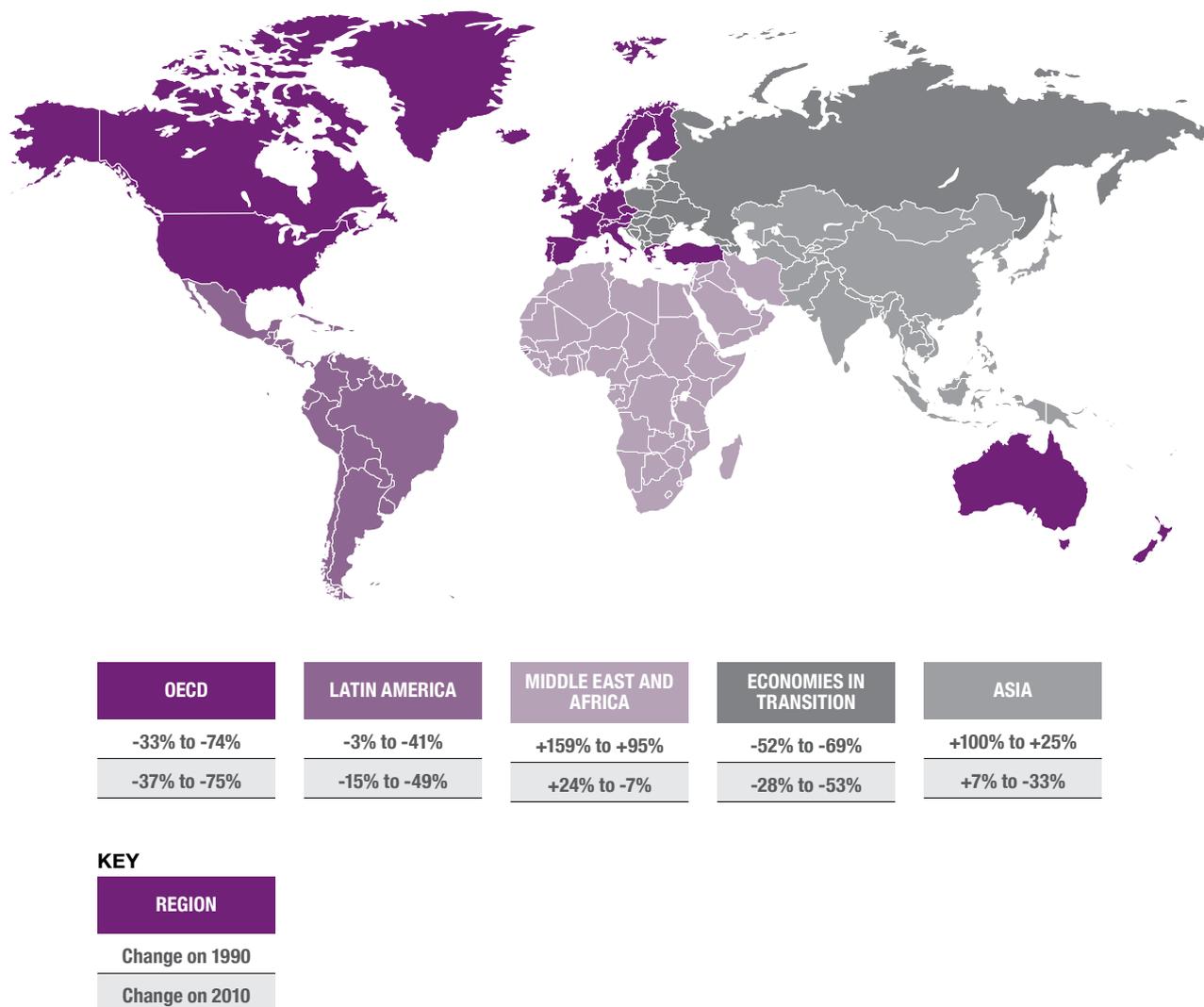
**Figure 14:**  
**Illustrative emissions trajectory for the transition to a low-carbon economy**



**4.6** Whilst the level of effort will vary according to a country's evolving responsibilities and capabilities, there is no top down formula that can be used at a global scale to set the level of action that each country should take. Circumstances differ widely. Looking at past emissions in isolation will not solve the problem; even if the EU and the US (who produced a large share of emissions in the past) reduced their emissions to zero, we would not achieve the below 2°C goal. Nor would we achieve it by only looking at future emissions and asking China to act if others weren't. Likewise, looking only at GDP or other measures of development will not suffice in the context of a global agreement. Some countries highlight that they have not historically contributed as much to climate change, while other countries say they face proportionately higher costs for reducing emissions. This issue is highlighted in Figure 15, which shows large ranges in suggested emissions reductions depending on which single measure you use to share the mitigation effort.

**4.7** The UK recognises this, and through our bilateral contacts and engagement in international meetings we are encouraging all countries to consider a wide range of indicators that cover both responsibilities, and capabilities. This includes past and future emissions. It includes mitigation costs, mitigation potential, and GDP per capita. And it includes measures of poverty and development needs.

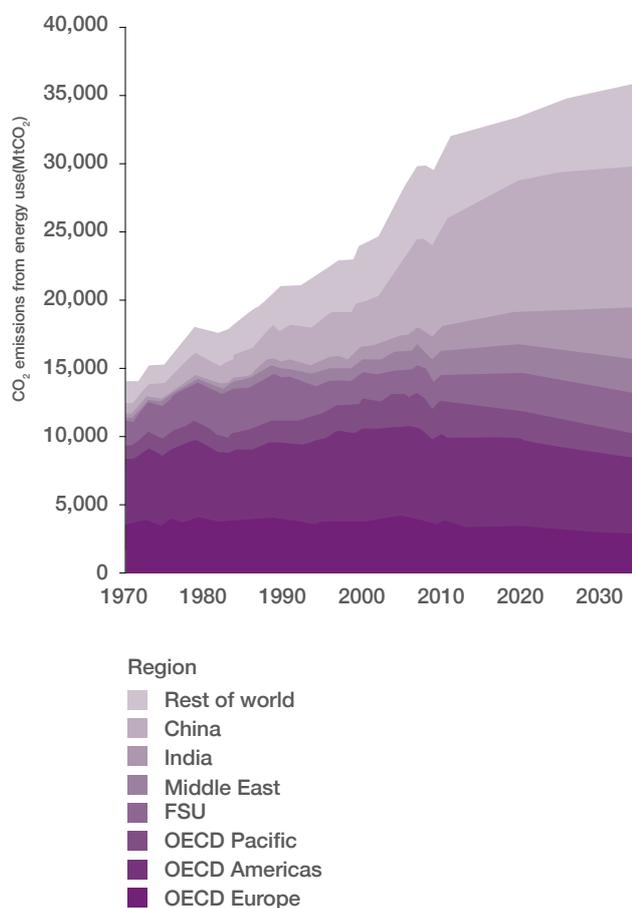
**Figure 15:**  
Regional 2030 emissions targets suggested by IPCC review of effort share approaches<sup>162</sup>



**4.8** Our view is that we will only achieve a fair and lasting deal through a spectrum of commitments, where those with the greater responsibilities and capabilities do more, and others contribute along a sliding scale, having taken all the factors above into account. One thing that we can be certain of is that the current ‘divide’ operating in the UNFCCC between the countries listed as Parties in Annex I (explained in glossary) and the rest of the world will not work. It does not pass the fairness test, it does not pass the ambition test, and it does not help the poorest and most vulnerable.

**4.9** The world is changing, and we cannot solve future problems only by looking to the past. Figure 16 shows that emissions from OECD countries and the Former Soviet Union are already outstripped by those from emerging economies. By 2020 non-OECD countries will produce more than two-thirds of global emissions, and China’s CO<sub>2</sub> emissions from energy use will be larger than those from the US and EU combined. These trends are only set to increase out to 2030.

**Figure 16:**  
Annual CO<sub>2</sub> emissions from energy use  
from 1970–2035



Source: IEA Statistics and IEA World Energy Outlook 2013. OECD groupings based on 2013 membership. Projections based on the WEO New Policies Scenario, which incorporates the impact of existing energy and climate policies that have been already been implemented or announced.

#### Key facts<sup>163</sup>

- Only 1 of the top 10 largest per capita emitters (from 1990 to 2010) is an Annex I country.
- Out of the top 20 per capita emitters (counting historical emission from 1990 to 2010) only 5 are Annex I countries.<sup>164</sup>
- 105 countries (including Brazil, China and South Africa) have higher GDP per capita than the poorest Annex I country (Ukraine).<sup>165</sup>

#### The most advanced economies

**4.10** The UK believes that the most advanced and richest economies including the EU, other Europeans, the US, Japan, Canada and Australia should take on the most ambitious commitments and we are pressing them to do so in our bilateral contacts. We want to see them commit to ambitious targets to reduce their absolute emissions across their whole economy, to reflect their high level of past emissions, their likely future contribution to climate change, and their capability to deliver such cuts. We would not expect any country with an economy wide cap to step back from that, or to put forward lower levels of ambition than in previous commitments. Figure 15 shows that, to meet the 2°C goal, these countries would need to adopt targets of between -34% and -74% on a 1990 baseline by 2030, according to a range of effort share approaches.

**4.11** Of these advanced economies, the EU, the US and Japan are the largest. The EU has begun its own negotiations on a domestic emissions reduction of at least 40% by 2030 below 1990 levels, based on a proposal by the European Commission. This would be consistent with the EU's long term target of an 80–95% reduction by 2050.<sup>166</sup> The EU will commit to a 2030 target regardless of what others put forward. But no EU target will be enough to meet our 2°C objective without ambitious commitments from others. If other countries come forward with ambitious commitments, the UK would argue for the EU to go further and move towards a 50% reduction, for example through use of international carbon markets.

**4.12** Similarly, we would expect the US and Japan to put forward targets that fit their profile as high emitters with high GDPs per capita. As they are two of the three largest advanced economies (alongside the EU), their level of ambition will be important to the deal. Both of these countries will argue that national circumstances will constrain their headline level of emission reductions but both have a long term target of reducing their own aggregate emissions by at least 80% by 2050.<sup>167</sup> We would expect to see commitments that represent a credible trajectory towards achieving this.

### Other major economies

**4.13** We would expect other major economies, including the other G20 members, also to take ambitious action; but the level of that action will depend not only on their national situation (in terms of responsibility and capability), but on how they manage the transition. For some this may mean absolute reductions, and it may mean peaking soon in order to start reducing emissions in the next few decades. For others there will be more scope for emission growth before reducing emissions to sustainable levels later on. In many cases taking action to mitigate climate change also contributes to meeting their wider development objectives.

**4.14** China is very exposed to the impacts of climate change, and as the largest single emitter with rapidly growing emissions (it will produce around 29% of global CO<sub>2</sub> emissions by 2020)<sup>168</sup> its level of contribution will be important to the deal. We hope its commitment will reflect this. We are encouraged by the active debate in China about when their emissions will peak, reflecting to a large extent concerns within China about the local environment and health impacts of emissions. China is currently very reliant on coal, and its economy is still growing rapidly, meaning that its emissions are likely to grow further before they start to decline. The year and the level at which China's emissions peak will be key. The earlier the peak in the 2020s, the more chance we have of achieving our below 2°C objective. The review of target methodologies included in the IPCC's 5th Assessment report (figure 15) suggested that

to meet the 2°C global goal, non-OECD Asia's emissions (of which China has a large share) would need to be between +7% and -33% of 2010 levels by 2030.

**4.15** Likewise, we would expect to see other major economies, with a smaller but growing share of emissions, such as India, South Africa, Brazil, Indonesia, the Gulf States, South Korea and Mexico take on commitments commensurate with their emissions levels, national circumstances and development needs. For example, India has low per capita emissions and is rightly focused on development and growth. We therefore expect India's emissions to grow in the near term. But it is the fourth largest emitter (after China, the US and the EU), and the earlier it can peak, around or shortly after 2030, the better.

**4.16** All of these countries stand to gain from early action through co-benefits including health, energy security and jobs, particularly as the costs of key technologies continue to fall. Some, for example Brazil and Indonesia, will likely include reforestation and preventing deforestation as significant components of their commitments. It is therefore important for the new Agreement to include land use; including a means of supporting ambition action in developing countries and verifying reduced deforestation.

### Other middle and lower income countries

**4.17** Middle-lower income countries in SE Asia, Latin America and Africa contribute a smaller share of global emissions, but cumulatively, their actions will have an impact. They vary widely in their GDP per capita and levels of poverty, and we would expect to see them contribute in a way that fits with their national circumstances, and their ability to act. A number of these countries are already taking ambitious action (as set out in Chapter 3), and they also have large potential in reducing emission from deforestation, as outlined above.

### Least developed countries and small island developing states

**4.18** We would expect the poorest countries, with very low emissions, and those most vulnerable to climate change, to contribute less. Their high levels of poverty, low GDP per capita, and high vulnerability is recognised within the UNFCCC. There is scope for these countries to lower their rate of emissions growth by taking advantage of opportunities to embark on low-carbon development pathways that aim to decouple emissions from growth. However, these countries will need support from the international community to do this and for many their top priority will be adaptation to climate risks e.g. flooding of low lying islands and extreme weather impacts on rural economies. But in many of these countries too, action to move to low-carbon development pathways, supported by new technologies, will not only reduce emissions, but also reduce energy bills, boost energy access and deliver development co-benefits, such as health.

### All countries should be ready well before Paris

**4.19** In order to ensure that the new agreement is one in which all countries make ambitious commitments to reduce their emissions, the UK is pushing through our bilateral engagement and discussions at international meetings, for countries to put their numbers on the table well before Paris. That requires all countries to step up their preparations, so that they are ready to put forward their own contribution to the new deal early in 2015. The UK has helped to provide support to a number of countries who need it to prepare their contributions, through organisations such as UNDP, the World Bank, CDKN and the World Resources Institute.

**4.20** It is important that we have time during 2015, before Paris, for all countries to develop a strong and clear understanding of all the commitments proposed: what emissions reductions are anticipated; how they were calculated; which sectors and gases are included; as well as the shape of the policies and measures likely to deliver the commitment.

**4.21** In addition to understanding the proposed commitments, we need time to assess whether they are ambitious enough both individually and collectively. It will allow international organisations and analysts to quantify the proposed emissions reductions and aggregate these so we can assess whether we are set to achieve our aim of keeping the below 2°C goal within reach. This will allow a consideration next year before commitments are inscribed about whether there is scope for countries' intended contributions to be strengthened. And it will inform agreement in Paris on what process for future reviews of ambition after 2015 might be necessary, as described in paragraph 4.10 above. The UK sees this as an important precursor to an ambitious deal. We want to have this conversation with our international counterparts, and we will continue to push for this through the negotiations.

### Tracking progress, building trust, and facilitating future ambition

**4.22** The individual commitments that countries put forward will not be the end of the story. A commitment to reduce emissions by a certain percentage means little if:

- The starting point is not explicit;
- The actual emission reductions are not clear; and
- There is no way of knowing whether those reductions have been met.

**4.23** In the same way that we need financial accounting standards for companies to understand how they are performing, we also need rules around emission reductions to make sure everyone can understand clearly which emissions are being reduced, by how much and how these reductions are calculated; and to build confidence that the world is acting together and delivering. Our experience with pledges put forward in Copenhagen has clearly highlighted the need for rules, as it has been extremely challenging to understand the true level of ambition of commitments and the rate of delivery because of the lack of a common and clear framework to track progress.

**4.24** We are not starting from scratch: we have been measuring, reporting and verifying emissions under the UNFCCC for many years. But the world has moved on and the new rules will need to accommodate a variety of commitments. The objective of the rules-based regime should not be to put unnecessary burdens on countries, rather to ensure that we promote transparency and accountability while incentivising ambition.

**4.25** We should first ensure that the rules are internationally legally binding, and that they are linked to a compliance regime which has the aim of facilitating compliance, rather than punishing non-compliance. To promote transparency, emissions should be monitored, reported and verified in a consistent and comparable manner. To measure commitments in a comparable way, we need to use common metrics and methodologies developed by the IPCC. Reporting of emissions should be publicly available and subject to some verification that gives confidence that emissions have been calculated adequately and accurately. It should promote international cooperation to ensure we improve the way we measure emissions and share lessons on best practices.

**4.26** But transparency alone is not enough. Without a common framework to track progress towards commitments, it will be difficult to know whether they are being met, and whether the world is on track. The ground rules should be adapted to whatever type of commitment a country might take (e.g. carbon budgets, absolute emission reductions, intensity targets, deviation from a baseline), that will allow the international community to understand the commitments and track progress on their delivery.

**4.27** These rules are particularly important in the context of carbon markets and the land sector. For example, we cannot have a situation in which one country can sell a unit of carbon to another, and both can use it towards their commitment. This would be double counting, and would mean that reductions on paper do not result in reductions of carbon in the atmosphere. Similarly, different accounting approaches to the land sector can have a substantial

impact on ambition. It is therefore important to ensure that the approaches used avoid any approaches that could undermine environmental integrity.

**4.28** Finally, but vitally, the agreement needs to provide a robust framework for countries to review and increase ambition in future years as they develop, as low-carbon technologies become more cost-effective, and based on the most up to date climate science. To promote ambition, it should include a review process at regular intervals that enables countries to increase their level of ambition in light of evolving national circumstances and ambition from others. As a rule, we must ensure that there is no rowing back from previous levels of ambition.

### **Providing support to those who need it, and helping all countries, particularly the poorest and most vulnerable, to develop climate resilience**

**4.29** Our vision of a successful agreement is one that helps all countries to achieve low-carbon, climate-resilient, sustainable development. This means providing support to those who need it to reduce their emissions, including, for example, through support for: initiatives in low and middle income countries to reduce emissions in sectors of their economies; rolling out new low-carbon technology to developing countries that need such assistance; action to prevent deforestation and promote reforestation in forest countries. Equally vital to reducing emissions will be providing support to help the poorest and most vulnerable to adapt to the impacts of climate change and minimise the risks of loss and damage.

**4.30** Developed countries have already committed to jointly mobilise \$100 billion per year, from a variety of sources, by 2020. The UK is playing its part, including through our £3.87 billion International Climate Fund (ICF) for 2011–2016, together with meeting the commitment to spend 0.7% of Gross National Income for Official Development Assistance from 2013. Other donors are also making significant efforts to scale up finance. For example, Germany has nearly quadrupled its annual climate finance contribution since 2005 from €471 million to approximately €1.8 billion in 2013.<sup>169</sup>

The Green Climate Fund (GCF) is an important part of the climate finance architecture, and will be important in building political momentum towards the deal. This is why we are working with others to ensure a successful round of initial contributions this year.

**4.31** It is important that traditional donors deliver on existing commitments. But the new agreement must go beyond these traditional donors to enhance the provision and increase the effectiveness of climate finance. It should ensure all countries are making efforts to mobilise climate finance according to their respective capabilities – particularly the major economies – from formulating low emission development strategies, implementing strategies and policies that increase climate investment, to mobilising domestic and international climate finance.

**4.32** The new agreement can also help to prioritise international public resources to where they are most needed. This includes catalysing low-carbon development and the rollout of technologies in developing countries that are taking ambitious action and leveraging private investment. Importantly though, it also includes supporting adaptation – particularly in the poorest countries.

**4.33** Beyond this climate finance, we know that significant additional investment is needed. Most of this additional investment cost will need to come from the private sector. But this can be mobilised through targeted public finance that can dramatically reduce the cost of capital, by for example targeted risk reduction projects and by actions to increase the familiarity of private lenders with low-carbon investments which may not be well represented in their current activity. Public climate finance remains vital and will need to be a core element of the new Agreement. This is why the UK is committed to continue to provide such public funding. But – especially in the area of mitigation – it will need to be targeted at mobilising private climate finance.

## Developing climate resilience: adaptation in the 2015 agreement

**4.34** The IPCC recognises that all countries are already experiencing some effects of climate change. We know the poorest and most vulnerable people will be hit first and hardest – they have the least capacity to adapt. The impacts will be felt by all, but women and girls face disproportionate impacts (see box on page 13). Countries are already taking action to adapt, and the UNFCCC already contains a commitment by all countries to do so. The UK supports adaptation through our ICF projects (see box on page 58).

**4.35** Against this backdrop, adaptation will be an important part of the 2015 agreement. It should assist all countries, but particularly the poorest and most vulnerable countries, in adapting to the consequences of climate change and increasing their resilience. The agreement should play a role in improving the effectiveness of the adaptation actions on the ground that countries choose to take as part of their national development planning. This will mean encouraging all countries to integrate adaptation into their mainstream economic development, rather than see it as a dimension that is added on at the end.

**4.36** Whilst the UNFCCC has already established a framework and institutions, such as the Adaptation Committee, and the International Warsaw International Mechanism for Loss and Damage, to guide its adaptation work, the new agreement is also an opportunity to reinvigorate all countries' commitment to share experiences, strengthen international cooperation and coordination and improve our understanding of what works.

**4.37** It will also need to provide for continued public funding from traditional and new donors to help poor countries undertake the necessary adaptation. However, relying on our collective ability to adapt to the consequences of climate change is an unaffordable and, in some places, potentially impossible strategy. As the Stern Review concluded it is cheaper to mitigate climate change than to pay for the costs of unmitigated climate change in the future.<sup>170</sup>

### International climate fund support for adaptation

Through the International Climate Fund (ICF), the UK is supporting adaptation programmes. We are working with the poorest countries in those sectors affecting poor peoples' livelihoods and which are vulnerable to climate change, including agriculture, water resources management, urban development, and disaster risk reduction. Our aim is to spend close to 50% of the ICF on projects focused on adaptation.

The UK's new 'BRACED' programme, for example, is responding to the challenge of increasing risks of climate related disasters. It will directly help more than 5 million people in developing countries across Africa and Asia, especially women and children, to cope with the impacts of extreme climate events such as droughts, floods and storms by providing grants to non-government organisations, research bodies, the private sector and other agencies to scale up activities on the ground. This includes, flood protection, water harvesting, early warning systems and community adaptation planning and insurance schemes.

### The path to Paris and beyond: the UK's role

**4.38 The prospects for a global deal are good but we face challenges in delivering an agreement in line with our vision. Building political ambition and ensuring that all countries prepare for the new agreement will be important in the run-up to Paris. The UK, with cross-Party unity on the need for this global deal, is in a strong position at home to maintain political momentum to Paris. So we, with the EU, are working hard to make the deal happen.**

**4.39** The UK has a strong history of leadership on international climate change, promoted by all the main political parties. Speaking at the UN General Assembly in 1989 Margaret Thatcher urged countries to come behind a new Convention on climate change, which went on to become the UNFCCC. Today we have both policy and practical partnerships with countries across the globe. We use these to share the UK's experience and expertise on reducing emissions and to help build resilience to the effects of climate change.

**4.40** The UK is playing an active role in the negotiations, at both official and Ministerial levels. We are reaching out to a broad range of countries and all country groupings in the UNFCCC negotiations to develop our own understanding of others' priorities and to shape the deal for Paris. In particular, the UK will work with the LDCs, Africa Group, Small Island Developing States (SIDS) and Latin American partners to ensure their interests are understood and to identify where our objectives coincide.

**4.41** The UK will enhance its dialogue with the BASIC countries (Brazil, South Africa, India and China), including at Ministerial level, and the Secretary of State has travelled to a number of these countries for discussions ahead of Lima. We will make particular use of our close relationships with our European partners, the US and other G7 colleagues to consider where these countries' objectives coincide with ours, especially on the rules and procedures within the new Agreement. And we are working with the most advanced economies, the other major economies in the G20 and beyond, including emerging economies across the Americas, Middle East and Asia; to ensure contributions to the 2015 Agreement are submitted well in advance of Paris and the mitigation ambition can keep the 2°C goal within reach.

**4.42** Through the FCO's network of nearly 270 diplomatic offices across the world we will use the UK's diplomatic influence to build political conditions for, and shape the content of, the new Agreement. The UK's participation in other international discussions – the Cartagena Dialogue for Progressive Action; the G7 and G20; the US-led Major Economies Forum – will offer further opportunities to work with all countries that attend to try to find ways forward on the trickiest issues within the UNFCCC.

**4.43** Our EU partners are vital to achieving our objectives in Paris next year. The EU and the Member States (including the UK) are each Parties to the UNFCCC and the Kyoto Protocol in their own right. However, within the UN negotiations the UK, the other Member States, and the EU negotiate as a team, which means the UK has a stronger voice. We are playing a central role in shaping EU positions and through this, influencing the international negotiations. We will support and help advance the EU position in the UN negotiations but also through EU outreach and dialogues with other countries.

### **Building momentum: political will**

**4.44** The prospects for a deal are good but we haven't forgotten the lessons learnt from the Conference of Parties (COP) in Copenhagen in 2009. We recognise the challenges to getting an agreement mean we need to make much more progress ahead of the 2015 COP itself. We are also aware that even with a successful outcome, Paris will not be the end of the story. Political will, commensurate with the scale and complexity of the global challenge we face, will be crucial in securing an agreement that: avoids the dangerous impacts of climate change; sends a clear signal to decision makers in both the public and private sectors globally that the future is low-carbon; and supports the poorest and most vulnerable to develop climate resilience. Working together, across the political spectrum and through the political calendar in 2015 here at home, our leadership and determination means we can deliver this in Paris next year.

“ Business needs three things from the political community: clarity, confidence, and perhaps most of all, courage. The more of these that the global business community can see, the greater and more transformational will be the business response.”

*Paul Polman, Unilever CEO, September 2014<sup>171</sup>*

“ Young people will not make the decisions at the COP meeting in Paris, but they will inherit the consequences. We know that two thirds of students are worried about climate change. I hope world leaders will take strong, agreed action for the greater good.”

*Toni Pearce, National President, NUS, September 2014<sup>172</sup>*

“ Climate change is already starting to bite and whether it's flooded homes in Britain or flattened villages in the Philippines, it's the most vulnerable who suffer most acutely. So not only do we need leaders to rise fast to the challenge, we also need to listen to ordinary people whose lives are already being shattered by climate change and ensure their demands for clean energy, secure food and a safe future for their children are met in any international agreement.”

*Andy Atkins, Chief Executive Officer, Friends of the Earth, September 2014<sup>173</sup>*

“ All countries have now heard the warnings from climate scientists; the IPCC tells us action is needed now and will make a difference. Many parts of the world, including some of the poorest and most vulnerable people, can already testify to the effects of climate change and we're starting to feel them ourselves at home. Given that no single country can solve the crisis for itself, we all need to play our part to solve the climate problem and to urge others to do the same. Together we can beat the problem: one of the greatest challenges the world has ever faced has the potential to create one of the world's greatest solutions.”

*Loretta Minghella, Chief Executive, Christian Aid, September 2014<sup>174</sup>*

“ Global co-operation on climate change is essential. We need an international agreement to end climate pollution, both to protect British businesses and families from the impacts of extreme weather, and to ensure that millions of people around the world have the opportunity to escape poverty and develop sustainably.”

*John Sauven, Executive Director, Greenpeace<sup>175</sup>*

“ There is a fashionable pessimism about multi-lateralism which shields people from disappointment but does nothing to protect us from the insecurity that climate change is bringing. Only a strong international agreement can avoid that and give nation states the confidence that they will not be alone as they decarbonise their energy systems.”

*Matthew Spencer, Director, Green Alliance<sup>176</sup>*

# Glossary

## Annex I Parties

The Parties listed in Annex I to the United Nations Framework Convention on Climate Change (UNFCCC or the Convention), committed to take action to mitigate climate change in accordance with Article 4(2) of the Convention. They include the 24 original OECD members, the European Union, and 14 countries with economies in transition. In addition, some of the Parties included in Annex 1 to the Convention have also taken on legally binding quantified emission limitation or reduction commitments for the period 2008-12 in accordance with Article 3 and Annex B of the Kyoto Protocol (KP). A further group has also consented to take on further a further quantified emission limitation or reduction commitment for the period 2013-2020, in accordance with the Doha Amendment to the KP.

## AR5

Fifth Assessment Report of the Intergovernmental Panel on Climate Change.

## Carbon Capture and Storage

A process consisting of separation of carbon dioxide from industrial and energy-related sources, transport to a storage location, and long-term isolation from the atmosphere.

## Cartagena Dialogue

The Cartagena Dialogue (also known as the Dialogue for Progressive Action) is an informal space, open to countries working towards an ambitious, comprehensive and legally binding regime in the UNFCCC, and who are committed, domestically, to becoming or remaining low-carbon. These are forward-looking countries, willing to work positively and proactively together, within and across regional groupings and traditional negotiating blocs in the UNFCCC. The aim of the Dialogue is to openly discuss the reasoning behind each other's positions and to explore areas where convergence and enhanced joint action could emerge. Participants include countries from Europe, Africa, the Middle East, Latin America and the Caribbean, the Pacific and Asia.

## CDKN

The Climate and Development Knowledge Network supports decision-makers in designing and delivering climate compatible development by combining research, advisory services and knowledge management in support of locally owned and managed policy processes. It works in partnership with decision-makers in the public, private and non-governmental sectors nationally, regionally and globally. The Network is managed by an alliance of organisations led by PricewaterhouseCoopers LLP (PwC), and including Fundación Futuro Latinoamericano, INTRAC, LEAD International, the Overseas Development Institute, and SouthSouthNorth. Its primary funding support comes from the UK and Dutch governments.

## Copenhagen Accord

The Copenhagen Accord is a political agreement, concluded at the 2009 UNFCCC Conference of the Parties, which calls on participating countries to pledge specific actions they will undertake to reduce greenhouse gas emissions. To date, over 90 countries, covering 80% of global emissions, have pledged to cut their emissions by 2020.

## Conference of the Parties (COP)

The supreme body of the UNFCCC, established by Article 7 of the Convention. It currently meets once a year to review the implementation of the Convention and makes decisions (within its mandate) which are necessary to promote effective implementation of the Convention. The word "conference" is not used here in the sense of "meeting" but rather of "association". The "Conference" meets in sessional periods, for example, the "fourth session of the

Conference of the Parties." It is often abbreviated using the number of the session, for example, COP.19.

## Green Climate Fund (GCF)

At COP.16 in Cancun in 2010, Governments established a Green Climate Fund as an operating entity of the financial mechanism of the Convention under Article 11. The GCF will support projects, programmes, policies and other activities in developing country Parties. The Fund will be governed by the GCF Board.

## Greenhouse gases (GHGs)

Atmospheric gases that absorb infrared radiation, including water vapour and carbon dioxide (CO<sub>2</sub>), and contribute to the "greenhouse effect", global warming and climate change. The major GHGs emitted by man and which are primarily responsible for current global warming and climate change are CO<sub>2</sub>, methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O). Less prevalent – but very powerful – man-made GHGs are hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF<sub>6</sub>).

## HFC

Hydrofluorocarbons.

## ICF

International Climate Fund. UK Government Fund to provide £3.87 billion between April 2011 and March 2016 to help the world's poorest adapt to climate change and promote cleaner, greener growth. Working in partnership with developing countries is aims to: reduce carbon emissions through promoting low-carbon development; help poor people adapt to the effects of climate change; and reduce deforestation.

## IEA

International Energy Agency

## Intergovernmental panel on Climate Change (IPCC)

Established by the United Nations Environment Programme and the World Meteorological Organization in 1988, the IPCC is the leading international body for the assessment of climate change. It publishes regular Assessment Reports and other outputs which provide the world with a clear scientific view on the current state of knowledge in climate change and its potential environmental and socio-economic impacts. The IPCC provides outputs to but is independent of the UNFCCC.

## Kyoto Protocol (KP)

An internationally legally binding agreement made under the Convention. Nevertheless, the KP requires separate ratification by States which wish to become Party to it. The KP places a number of obligations on Parties but a key feature is that, under Article 3 KP, Parties in Annex 1 to the Convention are able to take on legally binding quantified emission limitation or reduction commitments (QELRCs). The QELRCs are set out in Annex B to the KP. The QELRCs are established for commitment periods; the first commitment period ran from 2008-2012 and at CMP.18 a further commitment period was agreed. This second commitment period runs between 2013-2020.

## Meeting of the Parties to the Kyoto Protocol (CMP)

The Conference of the Parties to the UNFCCC also serves as the Meeting of the Parties to the KP, in accordance with Article 13 KP. Because not all Parties to the Convention are also Parties to the KP, when the Conference of the Parties serves as the meeting of the Parties to the Kyoto Protocol, it has a separate title, the CMP. The CMP is also abbreviated using the number of the session, for example, CMP.9. The CMP reviews the implementation of the KP and makes decisions to promote its effective

implementation.

## Least Developed Countries (LDCs)

The world's poorest countries. The criteria currently used by the Economic and Social Council (ECOSOC) for designation as an LDC include low income, human resource weakness and economic vulnerability. Currently 48 countries have been designated by the UN General Assembly as LDCs.

## Loss and damage

At COP 16 in Cancun in 2010, as part of the Cancun Adaptation Framework, Governments established a work programme in order to consider approaches to address loss and damage associated with climate change impacts in developing countries that are particularly vulnerable to the adverse effects of climate change. At COP19 in Warsaw in 2013, a new institutional arrangement – the Warsaw Mechanism for Loss and Damage, comprising finance, adaptation and technology experts – was established. Also under the Cancun Adaptation Framework, its remit is to enhance and promote knowledge of, and approaches to, addressing loss and damage as part of the spectrum of adaptation responses. It will report to the Conference of the Parties and its work will be reviewed in 2016.

## Major Economies Forum on Energy and Climate (MEF)

The Forum was launched on March 28 2009 by US President Barack Obama. The MEF is intended to facilitate a candid dialogue among major developed and developing economies, help generate the political leadership necessary to achieve a successful outcome at the annual UN climate negotiations, and advance the exploration of concrete initiatives and joint ventures that increase the supply of clean energy while cutting greenhouse gas emissions.

The 17 major economies participating in the MEF are: Australia, Brazil, Canada, China, the European Union, France, Germany, India, Indonesia, Italy, Japan, Korea, Mexico, Russia, South Africa, the United Kingdom, and the United States.

Collectively, these account for more than 80% of global greenhouse gas emissions.

## MRV

Measurement, Reporting and Verification. A process/ concept under the UNFCCC that allows for transparency, understanding and confidence in how, and progress being made by, Parties to the UNFCCC in meeting their obligations under the UNFCCC.

## Non-Annex I Parties

Refers to countries that have ratified or acceded to the United Nations Framework Convention on Climate Change but are not included in Annex I of the Convention.

## ODA

Official development assistance (ODA) is a term coined by the Development Assistance Committee (DAC) of the Organisation for Economic Co-operation and Development (OECD) to measure aid.

## OECD

Organisation for Economic Co-operation and Development.

## REDD

Reducing Emissions from Deforestation and Forest Degradation, a concept that would provide developing countries with a financial incentive to preserve forests.

## UNDP

United Nations Development Programme.

## UNEP

United Nations Environment Programme.

## UNFCCC

United Nations Framework Convention on Climate Change.

# Endnotes

- 1 HC Deb (2013-2014) 576 (part 126) col. 255 [online] Available at: <<http://www.publications.parliament.uk/pa/cm201314/cmhansrd/cm140226/debtext/140226-0001.htm#14022677000005>> [Accessed 27 August 2014].
- 2 President Obama of the United States of America. State of the Union Address, 28 January 2014. [online] Available at: <<http://www.whitehouse.gov/the-press-office/2014/01/28/president-barack-obamas-state-union-address>> [Accessed 27 August 2014].
- 3 Loeak, J., 2014. Marshall Islands President Calls for Climate Change Leadership Ahead of UN Summit. [online] Available at: <<http://skollworldforum.org/2014/07/02/marshall-islands-president-calls-climate-change-leadership-ahead-un-summit/>> [Accessed 27 August 2014].
- 4 The National People's Congress of the People's Republic of China, 2014. Full Text: Report on the Work of the Government. [online] Available at: <[http://www.npc.gov.cn/englishnpc/Speeches/2014-03/18/content\\_1856703.htm](http://www.npc.gov.cn/englishnpc/Speeches/2014-03/18/content_1856703.htm)> [Accessed 27 August 2014].
- 5 Modi, S.N., 2012. Convenient Action: Gujarat's Response to the Challenges of Climate Change. [online] Available at: <<http://www.narendramodi.in/convenient-action-2/>> [Accessed 27 August 2014].
- 6 Ki-moon, B., 2014. Climate Change affects us all. So what's stopping us joining forces to act on it? The Guardian, 6 May 2014. [online] Available at: <<http://www.theguardian.com/commentisfree/2014/may/06/climate-change-affects-all-solutions-new-york-summit>> [Accessed 27 August 2014].
- 7 Provided for this publication, September 2014.
- 8 Prime Minister David Cameron at the Commonwealth Heads of Government meeting November 2013.
- 9 To note: The first three sections of this chapter make extensive use of information in the three Working Group Reports of the Intergovernmental Panel on Climate Change's (IPCC) Fifth Assessment Report (AR5). With the exception of individual figures, these sections do not make specific references to AR5 within the text itself. [online] Available at: <<http://www.ipcc.ch/>>.
- 10 Robine, J.M., Cheung, S.L.K., Le Roy, S., Van Oyen, H., Griffiths, C., Michel, J.P., Herrmann, F.R., 2008. Death toll exceeded 70,000 in Europe during the summer of 2003. *Comptes rendus biologies*, 331(2), pp. 171-178.
- 11 Stott, P.A., Stone, D.A., Allen, M.R., 2004. Human contribution to the European heatwave of 2003. *Nature* 432, pp.610-614. [online] Available at: <<http://www.nature.com/nature/journal/v432/n7017/abs/nature03089.html>> [Accessed 26 August 2014].
- 12 Sweet, W., Zervas, C., Gill, S., Park, J.. Hurricane Sandy Inundation Probabilities Today and Tomorrow. [online] Available at: <[http://www.psmml.org/about\\_us/news/2013/workshop\\_2013/posters/Sweet\\_Hurricane\\_Sandy\\_GLOSS.pdf](http://www.psmml.org/about_us/news/2013/workshop_2013/posters/Sweet_Hurricane_Sandy_GLOSS.pdf)> [Accessed 25 August 2014].
- 13 Figure SPM8, Panel a). IPCC, 2013: Summary for Policymakers. In: *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. P22. [Accessed 26 August 2014].
- 14 Assessment Box SPM.1 Figure 1, right hand panel. IPCC, 2014: Summary for Policymakers. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. P4. [Accessed 26 August 2014].
- 15 Provided for this publication, September 2014.
- 16 Food Agriculture Organization of the United Nations, 2011. *The State of Food and Agriculture 2010-11: Women in Agriculture: Closing the gender gap for development*. [online] Available at: <<http://www.fao.org/docrep/013/i2050e/i2050e.pdf>> [Accessed 26 August 2014].
- 17 Coppock, D.L., Desta, S., Tezera, S., Gebru, G., 2011. Capacity Building Helps Pastoral Women Transform Impoverished Communities in Ethiopia. *Science*, [online] Vol. 334 no. 6061, pp. 1394-1398. Available through: Science website <<http://www.sciencemag.org/content/334/6061/1394.full>> [Accessed 28 August 2014].
- 18 FAO Corporate Document Repository. Women and sustainable food security. [online] Available at: <<http://www.fao.org/docrep/x0171e/x0171e02.htm>> [Accessed 25 August 2014].
- 19 Food Agriculture Organization of the United Nations, 2011. *The State of Food and Agriculture 2010-11: Women in Agriculture: Closing the gender gap for development*. [online] Available at: <<http://www.fao.org/docrep/013/i2050e/i2050e.pdf>> [Accessed 26 August 2014].
- 20 Although not separately referenced, this box draws extensively on information in the three Working Group Reports of the Intergovernmental Panel on Climate Change's (IPCC) Fifth Assessment Report (AR5) and the summaries produced jointly by the University of Cambridge Institute for Sustainability Leadership (CISL), the Cambridge Judge Business School (JBS) and the European Climate Foundation (ECF) [online] available at: <http://www.cisl.cam.ac.uk/Resources/Climate-and-Energy/Understanding-the-UN-Climate-Science-Reports.aspx>.
- 21 Provided for this publication, September 2014.
- 22 Provided for this publication, September 2014.
- 23 Melissa, D., Benjamin F. J. and Benjamin A. O., 2012. Temperature Shocks and Economic Growth: Evidence from the Last Half Century. *American Economic Journal: Macroeconomics*, [online] Vol. 4(3), pp.66-95. Available through: <[http://scholar.harvard.edu/files/dell/files/aej\\_temperature.pdf](http://scholar.harvard.edu/files/dell/files/aej_temperature.pdf)>. [Accessed 28 August 2014].
- 24 Provided for this publication, September 2014.
- 25 Bender, B., 2013. Chief of US Pacific Forces calls climate biggest worry. *Boston Globe*, 9 March, [online] Available at: <<http://www.bostonglobe.com/news/nation/2013/03/09/admiral-samuel-locklear-commander-pacific-forces-warns-that-climate-change-top-threat/BHdPVCLrWEMxRe9IXJZcHL/story.html>> [Accessed 28 August 2014].
- 26 Department of Defence: United States of America, 2014. *Quadrennial Defence Review 2014*. [online] Available at: <[http://www.defense.gov/pubs/2014\\_Quadrennial\\_Defense\\_Review.pdf](http://www.defense.gov/pubs/2014_Quadrennial_Defense_Review.pdf)> p.8 [Accessed 1 September 2014].
- 27 Ministry of Defence, 2014. *Global Strategic Trends – Out to 2045: Fifth Edition*. [online] Available at <[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/348164/20140821\\_DCDC\\_GST\\_5\\_Web\\_Secured.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/348164/20140821_DCDC_GST_5_Web_Secured.pdf)> p. 29 and p.39. [Accessed 3 September 2014]. and HM Government, 2010. *A Strong Britain in an Age of Uncertainty: The National Security Strategy*. [online] Available at <[http://www.direct.gov.uk/prod\\_consum\\_dg/groups/dg\\_digitalassets/@dg/@en/documents/digitalasset/dg\\_191639.pdf?CID=PDF&PLA=furl&CRE=nationalsecuritystrategy](http://www.direct.gov.uk/prod_consum_dg/groups/dg_digitalassets/@dg/@en/documents/digitalasset/dg_191639.pdf?CID=PDF&PLA=furl&CRE=nationalsecuritystrategy)> p.16. [Accessed 3 September 2014].

## Chapter 1

- 28 Government Office for Science, 2011. The Future of Food and Farming: Challenges and choices for global sustainability. [online] Available at: <[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/288329/11-546-future-of-food-and-farming-report.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/288329/11-546-future-of-food-and-farming-report.pdf)> p.37. [Accessed 3 September 2014].
- 29 Stewart, H. and Elliott, L., 2013. Nicholas Stern: 'I got it wrong on climate change – it's far, far worse'. Author of 2006 review speaks out on danger to economies as planet absorbs less carbon and is 'on track' for 4C rise. The Guardian, [online] (Last updated 8.24PM on 26 January 2013). Available at: <<http://www.theguardian.com/environment/2013/jan/27/nicholas-stern-climate-change-davos>> [Accessed 26 August 2014].
- 30 Stern, N., 2006. Stern review on the economics of climate change. Cambridge University Press Cambridge: New York, Melbourne, Madrid, Cape Town, Singapore, Sao Paulo 2006.
- 31 Weitzman, M.L., 2012. GHG Targets as Insurance Against Catastrophic Climate Damages. Journal of Public Economic Theory [online] 14(2), pp.221-244. Available through: Harvard University website <<http://scholar.harvard.edu/files/weitzman/files/ghgtargetsinsuranceagainst.pdf>> [Accessed 28 August 2014].
- And Dietz, S., and Stern, N., 2014. Endogenous growth, convexity of damages and climate risk: how Nordhaus' framework supports deep cuts in carbon emissions. Forthcoming in the 125th anniversary issue of The Economic Journal, published as a working paper. [online] Available at: <<http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2014/06/Working-Paper-159-Dietz-and-Stern-2014.pdf>> [Accessed 3 September 2014].
- 32 Provided for this publication, September 2014.
- 33 Adaptation Sub-Committee Progress Report 2014, 2014. Managing climate risks to well-being and the economy. [pdf] Committee on Climate Change 2014. Available at <[http://www.theccc.org.uk/wp-content/uploads/2014/07/Final\\_ASC-2014\\_web-version.pdf](http://www.theccc.org.uk/wp-content/uploads/2014/07/Final_ASC-2014_web-version.pdf)> p.29 [Accessed 28 August 2014].
- 34 Department for Environment, Food & Rural Affairs, 2014. Policy: Reducing the threats of flooding and coastal change. [online] Available at: <<https://www.gov.uk/government/policies/reducing-the-threats-of-flooding-and-coastal-change>> [Accessed 4 September 2014].
- 35 Adaptation Sub-Committee Progress Report 2014, 2014. Managing climate risks to well-being and the economy. [pdf] Committee on Climate Change 2014. Available at <[http://www.theccc.org.uk/wp-content/uploads/2014/07/Final\\_ASC-2014\\_web-version.pdf](http://www.theccc.org.uk/wp-content/uploads/2014/07/Final_ASC-2014_web-version.pdf)> p.29 [Accessed 28 August 2014].
- 36 Vardoulakis, S. and Heaviside, C. (Eds), 2012. Health Effects of Climate Change in the UK 2012: Current evidence, recommendations and research gaps. [pdf] London: Health Protection Agency. Available at: <[http://web.archive.nationalarchives.gov.uk/20140714084352/http://www.hpa.org.uk/webc/hpawebfile/hpaweb\\_C/1317135969235](http://web.archive.nationalarchives.gov.uk/20140714084352/http://www.hpa.org.uk/webc/hpawebfile/hpaweb_C/1317135969235)> p.2 [Accessed 28 August 2014].
- 37 Department for Environment, Food and Rural Affairs, 2013. The National Adaptation Programme: Making the country resilient to a changing climate. [pdf] London: Department for Environment, Food and Rural Affairs. Available at: <[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/209866/pb13942-nap-20130701.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/209866/pb13942-nap-20130701.pdf)> p.82 [Accessed 28 August 2014].
- 38 Department for Environment, Food and Rural Affairs, 2012. The UK Climate Change Risk Assessment 2012: Evidence Report. [online] Available at: <<http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=15747&FromSearch=Y&Publisher=1&SearchText=The UK Climate Change Risk Assessment 2012 Evidence Report&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description>> p.329, figure 9.2 [Accessed 3 September 2014].
- 39 Provided for this publication, September 2014.
- 40 Environment Agency, 2013. Managing flood and coastal erosion risks in England: 1 April 2012 to 31 March 2013. [pdf] Bristol: Environment Agency. Available at: <[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/297425/LIT\\_8443\\_200ddd.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/297425/LIT_8443_200ddd.pdf)> p.10 [Accessed 28 August 2014].
- 41 Gov.UK, 2014. UK Floods 2014: government response and recovery. [online] (7 May 2014) Available at: <<https://www.gov.uk/government/news/uk-floods-2014-government-response>> [Accessed 28 August 2014].
- 42 Carbon Disclosure Project, 2013. Reducing Risk and Driving Business Value: CDP Supply Chain Report 2012-13, p.3 and p.9 [pdf] London: Carbon Disclosure Project. Available at: <<http://www.accenture.com/SiteCollectionDocuments/PDF/Accenture-CDP-Supply-Chain-Report-2013.pdf>> [Accessed 3 September 2014].
- 43 Adaptation Sub-Committee Progress Report 2014. Managing climate risks to well-being and the economy. [pdf] Committee on Climate Change 2014. Available at <[http://www.theccc.org.uk/wp-content/uploads/2014/07/Final\\_ASC-2014\\_web-version.pdf](http://www.theccc.org.uk/wp-content/uploads/2014/07/Final_ASC-2014_web-version.pdf)> p.103 [Accessed 28 August 2014].
- 44 Department for Environment, Food & Rural Affairs, 2014. Policy: Adapting to climate change. [online] Available at: <<https://www.gov.uk/government/policies/adapting-to-climate-change/supporting-pages/national-adaptation-programme>> [Accessed 3 September 2014].
- 45 Provided for this publication, September 2014.
- 46 PricewaterhouseCoopers LLP for DEFRA, 2013. International threats and opportunities of climate change for the UK. [pdf] PricewaterhouseCoopers LLP. Available at: <<http://pwc.blogs.com/files/international-threats-and-opportunities-of-climate-change-to-the-uk.pdf>> p.2 [Accessed 28 August 2014].
- 47 Asda. The Challenge of a changing climate. [online] Available at: <[http://your.asda.com/system/dragonfly/production/2014/06/17/15\\_38\\_19\\_612\\_4234\\_Climate\\_Resilience\\_Campaign\\_a5\\_Brochure\\_v10.pdf](http://your.asda.com/system/dragonfly/production/2014/06/17/15_38_19_612_4234_Climate_Resilience_Campaign_a5_Brochure_v10.pdf)> [Accessed 26 August 2014].
- 48 Adaptation Sub-Committee Progress Report, 2014. Managing climate risks to well-being and the economy. [pdf] Committee on Climate Change 2014. Available at: <[http://www.theccc.org.uk/wp-content/uploads/2014/07/Final\\_ASC-2014\\_web-version.pdf](http://www.theccc.org.uk/wp-content/uploads/2014/07/Final_ASC-2014_web-version.pdf)> P117, figure 4.5 [Accessed 3 September 2014].
- 49 Managing climate risks to well-being and the economy. p117, figure 4.5.
- 50 Provided for this publication, September 2014.
- 51 The UNFCCC Cancun Agreements agreed at the 2010 Conference of Parties. United Nations Framework Convention on Climate Change. Cancun Climate Change Conference: November 2010. [online] Available at: <[https://unfccc.int/meetings/cancun\\_nov\\_2010/meeting/6266.php](https://unfccc.int/meetings/cancun_nov_2010/meeting/6266.php)> [Accessed 2 September 2014].
- 52 Arnell, N.W., Lowe, J.A., Brown, S., Gosling, S.N., Gottschalk, P., Hinkel, J., Lloyd-Hughes, B., Nicholls, R.J., Osborn, T.J., Osborne, T.M., Rose, G.A., Smith P., Warren, R.F., 2013. A global assessment of the effects of climate policy on the impacts of climate change. Nature Climate Change, 3, pp.512-519.
- 53 Ampere, 2014. Assessment of Climate Change Mitigation Pathways and Evaluation of the Robustness of Mitigation Cost Estimates. [online] Available at: <[http://ampere-project.eu/web/images/Final\\_Conference/ampere\\_synthesis\\_5-2014-compact.pdf](http://ampere-project.eu/web/images/Final_Conference/ampere_synthesis_5-2014-compact.pdf)> p.14 [Accessed 2 September 2014]. We have amended formatting for this publication.

## Chapter 2

- 54 Provided for this publication, September 2014.
- 55 Prince of Wales's Corporate Leaders Group, 2014. The Trillion Tonne Communiqué. [pdf] Available at: <<http://www.climatecommuniques.com/Trillion-Tonne-Communique.aspx>> [Accessed 28 August 2014].
- 56 Committee on Climate Change, 2008. Building a low-carbon economy – the UK's contribution to tackling climate change. [pdf] Available at: <<http://archive.theccc.org.uk/aws3/TSO-ClimateChange.pdf>> [Accessed 4 September 2014].
- 57 Department of Energy and Climate Change, 2014. 2012 UK Greenhouse Gas Emissions, Final Figures: Statistical release. [online] Available at: <[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/](https://www.gov.uk/government/uploads/system/uploads/attachment_data/)

- file/295961/20140204\_2012\_UK\_Greenhouse\_Gas\_Emissions\_Final\_Figures\_-\_revised\_27\_March\_2014.pdf> Table 3, p10 [Accessed 2 September 2014].
- 58 Green Investment Bank. Summary of Transactions. [online] Available at: <[http://www.greeninvestmentbank.com/media/25409/gib\\_ar\\_transactions\\_270814.pdf](http://www.greeninvestmentbank.com/media/25409/gib_ar_transactions_270814.pdf)> [Accessed 4 September 2014]. To note the mobilized £4.9bn= the UK GIB £1.4bn investment and £3.5bn private investment combined.
- 59 Department of Energy and Climate Change, 2014. Statistical Press Release: UK Energy Statistics. [Press Notice], 26 June 2014. Available at: <[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/323315/PN\\_June\\_14.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/323315/PN_June_14.pdf)> [Accessed 28 August 2014].
- 60 Department of Energy and Climate Change, 2014. Energy Investment Report. [online] Available at: <[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/305860/DECC\\_Energy\\_investment\\_report\\_Web\\_Final.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/305860/DECC_Energy_investment_report_Web_Final.pdf)> p4 [Accessed 2 September 2014].
- 61 Department of Energy and Climate Change, 2014. Delivering UK Energy Investment Report. [online] Available at: <[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/331071/DECC\\_Energy\\_Investment\\_Report.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/331071/DECC_Energy_Investment_Report.pdf)> p11 [Accessed 2 September 2014].
- 62 Department for Transport, 2013. Vehicle Statistics. [online] Available at: <<https://www.gov.uk/government/collections/vehicles-statistics>> [Accessed 4 September 2014].
- 63 Innovation & Technology, 2010. Nissan to Build Leaf Electric Vehicle in Sunderland. [online] Available at: <[http://www.nissan.co.uk/GB/en/inside-nissan/news/leaf\\_news/ev\\_news.html](http://www.nissan.co.uk/GB/en/inside-nissan/news/leaf_news/ev_news.html)> [Accessed 28 August 2014].
- 64 SMMT: Driving the Motor Industry, 2012. UK plant to build engines for BMW i8 plug-in hybrid sports cars. [online] Available at: <<http://www.smmt.co.uk/2012/06/uk-engine-plant-to-build-engines-for-bmw-i8-plug-in-hybrid-sports-cars/>> [Accessed 02 September 2014].
- 65 Department for Communities and Local Government, 2013. Energy measures to save £200 annually in fuel bills for a new home. [Press release] 30 June 2013. Available at: <<https://www.gov.uk/government/news/energy-measures-to-save-200-in-fuel-bills-for-a-new-home>> [Accessed 28 August 2014]. These headline numbers were drawn from published impact assessments. Note that the £16m is an equivalent annual net benefit taking into account the life cycle costs and benefits from all relevant buildings affected by changes made in 2013. The £200 saving in annual fuel bills for home owners is for a typical family/home and is the cumulative incremental saving from changes made in 2010 and 2013.
- 66 Department for Communities and Local Government, 2014. Next steps to zero carbon homes – Allowable Solutions: Government response and summary of response to the consultation. [pdf] London: Department for Communities and Local Government. Available at: <[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/327842/140626\\_Government\\_Response\\_to\\_Consultation\\_-\\_Next\\_Steps\\_to\\_Zero\\_Carbon\\_H\\_FINAL.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/327842/140626_Government_Response_to_Consultation_-_Next_Steps_to_Zero_Carbon_H_FINAL.pdf)> [Accessed 28 August 2014].
- 67 Department for Energy and Climate Change, 2014. Delivering UK Energy Investment. [pdf] London: Department for Energy and Climate Change. Available at: <[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/331071/DECC\\_Energy\\_Investment\\_Report.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/331071/DECC_Energy_Investment_Report.pdf)> p69 [Accessed 28 August 2014].
- 68 UK Scientific CCS Leadership (December 2013) – analysis undertaken by the UKCCSRC based on citations and publications as success indicators.
- 69 Department of Energy and Climate Change, 2013. CCS Cost Reduction Task Force Final Report. [online] Available at: <<https://www.gov.uk/government/publications/ccs-cost-reduction-task-force-final-report>> [Accessed 28 August 2014].
- 70 Department for Business, Innovation and Skills, 2014. Energy Intensive Industries: compensation for indirect costs of energy and climate change policies. [online] Available at: <<https://www.gov.uk/energy-intensive-industries-compensation-for-carbon-leakage>> [Accessed 3 September 2014].
- 71 Provided for this publication, September 2014.
- 72 Department of Energy and Climate Change. New energy reforms to support 250,000 jobs, keep bills down and produce cleaner energy. [press release] 19 December 2013. Available at: <<https://www.gov.uk/government/news/new-energy-reforms-to-support-250000-jobs-keep-bills-down-and-produce-cleaner-energy>> [Accessed 1 September 2014].
- 73 Department of Energy and Climate Change, Delivering UK Energy Investment Report, July 2014, p.11, 16. [online] Available at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/331071/DECC\\_Energy\\_Investment\\_Report.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/331071/DECC_Energy_Investment_Report.pdf) [Accessed 2 September 2014].
- 74 Department of Energy and Climate Change, 2014. Delivering UK Energy Investment Report. [online] Available at: <[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/331071/DECC\\_Energy\\_Investment\\_Report.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/331071/DECC_Energy_Investment_Report.pdf)> p70 [Accessed 2 September 2014].
- 75 Ernst & Young, 2014. Renewable energy country attractiveness index. [pdf] Ernst and Young. Available at: <[http://www.ey.com/Publication/vwLUAssets/Renewable\\_Energy\\_Country\\_Attractiveness\\_Index\\_41\\_-\\_June\\_2014/\\$FILE/EY-Renewable-Energy-Country-Attractiveness-Index-41-June-2014.pdf](http://www.ey.com/Publication/vwLUAssets/Renewable_Energy_Country_Attractiveness_Index_41_-_June_2014/$FILE/EY-Renewable-Energy-Country-Attractiveness-Index-41-June-2014.pdf)> P14 [Accessed 2 September 2014].
- 76 Department of Energy and Climate Change, 2014. Delivering UK Energy Investment Report. [online] Available at: <[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/331071/DECC\\_Energy\\_Investment\\_Report.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/331071/DECC_Energy_Investment_Report.pdf)> p42 [Accessed 2 September 2014].
- 77 Low-carbon Innovation Coordination Group, 2014. Coordinating Low-carbon Technology Innovation Support: The LCICG's Strategic Framework. [online] Available at: <[http://www.lowcarboninnovation.co.uk/working\\_together/strategic\\_framework/overview/](http://www.lowcarboninnovation.co.uk/working_together/strategic_framework/overview/)> P36 [Accessed 28 August 2014]. Note: summarised version of Table 1: Summary of potential of innovation up to 2050 for all TINA technologies (cumulative, discounted).
- 78 Provided for this publication, September 2014.
- 79 Carbon Trust, 2014. A "MUST" Win: Capitalising on New Global Low-carbon Markets to Boost UK Export Growth. [online] Available at: <<http://www.carbontrust.com/media/504208/ctc829-a-must-win-capitalising-on-new-global-low-carbon-markets.pdf>> p16, 18 and 19. [Accessed 28 August 2014].
- 80 Provided for this publication, September 2014.
- 81 Department for Business, Innovation and Skills, 2013. Low-carbon Environmental Goods and Services (LCEGS) Report 2011/12. [online] Available at: <[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/224068/bis-13-p143-low-carbon-and-environmental-goods-and-services-report-2011-12.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/224068/bis-13-p143-low-carbon-and-environmental-goods-and-services-report-2011-12.pdf)> [Accessed 1 September 2014].
- 82 Department of Energy and Climate Change, 2014. Delivering UK Energy Investment Report. [online] Available at: <[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/331071/DECC\\_Energy\\_Investment\\_Report.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/331071/DECC_Energy_Investment_Report.pdf)> p106 [Accessed 2 September 2014].
- 83 Carbon Trust, 2014. Opportunities in a resource-constrained world: How business is rising to the challenge. [online] Available at: <<http://www.carbontrust.com/media/468325/ctc828-opportunities-in-a-resource-constrained-world.pdf>> p12 [Accessed 28 August 2014].
- 84 Organisation for Economic Cooperation and Development/ International Energy Agency, 2013. Energy Efficiency Market Report, Executive Summary. [online] Available at: <<http://www.iea.org/Textbase/npsum/EEMR2013SUM.pdf>> p16 [Accessed 28 August 2014].
- 85 Sustainable Development Unit. NHS Carbon Footprint. [online] Available at: <<http://www.sduhealth.org.uk/policy-strategy/reporting/nhs-carbon-footprint.aspx>> [Accessed 2 September 2014].

- 86 Sustainable Development Unit. Case Studies. [online] Available at: <<http://www.sduhealth.org.uk/resources/case-studies.aspx>> [Accessed 2 September 2014].
- 87 Dr Lavery, G., Pennell, N., Brown, S. and Professor Evans, S., 2013. The Next Manufacturing Revolution: Non-Labour Resource Productivity and its Potential for UK Manufacturing. [pdf] Lavery/Pennell, 2degrees and IFM Management Technology Policy. Available at: <<http://www.nextmanufacturingrevolution.org/wp-content/uploads/2013/09/Next-Manufacturing-Revolution-full-report.pdf>> p10 [Accessed 28 August 2014].
- 88 Provided for this publication, September 2014.
- 89 Department of Energy and Climate Change, 2014. Delivering UK Energy Investment Report. [online] Available at: <[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/331071/DECC\\_Energy\\_Investment\\_Report.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/331071/DECC_Energy_Investment_Report.pdf)> p10 [Accessed 2 September 2014].
- 90 The Green Growth Group, 2013. Going for Green Growth: The case for ambitious and immediate EU low-carbon action. [pdf] Available at: <[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/253029/Green\\_Growth\\_Group\\_Joint\\_Pamphlet.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/253029/Green_Growth_Group_Joint_Pamphlet.pdf)> p13 [Accessed 28 August 2014].
- 91 International Energy Agency, 2011. World Energy Outlook 2011. [online] Available at: <[http://www.iea.org/publications/freepublications/publication/weo2011\\_web.pdf](http://www.iea.org/publications/freepublications/publication/weo2011_web.pdf)> [Accessed 2 September 2014].
- 92 Earp, M., 2014. UKCS Oil and Gas Production Projections. [pdf] London: Department of Energy and Climate Change. Available at <[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/287001/production\\_projections.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/287001/production_projections.pdf)> [Accessed 28 August 2014].
- 93 G7 Rome Energy Ministers Ministerial Meeting, 2014. Rome G7 Energy Initiative for Energy Security Joint Statement. [online] Available at: <[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/308669/Final\\_Joint\\_Declaration\\_may\\_6th\\_2014\\_DEFINITIVO.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/308669/Final_Joint_Declaration_may_6th_2014_DEFINITIVO.pdf)> [Accessed 28 August 2014].
- 94 Department for Environment Food and Rural Affairs, 2010. Air Pollution: Action in a Changing Climate. [pdf] London: Department for Environment Food and Rural Affairs. Available at <[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/69340/pb13378-air-pollution.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69340/pb13378-air-pollution.pdf)> p4 [Accessed 29 August 2014].
- 95 Read Report, 2009. Combatting Climate Change: A role for UK Forests. [online]. Available at <[www.forestry.gsi.gov.uk/readreport](http://www.forestry.gsi.gov.uk/readreport)> Chapters 8 and 10 [Accessed 3 September 2014].
- 96 European Environment Agency, 2014. European Union emission inventory report 1990–2012 under the UNECE Convention on Long-range Transboundary Air Pollution (LRTAP). [pdf] Copenhagen: European Environment Agency. Available at: <[http://www.eea.europa.eu/publications/lrtap-2014/at\\_download/file](http://www.eea.europa.eu/publications/lrtap-2014/at_download/file)> [Accessed 29 August 2014].
- 97 Chen, Ebenstein, Greenstone, Li, "Evidence on the impact of sustained exposure to air pollution on life expectancy from China's Huai River policy", Proceedings of the National Academy of Sciences. [online] Available at: <<http://www.pnas.org/content/110/32/12936.full.pdf+html?sid=a505a5dc-c915-447f-b1e1-99fb06c86a5b>> [Accessed 4 September 2014].
- 98 Committee on the Medical Effects of Air Pollution, 2010. The Mortality Effects of Long-Term Exposure to Particulate Air Pollution in the United Kingdom: A report by the Committee on the Medical Effects of Air Pollution. [pdf] Chiltern: Committee on the Medical Effects of Air Pollution. Available at: <[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/304641/COMEAP\\_mortality\\_effects\\_of\\_long\\_term\\_exposure.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/304641/COMEAP_mortality_effects_of_long_term_exposure.pdf)> [Accessed 29 August 2014].
- 99 Department for Environment Food and Rural Affairs, 2010. Air Pollution: Action in a Changing Climate. [pdf] London: Department for Environment Food and Rural Affairs. Available at: <[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/69340/pb13378-air-pollution.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69340/pb13378-air-pollution.pdf)> p7 [Accessed 29 August 2014].
- 100 Department for Environment Food and Rural Affairs, 2013. UK Biodiversity Indicators in Your Pocket 2013. [pdf] London: Department for Environment Food and Rural Affairs. Available at: <[http://jncc.defra.gov.uk/pdf/BIYP\\_2013.pdf](http://jncc.defra.gov.uk/pdf/BIYP_2013.pdf)> [Accessed 29 August 2014].
- 101 Joint National Conservation Committee and Department for Environment Food and Rural Affairs, 2012. UK Post-2010 Biodiversity Framework. [pdf] Peterborough: Joint National Conservation Committee and London: Department for Environment Food and Rural Affairs. Available at: <[http://jncc.defra.gov.uk/pdf/UK\\_Post2010\\_Bio-Fwork.pdf](http://jncc.defra.gov.uk/pdf/UK_Post2010_Bio-Fwork.pdf)> [Accessed 29 August 2014].
- 102 World Health Organisation, 2013. Global Health Observatory: Mortality from ambient air pollution. [online] Available at: <[http://www.who.int/gho/phe/outdoor\\_air\\_pollution/burden/en/](http://www.who.int/gho/phe/outdoor_air_pollution/burden/en/)> [Accessed 29 August 2014].
- 103 Provided for this publication, September 2014.
- 104 World Resources Institute. CAIT 2.0. 2014. Climate Analysis Indicators Tool: WRI's Climate Data Explorer. Washington, DC: World Resources Institute. Available at: <<http://cait2.wri.org>> [Accessed 2 September 2014]. Includes emissions from LULUCF; country emissions in 2012.
- 105 Department for Energy and Climate Change, 2013. Guidance International outreach work of the 2050 Calculator: The 2050 Calculator approach is being adapted and developed further by teams outside of the UK. [online] Available at: <<https://www.gov.uk/international-outreach-work-of-the-2050-calculator>> [Accessed 29 August 2014].

### Chapter 3

- 106 President H.E. Dr. Jakaya Kikwete, President of Tanzania. Opening speech at the Committee of African Heads of State and Government on Climate Change Meeting, Malabo, Equatorial Guinea, 25 June 2014. [online] Available at: <<http://www.ikulu.go.tz/index.php/media/speech/808>> [Accessed 29 August 2014].
- 107 World Resources Institute. CAIT 2.0. 2014. Climate Analysis Indicators Tool: WRI's Climate Data Explorer. Washington, DC: World Resources Institute. Available at: <<http://cait2.wri.org>> [Accessed 2 September 2014]. Includes emissions from LULUCF; country emissions in 2012.
- 108 United Nations Environment Program, 2013. The Emissions Gap Report 2013: A UNEP Synthesis Report. [online] Available at: <[http://www.unep.org/pdf/UNEP\\_Emissions\\_Gap\\_Report\\_2013.pdf](http://www.unep.org/pdf/UNEP_Emissions_Gap_Report_2013.pdf)> [Accessed 29 August 2014].
- 109 World Resources Institute. CAIT 2.0. 2014. Climate Analysis Indicators Tool: WRI's Climate Data Explorer. Washington, DC: World Resources Institute. Available at: <<http://cait2.wri.org>> [Accessed 2 September 2014]. Includes emissions from LULUCF; country emissions in 2012.
- 110 United Nations Environment Program, 2013. The Emissions Gap Report 2013: A UNEP Synthesis Report. [online] Available at: <[http://www.unep.org/pdf/UNEP\\_Emissions\\_Gap\\_Report\\_2013.pdf](http://www.unep.org/pdf/UNEP_Emissions_Gap_Report_2013.pdf)> [Accessed 29 August 2014].
- 111 World Resources Institute. CAIT 2.0. 2014. Climate Analysis Indicators Tool: WRI's Climate Data Explorer. Washington, DC: World Resources Institute. Available at: <<http://cait2.wri.org>> [Accessed 2 September 2014].
- 112 International Energy Agency, 2014. Special Report: World Energy Investment Outlook. [online] Available at: <<http://www.iea.org/publications/freepublications/publication/weio2014.pdf>> [Accessed 2 September 2014].
- 113 Nachmany, M., Fankhauser, S., Townshend, T., Collins, M., Landesman, T., Matthews, A., Pavese, C., Rietig, K., Schleifer, P. and Setzer, J., 2014. The Globe Climate Legislation Study: A Review of Climate Change Legislation in 66 Countries. 4th ed. London: GLOBE International and the Grantham Research Institute, London School of Economics. p8.
- 114 Nachmany, M., Fankhauser, S., Townshend, T., Collins, M., Landesman, T., Matthews, A., Pavese, C., Rietig, K., Schleifer, P. and Setzer, J., 2014. The Globe Climate Legislation Study:

- A Review of Climate Change Legislation in 66 Countries. 4th ed. p3.
- 115 The Globe Climate Legislation Study: A Review of Climate Change Legislation in 66 Countries. 4th ed.
- 116 The Globe Climate Legislation Study: A Review of Climate Change Legislation in 66 Countries. 4th ed. pp349-358.
- 117 Lazarowicz, M., 2010. Global Carbon Trading: A framework for reducing emissions. Norwich: The Stationary Office.
- 118 World Bank, 2014. The State and Trends of Carbon Pricing. Washington, DC: World Bank. Available at: <[http://www.wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2014/05/27/000456286\\_2014027095323/Rendered/PDF/882840AR0Carbo040Box385232B00OU090.pdf](http://www.wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2014/05/27/000456286_2014027095323/Rendered/PDF/882840AR0Carbo040Box385232B00OU090.pdf)> p25 [Accessed 29 August 2014].
- 119 World Bank, 2014. The State and Trends of Carbon Pricing. Washington, DC: World Bank. Available at: <[http://www.wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2014/05/27/000456286\\_20140527095323/Rendered/PDF/882840AR0Carbo040Box385232B00OU090.pdf](http://www.wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2014/05/27/000456286_20140527095323/Rendered/PDF/882840AR0Carbo040Box385232B00OU090.pdf)> p27 [Accessed 29 August 2014].
- 120 US Environmental Protection Agency: Cap and Trade. Cap and Trade Programs. [online] Available at: <<http://www.epa.gov/captrade/programs.html>> [Accessed 3 September 2014].
- 121 European Environment Agency, 2013. Trends and projections in Europe 2013: Tracking progress towards Europe's climate and energy targets until 2020, Executive Summary. [pdf] Copenhagen: European Environment Agency. Available at: <<http://www.eea.europa.eu/publications/trends-and-projections-2013>> [Accessed 1 September 2014].
- 122 This map was taken from the State and Trends of Carbon Pricing report 2014, developed by the World Bank and Ecofys, and published in May 2014. It was modified in August 2014 for the purpose of this report, to reflect the abolition of the Australian carbon pricing mechanism from 1 July 2014.
- 123 Provided for this publication, September 2014.
- 124 European Environment Agency, 2013. Trends and projections in Europe 2013: Tracking progress towards Europe's climate and energy targets until 2020, Executive Summary. [pdf] Copenhagen: European Environment Agency. Available at: <<http://www.eea.europa.eu/publications/trends-and-projections-2013>> [Accessed 1 September 2014].
- 125 World Resources Institute. CAIT 2.0. 2014. Climate Analysis Indicators Tool: WRI's Climate Data Explorer. Washington, DC: World Resources Institute. Available at: <<http://cait2.wri.org>> [Accessed 2 September 2014]. Includes emissions from LULUCF; country emissions in 2012.
- 126 Environmental Protection Agency, 2014. Federal Register, Vol. 79, No. 117. [pdf] available at: <<http://www.gpo.gov/fdsys/pkg/FR-2014-06-18/pdf/2014-13726.pdf>> P34832 [Accessed 29 August 2014].
- 127 Executive Office of the President, 2013. The President's Climate Action Plan. [pdf] Available at: <<http://www.whitehouse.gov/sites/default/files/image/president27sclimateactionplan.pdf>> [Accessed 29 August 2014].
- 128 Centre for Climate and Energy Solutions. Energy Efficiency Standards and Targets. [online] Available at: <<http://www.c2es.org/us-states-regions/policy-maps/energy-efficiency-standards>> [Accessed 29 August 2014]. And Renewable and Alternative Energy Portfolio Standards. [online] Available at: <<http://www.c2es.org/us-states-regions/policy-maps/renewable-energy-standards>> [Accessed 1 September 2014].
- 129 Elzen, M.D. (PBL Netherlands Environmental Assessment Agency), 2012. Implications of long-term global and developed country targets for developing countries to meet 2°C (EU effort-sharing). [online] Available at: <<http://www.mapsprogramme.org/wp-content/uploads/Brief-paper-EU-burden-sharing.pdf>> [Accessed 29 August 2014].
- 130 President Xi Jinping of China. Xi Stresses efforts to revolutionize energy sector. Xinhuan Report of the Meeting of the Central Leading Group on Financial and Economic Affairs, 13th June 2014. [online] Available at: <[http://news.xinhuanet.com/english/china/2014-06/13/c\\_133405882.htm](http://news.xinhuanet.com/english/china/2014-06/13/c_133405882.htm)> [Accessed 29 August 2014].
- 131 China Energy Statistics Summary Report 2013.
- 132 National Development and Reform Commission, People's Republic of China, 2007. Medium and Long-Term Development Plan for Renewable Energy in China(Abbreviated Version, English Draft). [online] Available at: <[http://www.martinet.info/China\\_RE\\_Plan\\_to\\_2020\\_Sep-2007.pdf](http://www.martinet.info/China_RE_Plan_to_2020_Sep-2007.pdf)> [Accessed 26 August 2014].
- 133 UNEP 2013. The Emissions Gap Report UNEP 2013. The Emissions Gap Report 2013. United Nations Environment Programme (UNEP), Nairobi. During the Warsaw Climate Change Conference in 2013, Xie Zhenhua reiterated China's goal of emission reduction by making sure that the commitment of reduction of emission per unit of GDP by 40-45% by 2020 from 2005 level is fulfilled. [online] Available at: <[http://usa.chinadaily.com.cn/world/2013-11/21/content\\_17119659.htm](http://usa.chinadaily.com.cn/world/2013-11/21/content_17119659.htm)> [Accessed 25 August 2014].
- 134 United Nations Environment Program, 2013. The Emissions Gap Report 2013: A UNEP Synthesis Report. [online] Available at: <<http://www.unep.org/pdf/UNEP-EmissionsGapReport2013.pdf>> [Accessed 29 August 2014].
- 135 Bureau of Energy Efficiency: A statutory body under the Ministry of Power, Government of India. National Mission on Enhanced Energy Efficiency published: 2008. [online] Available at: <<http://www.beeindia.in/content.php?page=schemes/schemes.php?id=8>> [Accessed 1 September 2014].
- 136 Planning Commission Government of India. Twelfth Five Year Plane 2012-17. [online] Available at <<http://planningcommission.nic.in/plans/planrel/12thplan/welcome.html>> [Accessed 1 September 2014]
- 137 Auffhammer, M. and Ramanathan, V., 2011. Climate change, the monsoon, and rice yield in India. Climatic Change, [online] Available at: <<http://www-ramanathan.ucsd.edu/files/pr186.pdf>> [Accessed 29 August 2014].
- 138 Modi, Shri Narendra, 2011. Convenient Action: Gujarat's Response to the Challenges of Climate Change (MacMillan Publishers India LTD, 2011).
- 139 Ministerio da Ciencia e Tecnologia, Projeto Prodes: Monitoramento da floresta amazonica Brasileira por satellite. [online] Available at: <<http://www.obt.inpe.br/prodes/index.php>> [Accessed 3 September 2014].
- 140 Federal Democratic Republic of Ethiopia Environmental Protection Authority, 2011. The path to sustainable development: Ethiopia's Climate Resilient Green Economy Strategy. [pdf] Federal Democratic Republic of Ethiopia Environmental Protection Authority. Available at: <[http://www.unccd2012.org/content/documents/287CRGE%20Ethiopia%20Green%20Economy\\_Brochure.pdf](http://www.unccd2012.org/content/documents/287CRGE%20Ethiopia%20Green%20Economy_Brochure.pdf)> [Accessed 29 August 2014].
- 141 Provided for this publication, September 2014.
- 142 REDD+ stands for Reducing Emissions from Deforestation and Forest Degradation, and fostering conservation, sustainable management of forests, and enhancement of forest carbon stocks.
- 143 BioCarbon Fund: Initiative for Sustainable Forest Landscapes. [online] Available at: <<http://www.biocarbonfund-isfl.org/>> [Accessed 29 August 2014].
- 144 United Nations Environment Program, 2013. The Emissions Gap Report 2013: A UNEP Synthesis Report. [online] Available at: <<http://www.unep.org/pdf/UNEP-EmissionsGapReport2013.pdf>> [Accessed 29 August 2014].
- 145 Renewable Energy Network for the 21st Century (REN21), 2014. Renewables 2014 Global Status Report. [pdf] Milan: REN21. Available at: <[http://www.ren21.net/Portals/0/documents/Resources/GSR/2014/GSR2014\\_full%20report\\_low%20res.pdf](http://www.ren21.net/Portals/0/documents/Resources/GSR/2014/GSR2014_full%20report_low%20res.pdf)> p17 [Accessed 29 August 2014].
- 146 Renewable Energy Network for the 21st Century (REN21), 2014. Renewables 2014 Global Status Report. [pdf] Milan: REN21. Available at: <[http://www.ren21.net/Portals/0/documents/Resources/GSR/2014/GSR2014\\_full%20report\\_low%20res.pdf](http://www.ren21.net/Portals/0/documents/Resources/GSR/2014/GSR2014_full%20report_low%20res.pdf)> p17 [Accessed 29 August 2014].
- 147 Bloomberg New Energy Finance, H2 2014 Wind Turbine Price Index.

- 148 Renewable Energy Network for the 21st Century (REN21), 2014. Renewables 2014 Global Status Report. [pdf] Milan: REN21. Available at: <[http://www.ren21.net/Portals/0/documents/Resources/GSR/2014/GSR2014\\_full%20report\\_low%20res.pdf](http://www.ren21.net/Portals/0/documents/Resources/GSR/2014/GSR2014_full%20report_low%20res.pdf)> P14 [Accessed 29 August 2014].
- 149 JPMorgan Chase & Co. Expanding Bond Market for Green Projects. [online] Available at: <<http://www.jpmorganchase.com/corporate-responsibility/green-bonds>> [Accessed 4 September 2014].
- 150 Carbon Disclosure Project, 2013. Are UK companies prepared for the international impacts of climate change? A FTSE 350 Climate Change Report 2013. [pdf] London: CDP. Available at: <<https://www.cdp.net/CDPResults/CDP-FTSE-350-Climate-Change-Report-2013.pdf>> P35 [Accessed 29 August 2014].
- 151 Nelson, J., 2014. Insurers must adapt to climate change: A Lloyds report is calling for the industry to consider new catastrophe modeling after the harsh lessons of Hurricane Katrina and Superstorm Sandy. The Guardian, [online] (last updated 18:44 BST on 11 May 2014). Available at: <<http://www.theguardian.com/commentisfree/2014/may/11/insurers-climate-change-lloyds-catastrophe-modelling-hurricane-katrina-superstorm-sandy>> [Accessed 29 August 2014].
- 152 Department for Energy and Climate Change, 2012. Climate Public Private Partnership (CP3). [online] Available at: <<https://www.gov.uk/government/case-studies/climate-public-private-partnership-cp3>> [Accessed 1 September 2014].
- 153 International Finance Corporation, World Bank Group, 2014. IFC Catalyst Fund Completes Fundraising at \$418 million for Climate-Related Investments. [online] Available at: <<http://ifcext.ifc.org/ifcext/pressroom/IFCPressRoom.nsf/0/0F16BCA CFBC6D5C985257D090067EB45>>
- 154 Climate Finance Lab, 2014. [online] Available at: [www.ClimateFinanceLab.org](http://www.ClimateFinanceLab.org).
- 155 NY.GNP.PCAP.PP.CD> [Accessed 3 September 2014].
- 166 EU Council Conclusions, October 2009. [online] Available at: <[http://www.consilium.europa.eu/uedocs/cms\\_data/docs/pressdata/en/ec/110889.pdf](http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/110889.pdf)> [Accessed 3 September 2014].
- 167 G7 Leaders' Declaration, 2009. Responsible Leadership for a Sustainable Future. [online] Available at: <[http://www.g8italia2009.it/static/G8\\_Allegato/G8\\_Declaration\\_08\\_07\\_09\\_final%20c0.pdf](http://www.g8italia2009.it/static/G8_Allegato/G8_Declaration_08_07_09_final%20c0.pdf)> [Accessed 3 September 2014].
- 168 International Energy Agency, 2013. World Energy Outlook: 2013. Paris: OECD/IEA. To note: Projections based on the WEO New Policies Scenario, which incorporates the impact of existing energy and climate policies that have been already been implemented or announced. Excludes CO<sub>2</sub> emission from LULUCF.
- 169 The Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety. The International Climate Initiative. [online] Available at: <<http://www.international-climate-initiative.com/print/en/issues/climate-financing/>> [Accessed 29 August 2014].
- 170 National Archives. Stern Review: The Economics of Climate Change: Executive Summary. [online] Available at: <[http://webarchive.nationalarchives.gov.uk/20130129110402/http://www.hm-treasury.gov.uk/d/Executive\\_Summary.pdf](http://webarchive.nationalarchives.gov.uk/20130129110402/http://www.hm-treasury.gov.uk/d/Executive_Summary.pdf)> [Accessed 01 September 2014].
- 171 Provided for this publication, September 2014.
- 172 Provided for this publication, September 2014.
- 173 Provided for this publication, September 2014.
- 174 Provided for this publication, September 2014.
- 175 Provided for this publication, September 2014.
- 176 Provided for this publication, September 2014.

#### Chapter 4

- 155 President Obama of the United States of America, 25 June 2013. Remarks by the President on Climate Change. Georgetown University, Washington, D.C. [online] Available at: <<http://www.whitehouse.gov/the-press-office/2013/06/25/remarks-president-climate-change>> [Accessed 29 August 2014].
- 156 Provided for this publication, September 2014.
- 157 Provided for this publication, September 2014.
- 158 Provided for this publication, September 2014.
- 159 Provided for this publication, September 2014.
- 160 United Nations Environment Program, 2013. The Emissions Gap Report 2013: A UNEP Synthesis Report. [online] Available at: <<http://www.unep.org/pdf/UNEPemissionsgapreport2013.pdf>> [Accessed 29 August 2014]. Defined as a medium (50-66%) chance of limiting global temperature rise to 2°C above pre-industrial levels. For likely (greater than 66%) chance of limiting global temperature rises to 2 degrees, global emissions would need to be 35Gt in 2030.
- 161 World Resources Institute. CAIT 2.0. 2014. Climate Analysis Indicators Tool: WRI's Climate Data Explorer. Washington, DC: World Resources Institute. Available at: <<http://cait2.wri.org>> [Accessed 2 September 2014]. Includes emissions from LULUCF; country emissions in 2012.
- 162 Höhne, N., Elzen, M.D. and Escalante, D., 2013. Regional GHG reduction targets based on effort sharing: a comparison of studies. Climate Policy, 14(1), pp. 122-147.
- 163 The World Bank. GNI per capita, PPP (current international \$). [online] Available at: <<http://data.worldbank.org/indicator/NY.GNP.PCAP.PP.CD>> [Accessed 3 September 2014].
- 164 World Resources Institute. CAIT 2.0. 2014. Climate Analysis Indicators Tool: WRI's Climate Data Explorer. Washington, DC: World Resources Institute. Available at: <<http://cait2.wri.org>> [Accessed 2 September 2014]. Includes emissions from LULUCF; country emissions in 2012.
- 165 The World Bank. GNI per capita, PPP (current international \$). [online] Available at: <<http://data.worldbank.org/indicator/>>

© Crown copyright 2014  
Department of Energy & Climate Change  
3 Whitehall Place  
London  
SW1A 2AW

[www.gov.uk/decc](http://www.gov.uk/decc)

URN: 14D/339