

Moving to a global low carbon economy: implementing the Stern Review

October 2007



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HM Government

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FOREWORD BY THE RT HON ALISTAIR DARLING MP, CHANCELLOR OF THE EXCHEQUER

The publication of the Stern Review a year ago was a critical moment for our understanding of the implications of climate change. It underlined the need for international action and broadened discussion around the world.

The crucial work done by Sir Nicholas Stern put beyond doubt that climate change is not only an environmental challenge, it is an economic challenge. Put simply, to enjoy future economic growth you must deal with climate change. That is why I am committed to putting tackling climate change at the heart of what we do at the Treasury, just as it is at the heart of the Government's work.

So this paper, published today alongside the Government's 2007 Comprehensive Spending Review, sets out how the UK is implementing the Stern Review both at home and with its international partners, providing a stock take of the past 12 months and a forward look.

The UK has a comprehensive set of policies in place to tackle greenhouse gas emissions, set out in the Climate Change Programme and the Energy White Paper. We are already on track to almost double our target under the Kyoto Protocol, and the Climate Change Bill, which is due to be introduced shortly to Parliament, will put the UK's ambitious long-term targets for further cuts in carbon dioxide emissions of at least 60 per cent by 2050, into legislation – the first of its kind anywhere in the world.

But the UK cannot tackle climate change alone. It is a global problem, and an international agreement is urgently needed to follow the first commitment phase of the Kyoto Protocol, which ends in 2012. We need to build on this existing framework to take forward global action that responds to the urgency of the threat.

Securing a comprehensive international agreement will not be easy, and there is a significant challenge ahead to avoid the threat of serious climate change. But the UK is determined to implement the conclusions of the Stern Review and encourage the reduction of carbon emissions across the globe. With international cooperation we can make significant progress towards averting this serious threat.



Rt Hon Alistair Darling MP

EXECUTIVE SUMMARY

1. Climate change is one of the most pressing challenges facing the world today. This document, published alongside the Government's 2007 Comprehensive Spending Review (CSR) and the 2007 Pre-Budget Report, sets out how the Government is seeking to move towards an efficient low carbon global economy. It also provides a forward look at the Government's plans for international and domestic actions over the coming months, to deliver lasting emissions reductions and reduce the likelihood of dangerous climate change.

The Stern Review's findings

2. A year ago, the Stern Review concluded that the costs of stabilising the climate are significant but manageable, whereas delay will be costly and dangerous. The Review found that climate change would affect the basic elements of life for people around the world – access to water, food production, health and the environment. Using formal economic models, the Review estimated that temperature increases associated with current business as usual emissions could lead to damages equivalent to as much as 5-20 per cent of global GDP. But if the world takes action now, and with the right policies in place, stabilisation of greenhouse gas concentrations at a level that avoids the most dangerous impacts of climate change could cost around 1 per cent of global GDP. This is significant but is clearly less than the costs of not taking action.

The need for an international solution

3. Climate change is a global problem that can only be solved through collective international action. The UK can help prevent dangerous climate change by showing the international community that a healthy low carbon economy is possible and affordable. But we also need to build on the existing international framework to take forward global action proportionate to the scale and urgency of the threat, particularly to the world's most vulnerable countries and communities. By strengthening this framework, we can provide the global policy certainty needed to drive greater investment in low carbon technology and financial flows to developing countries, as well as encouraging countries to adapt to the unavoidable impacts of climate change.

4. The global community must therefore collectively agree and deliver a plan to reduce greenhouse gas emissions to a level that avoids dangerous climate change. Significant steps have already been taken by the European Union on climate change. At the Spring European Council in March 2007, EU Heads of Government approved an ambitious climate change and energy package, including targets on greenhouse gas reductions, biofuels and renewable energy, which represented a decision to shift towards a competitive low carbon economy in Europe. This year's G8 Summit in Heiligendamm marked further progress, in particular agreement by leaders on the need for a global emissions goal and the central role for the United Nations Framework Convention on Climate Change (UNFCCC) in international negotiations.

A post 2012 framework

5. The UK, along with its EU partners, is seeking to launch comprehensive negotiations on a future framework at the UNFCCC meeting in Bali in December 2007, to ensure we conclude negotiations by 2009. The UK believes that a post 2012 framework must contain the following elements to tackle climate change:

- a long-term goal of reducing global greenhouse gas emissions by at least 50 per cent by 2050 on 1990 levels;
- deeper absolute emission reduction commitments by all developed countries;
- further fair and effective contributions by other countries;
- extending the carbon market, including innovative and enhanced flexible mechanisms;

- increasing cooperation on technology research, development, diffusion, deployment and transfer;
- enhancing efforts to address adaptation, including risk management instruments, finance and technologies for adaptation;
- addressing emissions from international aviation and maritime transportation; and
- reducing emissions from deforestation and enhancing sinks by sustainable forest management and land use practices.

The UK's policy framework 6. Within that framework, it is imperative that the proposals the UK and others implement to reduce emissions are achievable, affordable, and consistent with high and sustained economic growth. The Stern Review noted that the costs of moving to a low carbon economy could be minimised with policy frameworks that are credible, predictable and flexible, and that are built around three key elements:

- establishing a carbon price associated with the emission of greenhouse gases, so that governments, businesses and individuals are able to factor the cost of damages caused by climate change into their decisions. Carbon can be priced through trading, taxes, or regulatory standards, or indeed through a combination of all three. The Stern Review recognised that different approaches will fit differing circumstances;
- encouraging innovation in low-carbon technologies – through policies that address separately the market failures associated with innovation and bring forward low-carbon technologies in a timely and cost-effective way; and
- removing barriers to action, as there are many other opportunities to reduce emissions that are unlikely to be taken up without policies to encourage long-term behaviour change, and to overcome other barriers that may prevent or deter individuals and businesses from taking cost-effective action to reduce their emissions, particularly on energy efficiency.

7. The UK already has a principled framework for intervention to meet environmental objectives, and within this structure has introduced a comprehensive set of policies that reflect the key elements of the Stern Review framework, including:

A price for carbon

- cap and trade: the EU Emissions Trading Scheme sets a cap on emissions from key sectors and creates a carbon price covering around 50 per cent of the UK's emissions, allowing reductions to be made where they are cheapest;
- fiscal measures: for example, fuel duty is the principal way of pricing emissions in the road transport sector;

Supporting low carbon technologies

- the Renewables Obligation, which supports the development and deployment of emerging renewable electricity technologies through an obligation on electricity supply companies;
- the Renewable Transport Fuel Obligation, which incentivises the development of bio-fuels and other renewable fuel sources;
- the research, development and deployment of low carbon technology are aided through direct funding support. Examples include the new Energy Technologies Institute, which aims to provide up to £1.1 billion over 10 years from private and public sectors for applied research and development, and the

Behaviour change and overcoming other barriers

domestic element of the new Environmental Transformation Fund, worth £370 million over the 2007 CSR period. The UK also supports the Clean Energy Investment Framework being developed by the World Bank and other multilateral finance institutions, amongst others;

- the Act on CO₂ publicity campaign to encourage citizens to appreciate that they can make a difference;
- other policy measures to encourage long-term behaviour change include the Energy Efficiency Commitment/Carbon Emissions Reduction Target, revised building regulations, and information and advice for households and businesses; and
- the further measures announced at Budget 2007, aimed at incentivising behaviour change and improving energy efficiency across the economy. These included announcements of Vehicle Excise Duty rates for the next three years, with rates for the most polluting cars rising to £400 and rates for cleaner cars falling, as well as a rise in Climate Change Levy rates in line with current inflation, and a package of measures to support sustainable biofuels. In addition, the 2006 Pre-Budget Report announced an increase in all rates of Air Passenger Duty, in recognition of the environmental costs of air travel, and a time-limited Stamp Duty Land Tax exemption for the vast majority of new zero carbon homes. The Government keeps fiscal measures under review, and the 2007 Pre-Budget Report, published today, announces further reforms in support of the Government's environmental objectives.

Deforestation 8. The Stern Review also drew attention to one particular source of global emissions – deforestation – where there is a major opportunity to step up international action. Deforestation accounts for more global emissions than the transport sector, and reducing or avoiding it offers a highly cost-effective way to reduce global greenhouse gas emissions. The UK is therefore working with a number of countries to help avoid or reduce deforestation and is providing £50 million from the new international element of the Environmental Transformation Fund to support projects in the Congo Basin.

Adaptation 9. Alongside policies designed to reduce greenhouse gas emissions, both developed and developing countries need to adapt to the unavoidable impacts of climate change. Developing countries will be amongst the hardest hit by climate change, and this has significant implications for the achievement of development goals. The UK, along with other bilateral and multilateral development agencies, is actively exploring how to support more effective adaptation, including through better risk management tools, technology and finance.

10. In the UK, adaptation will be required to reduce the costs and disruption caused by climate change, particularly from extreme weather events such as storms, floods and heat waves. This is why the Government is announcing in the 2007 CSR that funding for flood and coastal erosion risk management will increase from £600 million in 2007–08 to £800 million in 2010–11.

11. The urgency of this challenge is very clear. The UNFCCC Conference in Bali in December should recognise the scale of the problem, the affordability of measures to mitigate the threat, and the imperative for early action, if the sustainable economic development to which all countries have a right is to be achieved. The UK looks forward to Bali, where we hope to make serious progress with the global community on the shape of a post 2012 future framework.

12. Meanwhile, the Government continues to exercise its own international and domestic responsibilities to reduce emissions. The Climate Change Bill, which is due to be introduced in the next Parliamentary session, will improve the credibility and predictability of policy by putting the UK's long-term target of cutting emissions by at least 60 per cent by 2050, and 26-32 per cent by 2020, into legislation, the first of its kind anywhere in the world. The Energy White Paper, published in May 2007, sets out the Government's international and domestic climate change and energy strategy to address the UK's long-term energy challenges.

13. But the UK cannot be complacent, and the Government will continue to keep its policies under review, to ensure that the potential for cost-effective emissions reductions is maximised, and that if necessary it further develops its policies to deliver on its long-term goals.

THE STERN REVIEW OF THE ECONOMICS OF CLIMATE CHANGE

INTRODUCTION

1.1 Tackling climate change is one of the most pressing challenges facing the world today. The scientific evidence about climate change and its likely impacts is increasingly firm, and provides a strong case for cost-effective action in order to move to a global low carbon economy. In order to take effective global action, an understanding of the costs of these impacts, and how best to mitigate the most serious consequences, also needs to be developed. The Government therefore commissioned Sir Nicholas Stern in July 2005 to lead a major independent review of the economics of climate change, in order to develop a more comprehensive understanding of the nature of the economic challenges and how they can be met. The Stern Review reported on 30 October 2006.

1.2 This document, published alongside the Government's 2007 Comprehensive Spending Review and 2007 Pre-Budget Report, one year on from the publication of the Stern Review, draws together the key aspects of the Government's response to date, and future priorities, in the context both of ongoing international negotiations and of the UK's efforts at home and abroad to reduce greenhouse gas emissions. It builds on the Government's publication *Long-term opportunities and challenges in the 2007 Comprehensive Spending Review*, which identified the increasing pressures on our natural resources and global climate as a key challenge for the next decade and beyond.¹ It also provides a forward look at the Government's planned international and domestic actions over the coming months to deliver lasting emissions reductions, in order to reduce the likelihood of dangerous climate change, while building resilience to those impacts of climate change to which we are already committed.

The Government's response to the Stern Review

1.3 The Government's policy response to the Stern Review has been comprehensive, with the policies and mechanisms already in place complemented by new policies and actions across a range of sectors. The Government recognises that climate change policy must derive from a simple and efficient regulatory framework, so as to avoid inconsistent measures that would weaken UK economic growth and the influence of its response internationally. The Energy White Paper, published in May 2007 and building on the 2006 Energy Review, was a key part of that response, setting out in detail the Government's objectives, analysis and policies for future climate change and energy policy. The Climate Change Bill, which will be introduced into Parliament shortly, will take this forward by introducing a legally binding framework for long-term action to reduce the UK's carbon emissions, the first of its kind anywhere in the world. Detailed analysis building on the Stern Review has been, and continues to be, produced by the Government to support the development and implementation of new policies.² The Government's response to climate change needs to be developed alongside policies to address other related priorities, in particular the need to ensure the UK has a secure, clean and affordable energy supply, and to maintain a strong economy.

1.4 Alongside the integration of the Stern Review's conclusions into the UK's domestic and international policies, it is also essential that its findings continue to be disseminated and developed. The UK is encouraging other regions and countries to continue to develop the evidence base on the economics of climate change. This work is detailed further in Chapter 2.

¹ *Long-term opportunities and challenges in the 2007 Comprehensive Spending Review*, HM Treasury, November 2006, www.hm-treasury.gov.uk

² For example interim guidance, 'How to use the Shadow Price of Carbon in policy appraisal', August 2007, www.defra.gov.uk

I.5 This chapter summarises the key conclusions of the Stern Review, and the framework it sets out for global policy to tackle climate change.

THE CASE FOR ACTION

A post-2012 framework: the need for global consensus

Global agreement to reduce emissions is needed

I.6 Climate change is a global problem that can only be solved through collective international action. The latest science shows us that climate change is a bigger and more urgent challenge than had previously been understood. The economics are clear: as the Stern Review shows, the benefits of strong early action heavily outweigh the costs. The existing United Nations Framework Convention on Climate Change (UNFCCC) framework and the Kyoto Protocol provide the overall framework for international action, but we now need to build on this to deliver global action proportionate to the scale and urgency of the threat, particularly to the world's most vulnerable countries and communities. An enhanced UNFCCC framework can provide the policy certainty which will drive the global investment and financial flows needed to research, develop and deploy low carbon technologies and to adapt to climate change.

I.7 The global community must collectively agree and deliver a plan to reduce greenhouse gas emissions, in order to meet the ultimate objective of stabilising greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. This will involve a more mixed and flexible form of commitments than we currently have. The UK, along with its EU partners, is seeking to launch comprehensive negotiations on a future framework at the UNFCCC meeting in Bali this December, in order to ensure we conclude negotiations by 2009. As national ratification of international treaties can take two to three years, international agreement must be reached by the end of 2009 to avoid a gap between the first and second commitment phases of the Kyoto Protocol. The UK has been working closely with global leaders throughout 2007, and will continue to engage international partners in the lead up to the meeting in Bali and beyond. This is explored further in Chapters 2 and 3.

Intergovernmental Panel on Climate Change reports have reaffirmed the scientific case for action

Greenhouse gas concentrations are increasing

I.8 The first step in building a global consensus around the case for action is to build a shared international understanding of the science of climate change. Scientific evidence used as the basis for the Stern Review confirmed that carbon dioxide concentrations in the atmosphere have increased by just over one third, from 280 parts per million (ppm) in pre-industrial times to around 380ppm today.³ In total, the atmospheric concentration of all Kyoto greenhouse gases is now equivalent to around 430 ppm of carbon dioxide equivalent (CO₂e) and this is rising by approximately 2.5ppm each year.⁴

³ *The Economics of Climate Change: The Stern Review*, Cambridge University Press, 2007

⁴ Carbon dioxide equivalent concentration (in parts per million) of carbon dioxide and the other Kyoto greenhouse gases (methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride)

I.9 The recent Intergovernmental Panel on Climate Change (IPCC) report on the physical science of climate change has confirmed that concentrations of carbon dioxide and other greenhouse gases have increased markedly as a result of human activities, with observations of increases in the world's air and ocean temperatures, widespread melting of snow and ice and rising sea levels.⁵ The burning of fossil fuels, and changes in the use of land, especially deforestation, have led to warming of approximately 0.7°C since around 1900. Research suggests that a doubling of pre-industrial gases is likely to cause a rise in global mean equilibrium temperatures of between 2-4.5°C, with a best estimate of 3°C.⁶ Emissions could increase by more than this amount, leading to scenarios in which temperatures could rise by 5-6°C by the end of the century.

This warming will have impacts around the globe

I.10 This projected warming could have a range of impacts around the world.⁷

- **Water:** On current trends, average global temperatures could rise by 2-3°C within the next fifty years, leading to many severe impacts which will often be felt through water. Climate change will alter patterns of water availability by intensifying the water cycle, with droughts and floods becoming more severe in certain areas;
- **Food:** In tropical areas, even small amounts of warming will lead to declines in crop yields. Agriculture currently employs 22 per cent of the global population and occupies 40 per cent of the land area. Many of the effects of climate change on agriculture will depend on the degree of adaptation, which itself will be determined by income levels, market structure, and farming type. Temperature rises of 2-3°C could increase the number of those at risk from hunger, with declining crop yields likely to leave hundreds of millions without the ability to produce or purchase sufficient food, particularly in the poorest parts of the world;
- **Health:** Climate change will increase worldwide deaths from malnutrition and heat stress. Vector-borne diseases such as malaria and dengue fever could become more widespread if effective control measures are not in place. In higher latitudes, cold-related deaths will decrease;
- **Land:** Sea level rise will increase coastal flooding, raise costs of coastal protection, lead to loss of wetlands and coastal erosion, and increase saltwater intrusion into surface and groundwater. Some estimates suggest that 150-200 million people may be permanently displaced by the middle of the century due to rising sea levels, more frequent floods and more intense droughts; and
- **Ecosystems:** The warming of the 20th century has already directly affected ecosystems, and for many species, the rate of warming will be too rapid to withstand. One study estimates that around 15-40 per cent of species face extinction with 2°C of warming. Rising levels of carbon dioxide have some direct impacts on ecosystems and biodiversity, but increases in temperature and changes in rainfall will have even more profound effects.

⁵ 2007: Technical Summary in *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Avery, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press.

⁶ As footnote 5.

⁷ *The Economics of Climate Change: The Stern Review*, Cambridge University Press, 2007.

The economic case for action

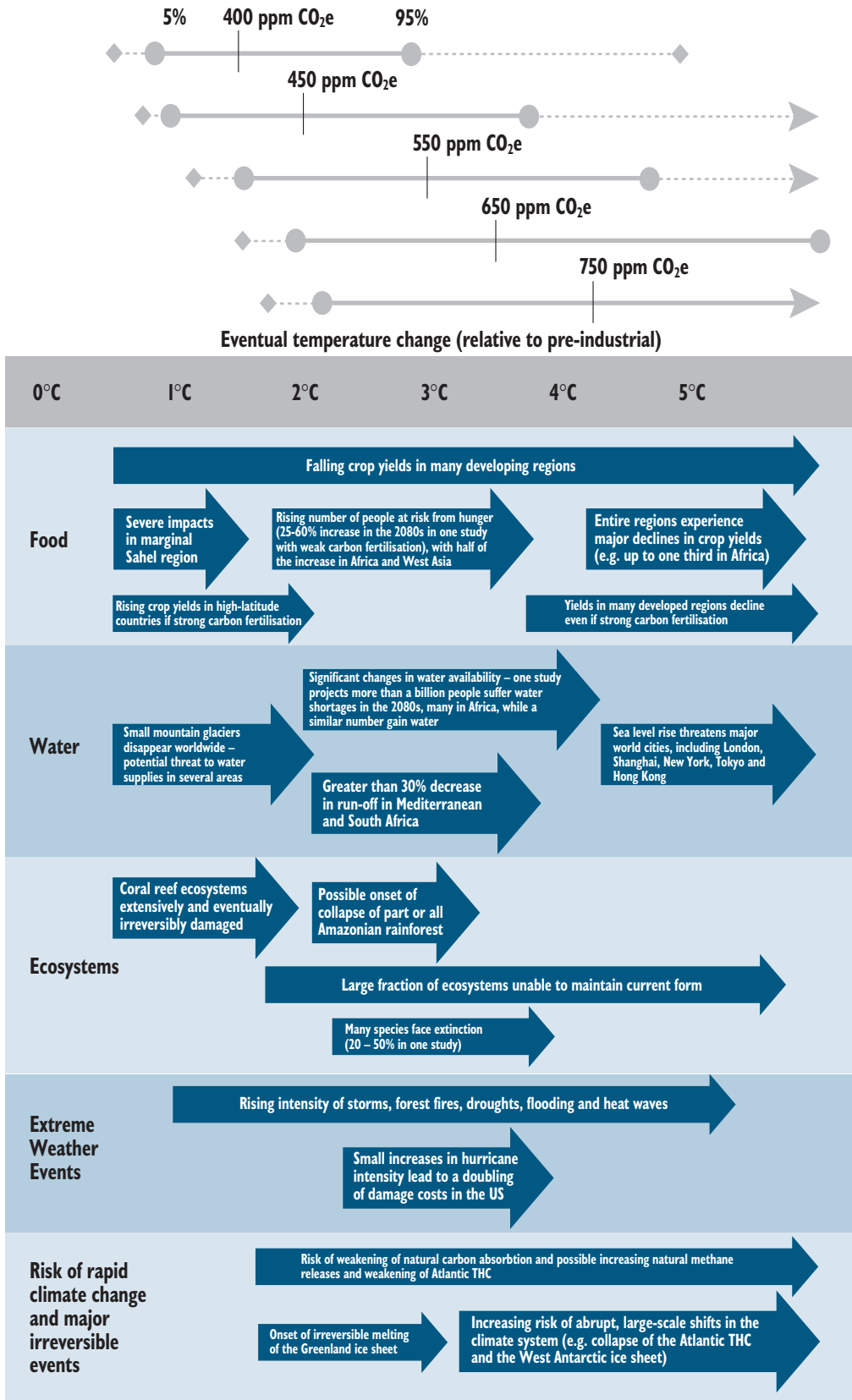
The costs of tackling climate change are significant but manageable

I.11 Using this scientific evidence as a starting point for its analysis, the Stern Review concluded that the costs of reducing emissions to levels that stabilise the climate are significant but manageable, whereas delay will be costly and dangerous. This overall conclusion is also clear within the findings of the IPCC, which has also assessed the economics of taking action. The Stern Review estimated that temperature increases associated with projected business as usual emissions could lead to damages equivalent to 5 per cent of global GDP. With other costs and considerations taken into account to give a full picture of the overall costs to, and impacts on, human society of climate change (such as direct impacts on the environment and human health, and potential feedbacks in the climate system), the cost estimate increases to 14 per cent of global GDP. In addition, as a disproportionate burden of climate change will fall on poorer countries, it is legitimate to weight the analysis to reflect the distributional impacts of unconstrained climate change. When this is included the total cost of unconstrained emissions could be up to a 20 per cent reduction in global GDP. These figures do not, however, include the additional costs of political instability and population displacement caused by climate change. There has been significant debate on the methodology used by the Review, but its conclusions remain intact; the human and environmental impacts of climate change merit strong policy action, and the costs of that action are significantly outweighed by the costs of inaction.⁸

I.12 Stabilising the stock of greenhouse gases in the atmosphere at 550 parts per million of CO₂e gives a 50 per cent chance of temperature increases of 3°C, as Chart 1.1 shows. There are still risks of serious widespread impacts associated with stabilisation at this temperature, though these are significantly less than business as usual. The Stern Review concludes that the risks of the worst impacts of climate change can be substantially reduced if greenhouse gas levels in the atmosphere can be stabilised between 450 and 550 ppm CO₂e, and that central estimates of the annual costs suggest that stabilisation at a level of 500 to 550 ppm CO₂e would cost around 1 per cent of global GDP. This cost is significant, but it is far lower than the costs of inaction.

⁸ Papers setting out this debate, and the response from the Stern Review team (including further sensitivity analysis and a discussion of key assumptions) are available at www.sternreview.org.uk. For example, 'Reflections on the Stern Review (I), A Robust Case for Strong Action to Reduce the Risks of Climate Change', Simon Dietz, Chris Hope, Nick Stern and Dimitri Zenghelis, *World Economics*, 2007.

Chart I.I: Stabilisation levels and probability ranges for temperature increases^a



^aThe Economics of Climate Change: The Stern Review.

THE POLICY FRAMEWORK

The need for flexible and credible policy

I.13 In order to minimise global abatement costs – whatever the overall goal – policy needs to be strong, credible and cost-effective. Strong policy means policy that has environmental integrity, for example, emissions trading schemes with caps linked to emissions reductions goals that are consistent with optimal long-term global outcomes. Policy is credible when markets and other actors believe it will be enforced and is realistic. This is needed in order to influence the investments that are being made now across the global economy. Given the long lifetime of some infrastructure and the risk of locking in high carbon technologies, a decision now to invest in high-carbon options could be expensive to reverse or retro-fit. Furthermore, cost-effectiveness comes from flexibility over what, where, and when emissions reductions take place – such as flexibility over which greenhouse gases are targeted, in which sectors abatement occurs, the geographical location of the emissions reductions, and about whether reductions occur at a specific point in time.

I.14 The Stern Review suggests that a cost-effective, credible, and flexible response to climate change must have three key elements to minimise the costs of tackling climate change and reducing carbon emissions – carbon pricing, technology policy and measures to remove other barriers to action and promote behaviour change. Action on one of these elements alone will not be sufficient to ensure the most successful and efficient response to the challenge, although individual countries may need to adapt policies to their own situations. The UK's policies are explored further in Chapter 4.

Pricing in the damage caused by emissions

I.15 The essential basis for policy to tackle climate change must be the creation of a carbon price, to reflect the damage caused by emissions and to require governments, businesses and individuals to meet the costs they impose on the environment by their actions. This can also provide long run signals, as greater certainty that there will be a carbon price in the future will affect investment decisions now. This carbon price can be established by taxation, trading or regulation, or through a combination of these.

Carbon pricing through trading

I.16 Countries and regions across the world are developing their own carbon pricing frameworks including, though not exclusively, through trading mechanisms. Emissions trading (or 'cap and trade') works by setting a limit on total allowed carbon emissions, but allows individual emitters to sell allowances if they achieve greater emissions reductions than anticipated, or to buy additional allowances from others if it is more expensive than reducing their own emissions. These approaches can then be linked to each other as well as other flexible mechanisms in developing countries, such as the Clean Development Mechanism (CDM). This allows reductions to be made where they are cheapest, ensuring that cutting emissions remains consistent with economic growth and development. The Kyoto Framework enables emissions trading between governments, and between businesses, and international carbon trading has the potential to generate significant resource transfers to developing countries through mechanisms such as the CDM. However, this approach may not be appropriate to all sectors or countries, and the Stern Review recognises that a variety of approaches will be needed.

The need for complementary policies

I.17 Carbon pricing is the foundation of effective climate change policy, by incorporating the costs of environmental damage into economic decisions, but it is not sufficient on its own. One of the important roles for complementary policies on technology and behavioural change is to make it less expensive to reduce emissions overall, although such policies can

also have other important co-benefits. Where caps are not yet at the optimal level for the desired environmental outcome, such cost reductions can help to set them at a more ambitious level in future.

Accelerating technological innovation and deployment

I.18 To deliver the scale of reductions in emissions necessary to avoid dangerous climate change, barriers to the deployment of existing and emerging low carbon technologies will need to be reduced. This will help to bring down the costs of technologies so that they are competitive on a commercial scale with fossil-fuel alternatives under a carbon pricing policy regime. The existence of a carbon price provides an incentive to deploy technologies that are already commercial, and can also create incentives for the development of new technologies.

I.19 As the Stern Review identifies, a portfolio of technologies will be required to stabilise emissions, because it is highly unlikely that any single technology will deliver all the necessary emissions savings. The role of government is therefore to address technology market failures, including those specific to the energy sector, such as through identifying effective ways of sharing the costs and risks of new technologies with the private sector. Given the global scale of the problem, governments also need to work with others internationally to ensure that the most cost-effective mechanisms and financing instruments are developed to ensure technologies are deployed at a scale and rate that is consistent with our medium- and longer-term aspirations.

Encouraging behavioural change

I.20 Carbon pricing, and other action to develop new technologies, will deliver reductions in emissions. However, there are many opportunities for low or negative cost emissions reductions that are unlikely to be taken up without policies to overcome the other barriers that may prevent or deter individuals and businesses from taking action. Energy efficiency is a particular area of concern, as making more effective use of energy could provide a significant contribution towards reducing carbon emissions at low or negative cost.

The barriers to action

I.21 The main barriers to such opportunities are:

- a lack of information; as individuals may not always be aware of the full costs and benefits of energy conservation;
- problems with access to capital; as energy efficient processes and products may have higher upfront costs, and so restrictions to the availability of capital could stop investment in these;
- a focus on the short term rather than the long term, as many people may be unwilling or unable to calculate the long-run savings they would make by using energy efficient products and processes; and
- split incentives: for example the 'landlord-tenant' problem in the buildings sector where landlords do not invest in the energy efficiency of their asset.

I.22 Further measures alongside those to price carbon and encourage technology development may therefore be needed to address these problems, including appropriate and well-designed regulation, tax, and the provision of information, incentives or financial support by the private and the public sector.

Deforestation

I.23 These policy approaches need to be adopted across the global economy in order to drive reductions in emissions. However, there is one particular source of global emissions identified by the Stern Review – deforestation – which is worth particular attention. Deforestation accounts for up to 18 per cent of global greenhouse gas emissions, more than the transport sector, and reducing or avoiding it offers a highly cost-effective way of reducing global greenhouse gas emissions. The Stern Review suggests that policies to reduce deforestation should be developed by those nations on which the forests stand, but with significant help from the international community – for example, well-designed carbon markets could play an important role in providing incentives to curb deforestation.

Adaptation to inevitable impacts

I.24 The world is already locked into some climate change as a result of past emissions. Alongside policies for mitigating climate change, both developed and developing countries need to adapt to these unavoidable impacts. This will be especially important in developing countries, which will be hit soonest and hardest. Much adaptation in these countries should be an extension of good development practice, reducing vulnerability to climate change by promoting growth and the diversification of economic activity, investing in health and education, and enhancing resilience to disasters. In the UK, adaptation will be required to reduce the costs and disruption caused by climate change, particularly from extreme weather events such as storms, floods and heat waves.

2

INTERNATIONAL ACTION TO TACKLE CLIMATE CHANGE

INTRODUCTION

2.1 This chapter sets out what steps have already been taken by countries to commit to emissions reductions, not only through commitments announced at formal meetings through the UNFCCC, the G8 and the European Union, but also independently in line with their own national priorities.

Developing the evidence base

2.2 Since the publication of the Stern Review, a number of countries and regions have launched their own studies on the economics of climate change at the country and regional level. Regional reviews are underway in China, India, South East Asia, Australia and Brazil on the economics of climate change. Each study is being carried out on the initiative of research teams based in the respective countries. The UK has responded to requests for assistance in several cases, and is contributing to a number of the studies through the provision of financial and technical support.

2.3 In the past twelve months, a number of new academic papers have been published that explore in more depth some of the key issues identified in the Stern Review. These have added significantly to the evidence base for economic policy-makers as they consider how to respond to opportunities in the international climate change negotiations. To highlight recent developments in the economics of climate change, the Government will be sponsoring a symposium, bringing together leading academics from around the world with key economic decision-makers and opinion-formers. The event, chaired by Sir Nicholas Stern, is planned to take place in the second quarter of 2008.

INTERNATIONAL NEGOTIATIONS HAVE ALREADY MADE SIGNIFICANT PROGRESS

United Nations Framework Convention on Climate Change

2.4 Over the last year the momentum for international action has been gathering, galvanised by the clear messages on the science and the economics. The UK's goal is to achieve the launch of comprehensive international negotiations for a post 2012 climate change agreement at the UNFCCC meeting in Bali in December 2007.

Building on the first phase of the Kyoto Protocol

2.5 An international agreement to reduce greenhouse gas emissions is already in place through the UNFCCC, within which all governments can work together towards global emissions reductions. Under the Kyoto Protocol, which came into force in February 2005, most of the world's industrialised countries have agreed to limit their total emissions of six greenhouse gases over the period 2008-2012 relative to a 1990 baseline. Overall, this should lead to emissions in these countries being around 5 per cent lower than they were in 1990. In the longer term, the EU believes that, in order to maximise the chances of preventing a global mean temperature increase of more than 2°C, global emissions should be reduced by at least 50 per cent by 2050 relative to 1990 levels.

2.6 The challenge now is to build on the first phase of the Kyoto Protocol to ensure long-term reductions, and the stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous climate change. To reduce the costs of tackling climate change, the international community must agree and deliver a long-term plan to reduce emissions – including a long-term goal for global reductions – based on the science and its economic implications.

2.7 The UK is working with its international partners towards agreeing a realistic, robust, durable and fair framework to follow the first Kyoto commitment period at the end of 2012. All major countries must be part of this framework, including the USA and major emerging economies like China, India and Brazil. We need to recognise different national circumstances and the UNFCCC principle of common but differentiated responsibilities.

Progress through the G8

The Gleneagles Plan of Action

2.8 International institutions, such as the G8 meetings of leading industrialised nations, are already making significant progress in highlighting the importance of tackling climate change. The UK is playing a major role in trying to promote international consensus and action, having championed climate change through its G8 and EU presidencies during 2005. Significant steps were taken at the Gleneagles Summit in July 2005, where G8 leaders agreed to a range of actions and principles for tackling climate change, as set out in the Gleneagles Communiqué and Plan of Action. The G8 leaders formally recognised that climate change is a serious and long-term challenge, caused by human activity, which demands an urgent response. They also committed to work together to: improve energy efficiency; generate power with lower carbon emissions; mobilise investment in clean technologies; promote wider participation in research and development for clean energy; embed climate risk, greening and management into development planning; and tackle illegal logging.

2.9 This year's G8 Summit in Heiligendamm marked further progress. G8 leaders agreed on the need for a global emissions goal, and that global emissions should stop rising and then fall. They also agreed on the central role for the UNFCCC in international negotiations, recognised the role for market-based policy solutions, stated their determination to act on deforestation and adaptation, and set out a range of cooperative actions on technology and energy efficiency. In parallel, the '+5 countries' (China, India, Brazil, Mexico and South Africa) agreed that they would contribute their 'fair share' to international action.

The role for the European Union

2.10 The UK can also have a significant impact on international opinion through its influence within, and as part of the EU, which is responsible for about 15 per cent of the world's emissions and generates over 30 per cent of global GDP. The EU has the political ability and strength to lead on climate change, and to contribute to the development of a new global agreement. The Government has long recognised the critical role the EU can and must play in helping the world avoid dangerous levels of climate change – acting together, the 27 Member States of the EU can be more effective and influential than they can be acting on their own.

The Spring European Council package

2.11 Significant steps have already been taken by the EU on climate change. At the Spring European Council in March 2007, EU Heads of Government approved an ambitious climate change and energy package, which represented a decision to shift towards a competitive low carbon economy in Europe. This agreed an ambitious, independent binding target to reduce Europe's greenhouse gas emissions by at least 20 per cent by 2020, with a commitment to a 30 per cent reduction as part of an international agreement, together with a binding target of a 20 per cent share of renewable energies in overall EU consumption by 2020, and a 10 per cent minimum binding target for the use of biofuels (subject to sustainability criteria and commercialisation of new technologies). The EU has already begun to use a range of policies to tackle climate change, including through emissions trading and other regulatory mechanisms, and faster development of low carbon technologies. The UK Government is working with the European Commission and other Member States to ensure that policies are effective in achieving the EU's greenhouse gas objectives, and that they provide a credible path to cost-effective delivery, in line with the Stern Review's recommendations.

Other countries are also making significant progress

2.12 International action on climate change is gathering pace, as recognised by the G8 summit at Heiligendamm. Alongside the EU, many other developed and developing countries with significant total greenhouse gas emissions are taking action that supports the transition to a lower carbon global economy. Mutual recognition by major economies of the action each has taken, and will continue to take, domestically is a step forward in creating the conditions for agreeing a new international framework. To illustrate this, brief descriptions of some of the measures underway in the US, China and India are set out in the boxes below.

Box 2.1 Action by the United States

The United States is the world's largest emitter of greenhouse gases, and its greenhouse gas emissions rose by over 16 per cent between 1990 and 2005.

The centrepiece of the Administration's recent approach has been the establishment of a conference of major emitters that took place 27-28 September 2007. In this meeting, the President emphasised the need to agree a long-term stabilisation goal and to advance negotiations under the UN Framework Convention on Climate Change. He also proposed an International Clean Technology Fund to finance clean technology in developing countries. He said that each nation should "decide for itself the right mix of policy tools to achieve results that are measurable and environmentally effective".

Domestically, the President set a target in 2002 to reduce emissions intensity in the US by 18 per cent by 2012.¹ Whilst it is on track to meet this goal, absolute emissions are expected to rise by 30 per cent above 1990 levels by this time.² However, in 2007 the US will spend about \$2.8 billion on energy technology research, and the Administration is committed to reducing US gasoline usage by 20 per cent by 2017 compared to projections. This is to be achieved through fuel economy and alternative fuels standards for vehicles.

There has also been significant recent activity at state level on climate change:

- 10 North Eastern US states are implementing the first mandatory US cap-and-trade programme for carbon dioxide (Regional Greenhouse Gas Initiative – RGGI) to collectively reduce greenhouse emissions by 10 per cent by 2019. Trading will begin next year in advance of the first compliance period starting in 2009;
- In February 2007, five Western Governors announced the Western Regional Climate Action Initiative, agreeing to develop a regional greenhouse gas target within 18 months. Utah, British Columbia (Canada) and Manitoba (Canada) have since joined the process, with others – including Australian and Mexican States – attending meetings as observers. UK officials are advising this process; and
- 40 states have signed up to the Climate Action Registry to start a harmonised process of monitoring and reporting emissions. Other states are also seriously investigating cap and trade programmes to tackle climate change – most notably Florida.

Together, these state-level measures would mean that over 20 per cent of US emissions would be subject to varying forms of a mandatory cap.³ This would be equivalent to the fourth-largest emitting nation in the world.

¹ Emissions intensity measures the ratio of greenhouse gas emissions to a measure of economic output such as GDP

² The US Energy Information Administration, www.eia.doe.gov

³ Pew Centre, www.pewclimate.org

Box 2.2: Action by China

If it has not done so already, China is about to overtake the US as the world's largest greenhouse gas emitter. The World Resources Institute attributed 14.7 per cent of global CO₂ emissions to China in 2000, and increasing energy consumption is driving a rapid growth in Chinese emissions, estimated to be 6 per cent per year.

Driven by strong economic growth, China's overall energy consumption has risen by 60 per cent in the last five years. Increasing coal use is the single biggest driver of China's emissions growth – in 2006 China built an additional 93 gigawatts of coal-fired power more than the UK's entire installed capacity.

China has set two targets as part of its energy strategy which could have a significant impact on reducing the growth in emissions:

- To improve the energy efficiency of its economy by 20 per cent between 2005 and 2010; and
- To increase renewables as a share of the energy mix to 10 per cent by 2010 and to 16 per cent by 2020.

These overall goals are supported by detailed policies in many sectors, including a Renewable Energy Law, investments in public transport infrastructure, fiscal measures to encourage the use of smaller cars, and detailed energy efficiency targets for the one thousand largest manufacturing industries.

The UK carries out a large number of bilateral activities with China, and leads in the flagship EU-China Near-Zero Emissions Coal (NZEC) project to demonstrate carbon capture and storage on a coal fired power plant within China.

Box 2.3: Action by India

Reflecting its large and growing population, India is one of the top ten emitters of greenhouse gases, with around 4 per cent of the world's total CO₂ emissions in 2004. The per capita CO₂ emissions of India's 1.1 billion population are relatively small at 0.99 tonnes, compared to the world average of 3.99 tonnes. India has the largest portfolio of CDM projects, with a CO₂ reduction potential of 240 million tonnes as of May 2006.

India is a signatory to the Kyoto Protocol and is clear that there should be common but differentiated international responsibilities. The Indian Prime Minister stated at the G8 Summit in Heiligendamm that India was prepared to make a commitment that their per capita emissions would never rise above those of the developed world.

The Prime Minister has convened two expert committees on climate change to develop a national and international policy:

- the High Empowered Committee, which will co-ordinate the Government's policy responses to climate change; and
- the Expert Committee on Impacts of Climate Change, which will study the impacts and identify measures that India may have to take in the future to address vulnerability.

India's Integrated Energy Policy (IEP) plan has set out initiatives to reduce the greenhouse gas intensity of the economy by a third. This included an emphasis on energy efficiency, mass transport, renewable energy, accelerated development of nuclear and hydro electricity, Clean Coal Technologies, and R&D on climate friendly technologies. This IEP has informed India's 11th Five Year Plan.

Other initiatives include:

- Increasing renewable energy by 2-3 per cent by 2012;
- Reducing primary energy demand by 5-7 per cent by 2012;
- Reducing transmission and distribution losses from 40 to 15 per cent by 2012; and
- Increasing forest and tree cover to 33 per cent by 2012.

3

THE UK'S VISION FOR A FUTURE INTERNATIONAL FRAMEWORK

INTRODUCTION

3.1 Building on the momentum described in Chapter 2, this chapter sets out the Government's vision for an international framework to follow the first commitment phase of the Kyoto Protocol which ends in 2012. In line with the EU's submission to the UNFCCC, the UK believes that a post 2012 framework must contain the following elements to tackle climate change:

- a long-term goal of reducing global greenhouse gas emissions by at least 50 per cent by 2050, on 1990 levels;
- deeper absolute emission reduction commitments by all developed countries;
- further fair and effective contributions by other countries;
- extending the carbon market, including innovative and enhanced flexible mechanisms;
- increasing cooperation on technology research, development, diffusion, deployment and transfer;
- enhancing efforts to address adaptation, including risk management instruments, finance and technologies for adaptation;
- addressing emissions from international aviation and maritime transportation; and
- reducing emissions from deforestation, and enhancing sinks by sustainable forest management and land use practices.

ELEMENTS OF A GLOBAL DEAL

A long-term goal **3.2** A long-term goal of reducing global greenhouse gas emissions by at least 50 per cent by 2050 on 1990 levels is needed. Such a goal can set the scale of ambition which a post-2012 agreement needs to meet, and can act as a 'yardstick' to assess progress on mitigation and to inform discussions on country commitments. It would also give certainty to governments and business on the direction of travel. The EU has stated a long-term goal to limit the global average temperature increase to no more than 2°C above pre-industrial levels, which is associated with limiting atmospheric concentrations to well below 550 ppm CO₂e, and cutting global emissions by 50 per cent below 1990 levels by 2050, with a 60-80 per cent cut in developed countries.¹

Deeper absolute emissions reductions by developed countries **3.3** Developed countries must continue to take the lead on reducing emissions. The EU has already agreed to reduce its greenhouse gas emissions by 30 per cent by 2020 compared to 1990, as part of a comprehensive international agreement, and made a firm independent commitment to achieve at least a 20 per cent reduction in greenhouse gas emissions by 2020 in any case. The Government wants other developed countries to follow suit.

¹ Fisher, B.S., N. Nakicenovic, K. Alfsen, J. Corfee Morlot, F. de la Chesnaye, J.-Ch. Hourcade, K. Jiang, M. Kainuma, E. La Rovere, A. Matyssek, A. Rana, K. Riahi, R. Richels, S. Rose, D. van Vuuren, R. Warren, 2007: Issues related to mitigation in the long-term context, in *Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds)], Cambridge University Press.

Further fair and effective contributions by other countries

3.4 The actions of developed countries alone will not be enough to stabilise greenhouse gases at a safe level. It is important to encourage greater participation by other countries in reducing their emissions intensity as they develop, based upon the principle of common but differentiated responsibilities, and in a manner that does not constrain their economic growth. Many ideas are already under discussion within the UNFCCC, the Multilateral Development Banks, and elsewhere. It is also essential to recognise the efforts many developing countries are already undertaking and build on these, and create incentives for them to reduce the greenhouse gas emission intensity of their economic development.

Extending the carbon market

3.5 The Government will encourage the evolution of the global carbon market, deepening, broadening and lengthening it, including through innovative and enhanced flexible mechanisms. The existing Clean Development Mechanism, and emissions trading schemes such as those in the EU and elsewhere, provide the foundation of an emerging global carbon market which can drive real investment in low carbon technologies. The carbon market is already worth around \$30 billion and will grow further. The recently produced UNFCCC report on existing and potential investment flows suggests that the carbon market can play a very significant role in scaling up and redirecting financial flows to encourage emission reductions – but it will need to evolve and be driven by deep developed country targets in order to do so.² Whilst the carbon market should play the leading role in financing international investment, other mechanisms will be needed. In particular, the multilateral development banks have a key part to play through an ambitious Clean Energy Investment Framework.

Increasing cooperation on technology research and deployment

3.6 Cooperation on technology research, development, diffusion, deployment and transfer needs to be increased. Even with a strongly functioning carbon market, we need to look at further incentives for investment in low-carbon technology. The UK is working to promote technology and investment cooperation through a range of initiatives, including supporting the World Bank-led Clean Energy Investment Framework. The Framework is a vital means of accelerating and scaling up public, private and carbon finance for investment in low carbon energy and adaptation. The 2007 Comprehensive Spending Review confirms the creation of a new £1.2 billion Environmental Transformation Fund, of which an international element of £800 million, jointly managed by the Departments for Environment, Food and Rural Affairs, and International Development, will support development and poverty reduction through environmental protection, and help developing countries respond to climate change. It will also help developing countries to access clean energy and adapt to climate change, and will support reduced emissions from deforestation.

Adaptation

3.7 Enhanced efforts are needed to address adaptation, including risk management instruments, finance and technologies for adaptation. It is important to scale up support and develop new mechanisms to assist the poorest developing countries, in particular to adapt to the unavoidable effects of climate change. The Government is developing its work in this area and is supporting significantly scaled up efforts in the World Bank and the regional development banks.

Addressing emissions from international aviation and maritime

3.8 Emissions from international aviation and maritime transportation are growing rapidly. For international industries such as these, international solutions, and specifically global trading schemes, are the best solutions. The Government is therefore pursuing these in the International Civil Aviation Organisation (ICAO) and International Maritime Organisation (IMO) respectively. However, until a truly global solution can be found, the inclusion of aviation in the EU Emissions Trading Scheme as soon as possible represents the best multilateral option available for this sector.

²Report on the analysis of existing and potential investment and financial flows relevant to the development of an effective and appropriate international response to climate change', UNFCCC, August 2007, www.unfccc.org

Reducing emissions from deforestation and land use change 3.9 With up to 18 per cent of global greenhouse gas emissions coming from deforestation, an international framework needs to include efforts to reduce emissions from deforestation, and to enhance carbon sinks by sustainable forest management and land use practices. Box 3.1 provides further details on deforestation and sustainable forest management.

Box 3.1: Deforestation

Emissions from deforestation in developing countries amount to up to 18 per cent of global carbon dioxide emissions. Deforestation also severely harms biodiversity. A future framework agreement must contain incentives for sustainable forestry management that reflect the value of avoiding deforestation. The UK recognises the need to find ways to include avoided deforestation in a future climate change agreement, in order to help reduce the risks of climate change, and because of the benefits for communities who depend on forests, and for biodiversity. The UK seeks a successful outcome to discussions on reducing emissions from deforestation in developing countries at Bali in December, and we are working actively within the EU and with other international negotiating partners to secure this.

The UK has allocated £50 million for a Congo forest conservation initiative from the international element of the Environmental Transformation Fund. The goals of this Congo Basin initiative are to prevent the destruction of Congo Basin Forest; including to:

- safeguard the livelihoods of 50m people;
- reduce the growing pressure on the Congo Forest from its people and from outside, slowing the rate of deforestation; and
- strengthen the capacity of the 10 COMIFAC³ countries, civil society and forest peoples to manage their forest sustainably

Conclusion 3.10 The urgency of this challenge is very clear. It is important that the Bali meeting recognises the scale of the problem, the affordability of measures to mitigate the threat and the imperative for early action, if the sustainable economic development to which all countries have a right is to be achieved. The UK looks forward to discussions at Bali and to serious progress with the global community on the shape of a post 2012 future framework.

³The Central Africa Forests Commission (COMIFAC).

4

ACTION BY THE UK TO TACKLE CLIMATE CHANGE

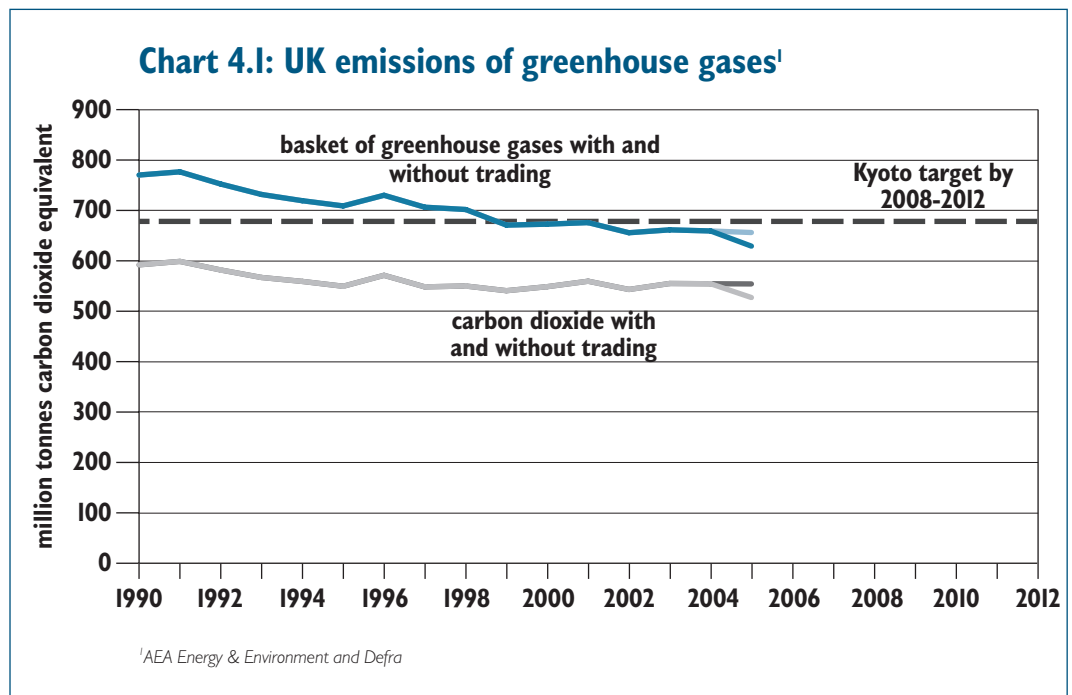
INTRODUCTION

4.1 An international approach is essential if climate change is to be tackled efficiently and effectively, and if all countries are to make their contribution to a global solution. The UK is playing a leadership role at both the EU and international level. Within this international context, the UK needs to make its own efforts, reducing emissions within the UK with well-designed policies, taking on responsibilities for reductions elsewhere through trading, working with other countries to develop new technologies, and supporting developing countries in adapting to climate change. This chapter sets out the UK's framework for action, and provides details of some of the policies and mechanisms the UK has put in place to reduce its emissions.

4.2 In the UK, many of the means to reduce greenhouse gas emissions have been devolved to the Scottish Parliament, the National Assembly for Wales, and the Northern Ireland Assembly. This document includes action taken by the UK Government in Scotland, Wales and Northern Ireland where the matter is reserved, but does not describe the action taken by the devolved administrations in devolved policy areas.

UK emissions reductions

4.3 The UK has made significant progress in reducing its greenhouse gas emissions. Emissions from activity within the UK's borders fell by around 15 per cent between 1990 and 2005, or 19 per cent when emission credits purchased through trading in the EU Emissions Trading Scheme are included, as Chart 4.1 shows. A key element of moving to a low carbon global economy will be for countries to take on increased responsibilities for emissions reductions where it is less costly to do so through trading mechanisms.



4.4 The UK is therefore already meeting its target under the Kyoto Protocol of a 12.5 per cent reduction in greenhouse gas emissions, from 1990 levels, by 2012, taking emissions trading into account. As a result of the policies and measures the Government has introduced, UK emissions will fall further in future years. Taking into account the impacts of emissions trading, UK emissions are projected to be about 23 per cent below 1990 levels by 2010, nearly double our Kyoto target. This shows that it is possible to move to a lower carbon economy and maintain economic growth and competitiveness. However, continued efforts will be necessary if the UK is to make its contribution to the global reductions needed to avoid dangerous climate change. The Government is taking steps to provide a flexible and credible framework within which this can take place, as well as the right information and support to the public sector, businesses and individuals and families, in order that all can make their contribution.

SETTING THE FRAMEWORK FOR POLICY

The UK's climate change and energy objectives

4.5 The Government has put in place a principled framework to ensure that the right action is taken to tackle climate change and other environmental challenges. This framework highlights that the decision to take action must be evidence-based, and that any intervention to tackle environmental challenges must take place at the appropriate level – international, national or local – and be part of a long-term strategy. It also highlights that action to protect the environment must take account of wider economic and social objectives, and the right instrument must be chosen to meet each particular objective. This emphasises the importance of using the right instruments to tackle climate change, and this is why the Government has introduced a range of innovative measures.

The Energy White Paper

4.6 The Energy White Paper, published in May 2007, sets out the Government's international and domestic climate change and energy strategy to address these long-term challenges. These challenges do not have a single solution, they cannot be addressed at the expense of each other and they cannot be solved by the UK alone. The UK must both tackle climate change by reducing carbon dioxide emissions within the UK and abroad, and ensure that energy supply is secure, clean and affordable as the UK becomes increasingly dependent on imported fuel.

4.7 The Energy White Paper sets out how the Government is implementing the measures in the 2006 Energy Review, as well as those announced since, including in the 2006 Pre-Budget Report and Budget 2007. Building on the analysis and policies announced in the 2006 Climate Change Programme, it contains policies that take the UK to between a 20 and 26 per cent reduction in carbon dioxide emissions by 2020, from a 1990 baseline, such as the Renewables Obligation and energy efficiency measures, as well as additional measures subject to consultation such as the Carbon Reduction Commitment and the possibility of new nuclear investment. Achieving the upper end of this range will put the UK on track to meet its 2050 emissions target.

The Climate Change Bill

4.8 The Climate Change Bill, published in draft in March 2007 and due to be introduced in the next Parliamentary session, is an essential element of the Government's response, setting the framework for other policies. It will improve the credibility and predictability of policy by putting the UK's long-term target of cutting CO₂ emissions by at least 60 per cent by 2050 and 26-32 per cent by 2020, from 1990 levels, into legislation. The Bill introduces five-yearly 'carbon budgets' up to 2050 and beyond, which will limit the total CO₂ emissions allowed in each five year period, beginning in 2008. A new independent body, the Committee

on Climate Change, will advise the Government on the level of carbon budgets, and on the optimum pathway to the 2050 target. Once the Bill is enacted, the Government will set three five-year budgets covering 2008-2012, after considering the advice of the Committee. The Government also intends to review the 2050 target, which is already stronger than most other countries, based on advice from the Committee on whether it should be even stronger. Having this framework in place strengthens the credibility of policy, ensuring that the Government's long-term ambitions are clear, and influencing both the actions of individuals, and the investment decisions of businesses. It also provides flexibility regarding how the emissions reductions are made, helping to ensure that they can be achieved at least cost.

Public Service Agreement to lead the global effort to tackle dangerous climate change **4.9** Alongside the Climate Change Bill to set the legislative framework, climate change has been included in the smaller set of Public Service Agreements (PSAs) for the forthcoming spending period to highlight the importance the Government attaches to it. The PSA describes the Government's vision to play a leading role internationally, securing effective and robust global commitments for the period after 2012, adopting and promoting policies in the UK and internationally which reduce greenhouse gas emissions, and managing climate risks through adaptation. It sets out the Government's delivery and risk management strategies and the outcomes it is seeking at both international and domestic level.

Office of Climate Change **4.10** The Office of Climate Change (OCC) was set up in autumn 2006 to support ministers and departments on UK climate change strategy and policy. The OCC undertakes policy-focused projects, helps to consolidate existing analysis, and helps to identify areas where further work may be needed. It also provides ongoing support for the Stern Review team, and the governance and programme management of climate change and energy policies across Government.

Tackling climate change cost-effectively **4.11** The Government has made ambitious commitments to reduce UK emissions. The policies implemented to reduce emissions must be achievable, cost-effective and consistent with high and sustained economic growth. Action on climate change which is not economically sound, or prevents business from remaining competitive, is likely to reduce the UK's effectiveness in arguing internationally for more rapid progress. The Government recognises that achieving this objective will require careful attention to better regulation principles. The publication of the Government's Response to the Better Regulation Commission's Report on the response to the Stern Review set out the Government's approach to developing cost effective policies and better regulation. This will ensure that the UK achieves its commitments to reduce greenhouse gas emissions, without placing an unnecessary burden on business. Specifically, the Government has committed to:

- keeping the overall regulatory burden on climate change under review;
- identifying overlaps, inconsistencies and conflicts between existing regulatory regimes and suggesting how these can be resolved;
- streamlining existing regulatory burdens; and
- ensuring that the strategic approach behind, and supporting case for, existing instruments is clear and transparent.

The framework for fiscal policy **4.12** The Government has put in place a principled framework for fiscal policy. This is set out in *Tax and the Environment*, which builds on the commitment made by the Government in its 1997 Statement of Intent to explore the scope for using the tax system to deliver environmental objectives, whilst making clear that tax is one instrument that should be used in combination with others like regulation and voluntary action.¹ Environmental taxes can support all of the three elements of the policy framework for an efficient and cost effective

¹ *Tax and the environment: using economic instruments*, HM Treasury 2002, www.hm-treasury.gov.uk

response to climate change, but should only be used where they are the most effective way to take action. Over time, the Government aims to reform the tax system to increase incentives to reduce environmental damage, which would shift the burden of tax from 'goods' to 'bads', whilst making sure that environmental taxation meets the tests of good taxation.

The links with other Government objectives

4.13 Climate change policies need to be designed to complement wider government objectives, including the UK's economic, social and international aims. These include, but are not limited to, the following examples.

Economic growth and competitiveness

4.14 Ensuring EU industries and economies remain internationally competitive is important to the UK. If some countries move more quickly than others in implementing carbon reduction policies, there are concerns that carbon-intensive industries will locate in countries that do not have such policies in place. Such carbon leakage would be economically damaging as well as defeating the primary environmental objective of reducing emissions. Whilst the Stern Review and other recent analysis shows that this would only be a potential problem for certain energy-intensive industrial sectors, it reinforces the importance of pursuing international policies to reduce this risk, such as the EU ETS, which require effort across countries and mean that competing firms face the same price for allowances. On the other hand, early decisions to make low carbon investment may be cheaper and better for economic growth in the long run than later responses, which may require more costly retrofitting, or lead to stranded assets. This is why the UK is pursuing international action based on credible, flexible and predictable policies.

4.15 However, it is clear that the right policies can support the take up of opportunities for economic growth. The UK environmental industry is strong and well established, with an estimated annual turnover of £25 billion in 2005. Projections suggest that the UK environmental goods and services market will grow to £46 billion by 2015.² The Commission on Environmental Markets and Economic Performance, which is expected to report later this year, will make recommendations for Government and business which could stimulate productivity and employment growth in the UK's environmental goods and services sectors, and in other sectors which make a significant contribution to environmental outcomes and resource productivity.

International development

4.16 The UK is committed to supporting environmental sustainability as part of long-term poverty reduction. Climate change will affect poor countries much more than rich countries because of their geography, dependence on agriculture, lower incomes, and access to resources. If significant progress is not achieved on global mitigation then there will be much higher adaptation costs across the world in the long run. There will be different challenges in different developing countries, and international carbon finance will be essential to ensure that developing countries can experience economic growth whilst reducing their emissions. The UK is also working to help developing countries adapt through improving the information base for decision makers, with programmes such as ClimDev Africa. In addition the UK has piloted risk-screening processes on its development programmes in several countries, to ensure they are contributing to building climate resilience. Other areas of support include capacity building for adaptation, adaptation research, and the contributions to funding to international mechanisms for adaptation finance.

² *Environmental Innovation – Bridging the gap between environmental necessity and economic opportunity – first report of the Environmental Innovation Advisory Group*, November 2006, www.berr.gov.uk

Energy security of supply 4.17 Ensuring secure, clean and affordable energy as the UK becomes increasingly dependent on imported fuel is a key long-term challenge. Energy supplies may be volatile for a number of reasons, all of which contribute to price volatility. This volatility may interact with climate change policies. For example, energy efficiency policies will lead to a reduction in energy demand, which will both lower emissions and reduce exposure to energy security risks. Market reforms can encourage suppliers to be more efficient, and can also improve energy security by reducing the concentration of market power. These can reduce energy demand and therefore CO₂ emissions. However, other policies may conflict. For example, the switch to coal can contribute to energy security as many different countries hold large reserves, but CO₂ emissions from coal are around twice those from gas in electricity production. The Government will continue to consider this interaction with other energy policy goals when developing its strategy to tackle climate change.

Social objectives 4.18 Fuel poverty is driven by the interaction of three main factors: energy efficiency, household income and energy costs. Climate change policy can help to reduce fuel poverty, by improving building regulations and removing barriers to investment in energy efficiency measures, both of which will lower households' energy bills. At the same time, if there are energy price rises in the short term, this will counteract some of the benefits of these energy efficiency measures. The Government keeps this issue under review as part of its regular assessments of progress towards its fuel poverty targets.

Other co-benefits 4.19 Action to reduce greenhouse gas emissions can also have other benefits, such as enhanced energy security and environmental protection. In particular, reduced emissions can improve air quality, helping to prevent health problems.

4.20 Within the framework described above the Government has introduced a number of policies designed to address the essential elements of the policy framework set out by the Stern Review.

PRICING THE DAMAGE CAUSED BY EMISSIONS INTO ECONOMIC ACTIVITY

4.21 Carbon pricing, through tax, trading or regulation, ensures that governments, businesses and individuals take account of the costs they impose on the environment through their actions, stimulates private investment in clean technology and energy efficiency, and rewards those businesses which develop future technologies first.

Carbon pricing through trading

The EU Emissions Trading Scheme 4.22 The EU Emissions Trading Scheme is the focus of the Government's carbon pricing policy. It requires emitters in certain sectors to surrender an allowance for each tonne of CO₂ they emit. It currently covers around 50 per cent of UK emissions, setting a fixed cap on emissions across the UK, but allowing companies to trade in allowances in order to find the most cost-effective opportunities for reducing emissions. International trading schemes can work well and be effective ways to reduce emissions. Whilst carbon-based taxes can be appropriate, they can create inefficiencies where there are already trading schemes in place.

³State and trends of the carbon market, World Bank, 2007, www.worldbank.com

4.23 In only a few years, the EU ETS has developed the potential to become the centre of an international emissions trading system encompassing many developed countries and projects from developing economies. In 2006, international carbon market transactions were worth \$30 billion, with the EU Emissions Trading Scheme, established only in 2005, worth an estimated financial value of \$24.4 billion.³ Financial transactions related to the CDM were worth \$5.3 billion in 2006, and there are currently over 2000 CDM projects in the pipeline.

4.24 Phase I of the EU ETS will finish at the end of 2007. While Phase I has had a number of problems as a result of over-allocation of allowances in the EU as a whole, it has provided valuable learning opportunities for emitters, regulators, traders and governments. The Government supports the European Commission in its efforts to learn from the experience of Phase I and ensure that caps for Phase II (2008-2012) deliver real reductions in emissions, and a well functioning carbon market.

4.25 There is much still to do to ensure that the EU ETS meets its full potential to deliver emissions reductions. The Government's Vision for Emissions Trading, published in October 2006, called for reforms to:

- cover more sectors, in particular aviation, and other greenhouse gases to avoid the need for more costly measures at Member State level;
- link with schemes in other countries to develop a truly global carbon market and increase the liquidity of the market;
- encourage EU firms to invest in emissions reductions in developing countries by expanding and scaling up the use of instruments such as the CDM;
- create a level playing field with no adverse impacts on competitiveness; and
- move towards more auctioning of allowances in future phases to ensure a more efficient allocation.⁴

4.26 A key step required to develop a truly global emissions trading scheme is to facilitate effective linkage between trading schemes such as the EU ETS and emerging schemes in US states, New Zealand and other countries. Budget 2007 announced that the UK would host an international conference on the developing global carbon market, focusing on how to link trading schemes in different countries and enhance trading with developing nations.

The future of the EU ETS beyond 2012

4.27 The European Commission is currently undertaking a review of the EU ETS to inform its development after 2012, and draft proposals are expected in December 2007. This provides an opportunity to improve the design of the scheme, and to provide greater certainty and predictability. The Government believes that caps in future phases of the EU ETS should be set so as to achieve greenhouse gas reduction goals, to drive both low carbon investment in the EU economy, and an enhanced contribution to finance flows for low carbon investment in the developing world. The more it is possible to trade emissions reductions across international borders, and the more emissions that are covered, the more cost effective it will be for all countries to achieve challenging emissions reduction targets.

⁴ *Emissions Trading: UK Government Vision*, October 2006, www.hm-treasury.gov.uk

The importance and future evolution of the Clean Development Mechanism **4.28** The EU ETS also has an important link to the Clean Development Mechanism, created as part of the flexible mechanisms under the Kyoto Protocol. This link allows emitters which have a limit on the amount of emissions they can produce to invest in projects in developing countries which reduce emissions at lower cost, and credit these emissions reductions against their own limit. The CDM therefore allows finance to flow from richer countries to developing countries, providing funds for investment, and facilitating the transfer of technology and expertise.

4.29 The CDM represents the most transparent and robust project offsetting mechanism available internationally, where individual projects are subject to international supervision, emissions reductions are assessed by independent third parties, and project documents are available for public scrutiny and comment. On this basis, the Government is exploring whether CDM and other compliance credits should set the standard for voluntary offsetting.

4.30 The Government believes there is a strong case for scaling up and reforming the CDM, as well as exploring the potential for innovative and enhanced flexible mechanisms, so that the global carbon market can deliver greater flows of investment to developing countries, and allow reductions to be made most cost effectively. This will require commitment on the part of both developed and developing countries to the reform of the market mechanisms underpinning these financial flows, including contributions from more advanced developing countries, and support and capacity building for less-developed countries, so that they can participate in this important market. It is also important for countries to comply with international agreements on the principle of supplementarity, and strike an appropriate balance between domestic emissions reductions and those from mechanisms such as the CDM.

4.31 Particular measures to achieve such goals may include the simplification and standardisation of emissions baselines for CDM projects, implementation of more programmatic approaches to CDM, the incorporation of sectoral commitments, and no-lose targets. The Government will continue to explore the potential of these mechanisms in dialogue with its major partners.

Structured Dialogue on Climate Change **4.32** The United Kingdom has a Structured Dialogue on Climate Change (SDCC) with India, and Working Groups on Climate Change (WGCC) with China and Brazil, and is in the process of establishing similar structures with South Africa and Mexico.

4.33 The WGCCs and the SDCC provide a framework for engagement between the UK and participating countries on climate change, and enable progress to be made on key multilateral and bilateral issues, including the economics of climate change and the use of the flexible mechanisms, such as the CDM. Outputs from the groups can feed into and shape activities relating to the G8 Dialogue, EU-3rd Country Partnerships on Climate Change, and activities under the UNFCCC. The expansion and broadening of the CDM is part of the India-UK Economic & Financial Dialogue between finance ministries and a key point of discussion in the cross-ministry India-UK SDCC, announced by the Prime Ministers in 2004. These informal, bilateral dialogues build a fuller understanding of the issues different countries are facing, and help develop ideas and consensus that can feed into the multilateral process.

The role for other carbon pricing measures

4.34 In sectors not currently capped by the EU ETS, UK domestic measures can play a part in carbon pricing. The Government has a range of potential policy levers and needs to consider all the relevant economic, social and other factors in deciding the most appropriate policy in each sector.

Pricing emissions from the transport sector

4.35 The clearest example of this is in the transport sector. Currently, UK transport emissions are priced primarily through the taxation framework, mainly through fuel duty, which provides incentives to individuals and business to drive less, use other modes of transport, and choose more fuel efficient vehicles, as well as taking into account wider external costs of motoring such as congestion, and the need to maintain sound public finances. Budget 2007 announced fuel duty rates for the next three years – for environmental reasons, to fund public services and to provide certainty alongside the other tax reforms. Fuel duty rises help the Government meet its twin objectives of reducing polluting emissions and funding public services, as well as pricing other externalities such as congestion.

4.36 The Government is also considering the role that international emissions trading can play in pricing carbon into the costs of travel, for example shipping, and is committed to including aviation in the EU ETS.

THE ROLE FOR TECHNOLOGY INVESTMENT AND TRANSFER

4.37 The UK agrees that carbon pricing will be necessary but insufficient to drive investment in low carbon technologies at the scale and speed required. It needs to be combined with technology policies, the second leg of the Stern Review's policy framework, to address market failures, bring down the cost of low carbon technology, and encourage technology investment and transfer.

International cooperation and technology transfer

4.38 The research, development and demonstration of low carbon technologies can be carried out both nationally and internationally. International cooperation has an important part to play, as it allows information, costs, benefits and risk to be distributed more efficiently in a world in which capital movements and investments do not respect national boundaries. In the longer term, reducing greenhouse gas emissions is likely to require a reduction in technology cost that can be achieved more efficiently through international collaboration. Methods of collaboration could include regulatory standards for particular sectors, investment in developing and deploying new technologies, and trade agreements to develop low-carbon technologies with India, China and other emerging economies and developing countries. This will be supported by the Multilateral Development Banks' Clean Energy Investment Framework, which is explored further in Box 4.1.

The Renewable Energy and Energy Efficiency Partnership

4.39 International technology cooperation between developed and developing countries has a vital role to play, both in scaling up public and private investment in existing low carbon technology, and in driving innovation and the development of new technologies. The UK is the principal contributor to REEEP (the Renewable Energy and Energy Efficiency Partnership) – a global public-private partnership that delivers projects on the ground to scale up and accelerate the markets for renewables and energy efficiency, assisting the transition to low carbon pathways. REEEP helps create the policy environments in recipient countries to enable them to access funds that will implement initiatives at scale, such as the Clean Energy Investment Framework and the Environmental Transformation Fund.

Box 4.1: Clean Energy Investment Framework

Investment in cleaner, more efficient energy is crucial for developing countries to ensure their growing energy needs can be met without accelerating climate change. At the Gleneagles Summit in 2005, the G8 called on the World Bank and Regional Development Banks to develop a framework (the Clean Energy Investment Framework) for increasing public and private investment in clean energy, energy efficiency and adaptation in developing and transition countries. By providing a range of financial instruments and policy advice, the Multilateral Development Banks are expected to help reduce the risks and costs associated with clean energy and energy efficiency, and in doing so help catalyse significant investment in these areas. The CEIF will also support access to energy in developing countries.

The World Bank currently expects to invest over \$4 billion in low carbon energy projects between 2006-2008, leveraging additional private sector and government co-financing. The European Bank for Reconstruction and Development (EBRD), the Asian Development Bank (ADB) and the Inter-American Development Bank have also put plans in place for increasing investment in clean energy and energy efficiency by 2008, with regionally specific emphases such as energy efficiency in Eastern Europe and Central Asia, and bio-fuels in Latin America. The African Development Bank is still finalising its proposals. Together, the Multilateral Development Banks have also launched an outreach programme with the private sector.

The World Bank, EBRD and ADB also manage carbon funds worth over \$2 billion, using the money contributed by donors to purchase project-based greenhouse gas emission reductions in developing countries under the framework of the Kyoto Protocol.

The UK is working with other countries to implement and scale up the Clean Energy Investment Framework. This is expected to be finalised next year during Japan's G8 Presidency, and to include a set of ambitious targets and innovative financial instruments. This will mark an important step forward in tackling international climate change.

Domestic action on technology

4.40 The UK can also contribute domestically to innovation and technological advances which can be used to reduce emissions around the world. The UK has a mix of policies across the innovation chain, and Government support for energy innovation is rising. Examples include the development of cleaner energy generation and transport technologies, and strategies to decarbonise heat. All these sectors present opportunities over the medium to long term for substantial reductions.

4.41 The Research Councils' energy programme is contributing £70 million this year to conceptual research. In addition, the new Energy Technologies Institute, which is expected to be fully operational in 2008, aims to raise £1.1 billion for applied energy research over the next decade. To date, the private sector has already committed £300 million to the Institute, and the Government will provide match funding up to a total of £550 million. The domestic element of the Environmental Transformation Fund, which will fund investment in the demonstration and deployment of low-carbon energy and energy efficiency technologies, will be established from April 2008 with funding of £370 million over the CSR period jointly managed by the Department for Business, Enterprise and Regulatory Reform and the Department for Environment, Food and Rural Affairs. These three initiatives are closely linked to ensure a coherent and well-funded path for technology development.

4.42 Devolved and regional government also provide support for innovation. For example, the ground-breaking Wave Hub is a deep-sea electricity ‘socket’ that will sit on the seabed ten miles off the Cornish coast. The £20 million development, to be funded largely by the South West Regional Development Agency and the Environmental Transformation Fund, will deliver the infrastructure to support commercial-scale demonstrator wave energy projects. It will ultimately provide 20 megawatts of renewable electricity for 7500 homes when fully commissioned.

Carbon Capture and Storage

4.43 The Stern Review highlighted Carbon Capture and Storage as a key technology to help tackle global emissions, and in Budget 2007 the Government announced that a competition would be launched to demonstrate the technology on a full-scale commercial project, one of the first in the world. This competition will ensure the UK is a global leader in bringing forward this globally important technology, which is of relevance not only to the UK, but also to the EU’s aspiration to have 10-12 demonstration projects by 2015 (as agreed at Spring European Council in March 2007), and the transition to a low carbon economy in fast-growing developing countries such as China and India.

4.44 The Energy White Paper also set out policies to encourage the deployment of renewable and low carbon energy technologies. It announced work to develop a strategy to decarbonise heat, and in the electricity sector a consultation on changes to the Renewables Obligation to increase the deployment of a range of renewable technologies, including offshore wind and marine power. The policy is forecast to increase renewable electricity generation to 15 per cent of total generation by 2015. The White Paper also notes the possible need for further action as a result of the EU ambitions for renewable energy supply agreed at the Spring European Council in March 2007.

Technology in the transport sector

4.45 Transport is a significant source of global carbon emissions, and technology has a significant role to play in reducing emissions from the transport sector. The Government’s Low Carbon Transport Innovation Strategy (LCTIS), published in May 2007 alongside the Energy White Paper, set out a wide range of measures the Government is taking to incentivise the development of lower carbon transport technologies. Action under LCTIS includes contributing an additional £5 million per annum to the low carbon transport theme of the Energy Technologies institute, in conjunction with the Technology Strategy Board and the Engineering and Physical Sciences Research Council, developing a new Low Carbon Vehicle Platform providing up to £30 million of finance and critical coordination. With initial funding of £20 million, the Government will also develop a programme of public sector procurement to promote and support low carbon vehicle development, including small fleet demonstrations, to provide early markets for new innovative lower carbon vehicle technologies.

The King Review

4.46 In addition, Budget 2007 announced that Julia King, Vice-Chancellor of Aston University and former Director of Advanced Engineering at Rolls-Royce, working with Sir Nicholas Stern, would lead a review to examine vehicle and fuel technologies that over the next 25 years could help to decarbonise transport. The Review is publishing an interim report alongside the 2007 Pre-Budget Report. This identifies that:

- there is no single solution to decarbonising the transport sector, and the use of cleaner fuels, more fuel efficient vehicles and smarter driving choices all have a role to play; and
- in assessing how this can be achieved, it is imperative that life-cycle carbon emissions are considered, for example for fuels this relates to the carbon emissions produced from the well to the wheel, because different fuels result in CO₂ emissions at different stages in their production, transport and use.

4.47 The Review will publish its full report in 2008. In the meantime, the Government continues to engage with the European Commission and other stakeholders as they develop their proposals published in February for legislation on setting an EU-wide target to reduce CO₂ from new cars. The Commission proposal is to set a mandatory target for vehicle manufacturers to reduce average new car CO₂ in the EU to 130g/km by 2012. The UK strongly supports a move to a mandatory target, and would also like to see a recognition of the need for a longer-term strategy included in the proposals. The Commission is expected to publish its full legislative proposal by the end of this year.

4.48 The Government also sponsors the Low Carbon Vehicle Partnership, which brings together a wide range of stakeholders, including representatives from the automotive and fuel industries, to provide advice to Government on how to accelerate the shift to clean low carbon vehicles and fuels in the UK. Through the Energy Saving Trust, the Government provides funding for the installation of refueling or recharging stations for alternative fuels.

Sustainable biofuels **4.49** The Stern Review identifies sustainable biofuels as a viable low carbon transport fuel, and emphasises the need for greater technology cooperation with and between developing countries. The UK has launched a joint taskforce with Brazil, South Africa and Mozambique to promote the development of a sustainable regional biofuels industry in Southern Africa. The taskforce will bring together key partners in order to promote the production and use of biofuels in the region, and includes leading experts from Brazil, in order to enhance South-South technology transfer between Brazil and Southern Africa.

4.50 To encourage the development of sustainable biofuels, the Government is introducing from April 2008 a Renewable Transport Fuel Obligation (RTFO), which will require transport fuel suppliers to ensure a set percentage of their sales are from a renewable source. In June this year, the Secretary of State for Transport announced that, from 2010, the Government aims to reward biofuels under the RTFO according to the carbon that they save, rather than on a volume of sales basis. In addition, from 2011 the Government aims to reward biofuels under the RTFO only if they meet appropriate sustainability standards. These aims will enhance the environmental focus of the RTFO, directly benefiting those who produce and sell the most sustainable biofuels.⁵

BEHAVIOUR CHANGE AND ENERGY EFFICIENCY

4.51 Carbon pricing and measures to tackle technology market failures are important in the effort to tackle climate change. However, even with these measures, the Stern Review explains that there may be other reasons why individuals and businesses do not act to reduce their emissions, and energy efficiency measures which can benefit both the environment and save money may not always be taken up. These barriers need to be overcome, and the public sector, businesses and individuals informed and encouraged to make changes in their behaviour. While it may still be possible to avoid dangerous climate change without policies to address other barriers, it will be much more expensive to do so, as low cost opportunities for reductions will be missed.

4.52 There are a number of policy responses which may be appropriate to tackle these barriers, including:

- voluntary action;
- regulation;
- financial support;
- fiscal measures;
- downstream trading to reduce demand; and
- the provision of information and advice.

⁵ A policy paper exploring this is available via the Department for Transport's website www.dft.gov.uk

Voluntary action

4.53 Many organisations and businesses are taking voluntary action to reduce emissions, and the Government is driving progress by seeking voluntary action by retailers, manufacturers and service providers to phase out the least efficient products and to raise their own standards in line with these targets. For example, following a commitment in Budget 2007, the Government announced on 27 September 2007 that major retailers, with the support of manufacturers and energy companies, have agreed an ambition to phase out inefficient incandescent bulbs by 2011. This aims to save 5 million tonnes of CO₂ a year by 2012 from UK electricity generation.

The role for regulation

4.54 Regulation can reduce barriers associated with information or other market failures, by reducing transaction costs and encouraging competition and innovation as well as addressing the problem of split incentives.

Building regulations

4.55 Building regulations can overcome barriers to energy efficiency and improve the performance of buildings by requiring mitigation and adaptation to climate change. Box 4.2 provides more information about the Code for Sustainable Homes and building regulations that are reducing the carbon impact of new developments.

Box 4.2: Building regulations and zero carbon homes

To lower the carbon impact of new development and encourage higher sustainability standards in house building, the Government published the Code for Sustainable Homes in December 2006. This sets out six levels for sustainability in homebuilding, acting as a signal for consumers and recognising those developers that do go further in meeting these levels. The Government will also continue to drive forward improvements in the sustainability of new housing through tougher building regulations. Alongside the 2002 update to regulations, the new Part L building regulations, which came into force on 6 April 2006, increased the energy efficiency of new homes by 40 per cent compared to those built before 2002, and over 20 per cent over those built after 2020. These new standards (including measures for boilers announced in April 2005) will deliver a saving of approximately 3.3MtCO₂ per year by 2010.⁶

The Government has set an ambitious target that by 2016 all new homes will be zero carbon. This will be achieved through a progressive tightening of the carbon standards in building regulations – by 25 per cent in 2010 and by 44 per cent in 2013 – up to the zero carbon target in 2016. To bring forward progress towards this aim, the Pre-Budget Report 2006 announced a stamp duty exemption for the vast majority of new zero carbon homes. This is designed to incentivise demand for zero carbon homes among homebuyers ahead of the proposed target, and to support housebuilders, recognising that, in order to raise energy efficiency standards significantly beyond where they are now, the industry will have to modernise production methods and innovate through the employment of new materials and technologies.

4.56 Dynamic performance standards can reduce long-run energy demand by promoting more efficient products and removing inefficient ones from the market through the enforcement of minimum standards. Internationally agreed regulations and product standards can play an important role in improving energy efficiency, by reducing the costs to business of complying with a range of different national regulations. The EU has adopted directives that cover a range of areas including the energy performance of buildings, energy using products, and energy use and energy services directives.

⁶By way of comparison, provisional estimates indicate that in 2006, total UK carbon dioxide emissions were 560.6 MtCO₂.

Financial support

4.57 Financial support can play a role in reducing the barriers to behaviour change, although if there is public investment in energy efficiency measures, it is essential to consider the degree of additionality involved, identifying the barriers to private sector action and private funding, and ensuring that policies provide value for money. The barriers to the take up of cost-effective energy efficiency measures may be very different amongst those who could afford to take such measures than amongst vulnerable households, where access to capital may be much more problematic and pose a significant barrier.

Tackling fuel poverty **4.58** To combat barriers to the access of capital, the Government funds a range of energy efficiency measures to tackle fuel poverty in vulnerable households and improve the energy efficiency of the housing stock. In England, the Warm Front scheme has helped over 1.4 million households through a system of grants to install heating systems and insulation measures, and through benefit entitlement checks. The 2007 CSR provides resources to continue the Warm Front programme.

The Energy Efficiency Commitment **4.59** However, Government-funded programmes are not the only mechanism for supporting greater energy efficiency. The Energy Efficiency Commitment (known as the Carbon Emission Reduction Target from 2008) places an obligation on electricity and gas suppliers to meet targets for the promotion of improvements in household energy efficiency measures, such as insulation in their consumers' homes (see box 4.3 for further information). Subject to final decisions, the combination of Warm Front, and the CERT Priority Group, mean that spending on energy efficiency and other measures in low-income households will rise in the CSR period compared to the previous spending period.

Box 4.3: The Energy Efficiency Commitment

The Energy Efficiency Commitment was introduced in 2002 to drive increases in the energy efficiency of existing homes. Electricity and gas suppliers have targets for the promotion of energy efficiency measures in the domestic sector, including a specific proportion to low income households known as the Priority Group. This can be achieved by a combination of approved measures, including:

- installing insulation;
- promoting energy efficient light bulbs; and
- supplying high efficiency appliances or boilers.

The first phase of the EEC ran from 1 April 2002 to 31 March 2005 and is expected to save 1.1MtCO₂ annually by 2010. The current phase of EEC, over 2005-08, roughly doubles the activity of the first phase; and is expected to deliver saving of 1.8MtCO₂ by 2010. The third phase of EEC, now known as the Carbon Emission Reduction Target (CERT) will run over 2008-11. In addition to energy efficiency, CERT will include microgeneration and behavioural measures. The Government has consulted on a broad doubling of activity compared to the second phase of EEC.

Fiscal measures

4.60 Fiscal measures can provide incentives and rewards for changing behaviour and can encourage fuel and energy efficiency. The Government has introduced new, and reformed existing, fiscal measures in order to encourage behaviour change, to improve efficiency, and ensure that consumers are aware of the consequences of their actions, including the Climate Change Levy (CCL), Vehicle Excise Duty (VED), Air Passenger Duty (APD) and Stamp Duty Land Tax (SDLT).

Climate Change Levy 4.61 This chapter has already set out the central role that the EU ETS plays in the UK's approach to carbon pricing, covering around 50 per cent of UK emissions. The Government has sought to complement EU ETS with a range of measures to improve business energy efficiency.

4.62 The CCL was introduced in 2001 to encourage business to reduce energy demand. Independent analysis by Cambridge Econometrics estimated that the levy delivered cumulative savings of 60.5 MtCO₂ to 2005. By 2010, it is estimated that the levy will have reduced energy demand in the commercial and public sectors by around 15 per cent per year, compared with the levy package not being in place. The full impact of the levy package was set out in a report published at Budget 2006.

4.63 Improving energy efficiency helps business to reduce their energy costs, and makes them less vulnerable to energy market volatility. Therefore, targeting energy efficiency effectively continues to be the right focus for CCL. As announced in Budget 2007, the Government confirms that CCL rates will increase in line with inflation from 1 April 2008, to maintain the levy's environmental impact. The Government will continue to explore how energy efficiency objectives can be further improved in future.

4.64 In order to protect the competitiveness of the most energy-intensive sectors of industry, Climate Change Agreements (CCAs) were introduced as part of the CCL package. CCAs provide an 80 per cent discount from the levy for energy-intensive sectors, provided they enter into agreements to meet energy efficiency targets. By 2010, it is forecast that CCAs will deliver emissions savings of around 10.3 MtCO₂ per year.

Vehicle Excise Duty 4.65 In 2001, the Government reformed VED away from a flat rate system to a structure graduated on the basis of CO₂ emissions. This sends an important signal to motorists to consider environmental impacts when making car purchasing decisions, and is an effective incentive to purchase more fuel efficient cars. Following the announcements in Budget 2007, the differential between the amount of VED payable for the most and least fuel efficient vehicles will rise to £400 per year in 2008-09. Fuel efficiency labels matching the graduated VED structure were introduced into car showrooms in 2005, to raise consumer awareness of the potential fuel savings that can be achieved by choosing a lower CO₂ emission vehicle.

Air Passenger Duty 4.66 The Government estimates that its decision to increase the rates of APD in the 2006 Pre-Budget Report will deliver savings of up to 1.1 MtCO₂ per year. Taking account of the full range of aviation's climate effects, the exact scale of which are still uncertain, these savings could equate to an equivalent saving of 2.1 to 4.4 MtCO₂.⁷

Stamp Duty Land Tax 4.67 The UK is using an SDLT incentive, to encourage the building of new zero carbon homes. On the first acquisition of a new house costing less than £500,000 that meets the zero carbon standard, set by HM Treasury, no SDLT will be payable. A zero carbon house costing in excess of £500,000 will receive a reduction of £15,000 in the Stamp Duty Land Tax bill.

4.68 The Government's fiscal measures have played a key part in cutting the UK's greenhouse gas emissions, and ensuring that the economy continues to develop in the most sustainable and energy efficient way. The Government keeps fiscal measures under review, and the 2007 Pre-Budget Report, published today, announces further reforms in support of the Government's environmental objectives.

⁷ These issues are explored in further detail in *Consultation on the emissions cost assessment*, August 2007, www.dft.gov.uk

Downstream trading measures

4.69 Downstream trading measures target organisations which are already covered by the EU ETS, to encourage firms to invest in energy efficient measures by creating awareness about the benefits of saving energy. They encourage firms to minimise their emissions by requiring them to purchase allowances to cover their energy use, and allow them to trade allowances in order to find cost-effective opportunities to reduce emissions. In the short term, encouraging firms to reduce their electricity consumption will not reduce the UK's net carbon emissions as these are covered by the EU Emissions Trading Scheme, but in the longer term reduced demand will enable tighter caps to be set in future periods. Furthermore, downstream measures that encourage a reduction in gas and other fuels not covered by the EU ETS will lead to an immediate reduction in the UK's net carbon emissions.

The Carbon Reduction Commitment **4.70** In the UK, the Government has decided to implement downstream trading through a mandatory cap and trade scheme, the Carbon Reduction Commitment (CRC). The CRC will secure reductions of approximately 4 MtCO₂ per year by 2020 (relative to a 2010 baseline) from large non-energy intensive commercial and public sector organisations, a sector made up mainly of organisations not currently subject to legally binding emissions targets. The scheme will cover both indirect emissions from downstream electricity consumption, and direct emissions from the consumption of gas and other fuels. The Government has recently undertaken consultation on the detail of the CRC.

Information, advice and education

4.71 Information policies can provide individuals with a greater idea of the environmental and economic consequences of their actions, and encourage them to take responsible action. They can also help to stimulate innovation and competition in the market for environmentally friendly goods and services, and reduce the transaction costs associated with investment in low carbon goods and services.

4.72 There are a number of programmes, both public and private, which are designed to increase the provision of information, such as:

- Energy Performance Certificates (EPCs), which will be mandatory for all homes bought and sold in England and Wales. EPCs provide an A to G rating for properties to reflect their energy efficiency and carbon emissions. Details will also be provided on how consumers can improve the rating through energy efficiency measures;
- the work of the Energy Saving Trust, which works with households and the public sector to encourage a more efficient use of energy, stimulate the demand and supply of cleaner fuelled vehicles and promote the use of small-scale renewable energy sources, such as solar and wind. The Energy Saving Trust also provides advice on greener motoring within fleets and the Trust's local advice centres provide impartial information on home energy efficiency;
- the Carbon Trust, which works with businesses and the public sector to promote and advise on the use of existing technologies to reduce carbon emissions through improved energy efficiency (often identifying 20-30 per cent savings in energy costs) and the broader strategic issues of carbon management; to develop low carbon technologies, and to encourage changes in attitudes, behaviour and business processes;
- the Climate Change Communication Initiative, a cross-Government initiative to raise awareness and understanding of climate change, including through climate change champions, the Climate Challenge Fund (which has been set

up provide financial support for communication projects seeking to achieve positive changes in public attitudes about climate change), and information on Government policies about what steps individuals can take to reduce their carbon impact; and

- the Government's Act on CO₂ campaign provides information about what steps individuals can take to reduce their carbon impact. The first element of the campaign was aimed at raising awareness among motorists of what they can do to help reduce emissions. The Government also supports a range of measures to help people choose sustainable transport options, and is considering the development of an accreditation scheme to encourage and recognise those organisations who implement best practice and show improvements in the environmental performance of their transport operations.

ADAPTATION

Supporting developing countries

4.73 All countries will be affected by climate change, but it is the poorest countries that will suffer earliest and most, as they are the most vulnerable. The UK attaches great importance to helping developing countries to adapt to the adverse impacts of climate change. Even with action to stabilise global greenhouse gas concentrations, temperature rises will have an impact in many parts of the world.

4.74 The UK must deliver on its commitment to support developing countries to adapt to the unavoidable effects of climate change. Development assistance needs to take into account the risks posed from climate change, and other sources of funding will be needed to deliver the level of finance necessary. It is also important to help developing countries access better information and research on climate risks, to ensure their national development plans are resilient to climate changes and increased climate variability.

The international Environmental Transformation Fund **4.75** As part of the UK's commitment to supporting developing countries, Budget 2007 announced an £800 million international element of the Environmental Transformation Fund, to finance overseas development projects that deliver both poverty reduction and environmental benefits in developing countries, to help them respond to climate change.

Adaptation in the UK

4.76 The UK will also be affected by the unavoidable impacts of climate change. In November 2006 the Government published its analysis of the long-term opportunities and challenges in the 2007 Comprehensive Spending Review, which explored the implications of global climate change for the UK⁸. This is informing the framework for UK adaptation. Climate change will have mixed effects on the UK. Parts of the UK will experience hotter, drier summers, and warmer, wetter winters, which could lead to increased frequency of flooding. Sea levels will continue to rise around the coast and the frequency of storm surges could increase. At present, there is more confidence about impacts driven by temperature than those mediated by rainfall, where predictions still differ between climate models.

⁸ *Long-term opportunities and challenges in the 2007 Comprehensive Spending Review*, HM Treasury, November 2006, www.hm-treasury.gov.uk

⁹ *Foresight Future Flooding report*, Office of Science and Technology, 2004

4.77 As a result of these changes, the annual costs of flooding to homes, businesses and infrastructure could increase. The Government's Foresight report identified a range of costs from 2 to 27 times current spending levels by the 2080s, depending on global emissions trajectories and the choices made about the balance between defences to mitigate flooding and the costs of dealing with floods when they do happen.⁹

Funding for flood risk management

4.78 This is why the Government is announcing in the 2007 CSR that funding for flood and coastal erosion risk management across Government will increase from £600 million in 2007-08 to £800 million in 2010-11. Within this settlement, the Government will also introduce an adaptation toolkit of £10 million per year to assist communities in adapting to change where constructing defences is not the most appropriate means of managing flood and coastal erosion risk.

4.79 The planning system is one of the most effective ways to control the risks from flooding and climate change. In December 2006 the Government published new planning policy on development and flood risk (PPS25) to:

- avoid inappropriate development in areas at risk of flooding;
- direct development away from areas at highest risk; and
- where development is needed in exceptional cases in flood risk areas, it will make it safe, without increasing flood risk.

4.80 To complement PPS25, supporting guidance *Improving the flood performance of new buildings: Flood resilient construction* recognises that, while planning policy aims to direct inappropriate development away from flood risk areas, some building will be necessary to maintain existing services and communities. Therefore, structures should be designed and constructed to keep people safe, reduce financial losses, and speed up recovery.

4.81 The Government, as part of its strategy for flood and coastal erosion risk management *Making space for water*, is continuing to work with the Association of British Insurers on encouraging greater uptake of property-level flood protection measures and resilient repair of properties after a flood – both important adaptations for preparing the country's housing stock for the impacts of increased flood risk.¹⁰

4.82 To ensure that this comprehensive approach to adaptation is brought together in an effective and coherent way, the Government is developing an Adaptation Policy Framework. This framework will help coordinate the efforts of different departments and increase the transparency of the Government's efforts to adapt to climate change.

¹⁰ *Making Space for Water*, Department for Environment, Food and Rural Affairs, 2004, www.defra.gov.uk

5

CONCLUSION AND NEXT STEPS

5.1 This document has provided a summary of the past 12 months, since the publication of the Stern Review, assessing the Government's existing policy framework against that proposed by the Stern Review, and setting out how the Government has taken on board the Stern Review's conclusions.

5.2 The UK recognises the need for early and coordinated international action. The key challenge will be for the world to agree and deliver a long-term target to reduce emissions, in order to reduce emissions to a level which avoids the most serious impacts of global warming. The recent G8 summit made good progress on climate change, calling for strong and early action. It is essential that the UNFCCC meeting at Bali in December 2007 recognises the scale of the problem, the affordability of measures already available to mitigate the threat of climate change, and the case for early multilateral action. The UK looks forward to discussions at Bali, where we hope to make serious progress with the global community on the shape of a post 2012 future framework.

5.3 Within the EU, the key challenge over the coming months is to ensure that the EU takes forward the package of decisions agreed at the Spring European Council in March 2007, ensuring that it retains the focus on reducing greenhouse gas emissions cost-effectively. The EU ETS after 2012 should deliver a well-functioning market with scarcity of allowances, and the EU will also need to deliver its target for a 20 per cent renewable energy in overall EU consumption by 2020.

5.4 In the UK, the recently published Energy White Paper, Planning White Paper, Waste Strategy, Air Quality Strategy, and the Government's response to the Better Regulation Commission's Report on the Stern Review, show how the UK is integrating climate change within the wider context of natural environment and energy policy. Key to supporting this policy framework will be the introduction of the Climate Change Bill.

5.5 Alongside policies for mitigating climate change and reducing greenhouse gas emissions, both developed and developing countries need to adapt to the unavoidable impacts of climate change. Developing countries will be amongst the hardest hit by climate change, and this has significant implications for the achievement of development goals. The international element of the Environmental Transformation Fund will form a key part of the UK's strategy for adaptation in developing countries, by financing overseas development projects that deliver both poverty reduction and environmental benefits. And, in the UK, funding for flood and coastal erosion risk management across Government will increase from £600 million in 2007-08 to £800 million in 2010-11, to help the UK adapt to the unavoidable impacts of climate change.

5.6 This portfolio of policies shows why the UK is seen as a world leader in tackling climate change. The Government is committed to keeping its policies on energy efficiency and carbon savings under review. We cannot be complacent – we must maintain momentum to ensure continued action to avoid the most dangerous impacts of climate change.

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