

A progressive global deal on climate change

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Executive Summary

Climate change represents the greatest market failure the world has seen. For the first time in history every country and every region faces a common threat that has no solution without broad collective action.

An international agreement is essential. It must be based on the criteria of effectiveness, efficiency and equity. Effectiveness demands a long-term global goal capping global emissions and providing a long-term trajectory for investment in low carbon technologies. This should be at least a halving of global emissions by 2050. A pragmatic principle of equity would require an equalisation of per capita emissions by then. This will require developed countries to cut by around 80%. But it will still also require significant reductions over business as usual trajectories from emerging economies to allow space for the least developed to grow. Developing country commitments could include energy intensity or sectoral targets, and will need to be graduated according to the stage of economic development.

Efficiency requires the use of economic instruments to achieve emissions reduction, particularly emissions trading through a global carbon market. To achieve stringent targets, developed countries will need to purchase some of their emissions reduction from developing countries through a reformed Clean Development Mechanism, which can at the same time provide finance for such countries' low carbon growth and the transfer of technology.

There are seven key elements to an equitable, efficient and effective global climate deal: defining a global target for 2050, with intermediate targets to keep countries on track and provide certainty to the private sector; building a genuinely global carbon market, through linking ~~between~~ regional schemes; developing and reforming the emissions credit system to accelerate low-carbon growth in developing countries; establishing sectoral agreements to provide for partial commitments in emerging countries and address concerns over trade competition and 'carbon leakage'; funding the development, demonstration and transfer of low-carbon technology; financing reduced emissions from deforestation; and funding adaptation, particularly given climate change's disproportionate impact on the poorest and most vulnerable.

The political dimension of climate change is becoming increasingly visible. It is public demand which will promote action. Climate change needs not adjustment but a profound transformation of our societies. As a common risk, it can create the political space for social change. Progressive leaders seek equity and social justice as well as growth. The risks of climate change means that must now include the protection of environment. Without that protection neither sustained growth nor global justice can be achieved:

To: Progressive Governance heads
From: Nicholas Stern and Laurence Tubiana
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Introduction

The last few years have seen a deepening understanding of climate change, particularly the risks the world faces from business-as-usual paths of economic growth. These risks are environmental in origin, but will take economic, humanitarian and security forms. Changes to agricultural productivity, greater water scarcity, increased incidence of extreme weather events, and the more rapid spread of diseases as temperatures rise will cause significant economic and human costs within the next two decades. Indeed, such costs are already beginning to appear. And as the Solana report for the EU has recently shown, increasing competition for scarce water and energy resources and the likelihood of migration as people seek to escape areas at risk pose potential security threats in a number of regions.

Yet at the same time there is also increasing understanding of the scale of the response required in terms of reductions of greenhouse gas emissions, and the economic and technological instruments that can support and drive these reductions. Businesses as well as governments are becoming clear about what is necessary. And this understanding is increasingly reflected in public demand for responsible action. In country after country this is being demonstrated in the political and electoral processes. For example, in November 2007 we saw an Australian Prime Minister thrown out of office in part because of his perceived weakness on this issue. It is remarkable that when elections come around politicians recognise strong public interest and demand for action. It has become a unifying and defining issue in European politics. It has not moved at the same pace in all countries but we are also seeing strong changes in perception in the key countries of the USA, China and India. It is public demand which will promote and sustain action at the individual, community, national and international levels.

Already there are some promising movements in world and individual country policy. The UN conference in Bali in December 2007 was a major step forward, with a commitment by all countries to seek a new global deal by the end of 2009, and a broad (though not universal) recognition of the need for global greenhouse gas emission reductions by 50% by 2050 and 25-40% cuts by rich countries by 2020 (although only the phrase 'deep cuts' was agreed). There was also progress on international action on deforestation. But it was the launch of negotiations only; it was not an agreement on a shared global framework.

To build that framework, we need to recognise the nature of the problem. Climate change involves a fundamental failure of markets: those who damage

others by emitting greenhouse gases generally do not pay. Indeed the scale of its costs across both distance and time make climate change the greatest market failure the world has seen. Tackling it is quintessentially a 'collective action problem': only if all countries which emit significant quantities of greenhouse gases reduce their emissions will it be worth it for any individual country to do so. The problem of free riding therefore makes an international agreement essential.

Three basic criteria should be invoked in shaping the specifics of a new global deal:

- Effectiveness: the scale must be commensurate with the challenge – which means setting a long-term stabilisation goal and an associated emissions reduction path towards it which will keep the risks at acceptable levels.
- Efficiency: we must keep down the costs of emissions reduction, using carbon pricing instruments wherever possible.
- Equity: the problem is deeply inequitable, with the rich countries having caused the bulk of current stocks of greenhouse gases and the poor countries being affected earliest and hardest – which means that the rich countries must take the lead.

To meet these criteria, a global agreement to reduce greenhouse gas emissions must have targets and trading at its heart.

A long term global goal

We need a long-term global goal which reflects a shared vision of the global actions necessary to limit climate change at an acceptable level. Fixed quantity emission reduction targets are crucial for the management of risk. But we need more than an agreement on absolute numbers: we need a common understanding of which development pathways will lead to that common goal and which will lead by contrast to the dangerous zones of climate change. It will be critical to create such a common vision - between the old developed world, the emerging economies and the least developed ones - of the nature and the modalities of a growth path that will be sustainable in the long term. In turn this global goal will be a way to define the credible 'horizon' for countries to choose and therefore to implement adequate policies and measures.

According to the latest IPCC Assessment Report, the current rate of global greenhouse gas emissions will need to be at least halved by 2050 to achieve a 50% probability of global mean temperatures increasing by less than 2 degrees Celsius. To reach that goal, global emissions have to peak no later than 2020-25. If global emissions are still rising beyond 2020, the IPCC estimate a probability that global mean temperature will increase by 3 degrees Celsius or more. Impacts associated with this level of warming include hundreds of millions of people suffering food insecurity and water stress, major increases in the number of deaths from heat, floods and droughts, and

30% or more of species threatened by extinction. Ecological 'tipping points', where feedback effects lead to irreversible changes, are significantly more likely.

It is this analysis which has formed the basis of the objective of a 50 % reduction in global emissions by 2050, which was agreed at the G8 summit in Heiligendamm in June last year. Such a reduction would offer a reasonable chance of keeping temperature increases below 2 or 3°C. While these targets will require strong action with substantial costs – perhaps 1-2% of global GDP - such costs will be much less than the costs of the climate change they will avoid. In this sense they are not over-ambitious relative to the risks of failing to achieve them.

Within these global targets arises the critical question of distribution. For progressive governments such an agreement must be based on a notion of equity.

If we take any particular good it will generally be true that rich people consume more than poor people. That is simply an expression of their being richer. In the case of the atmospheric reservoir for greenhouse gas emissions, it is hard to think of an argument as to why rich people should have more of this shared resource than poor people. They are not exchanging their labour for somebody else's and they are not consuming the proceeds of their own land, or some natural resource which lies beneath it. Any global deal will therefore have to involve some implicit or explicit understanding over the sharing of this 'reservoir'.

One way of judging this is in terms of the relative level of future flows: equity would demand per capita convergence of emissions rates. Currently global emission flows are around 40-45 Gt CO₂e. With a world population of around 6 billion that means average global per capita emissions are around 7 tonnes. Given that the world population in 2050 will be around 9 billion, in order to achieve 50% reductions (i.e. an aggregate flow of around 20 Gt CO₂e) by then, per capita emissions will have to be 2-2.5 tonnes. And since around 8 billion of these people will be in currently poor countries, those countries will have to be in that range even if emissions in currently rich countries were to fall to zero. It is clear from this basic arithmetic that any effective global deal must have the currently poor countries at its centre. Equity will inevitably be a precondition of their participation.

From the point of view of equity the numbers are stark. The currently rich countries are responsible for around 70% of the existing stock, and are continuing to contribute substantially more to stock increases than developing countries. The United States, Canada and Australia each emit over 20 tonnes of CO₂e (i.e. from all GHGs) per capita, Europe and Japan over 10 tonnes, China more than 5 tonnes, India around 2 tonnes, and most of sub-Saharan Africa much less than 1 tonne. Even with fairly conservative estimates, it is likely that, under BAU, China will reach current European per capita emissions levels within 20-25 years. With its very large population, over this time, China under BAU will emit cumulatively more than the USA and Europe

combined over the last 100 years. That is one indication of the urgency of finding a global response quickly.

To get to the required 2 tonnes global average level by 2050, Europe and Japan would need to cut their emissions rates by around 80%. Yet an 80% reduction by the USA, Australia and Canada by 2050 would leave them around 4 tonnes, twice the required average level. Thus a 50% overall reduction and an 80% rich country reduction would still leave average rich country flows above the world average in 2050. Who will pay for these excessive emissions?

We should note too that equalising the per capita flows of emissions by 2050 is in fact a rather weak notion of equity. It takes no account of the stock of greenhouse gases in the atmosphere, which are the result of 200 years of fossil fuel consumption. This has occurred very largely in the now developed countries. A 'stock' notion of equity would seek to equalise not the flows into the remaining atmospheric reservoir before GHG stabilisation is reached, but the total reservoir since the pre-industrial period. This would give a much higher 'remaining' allowance to the currently poor countries. There is thus a very big difference between a stock and a flow notion of equity. An 80% reduction of flows by rich countries by 2050, in the context of a 50% reduction overall, is therefore not a target for which rich countries should congratulate themselves warmly as demonstrating a splendidly powerful commitment to equity. Rather the target of equalising by 2050 may be seen as being a fairly pragmatic one, on which it might be possible to get agreement, and one which whilst only weakly equitable is a lot less inequitable than some other possibilities, such as less stringent targets for rich countries.

A number of developed countries and states have now adopted targets for 2050 in this range. California has a target of 80% reductions by 2050. France has its 'Facteur Quatre': dividing by 4, or 75% reductions, by 2050 (Stern, 2007, p.516). The UK has a longstanding 60% target but the Prime Minister indicated in November 2007 that this could be raised to 80% (Brown, 2007). Australia, under the new government elected at the end of November 2007, has a target of 60% (Rudd, 2007); 80% is under consideration after the Garnaut Review is published next summer. In an interview in August 2007, Hillary Clinton indicated that she thought that 80% was in the right range for the US as a whole (Griscom Little, 2007). In addition three countries, Costa Rica, New Zealand and Norway, have declared targets of 100% reductions by 2050, i.e. becoming 'carbon-neutral'.

Targets for 2050 seem far away but the long lifetime of many investments means that early decisions are needed to reach them. This will require intermediate targets. At the UN Conference in Bali in December 2007, Kyoto signatories agreed to consider 25-40% cuts for developed countries by 2020. That is indeed in the right range for reductions of 80% by 2050 and provides at least an initial 2020 benchmark. It is consistent with the commitment of the European Union at its Spring Council in 2007 to a legally binding reduction of 20% (on 1990 levels) by 2020, rising to 30% in the event of an international agreement. For some European countries this will require greater reductions:

Germany has set a 40% target by 2020, while the UK is putting a 26-32% reduction into law through its current Climate Change Bill. How such targets are achieved country-by-country will vary and must take account of economic as well as environmental, social and political considerations. But developed countries must be clear and declare they are ready to make ambitious reductions.

Cuts of this magnitude will require developed countries to purchase part of their emissions reductions overseas. This is allowed for by the so-called 'flexible mechanisms' of the Kyoto Protocol, Joint Implementation (JI) and the Clean Development Mechanism (CDM), by which credits created by emission reduction investments in transition and developing countries can be used to fulfil developed country targets. Because emissions reduction is generally available more cheaply in developing countries than developed, overseas purchase reduces the cost of achieving a given target – and thereby enables more stringent targets to be set. The atmosphere itself is indifferent to the location of emissions: a tonne of carbon dioxide has the same global effect whether it comes from Belgium or Bangladesh. At the same time overseas purchase acts as a transfer of resources to developing countries, enabling investments in emissions reduction – notably energy efficiency and use of lower carbon sources – which would not otherwise occur. This will be vital to accelerate the transition to lower carbon economic development in emerging and developing countries – without it, higher carbon infrastructure will be laid down over the next decade, making subsequent emissions reduction harder and more expensive and delaying global stabilisation. It is important that such investments are properly additional to business as usual, paying for genuinely emissions-reducing activities (the current system needs reform – see below); but the double advantage of overseas purchase – to reduce costs and to finance developing country investment – makes it a vital instrument.

To achieve global targets under the principle of equity, the UN principle of 'common but differentiated responsibilities and respective capabilities' will need to be applied. This obligates rich countries to start reducing their emissions in absolute terms quickly. But it also requires emerging economies to begin reducing their emissions – over business as usual trajectories - as well. For the arithmetic of the global goal is unambiguous: even if the developed countries cut their emissions to zero by 2050, without significant cuts in the rest of the world we would miss the goal. If the poorest countries are to be given any room to grow at all, emerging countries must begin now seriously to control their emissions intensity. This suggests a three-fold division of responsibilities, with the form and nature of actions to be taken different in each group:

- 1) Rich countries must take ambitious commitments in term of absolute reduction numbers with intermediate objectives for 2020 that clearly set them on the right track
- 2) Emerging countries will have to formulate their objectives in term of increased energy efficiency or reduction in emission intensity per unit of GDP. Such economy-wide objectives could be achieved by partial objectives for

specific industrial sectors through sectoral policies. They would expect to be partially financed by overseas purchase investments by developed countries. The commitments made by this group of countries would be expected to change over time as their economies developed. The most advanced of them, notably China, might be expected progressively to define national caps on emissions by the end of the next decade. The uncertainty of China's future growth rates and growth patterns makes a discussion of fixed targets at the present time premature. But as sectoral agreements or sectoral policies make progress (see below) and more knowledge is accumulated, China could be expected to take binding commitments on specific sectors.

3) For the rest of the developing world, a more flexible approach is needed, inviting countries to participate with their own choice of policies and measures for sustainable development supported by the international community

As agreed in Bali, the commitments made by all countries in the global deal will have to be 'measurable, reportable and verifiable', and binding on them through the terms of an international treaty. However the differentiated nature of the commitments made by countries at different stages of economic development will make the next stage of the deal more like a framework than a tight "WTO like" agreement founded in legal structures, with compliance driven by sanctions. Different formulae are likely to coexist: "Kyoto like" commitments to absolute caps, global or near-global sectoral agreements, and sets of national policies and measures producing quantifiable results. Bilateral and regional agreements may help to link emission trading mechanisms and provide financial assistance in a reformed framework. They can also be a framework to deal with competitiveness and trade concerns, allowing developing countries to gain security of market access as they develop sustainable development policies.

Using economic instruments

Reducing greenhouse gas emissions is both a very diffuse and very concentrated economic task. It is diffuse, in that energy is used in every activity of the economy, and increasing the efficiency with which energy is used therefore requires action in every sector. But it is concentrated, in that energy, forestry and land use account for almost all emissions, and therefore the focus of required policy is very tightly defined. In the energy sector, energy efficiency is the first requirement of reducing emissions, since low historic prices have tended to make energy very wastefully used, and more efficient use can bring net positive economic benefit. However, as economies grow, there will be both thermodynamic and economic limits to ever-increasing energy efficiency. So ultimately the control of energy emissions must come through the decarbonisation of energy sources – moving from unabated fossil fuels to renewables, nuclear and the capture and storage of fossil carbon.

To achieve agreed international commitments, countries will need to develop

their own set of domestic policies based on their own set of preferences. However it is clear that as well as the equity and effectiveness discussion, we need to address the efficiency dimension of the problem: how to change growth pathways in a cost effective manner. And here both energy efficiency and decarbonisation require the same kind of instrument: the pricing of carbon through taxes, cap and trade schemes (emissions trading), and regulations and standards. Carbon pricing will play a central role in keeping the costs of abatement down.

Carbon taxes can offer particular economic benefits. But in practice cap and trade schemes appear to be politically easier to implement. The EU has now embarked on the second phase of its Emissions Trading Scheme (2008-2012) with tighter allocations than in its introductory period. The carbon price is now above €20 per tonne, already approaching the type of range necessary to give a signal clear and strong enough for European industry to embark on serious investment in emissions reducing technology. It has demonstrated already a real influence on the transformation of the power sector and energy intensive industries and induced a learning process for economic actors as well as for decision makers. The EU ETS represents a major policy innovation and has been followed by the development of similar cap and trade schemes in both the north eastern and western states of the USA and in Australia and New Zealand. The EU ETS shows at the same time that such policies cannot be implemented in one country alone – for both competitiveness and efficiency reasons - and that international coordination is essential to their success.

But pricing carbon will not be sufficient to address the entire problem. First, the systemic nature of energy use will make sectoral policies also essential - for example coherent urban policies for buildings, transport, infrastructure networks and so on. Second, the path dependency of infrastructure and the long-lived time horizons of the capital stock in particular sectors, notably electricity generation, demand specific policies that do not rely only on the carbon price. Relying on a carbon price alone will see long-lived high-carbon capital stock laid down before the price reaches a sufficient level to prevent this, thereby 'locking in' emissions and making future emissions reduction harder and more expensive. New energy technologies, in particular, will require public support for research, development and demonstration (RD&D). And as a rising carbon price helps mature technologies disseminate, deployment of "less mature" technologies (such as for example carbon capture and storage and solar energy) will need public support and differentiated tariffs to benefit from a learning curve. Again, many countries have such policies in place. The EU's targets for renewable energy (20% of all energy by 2020) and carbon capture and storage (up to 12 demonstration plants by 2015) are manifestations of this technology support approach.

Seven key elements of a global deal

Domestic policies that will curb efficiently GHG emissions encompass a broad number of instruments. However, no country will develop domestic policies

without a framework for international cooperation. The efficiency of these policies will depend on what happens in global markets. Moreover as the need is for a transformational economic change towards low carbon growth even in poor countries, an international agreement will have to include incentives such as funding, technology cooperation and development, it will have to address adaptation, competitiveness and trade issues, and consider the different needs of different countries-. Finally this agreement cannot build on the traditional burden sharing approach. It has to help the international community understand that climate stabilization is a global public good; and that rich countries, for their own sakes, must bear part of the cost of this transformation in developing countries.

This can be encapsulated in seven elements:

1 - Define a global target

As already discussed, this should be for at least a 50 % reduction in global emissions by 2050, with rich countries reducing by at least 80%. Intermediate goals for 2020-25 need to be set to confirm that rich countries are on the right track and build trust. Medium term targets give a signal to economic actors and allow them to anticipate technology changes and investments opportunities.

2 - Build a global carbon market

The justification for a major focus on emissions trading lies in its promotion of both efficiency and collaboration.

Carbon markets provide the necessary flexibility for countries to make and comply with ambitious international commitments at the lowest available cost. As any global deal will be based on the foundation of domestic policies, carbon markets can offer a mechanism to link and coordinate domestic policies and build further incentives. Conditions of access to carbon markets may be redefined in line with the nature and modalities of commitments (including voluntary commitments or sectoral agreements), helping emerging countries define their involvement after 2012.

A first stage in the development of a global carbon market is to link regional trading schemes. The EU Emissions Trading Scheme already allows for this, and inter-trading is likely to occur with the Australian and New Zealand trading schemes when these are established in the next few years, Such linking increases the liquidity and depth of both schemes. A next step would be for particular traded sectors in developing countries – such as aluminium, iron and steel or cement - to join global emissions trading schemes. This would both enable efficient emissions reduction and mitigate against competitive distortions in international trade through 'carbon leakage'.

3 - Development and reform of the emission credits system

A global carbon market also allows for private sector flows from richer to poorer countries to help finance lower carbon investments, through purchase of emissions credits. Unless financing flows for the extra costs of reducing emissions are available to poor countries, they are extremely unlikely to join

the effort on the scale and pace required. They feel the inequities of the situation and phenomena acutely. Just when, they argue, they are beginning to overcome poverty, in part by rapid growth, they should not be asked to slow down. Financing, together with technology demonstration and transfer, will be needed to convince them that moving to a low-carbon growth path is not the same thing as moving to a low growth path. For all these reasons rich countries have to make clear and demonstrate that they are ready to buy credits in developing countries and set their commitments of GHG reductions in accordance. No real demand of commitments from developing countries can be legitimate without sufficient financial flows.

The current system, the Clean Development Mechanism (CDM), was established by the Kyoto Protocol and operates at the level of projects in developing countries. Either developed countries in their own right, or firms in such countries which are part of trading schemes (such as the EU ETS) can buy an emissions reduction achieved by a project which uses technologies or approaches from an admissible list. The amount of the notional reduction comes from comparing the project with a counterfactual – what the entity doing the project might otherwise have done. Approval of a project goes through the poor country authorities and a special UN-based institutional structure, the CDM Board, currently located in Bonn. The system is slow, cumbersome and very 'micro'. We need a broader mechanism focused on countries and sectors where more transformational change can be achieved.

Trading on the scale required to reach the type of targets discussed requires a much simpler, 'wholesale' system. Wholesale measures can include technological benchmarks such as employing carbon capture and storage (currently excluded from CDM), or sectoral benchmarks such as getting below a certain amount of CO₂ per tonne of cement. Programmatic CDM would allow whole programmes of investment – for example in urban transport – to qualify. As 'no-lose' or 'one-sided' trading measures (where the developing country gains from innovation, but is not penalised for BAU), the benchmarks could be set ambitiously and targeted to sectors where they can help governments to implement their own domestic policies.

After these trading mechanisms have been in place (with associated technology sharing) for a while, developing countries should acquire confidence that a trading system can work on an appropriate scale. Again if the reformed mechanism does not show capacity to generate financial flows that can make a real difference in key sectors, rich countries will have little chance to engage developing countries in discussion on more ambitious commitments. However, if it does bring such flows, then it will be reasonable to ask them to accept targets consistent with overall global goals in the context of a strong set of goals by rich countries. If we look for targets from poor countries now, the only ones that would be accepted would be far too loose and would knock the bottom out of international trading by collapsing the price. And in the future these loose targets would be likely to form a baseline for subsequent discussion. That is why a staged approach is essential. Use of the CDM now will enable the definition of graduated commitments over time by currently developing countries. Only this is likely to lead to their

participation in a global stabilisation goal so that by 2050 their emissions average around 2 tonnes per capita. (Recall that this is a half or a third of China's current level).

It should not be expected that low carbon growth paths in emerging economies should be entirely financed by flows from rich countries. These countries must co-finance their own transition, as most are now beginning to do. China, in particular, has a global responsibility in this regard, as the most advanced and largest emerging economy. Like others, it has real incentives to do so, given the co-benefits in terms of economic efficiency and pollution control. Nevertheless, a degree of financing by the developed world, particularly for poorer countries, will be necessary. But it is very unlikely to be possible to find financial flows on the scale required from the public sector (Witness the difficulty in getting resources for Overseas Development Assistance (ODA), which will be strained still further by the challenge of adaptation.) The trading system has the great advantage of providing for private investment flows.

4 - Develop sectoral agreements

As climate negotiations grow in complexity and in scope, sectoral agreements offer a way of finding common ground between developing and developed countries. A sectoral agreement seeks to provide for common or comparative standards of emissions performance, technology or carbon price in a particular industrial sector across countries. Such agreements are likely to be negotiable in sectors where production is highly concentrated in a relatively small number of firms and in a small number of countries. They could provide a way of securing engagement of emerging economies by targeting specific sectors without asking these countries to make economy-wide commitments which they are currently unable or unwilling to.

The rationale for supporting such agreements will be different for developing and developed countries. Developing countries might favour sectoral agreements as a way to create a progressive dynamic for emissions reduction, to facilitate technology transfer, and to incentivise implementation of domestic policies and measures. Developed countries would be seeking a method to ensure fair competition between countries in sectors subject to international trade, and thereby prevent 'carbon leakage'.

Three conditions are necessary for sectoral agreements to represent a real option in a global climate deal. First, they require international governmental involvement to ensure complete coverage and efficiency. Although voluntary, private sector-led agreements can play an important role in terms of technical and managerial innovation and learning processes, they cannot guarantee full participation of all relevant firms in the sector and— may be only a way of escaping government regulations. Governmental agreement has the opportunity for sufficiently wide international coverage that carbon leakage concerns would be largely addressed.

Second, they must be designed to achieve a real internalization of the carbon price. This can occur through international performance benchmarks for

emissions or technology. One option would be to secure international agreement based on such performance indicators, and then to remove such industrial sectors from emissions trading schemes or other CO₂ pricing instruments. However this would have the disadvantage of reducing the efficiency both of the sectors covered and of the remaining trading or other mechanisms.

Ideally therefore the optimal design of a sectoral agreement would be through common participation in carbon pricing schemes – either through harmonisation of domestic taxes or trading, or directly through sectoral participation in a global trading scheme. In this way a sectoral agreement would provide a full economic interface with national economies and domestic policies (Colombier Neuhoff 2007). It is notable that some countries, such as China, are already willing to tax energy intensive activities for energy security and energy efficiency motives. Energy intensive industries have been frequently excluded from energy taxation because of international competitiveness concerns. Sectoral climate policies might offer a coordination mechanism to overcome this effect.

5 - Funding Technology

If the 50% / 80% long-term global targets are to be achieved there needs to be rapid technological advance: the technologies of near-complete decarbonisation of our energy supply do not yet exist at commercial scale and cost. The development of technologies must be accelerated and methods found to promote their sharing. Problems – and solutions – differ according to the degree of maturity of technology. Mature technologies (including most of those for energy efficiency) can be disseminated if sound public policies are in place. In some cases the normative power lies in the major markets of developed countries that can accelerate the diffusion of technology by adopting standards. In other cases this diffusion depends on domestic policies (efficiency in buildings for example). Here the issue is to understand what combination of private and public funding including ODA can help these policies.

The case for new technology is different. Clear policy signals and incentives are needed to foster co-development of technologies in markets where the investment rate is high. There is plenty of room for international cooperation between rich and emerging countries building on the dynamic of their markets (infrastructure, building, transports, energy production). Combining carbon markets with financial facilities like the Clean Energy Investment Framework of the Multilateral Development Banks can facilitate deployment of new technology. Intellectual property rights may be an issue here but should not prevent rapid diffusion of new technology. Financial and technical cooperation between rich and developing countries is a powerful engine to engage transformation.

Globally RD&D public and private funding on clean energy and energy efficiency must grow significantly, reversing the negative trend in developed countries which has seen energy R&D receiving much less public funding than 20 years ago. Carbon capture and storage (CCS) for coal is particularly

urgent since coal-fired electric power is currently the dominant technology round the world and emerging nations will be investing heavily in these technologies. For \$5 billion a year, in the form say of feed-in tariffs (which could be reduced as carbon prices rise), it should be possible to create 30 commercial scale coal-fired CCS stations within seven or eight years. There are no current plants using CCS for coal-fired generation on a commercial scale. From 2015 or 2020 the world will need most of its new coal-fired electricity generation plants to be operating with CCS if it is to have any chance of realising its targets. If CCS cannot work on the necessary scale, then we need to know soon and follow alternative strategies. Unless the rich world demonstrates, and quickly, that CCS works, developing countries cannot be expected to commit to this technology. Contributions should differ if the funding is for climate rationale only (like CCS) or has development benefits. In the case of CCS there is a strong argument for funding by rich countries. Similar arguments apply to the development of solar power and biogas, which have clear transformative possibilities in developing countries.

6 - Funding forests

Deforestation contributes 15-20% of greenhouse gas emissions. A coherent, integrated international effort is needed to combat it. For \$10-15 billion per year, a programme could be constructed that could stop up to half—of deforestation. The cost of abatement can be roughly estimated at around \$5 per tonne of CO₂, -taking into account the opportunity costs of land and the institutional, administrative and enforcement measures necessary (Stern 2008). Some have estimated higher costs but there appear to be large amounts of 'initial' reductions available at lower costs, particularly if programmes are large-scale and co-ordinated across countries.

Deforestation is the result of complex dynamics in land use, property and land rights. Forests are the sovereign resources of the states in which they are located. Therefore sustainable forestry policies will need to be – and are being - designed by each forest nation adapted to its own circumstances. There will be no 'one size fits all'; policies needs a long term framework to enable structural change. International financing mechanisms need to be designed in this context.

Initially we would expect international assistance to come from public sector flows. But in the medium term there are clear opportunities to release private sector flows by bringing deforestation into the carbon trading process. This will have to be very carefully done, with at least initially a specific and separate mechanism for forests. Given the difference in carbon price, bringing forests into the existing CDM would simply kill investment in clean technology and would achieve no greater overall emissions reduction. Considerable further analysis is required to establish how a forestry carbon market could be established.

7 - Funding Adaptation

Even with very stringent mitigation policies the world is likely to see an additional 1-2°C of warming in the next three decades over and above the 0.8°C it has already experienced. Adaptation to this climate change will be

necessary in all countries, and will be particularly difficult for the poorest and most vulnerable. Recently the UNDP has estimated additional costs for developing countries of around \$85 billion p.a. by 2015 (UNDP, 2007, p.15). And it will rise after that.

Such extra financing will be hard to find. It may be compared with the \$150-200 billion p.a. extra that would arise if the OECD countries moved to 0.7% GDP in ODA by 2015, as many of them have promised. The ODA promises of the 2002 UN Financing for Development conference in Monterrey, -and of the UK-chaired G8 Gleneagles Summit in 2005 to achieve the Millennium Development Goals, were powerfully argued and justified at the time. But they took little account of climate change. If that aspect is added, as it should be given the magnitude of the challenge, and combined with the historical responsibilities for stocks of GHGs and the implied consequences for poor countries, then the argument for 0.7%, becomes overwhelming. It is difficult to see how additional financing for adaptation in this way can be achieved if reliance is placed simply on discretionary funding by rich countries. It is therefore worth examining whether a system of global taxation in some form could be established. This could come from levies on emissions trading auctions or taxes; or on global activities such as flying or international investment.

Adaptation to a changing climate should not be seen as an issue of compensation for losses or as an addition to development but as a part of good development. Coherence between development policies will play a major role in allowing countries to choose sound development pathways which are resilient to the changes in climate which will be experienced.

The priority for poorest countries is to get more access to energy and consequently to emit more carbon, even though, a long term preference for a low carbon economy has to be integrated if only for energy security reasons. Africa will host 1.4 billion people in 2050, most of them living in cities. To overlook such developments can produce unsustainable ways of life conducting to further impoverishment. Developing models of an integrated, climate-resilient and low carbon path of development is therefore an urgent task.

Conclusion

The framework described above meets the criteria we suggested originally. Those were: effectiveness – it is on the right scale; efficiency – it relies heavily on markets and market-orientated innovation; and equity – it gives specificity to the "common but differentiated responsibility" of countries according to their stage of economic development. It builds on existing commitments and some aspects of the current discussions in international fora. It is also designed to give some realistic opportunity for the major developing countries to become strongly involved, as they must if serious targets are to be agreed and achieved.

It is a framework which could allow all countries to move quickly along what they see to be a responsible path. What is very striking here is how broadly basic understandings have already been established. Country-by-country we see targets being erected and measures being set by individual countries recognising their own responsibilities as they see international agreement being built. People seem to understand the arguments for action and collaboration on climate change much more readily than they do for international trade. That does not mean that the problems and necessary actions are universally recognised and accepted. Scientific agreement seems broad and deep but we cannot yet say that about economic policy and amongst politicians. This is a time for exchange of ideas and intensive discussion. It is intensive public discussion that will be the ultimate enforcement mechanism.

The discussion of that global framework will move forward strongly over the next few years. Addressing climate change is about sound economic policies. The challenge of climate change is especially difficult because it covers so much of the economy, is so long term, is so full of risk and uncertainty, is so demanding internationally, and is so urgent because of the problem itself and the pace of public discussion and decision-making. It is also a long-term problem, for analysis. We will be learning all the time and policy will be made and reformed over coming decades.

But addressing climate change is also about changing politics. The political dimension of climate change is becoming increasingly visible. For progressive leaders engaged in reforming world politics along the lines of justice and social and economic inclusion, climate change offers a powerful leverage.

Climate change politics demonstrate that power relationships are not the most effective way to deal with common threats. For the first time in history every population every country or culture every region is living with a common threat that does not have any solution if a broad collective action is not organized and implemented. Rich nations depend on poor countries' willingness to participate; the excluded have leverage on the included. Climate change needs the whole of society's involvement, a broad coalition of civil societies and governments, breaking the boundary between domestic politics and world affairs and a new definition of sovereignty. Climate change needs not adjustment but a profound transformation of our societies. As a common risk it can create the political space for social change. Progressive leaders seek equity and social justice as well as growth. The risks of climate change means that must now include the protection of environment. Without that protection neither sustained growth nor global justice can be achieved. Finally climate change is *par excellence* an inspiring cause for internationalism: it involves not only states but requires the solidarity and perception of a common destiny by all the world's citizens.

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