After the Stern Review: reflections and responses

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PAPER C:

'Building an effective international response to climate change'

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Building an effective international response to climate change

The Stern Review set out a clear framework for policy to mitigate climate change and identified opportunities for international action in support of both mitigation and adaptation. The Review was published as a contribution to the discussion of the challenge of building the international action necessary to combat climate change. Since publication, the Stern Review team have been involved in discussions with people across the world about climate change, how they perceive the problem, what they are doing nationally to contribute to overcoming the problem, and focusing in particular on the challenges of building a global response.

As a team of people who have looked at the climate change problem from a global, rather than a particular national perspective, we have used these discussions to listen in detail to the views of people in government, business and civil society in Europe, Africa, Asia and the US. Our discussions have been open-minded, frank and concerned with what must happen next. The conversations have given us unique insights into what people in many parts of the world have been thinking and doing since our publication last Autumn. We have also used the conversations to pass on information about what others are doing nationally– much of which was new to our interlocutors and demonstrates the need for ways of sharing such information.

A lot has happened on policy development in the last few months, and that is hugely encouraging. Much is already happening at the national level that can be built on to stimulate international action to reduce emissions. We are confident that there is a will, across the world, to make a concerted move to tackle the problem. All the key players, including the USA, have a crucial role to play. We do not assume that achieving international action will be easy, nor are we assured that action will occur with the necessary ambition or urgency that the risks require. But we cannot afford to abandon hope; instead we must redouble our efforts in a manner commensurate to the urgency and risk to the people and planet of allowing climate change to continue unchecked.

In this light, this paper provides some reflections on the discussions we have had, with a view to emphasising what we consider to be the key opportunities for international discussions this year to build an effective and timely global response.

C1 Tackling a market failure and developing new markets around the world

Climate change is perhaps the greatest example of market failure ever seen - but by providing a strong policy framework to overcome that the failure, governments can harness the tremendous power of markets to find creative and cost-effective responses to the challenge.

There are three dimensions to mitigation policy- carbon pricing, technology policy and tackling market failures and behaviours that prevent the take-up of lower cost emissions reductions. Climate change policy can make major contributions to other policy objectives if it is designed well. In a comprehensive assessment of the costs and benefits of climate change policy, it is therefore necessary to value these co-benefits. The co-benefits are delivered through pursuing the important harmonies between climate change, growth and energy security[1].

Growth is supported by energy efficiency as, by definition, it increases resource productivity. Measures to improve energy efficiency can also help reduce expenditure on energy for vulnerable individuals and contribute to reducing fuel poverty. Diversifying energy generation into using more domestic renewable resources reduces dependency on foreign imports of fossil fuel, supporting energy security objectives. Using carbon capture and storage technologies to enable the exploitation of domestic coal reserves without unacceptable damage to the environment can also support energy security. Increasing investment in renewable technologies increases the potential for distributed energy generation, improving access to energy. Avoiding deforestation and improving the management of degraded land can provide protection against flooding and soil erosion and support local objectives for sustainable development. The pursuit of good policies now to adjust to a future with lower emissions will put countries in a strong position to exploit the future markets for new low carbon technologies- by 2050 these markets could be worth up to US $500 billion a year.

It is for these reasons that countries across the world have begun to pursue the objectives of growth, energy security and climate change as mutually supportive policy goals.

[1] These are described in more detail in Chapter 12 of the Stern Review.

Since publication, the Review team have travelled widely, presenting the results of the Review and listening to the reactions of policymakers, academics and business leaders, in particular in the EU, China, India, Japan, Africa and the US.

The **development of policy in the EU has accelerated significantly in the last few months**. The European Commission rejected several of the draft National Allocation Plans for Phase II of the EU Emissions Trading Scheme, asking for allocations to be reduced in a number of countries – a move that will increase the credibility of the market for 2008-2012. This has sent a strong signal on the role of carbon markets at the centre of the EU's strategy to deliver deeper emissions cuts. The European Commission's Communication on Climate Change and its Strategic EU Energy Review (SER)[2], published in January 2007, recommends a target for developed countries to reduce greenhouse gases by up to 30% compared to 1990 levels by2020, as part of an international agreement and an independent EU commitment to reduce greenhouse gases by at least 20% by 2020. The EU also proposes other mandatory targets on energy efficiency, renewables and biofuels.

In China and in India, policymakers are also demonstrating a strong interest in moving towards more secure and sustainable energy use. In China, we heard about the wide range of measures that China is beginning to implement towards its domestic target to improve energy intensity by 20% by 2010: energy efficiency audits and major investment projects for manufacturing industry, and changes to taxation of vehicle sales and energy-intensive products for export. In India, we saw how the Integrated Energy Policy under the 11th Five Year Plan is being taken forward – including changes to energy subsidies, plans for more efficient coal-fired power plant and further development of innovative new technologies for renewable energy.

In Japan, debates between government, industry and civil society on the challenges of designing further domestic and international action are intensifying. There was encouraging news of rapid technological progress – confidence on the role of plug-in hybrid vehicles and imminent breakthroughs in solar technology. There was increasing recognition of the role of trading and investment strategies in creating stronger co-operation with China and India, and interest in sectoral approaches that could mitigate concerns about competitiveness.

[2] See European Commission (2007a) and European Commission (2007b) for more details.

In Africa, climate change has risen sharply up the agenda. The decision by the African Union to make climate change one of the key themes for its Summit in January 2007 has drawn the attention of African leaders to the vulnerability of their countries, and to the opportunities for adaptation, sustainable land management and low-carbon development.

In the US too there have been some very significant moves to reduce dependence on fossil fuels, and some states have set objectives to limit greenhouse gas emissions. At the state level, California has committed to making a 25% reduction in emissions compared to 1990 levels by 2020, and 80% reductions by 2050. There is progress on the implementation of a regional emissions trading scheme in the North Eastern states of the US. Business is looking for progress too. In advance of the 2007 State of Union address, a group of leading business and environmental organisations called for US Congress to provide national legislation to require significant reductions of greenhouse gas emissions over the short and mid-term. In this year's State of the Union Address, President Bush outlined plans to improve efficiency, reduce emissions and improve energy security particularly in the transport sector. Energy efficiency standards in such large markets can stimulate innovation and influence markets throughout the world.

In the light of these developments, there are clear opportunities to build momentum towards effective international collective action on climate change.

This will be challenging. In particular, policy-makers must get to grips with two key questions:

- how to find the balance between the **fixed long-term goals** that are required to reduce the risks of climate change, and the flexible**, efficient short-term policy measures** that will reduce the costs of taking action;

- how to find the balance between seeking **international frameworks** that lead to an effective, efficient and equitable global response and taking **national policy** decisions in advance of, or alongside, such frameworks.

As the Review discussed, reducing greenhouse gas emissions rests on the voluntary decisions of nation states. It is national governments that have the power to introduce binding legislation and other policy instruments to shape private markets

and alter patterns of investment and consumption. But an international framework of formal and informal agreements for co-ordination of these national policy decisions, firmly linked to a long-term global goal, has very strong advantages over a purely domestic approach.

Above all, **broad international consensus on the tolerable levels of risk from climate change is essential to provide context for national policy objectives**. The Review recommends that debate should focus on limiting concentrations of CO2 equivalent within the range 450-550 ppm CO2e, although the goal could also be expressed in terms of other metrics (including cumulative emissions or the scale of long-term reductions required).

Some have questioned whether such a global goal is really required. International co-operation to protect the ozone layer focused on timetables for phasing out harmful chemicals, without specifying an overall acceptable limit on the concentration of ozone depleting substances in the atmosphere. By focusing on controlling the use of key substances, policymakers were able to target particular activities that were amenable to direct control and to provide appropriate but limited financial support to encourage the participation of poorer countries[3]. Many other environmental issues have been managed with a similar approach.

Goals for the composition of the global atmosphere are inevitably open to free-riding and unenforceable. **But the purpose of seeking consensus on a global goal is not to provide direct and binding external controls on national activities; it is required as a benchmark for international and national decision-making.** It provides an index of the level of risk that people are willing to tolerate in terms of the potential impacts of climate change, an indicator of the order of magnitude of the technical challenges and therefore a guide to more specific policy measures required across different countries and sectors, and a means to track progress. These policies should reflect the sound basis of the economics of risk that point to the urgency and specifically the importance of global emissions peaking within the next 20 years as we are already starting at around 430 ppm CO2e.

[3] See for example Barrett (2003)

C2 Creating effective domestic policy frameworks

Consensus on the overall global long-term goal for climate change policy allows policymakers to assess how much action is required and to put in place short and medium-term policy measures towards that end.

Making sharp reductions in greenhouse gases in the short term will always be more costly than making gradual reductions in line with investment cycles, given the lead times for changing infrastructure and introducing new technologies in sectors such as energy, transport and buildings. So policy must find a credible means of influencing medium- and long-term investment decisions if deep cuts are to be achieved.

This points to the importance of using different national policy instruments in parallel – a carbon price, to address the externality and encourage business and individuals to identify cost-effective short-term reductions; technology policy to accelerate R&D and encourage the deployment of lower carbon technologies; and the use of regulation and other measures where necessary to overcome other significant barriers. Such measures will promote confidence in the future direction of the how markets, create economies of scale and thus accelerate R& D. An example of these measures is the proposal this month by the European Commission to move to mandatory standards for new cars. All cars sold in the EU must produce on average of 120 grams of carbon dioxide per kilometre travelled by 2012. EU vehicles currently emit an average of 163 g/km. This creates clarity that the market for low carbon cars will grow in the world's second biggest car market.

It is important to note that behavioural change can also be influenced by building a sense of individual responsibility to contribute to tackling climate change. In every country we visited, people have emphasised that this is a powerful tool both to increase understanding of the issue, and to build support for policy measures that use pricing or standards to influence behaviour. Policy should therefore look to include education on climate change through schooling, but also recognise the value of public discussion on the issue to help people understand what the impacts will be from the climate change we already expect, and the risks to future generations of further increases in average global temperature.

Effective policy frameworks are likely to combine credibility, predictability and flexibility. Credibility and predictability – "long, loud and legal" policy signals – help investors make clear choices about long-term infrastructure and research decisions, and allow capital markets to function efficiently in supplying project finance. The current patchwork of international, regional and national arrangements is not providing sufficient horizons to guide markets effectively. But investment cycles stretch over 20-30 years or more, and it is not necessarily desirable to fix policy once and for all over that time horizon. This is an area where new information about the science of climate change, and new information about the range of options for mitigation, will continue to develop rapidly. There is a balance to be struck here, and rules-based frameworks may be helpful – parameters within which policies can be updated periodically in the light of new information, on a basis that is transparent and predictable. We suggest that this should incorporate:

- clear programmes and policies to meet emission reduction targets to at least 2020
- clear emissions reduction targets for 2050

Developing effective domestic policy and legislation on climate change requires an understanding of the international nature of the problem and the international context. As international negotiations on climate change begin to gather pace, the economics of climate change point to a number of key areas where co-operation will add value to national efforts:

- **Supporting the development of more efficient carbon markets**. Links between emerging markets for carbon reductions will increase their efficiency and create flows that support low-carbon development paths in poor countries, but these links can only be created if there is agreement on the technical and practical issues required to allow credits to be traded across borders;

- **Addressing concerns about competitiveness impacts.** As countries consider how to take action in different ways and at different speeds, international action can provide solutions to mitigate concerns about the impacts on the competitiveness of energy-intensive industrial sectors that are open to trade;

- **Accelerating the deployment of low-carbon technologies**. International co-operation can help to bring forward the demonstration of key technologies. Increasing the size of markets for cleaner, low-carbon technologies will also spur innovation;

- **Expanding the scale and urgency of efforts to reduce deforestation.** The countries within which forests stand must take the lead in managing their natural resources and;

- **Integrating adaptation to climate change into development, and supporting the provision of global public goods for policies and strategies for adaptation.**

Each of these areas is considered in more detail below.

We have seen significant progress, including in the last few months, but working back from the end of the current framework in 2012, the next two years are particularly important in shaping the world's response to the challenge of climate change. A failure to come together internationally and to take action domestically increases the risk that we will not be able to avoid costly impacts on planet and the lives of our and future generations. This year's EU Spring Council and G8 plus 5 meetings should be pivotal in injecting dynamism for agreeing what the next steps should be. Making significant progress at this year's UNFCCC Conference of Parties meeting in Bali is crucial.

C3 Supporting the development of more efficient global carbon markets

As we noted in the Review, taxation, emissions trading and regulation can all deliver a price signal for carbon and create markets for solutions in emission reductions. Different countries will choose different combinations of these approaches for different sectors, reflecting their existing policy mix, histories, conditions and national politics.

In many countries, policy makers consider taxation to be an important policy instrument to price carbon. The Review outlined that both taxation and trading policies can be used to price carbon, both instruments price carbon and both can be

used to raise public revenues (under trading this requires governments to sell allowances). The main difference between the two policies is the potential for facilitating rapid international co-operation and giving access to international markets[4]. To take the case of taxes, they are most useful in pricing carbon emissions from sectors that have a large number of small emission sources, which may also be mobile (such as road vehicles). In such sectors, the transaction costs for a large number of small emitters being involved in emissions trading schemes may be prohibitive. In many countries, it may also be that these sectors already have a fiscal policy in place that makes the use of taxation for carbon purposes easier to implement than a new approach to using emissions markets.

In other sectors that have large, stationary sources of emissions (such as electricity generation or heavy industry), transaction costs for involvement in trading will be lower, making them more suited to using emissions markets. In many cases, these sectors are also competing internationally. Inclusion in an international trading scheme therefore helps to reduce any risks of differing carbon prices being imposed at the domestic level that have may impact on competitiveness. In theory, taxes could be harmonised across countries to prevent any competitiveness impacts, but experience in other policy areas shows this is very difficult to attain.

In terms of impacts on international co-operation, trading is seen as more effective due to the fact that it opens up markets for emissions reductions across borders and therefore allows automatically for transfers of finance and investment between countries. Access to broad international markets is likely to allow firms to access least cost options for reductions and therefore keep compliance cost low. Where developing countries are involved in such markets, it therefore offers a channel for the financing of low carbon investments in these countries, which is particularly important for international co-operation on climate change. Again, in theory, carbon taxation could be used to transfer revenues across borders, but in practice this would be more difficult to achieve than through the direct, and largely private sector transactions that occur within an international emissions market.

The Review therefore saw emissions trading as a particularly powerful instrument to tackle climate change, as it encourages both least-cost emissions reductions and facilitates international co-operation. Since the Review was published and in

[4] See Chapter 14 of the Stern Review for more details.

discussions around the world, there is growing evidence that emissions trading will be increasingly important going forward.

The world's largest emissions trading scheme, the EU Emissions Trading scheme (EU ETS), is now gaining experience and credibility. The Review noted the problems of the first phase – including over-allocation of allowances and low transparency. The Commission has already shown that it is willing to address these problems, with the decision to reject a number of National Allocation Plans for Phase II and insist on tighter caps. The European Commission's Communication on Climate Change and Strategic Energy Review proposal, offers a basis to establish long-term visibility on emissions trading, with targets for at least 2020 and 2050.

The EU's proposal offers the opportunity to build partnerships, including with the US, China and India, by exploring the basis on which credits from other trading schemes and from offset mechanisms can be used within the EU ETS. The existing institutions under the Kyoto Protocol provide a part of the answer, but there are also opportunities to think more broadly – for example about how "sub-sovereign" regional schemes can be linked with the EU, and to consider the basis for scaling up flows of carbon finance to countries like India and China to support strategic transformations in the energy sector or to support efforts to reduce deforestation in poor countries.

The design of emissions trading schemes is key to their effectiveness. Key design features include:

1) The demand side for reductions must be ambitious enough to create scarcity in the market.

Reductions sought from emissions trading markets should contribute to the objective of making reductions in the region of 60% to 80% by 2050 in the developed world. Trading is a least cost instrument and can therefore make significant contributions to meeting these targets. The current low prices in the EUETS Phase 1 market clearly demonstrate that market design that allows over allocation and does not ensure scarcity, risks undermining the market[5].

[5] See Box 15.1 in Chapter 15 of the Stern Review for more details on EU ETS design and early experience of trading in EU allowances.

2) The market must create effective incentives for investors to consider the cost of carbon in their decisions about the long term.

To be transformative in influencing long-term investments, **emissions markets require clarity about the direction of policy in the long term**. Achieving this will begin to develop the basis of more stable, effective emissions markets and will enable vital markets to arise in emissions futures and other financial tools for efficient risk management. Realising this requires a clear view of what will be expected for at least the next few decades from emissions trading schemes. Unlike say, a commodity market, emissions trading markets are purely policy driven, and as such, only policy makers can set out this long-term view.

At a basic level it is clear that to prevent a 'cliff edge' in investment and confidence in emissions trading markets, **it is now very urgent that international negotiators clarify the conditions for emissions trading from 2012 to at least 2020**. This includes the future of the Clean Development Mechanism (CDM) or its successor market for developing world. emissions reductions. Under current conditions, the carbon market is unable to deliver investment that ensures avoiding a lock-in to long-lived carbon-intensive infrastructure.

3) The market must respond to new information on a transparent and predictable basis

New information about the science of climate change, the technologies for mitigation, and the costs to industry of making reductions in a given timeframe will continue to emerge. Whilst a long-term planning horizon is essential for investors, policy-makers will want to retain the ability to make adjustments where these become essential.

As in other areas of economic policy-making (for example interest rates and monetary policy), decisions on sequential adjustments are more effective if they are based on a sound, transparent and predictable framework. Sequential adjustments could be administered in emissions trading schemes through setting caps for trading periods in tranches over sequential shorter-term trading periods. Taken together, such periods should provide a minimum-planning horizon of at least ten years, in order to influence large-scale investment in reductions in the sectors covered by emissions trading.

Banking allowances between short trading periods could also allow policy makers to keep some control on adjusting sequentially the ambitions for short term trading periods, while allowing investors to smooth their investments across time.

Another tool to instil predictability in the emissions market is the use of price controls- either a cap to prevent prices rising above a certain level, or a floor, to guarantee a minimum value for carbon. The advantages and disadvantages of these tools have been outlined in the Review[6]. The key argument for such controls, is that they avoid either very high or very low marginal abatement costs to industry over the short term, and can act as a price like mechanism while retaining some of the benefits of a quota trading system. In principle, minimising uncertainty on carbon prices and volatility is useful, but the Review argued that the benefits were limited due to the fact that a price control is still a policy decision and does not overcome the problem of uncertainty that these controls will change or be removed. Further, using caps and floors has risks for limiting international co-operation and also to the public finances.

However, as we have outlined above, there are many features of the policy framework and the design of the emissions trading scheme itself that can be used to achieve more stable emissions markets, without compromising a pure quota based trading system. Firstly, in much discussion with business, the concerns on uncertainty over carbon value are related to uncertainty on the existence of a carbon value in the future, rather than uncertainty on the carbon price itself. Secondly in terms of the price volatility seen in markets such as the EU ETS, much of this has been an outcome of flawed design, which can be learned from to prevent such uncertainty in price movements in the future. Markets like the first Phase of EU ETS, that have intransparent allocation methods, over-allocation, short trading periods and a narrow participation in terms of number of firms and different economic sectors will be susceptible to price spikes and troughs. Designing schemes without these features will overcome some of the factors driving price volatility.

Aside from considering better emissions trading scheme design, the Review also emphasised that using price controls in individual schemes would make the task of linking up global carbon markets much more challenging than is already the case. Much as with the case on agreeing a global tax, it would be difficult for a global cap on carbon prices to be agreed for emissions trading schemes. Therefore if schemes

[6] See Box 15.2, pp 376 in the Stern Review for more detail.

emerge with different caps and floors, linking them up risks carbon leakage and will be less efficient than if trading occurs between jurisdictions where no price controls exist. This disincentive to moving towards linking into a global carbon market makes the use of caps and floors unattractive for tackling the climate change problem. Finally, there are risks to public finances from implementing price controls. Deciding on where to set them will be difficult and subject to lobbying pressures by short-term interest groups. Governments risk buying or selling emissions allowances to firms at prices that may be well above or below future market prices.

Following from this, the debate on the future of global carbon markets could benefit from a careful consideration of how a system based on clear long-term targets and decisions on short-term adjustments of emissions trading reductions or caps over time could be made in an international context.

4) Emissions trading schemes should not be based on free allocation, particularly over sequential time periods.

Free allowances dampen incentives to reduce emissions, and over time will slow adjustment of the capital stock and therefore raise overall compliance costs[7]. Making firms pay for allowances should be a significant aspect of allocation in emerging schemes and Phase III of the EU ETS. Discussions on the design of the Regional Greenhouse Gas Initiative (RGGI) in the US, already proposes that allocation should be have at least 25% of permits auctioned, with some states suggesting more or even 100% auctioning should be used [8].

5) Emissions trading schemes that are open and permit trade across countries are likely to be more efficient

Regional emissions trading schemes are likely to be more efficient if they are linked as part of a global network of broad, deep, and liquid emissions markets that include a wide range of sectors and greenhouse gases. Broader, deeper markets will quickly enable more sectors of the economy to face the same carbon price, which improves the efficiency of climate change policy and decrease competitiveness risks. Broader

[7] See Section 15.4 of the Stern Review for more detail on allocation methods and impacts on incentives and compliance costs.
[8] See CMNA, December 2006. Also www. rggi.com for details on the RGGI in the USA.

markets with firms of different sizes and varying economic sectors participating are likely to be more stable and more liquid.

In this light, the European Commission has already put forward proposals to include aviation emissions in Phase II of the EU ETS. The debate on whether other sectors can be included in emissions trading (eg. downstream road transport emissions covered via upstream emissions trading by refineries) could benefit from more analysis.

A series of linked emissions markets in different regions, countries or sectors, or a single global carbon market would provide a common price for the global externality of greenhouse gas emissions. Such a market would provide maximum flexibility and efficiency, therefore lowering global mitigation costs[9].

From the outset, emissions trading schemes would benefit from being designed with the objective of being open to trade across the developed and developing world. This means looking outwards now to what other scheme designs are and what new schemes are planning, and working to adopt as a basic foundation in design a common standard for measurement and verification of emissions. Policy makers should consider the negative consequences for efficiency and global co-operation if a global carbon market emerges with very fragmented markets that adopt different measurement standards, targets or price controls.

Linking national and regional emissions trading schemes is also progressing. The EU finance ministers have already agreed to link its scheme with the countries of the European Free Trade Area[10]. Policy makers responsible for RGGI and the proposed trading scheme in California are considering linking their schemes. Further linking between North American and other schemes should be a priority for the design of Phase III of the EU ETS from 2012. In our discussions with business, government and civil society groups since the Review, developing a global carbon market has been seen as a key action point across the world.

To facilitate links between different national, regional or sectoral schemes will require discussions around three key areas:

[9] See Chapter 10 of the Stern Review for more details
[10] EFTA includes Iceland, Norway, Switzerland and Liechtenstein.

1) **Defining emissions reductions across different jurisdictions**
2) **Scaling up carbon finance for developing countries;**
3) **Undertaking the technical challenges of linking different schemes.**

To a great extent, a number of these areas are already part of the UNFCCC and Kyoto Protocol framework, and a live topic of discussions by industry and policy makers across the world. This expertise and understanding should be built on to deliver quickly the tools for building markets in the future.

1) Defining emissions reductions in different jurisdictions

This is about the challenge of ensuring that all emission reductions have the same environmental value, to ensure that a tonne of greenhouse gas reductions made in one part of the world is the same as a tonne of reductions somewhere else. **Legal, accounting and emissions verification systems are crucial to underpinning confidence in emissions markets and therefore their effectiveness**. Developing common approaches to these compliance mechanisms would boost the credibility of emerging emissions markets around the world and facilitate a practical step towards linking different schemes by means of establishing a 'common currency'[11]. There are policy, as well as technical, challenges associated with developing such standards. As new schemes are considered in the US and elsewhere, and the post 2012 EU ETS is being developed, policy-makers and business leaders should now address how such common standards could be established.

2) Scaling up flows of carbon finance to developing countries

This will require improvements to the system of recognising emission reductions, going beyond the current project-by-project approach. In this respect, **moving towards using programmatic, sectoral or technology-based or even national baseline approaches is crucial**. To facilitate this, technical work should be accelerated on defining and measuring reductions from different policies and measures across multiple sources and sectors against the expected business as usual emissions (BAU) in developing countries[12]. This is challenging work that will need the input of expert researchers, regional banks and multilateral institutions.

[11] See Kruger & Egenhofer (2005).
[12] For an interesting analysis of developing country's mitigation opportunities from current policies and detail on sectoral approaches, see papers by the Centre for Clean Air Policy at www.ccap.org/international/developing.htm

3) Undertaking the technical challenges of linking

Schemes that develop purely on the basis of different regional or national policy contexts and within different jurisdictions are likely to incorporate quite different features. However, international discussion of common principles could make it very much easier to link schemes in future. In addition to the issues of accounting and verification identified above, these include

- Finding ways to trade between schemes that may fall under different legal jurisdictions such as countries that continue to operate under the Kyoto Protocol (and therefore have AAUs), with those who are outside Kyoto;
- Addressing issues around the basis for trade between regional and national schemes with sub-sovereign level or sectoral schemes;
- Linking schemes based on different types of target, such as absolute and relative emissions; and
- Linking schemes with different approaches to banking and borrowing or schemes in which price caps and/or floors are present.

There are technical solutions to these issues[13], but the starting point is a willingness to work together to make schemes as compatible as possible from the outset and a commitment to ensure free and active trade between jurisdictions will occur. As policy makers design new schemes, the efficiency benefits of being part of broader, global markets through an open approach to the market should be at the forefront of decisions on design options.

C4 Dealing with concerns about competitiveness

In every country we have visited, there are high levels of concern in particular sectors about the impact on growth and competitiveness of taking on commitments to climate change policy that are out of line with their competitors. If some countries move more quickly than others in implementing carbon reduction policies, there are concerns that carbon-intensive industries will locate in countries without such policies in place The Review emphasised the importance of looking at this problem using rigorous analysis. It is essential to make informed judgements about the scale of the impacts of particular sectors and the appropriate response. Any response should consider what the appropriate balance is between the short-term interests of particular sectors

[13] See Ellis & Tirpak (2006)

of the economy, the environmental effectiveness of the measures and the process of adjustment to a flexible, dynamic global low-carbon economy in the longer-term.

The long-term interests of the economy are to be able to reduce emissions at least cost. The Review found that the costs of action were 1% of global GDP, this is equivalent to price changes of an order that we are used to dealing with all the time, through, for example, changes in exchange rates. But to keep the cost down to 1% of global GDP, well-designed policy is required[14]. Least-cost policy regimes embody three key design features: allowance for 'what', where' and 'when' flexibility in reducing emissions, action to bring forward low carbon technologies and giving the private sector a clear signal on the long term policy environment. To ensure an economy is competitive in the long term therefore requires putting in place policy that can achieve a transition to lower emissions using good policy. In short, if we accept that the future will be carbon-constrained, then policy makers and business have a clear interest in planning for a smooth transition to such constraints, rather than having to make a sharp downward correction in emissions later on, at higher cost.

The short-term interests of the economy are to be able to minimise the costs of transition, including the impact on competitiveness, while making steady progress in reducing emissions. The Review's analysis of the costs to competitiveness showed that they are very small at the macroeconomic level. These costs are borne more by energy intensive sectors that see bigger impacts in their cost base from carbon price induced input and electricity price increases. Even in these sectors, the impacts are not very high.

The exceptions to this are industries such as iron and steel, paper, aluminum, chemicals and potentially cement, which operate in highly internationally exposed markets. To the extent that energy-intensive industry is open to trade, the bulk of the competition tends to be limited to within regional trading blocs. In part this reflects the importance of transport costs, but often it also reflects the similar economic structure of countries within blocs (for example, European economies tend to be high-wage, high-skill, predominantly service-sector economies and so will compete on the basis of similar factor endowments). Application of greenhouse gas policies within these blocs is likely to reduce competitive impacts dramatically[15].

[14] See Chapter 11 of the Stern Review for more details.
[15] See Chapter 11 of the Stern Review for more details.

However, some countries bordering the geographical limits of a trade bloc may be more vulnerable to cross-border competition. But it is essential to understand the other cost differentials that these greenhouse gas intensive industries face compared to their competitors. For example, the differential in wage costs for energy-intensive industry in the developed world compared to those in emerging markets is far greater- by a factor of five or more. This is because costs imposed by tighter pollution regulation are not a major determinant of trade and production location patterns, even for those sectors most likely to be affected by such regulation. Country-specific factors, such as the size and quality of the capital stock and workforce, access to technologies and infrastructure, proximity to large consumer markets and trading partners, and other factor endowments are likely to be the most important determinants of location and trade. In addition, the business tax and regulatory environment, agglomeration economies, employment law and sunk capital costs are also key fcators.

Empirical evidence supports the theory, and suggests environmental policies do affect pollution-intensive trade and production on the margin, but there is little evidence of major relocations[16]. If all countries were identically similar, then small changes in the cost of energy inputs might make a significant difference, but this is not the world we live in. Policy makers would therefore benefit from looking at the impact of climate change policy on competitiveness in the broader context of other cost differentials that energy intensive industry faces and the economic comparative advantages brought about by a broad range of factor endowment and policy variables which determine production location and trade flows.

Abstracting from trade and investment flows, countries with a larger proportion of economic output driven by energy intensive sectors are likely to be more exposed to emissions policy, and will require contributions from other countries to help share the cost burden of mitigation. Concerns about competitiveness and asymmetric costs must be considered in the context of the recognition of what countries are already doing to contribute to reducing emissions. In practice, as we have highlighted in earlier discussion, there are measures being taken that reduce emissions from both developed and developing countries that are outside of formal international agreements such as the Kyoto Protocol. It is not true that firms in countries outside of the Kyoto Protocol do not face policy constraints on energy use. As noted earlier,

[16] Antweiler, Copeland and Taylor (2001)

firms based in California will face a cost of carbon to contribute to that state's targets for 2020 and 2050. Similarly, China has introduced regulatory measures for its thousand largest manufacturing enterprises and a tax on exports of energy intensive goods designed to address trade imbalances and encourage domestic investment to focus on less resource-intensive sectors for economic growth. The taxes range from 5% to 15% on exports of goods from sectors including chemicals, iron and steel, cement and aluminium[17]. This compares well to the cost imposed by the EU ETS on firms in these sectors. At allowance prices of €20/t CO2, the impact is estimated at 1% for Integrated Steel and 4% for aluminium, based on the increase in electricity prices[18]. Current prices for EU ETS allowances are €2 to €5 euros, implying far smaller impacts[19].

International co-operation offers a number of solutions capable of minimising competitive distortion from implementing climate change policies. The Review emphasises that the most efficient way to overcome the global externality of climate change, and at the same time manage risks to competitiveness, is to actively pursue global approaches to reduce emissions. Achieving broader international agreement would therefore be the first best solution to any competitiveness risks. In the interim to achieving this, there is a clear case for pursuing global sectoral agreements for the most internationally exposed energy- intensive industries. This could work in parallel with thinking about ways to introduce sectoral approaches to scaling up carbon finance to support emission reduction mechanisms in the developing world.

The next best approach is to consider national or regional measures that recognise risks in these few energy intensive sectors. For example, if these sectors are covered by emissions trading, with careful analysis, allocation methods may be used to compensate highly internationally exposed sectors for costs they may have to internalise from higher electricity prices. The last possible approach is the use of trade measures to try to protect these industries from imports from countries that are not pursuing emission reductions policy. Although trade-based approaches may have some effect as a policy of last resort, we emphasised in the Review that it may be counterproductive in terms of the overriding objectives of achieving international co-operation, and that there are substantial risks of inefficient protectionist policy.

[17] Information from MoFCOM, China
[18] See Reinaud (2005)
[19] See Point Carbon for recent EUETS price data. www.pointcarbon.com

C5 Accelerating the demonstration and deployment of low carbon technology

Technology development is a key component of the climate change challenge[20], and the development of a portfolio of low-carbon technology options is a global public good. A shared understanding of the scale of the challenge and the levels of public and private that are likely to be required would support an effective response. If the there is insufficient investment in promising technologies (for example for reasons set out in section 24.2 of the Review), this will increase the global cost of mitigation.

Modelling and monitoring undertaken in the review suggests that the scale of effort in both R&D and deployment support should increase significantly – public R&D could be doubled, in order to return to levels of investment seen two decades ago, and deployment support may need to be expanded by 2-5 times from its current levels. There is currently much momentum behind many low-carbon technologies such as solar and cellulosic biofuels. It is important that when appraising policies to support these technologies co-benefits such as energy security and local environmental pollution are considered. Cellulosic biofuels may have particular advantages if they allow use of marginal land. It is also important to remove barriers such as trade protection to prevent the distribution and transfer of low-carbon options.

The challenge of demonstrating carbon capture and storage (CCS) technologies

Fossil fuels are likely to continue to play a major role in the energy sector, even with very strong development of renewable and nuclear technologies. Modelling exercises have consistently pointed to the importance of using the strategy of capturing carbon from power stations and storing it in geological formations to enable coal, oil and gas to be burned with near zero emissions of CO2[21]. This strategy will be particularly relevant given that many countries have large domestic reserves of coal (including China, Germany, USA, Australia and India)[22]. Discussions between the Stern Review team and the Governments in India and China have shown they are keenly

[20] For example, Gleneagles Plan of Action – Climate Change, Clean Energy and Sustainable Development http://www.fco.gov.uk/Files/kfile/PostG8_Gleneagles_CCChangePlanofAction.pdf
[21] See Box 9.2 of the Stern Review for more detail.
[22] For more see Box 9.2 and 24.8 and Sections 24.3 and 16.6 of the Stern Review

aware of the potential importance of CCS and are keen to learn more. Models show that including fossil fuels with CCS in the energy mix reduces the costs of deep cuts in emissions compared with strategies that rely on renewable energy[23].

Although the elements of technology for CCS are well understood, there are currently no examples of a full-scale demonstration of power generation with CCS. The EU, Norway, US and Australia all have plans to accelerate R&D and demonstration of the various technologies that are available for CCS. Australia has an active programme of public R&D support investigating different technologies (including pre- and post-capture options), and different approaches to storage.

The European Commission's Strategic Energy Review[24] announced the intention to "*design a mechanism to stimulate the construction and operation by 2015 of up to 12 large-scale demonstrations of sustainable fossil fuel technologies in commercial power generation in the EU*". In the same announcement the Commission outlined its intention to: "*Provide a clear perspective when coal- and gas-fired power plants will need to install CO_2 capture and storage…. the Commission believes that by 2020 all new coal-fired plants should include CO2 capture and storage technologies and existing plants should then progressively follow the same approach."*

The challenge for the EU now is to design an effective mechanism to deliver this ambition. In the long-run market based mechanisms rather than command and control regulatory approaches will minimise the cost of mitigation. However, while such mechanisms are being established, additional interventions are likely to required to support the first stage of demonstration projects and to provide incentives for innovation in the early stage of deployment of the various technologies involved.

The design of regulatory commitments requires careful consideration to avoid perverse incentives. Setting a date could encourage increased investment in non-CCS stock ahead of the deadline and hence increase carbon lock-in. Alternative approaches include setting an obligation on suppliers to source a small proportion of their power from CCS sources, with a clear timetable for the obligation to increase over time provided that certain financial and technological criteria are met.

[23] Transition costs may also be lower since fewer jobs would switch from high emissions fossil fuel sectors to low-emission technologies such as renewables.
[24] See European Commission (2007a) for more details.

Building a global portfolio of low-carbon technologies

Pooling information on research priorities and programmes – including through the International Energy Agency and the wide range of partnerships that focus on particular technologies - supports the identification of a broader range of opportunities than any one country might wish to pursue. All the modelling including the IEA[25] analysis highlight that a portfolio of mitigation technologies will be required to stabilise emissions.

Formal modelling of technology portfolios could provide further guidance to governments in developing a balanced portfolio across international priorities. This could help in particular to identify technologies that are further from technological maturity[26] - where there is greater uncertainty about the prospects of successful development but the learning costs are lower[27]. With evidence on previous learning rates, the scale of reductions required and constraints of individual technologies it is possible to do generate guidance about what a suitable portfolio might contain and what balance of support for different technologies might meet different abatement targets. This can use techniques such as real options portfolio management to determine the real value of deployment support, the value of parallel investments, portfolio selection rules and sensible support abandonment rules for each technology. This can use different assumptions on the uncertainty of future learning rates and expectation on the scope for future learning[28].

Such an approach will inevitably be dependent on the assumptions and can be supplemented by other modelling approaches such as modelling by IEA and GTSP[29]. These exercises should indicate what the response should look like under a number of different scenarios[30]. This sensitivity analysis and a diverse range of modelling approaches should help indicate strategies that are likely to deliver against a range of uncertain outcomes and the scale of intervention required. They should

[25] World Energy Outlook (2006) and Energy Technology Perspectives (2006)
[26] When the technology has been utilised at a large scale and technological breakthroughs have become limited
[27] Since doubling the scale of production is cheaper see Box 9.4 of the Stern Review for more detail.
[28] So scepticism on future learning rates especially in further from market technologies could be quantifiably applied.
[29] Global Energy Technology Strategy Program (GTSP), (2005): 'Addressing climate change initial findings from an international public-private collaboration', available from http://www.pnl.gov/gtsp/docs/infind/cover.pdf
[30] This can reflect different stabilisation targets and paths that might evolve as scientific understanding develops, different technological constraints and rates of progress.

match up against intuitive outcomes such as the potential role of CCS given dependence on coal in many regions.

This work should be the subject of much further research to guide policies in this difficult area and ensure existing and future technology policy is spent prudently on taking a proportionate chance on a suitable number of the most promising technologies. It can inform moves towards building a shared vision of what technological priorities are and allow evaluation of how existing and planned policies stack up against these insights from modelling.

Pooling risk and reward in key areas for international technology collaboration

There are a number of options for structuring international efforts to pool risk and reward for technology development. The Consultative Group on International Agricultural Research[31] (CGIAR) provides one potential model of international R&D collaboration helping to meet a global challenge. There are other examples of successful international collaboration on energy research (such as ITER for nuclear fusion). The scope for international technology collaboration in specific areas such as hydrogen, solar power, bioenergy and energy storage should be explored urgently[32]. There is certainly a role for a monitoring the scale existing investment and how it matches up technology priorities and the scale of the challenge.

Encouraging technology transfer

The transfer of low-carbon and energy efficient technologies will help minimise global mitigation costs by reducing abatement costs wherever it is cheapest. Technology transfer[33] can help reduce the potential conflict between short-term energy and development priorities given budget constraints and domestic and international environmental issues and energy security. Stimulating technology transfer helps to build international co-operation and is vital to allow and encourages developing countries to reduce emissions.

An international element to technology policy can help reduce costs. Research and development costs can benefit from the 250,000 scientists and engineers graduating

[31] See Box 24.4 of the Stern Review for more detail.
[32] See Box 24.5 of the Stern Review for more detail.
[33] See section 23.4 of the Stern Review for more on technology transfer

in India and China each year. Multinational companies use research bases around the world. Microsoft's research is strengthened by its operations in China[34] and India[35] to take advantage of local expertise. The EU-China Near-Zero Emission Coal Initiative in China[36] that seeks to demonstrate CCS in China is a good example of the sort of project that can deliver technological benefits and help encourage co-operation. During a visit to the Africa Union the Stern Review team learnt of great interest in utilising local hydro-electric power resources.

Deployment of low-carbon technologies in developing countries to help meet developed country targets can also reduce costs[37]. Deployment in locations with favourable conditions (wind and solar) could increase productivity of the technology and provide valuable lessons of the viability of these technologies in different environments. Such a policy would also have to recognise the loss of local co-benefits - energy security and local environmental effects but this could be done by limiting the total quantity or applying an exchange rate. Low-carbon technologies such as wind and solar technologies may also have further advantages in developing countries as they can support local populations and not rely so heavily on the investment in electricity grids as traditional centralised fossil fuel technologies. Disaggregated energy systems may also avoid problems relating to corruption and theft that can develop.

Increasing the impact of carbon finance

Existing carbon finance such as the Clean Development Mechanism has yet to deliver significant technology transfer and influence in long-lived energy and transport infrastructure[38]. However, a desire to reduce emissions wherever it is cheapest to minimise costs ensures that carbon finance can be expected to deliver technology transfer in any credible future framework seeking to stabilise emissions at relatively 'safe' levels. Given the role developing countries will play in shaping future agreements, expectations of future carbon finance and mechanisms to support technology transfer will be important to encourage greater commitment. In our discussions, developing countries have emphasised that to have the confidence to take strong action on climate change will first require a demonstration from the

[34] http://research.microsoft.com/aboutmsr/labs/asia/default.aspx
[35] http://research.microsoft.com/aboutmsr/labs/india/default.aspx
[36] See Box 24.7 of the Stern Review for more detail.
[37] See section 24.4 of the Stern Review and IEA (2005)
[38] See section 23.5 of the Stern Review for more detail.

developed world that significant flows of carbon finance will materialise, and that cutting edge technologies such as CCS can be proven in the developed world and more broadly technologies can be shared.

For poor countries, carbon finance is important as it is estimated that in the near term the incremental costs of low carbon technologies investment in developing countries would be $20-30 billion per year, rising over time. To provide the required finance there is a range of instruments that should to be developed more aggressively: extension of the emissions trading schemes such as that of the EU; the CDM; bilateral finance; multilateral finance, including that that would be available from the CEIF; and the considerable resources that could be mobilised from the private sector and foreign investment by national policies favouring low carbon technologies and practices.

Finance from multilateral organisations such as regional development banks and the World Bank represent significant flows that could push the technological frontier. These are often constrained by procurement rules that emphasise investment in proven low-cost technologies. Given the increased cost of options nearer the technology frontier this is understandable but there may be dynamic cost advantages to diverting a portion of funds to new technologies, particularly those that are likely to be more effective across the developing world (and under-invested by the investments in developed countries) and deliver co-benefits for local pollution, wider infrastructure costs, reduced rents on fuel costs and energy security.

Building capacity for technology transfer

The UNFCCC treaty contained a strong commitment to technology transfer that, without clear metrics and mechanisms, has not made a dramatic impact on technology transfer. Subsequent work on technology transfer has highlighted that is a very complex area with much depending on local and technology specific circumstances. While cost is a potential barrier, many other barriers exist, for example, lack of information and the local business environment. This means that in addition to carbon finance technology transfer should be encouraged through additional policies such a capacity building to ensure that there is a transfer in skills and knowledge as well as hardware. Developed countries do support such capacity building but this could be significantly increased to spur further international co-operation.

International negotiations have often focussed on intellectual property rights (IPR) with the suggestion that developed world governments buying out IPR rights for technologies[39]. However, IPR is often a small component of cost and tacit knowledge[40] often ensures that IPR is insufficient and the involvement and support of technology owning companies is required for effective transfer.
For reasons outlined in the review IPR buy-out is unlikely to be a suitable solution for most technologies. Governments are also likely to struggle to negotiate an effective price of the technology given uncertainties over impacts and future adoption. Command and control approaches risk alienating existing owners whose support will be required for the transfer of tacit knowledge and knowledge of further developments and maintenance.

Direct price support, such as carbon finance, is likely to be more effective and continue to work with the grain of the market. Capacity building to encourage skills transfer and international elements technology policy will also prove effective in stimulating transfer and familiarity with advanced technologies. Many insights into where developed countries can effectively support action are highlighted in the Technology Needs Assesments[41] (TNA) of developing countries, which explore constraints to technology transfer and sectoral analyses on how to address these. More than twenty countries have completed such assessments and developed countries could play a more prominent role in helping countries address the issues raised and supporting studies in further countries.

C5 Expanding the scale and urgency of efforts to reduce deforestation

In the Review, we reported estimates that emissions from deforestation make up 18% of global emissions, and noted that there are significant uncertainties in arriving at these estimates. In subsequent discussions with us, some experts have argued that the true figure should be closer to 9%. This is an area of ongoing debate, but it does not undermine the key conclusions that we reached. It is worth taking action to reduce deforestation, both to maintain the global function of forests as carbon sinks and to protect other benefits, including biodiversity, watershed management and their role in local climate systems.

[39] See section 23.4 and Box 23.3 of the Stern Review for more detail.
[40] Knowledge not covered by the patent as it is embedded in skills and know-how.
[41] See Box 23.2 of the Stern Review for a Ghana case study and preceding text for TNA background.

Policies on deforestation should be shaped and led by the nation where the forests stand. But there should be strong help from the international community, which benefits from their actions. Compensation from the international community should take account of the opportunity costs of alternative uses of the land, which in many cases are relatively low, but must also recognise the costs of administering and enforcing protection, and of managing the political transition as established interests are displaced.

Carbon markets could play an important role in providing such incentives in the longer term. But there are short-term risks of de-stabilising the crucial process of building strong carbon markets if deforestation is integrated without agreements that strongly increase demand for emissions reductions. These agreements must be based on an understanding of the scale of transfers likely to be involved.

This longer term process of building markets can be complemented by immediate efforts to carry out large-scale pilot programmes. International negotiations are now over halfway through the process on consideration established at the 11th Conference of Parties to the UNFCCC in Montreal 2005 and proposals are currently under consideration or emerging. Policy makers need now is to find consensus acceptable to the countries concerned in order to reach a substantive outcome when the Conference reconvenes in Bali.

C6 International support for adaptation

It remains clear that adaptation to climate change is now both inevitable and very important. Much of adaptation will have to be done by individuals and the private sector. A major role for governments in tackling climate change will therefore be to ensure that households, communities, and firms have the tools and incentives necessary to adapt. For developing countries, good adaptation and good development policy are strongly complementary, and it is right that climate change should now become central to national planning processes. International support for adaptation will come in large part through the delivery of the commitments made by rich countries to double aid by 2010 and the commitments made by some countries to meet the target of 0.7% of GNI by 2015. This will deliver an increase of hundreds

of billions of dollars. To maximise the benefits of this support, climate factors must be integrated into development assistance, and investments assessed and managed for climate risks.

Adaptation can also be supported through effective co-operation to deliver a number of global public goods. More comprehensive global climate observations and better regional climate models support advances in the scientific understanding of climate change, and can also benefit poorer countries directly by providing better information to support adaptation. The Climate for Development initiative in Africa is an excellent example of this kind of co-operation. More resilient crops and advances in water conservation and irrigation technologies will support adaptation in agriculture around the world. Effective international co-ordination of disaster response could benefit any country that is unfortunate in suffering any type of natural disaster, and would also help donors to provide effective help. Finally, aggressive measures to bring malaria under control would reduce one of the most significant health risks from climate change in developing countries.

There is an important role for ODA in supporting early adaptation in developing countries. However, it will not be able to manage the whole burden for both the public and private sector. And it will fail to deliver its development goals if adequate mitigation action is not taken as the scale and cost of adaptation will rise dramatically.

Notwithstanding its importance, there are limits to what adaptation can achieve however well designed and implemented. Small island developing states threatened by sea level rise have fewer options to adapt. Sea defences are particularly costly for low-lying islands, and may do little to protect the tourism and fisheries that sustain the local economy. Development and diversification are still important strategies wherever possible, but ultimately the international community will have to identify and agree on ways to support alternative responses, including the managed resettlement of some people. This will bring many challenges, particularly for those people that must move. There will be much greater pressures if unabated climate change leads to sea level rise that threatens much larger populations in low-lying coastal areas.

C7 Conclusions

Climate change presents an extraordinary challenge to policy-makers. It is a global problem with major long-term, irreversible effects. We have heard from people around the world that a problem of this nature is something that they are concerned about, and that they are willing to do something to help tackle the problem. Concern is moving into action domestically, and understanding of the issue in government, business and civil society across the world is pushing for even more to be done in response to the problem.

The response must be global as the efforts of any one country alone can never be sufficient to reduce the risks, and there are short–term costs from bringing in new policies to price or regulate emissions which may not command widespread support if they are perceived to be isolated efforts. We therefore require an international effort to limit the fast growing increases in atmospheric concentrations of greenhouse gases continue to rise. To keep open the option of stabilising below 550ppm CO2e, and limiting the risks of temperature increases above 4degC, global emissions must peak within the next ten to twenty years.

Keeping this option open is well within our reach. We have a strong basis in the scientific understanding of the problem that makes the risks and costs of those clear to policy makers. We have a better understanding of how climate change policies can work in harmony with goals for growth, sustainable development and energy security. In many instances, we already have the technologies and techniques such as energy efficiency and avoiding deforestation that can help begin making substantial reductions at low cost. So we don't have to wait for technologies to arrive to begin a strong response.

But to make a sustained international response, at the scale required to reduce emissions in the longer term, we must develop a system that builds on national policies while developing contributions to an international response. This will require three key features. The first is to establish a clear, long-term policy on a quantity of reductions expected. This will require policy makers assessing the options now on how best to deliver a long-term signal on policy development as well as what the acceptable level of risk is for global atmospheric concentrations of greenhouse gases.

Secondly, policy makers must also ensure they use sensible economic policies for reducing emissions that allow maximum flexibility over time and space- such as trading, and invest in the development and sharing of technologies that are essential for moving to a low carbon global economy. Economic instruments to price carbon such as trading is already in place and being developed- we must strengthen them and extend their global reach. Investment in technology research and development is already underway, we need to do more to ensure there is more international collaboration and demonstration of key technologies such as carbon capture and storage.

Thirdly, recognising that it is developing countries are likely to be hit hardest and first by the impacts of climate change, requires the international community to make good on recent promises to increase development spending. Co-operation on global public goods and better integration of climate risks into development assistance and investment policy is essential.

Above all, an effective international response requires that we all understand the case for urgent action as being in all our interests. No one is immune from the impacts of climate change. We must therefore strike a balance between taking stronger, cost effective action now, using policies we already have in train, or fail to take sufficient action now and find we face costly damage to the planet and its people in the future. Only time will tell whether the international community is up to such a task and will take action strongly or urgently enough, but we must hope that concerns of people across the world can make that happen.

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