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Principles of Climate Policy after 2012

The UN conference on climate change in Montreal ended with an agreement to negotiate the extension of the Kyoto Protocol beyond 2012 and the launch of "open and non-binding" talks with non-Kyoto signatories. The following articles look into a number of challenges that will have to be met on the way to a post-20012 climate policy strategy.

Axel Michaelowa*

Climate Policy after 2012 – Cutting the Gordian Knot

Climate policy is one of the most challenging policy issues as the reduction of greenhouse gases has repercussions on all branches of the economy.[1] The speed and scale of the socio-economic transformation needed to avoid the risk of serious impacts of climate change is unprecedented. If we fail to achieve fundamental changes in the next 20 years, we shall have foreclosed our options by entering a world we cannot leave by any effort – one at serious risk of major systemic changes.[2] Of course, the longer action is delayed, the tougher the economic challenge will be. While long-term solutions such as new technologies are fundamentally important, we shall also need to focus on effective action in the short term.

Neither track will be easy: in the coming decades the world expects to see substantial economic development and investment in energy infrastructure. Much of this will be in developing countries as they strive for the standard of living of today's industrialised countries. In both industrialised and developing countries, a critical element of the "next 20 years" challenge is therefore ensuring that energy investments use the best available technology. This is a challenge that will require an international response on a scale with few precedents.[3]

In order to achieve a credible long-term outcome of the process, we need to approach climate change in a way that addresses the fundamental development aspirations of nations, peoples and individuals. This will require the integration of climate policy across a broad range of policy fields.

Against this background, climate policy can be seen as a battle between old, large and unwieldy energy-intensive industries and small, versatile upstarts who have a vision of an efficient society based on renewable energy. As we know from the Bible's account of David and Goliath, such a fight can be won by the upstarts against all odds, but they need a lot of cunning. So far, Goliath is still alive and kicking and the Davids around have not been able to seriously challenge him.

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[1] The gorgeously illustrated book by Kevin Baumert, Timothy Herzog and Jonathan Pershing: Navigating the numbers. Greenhouse gas data and international climate policy, World Resources Institute 2005,contains an intriguing diagram showing energy flows and resulting emissions differentiated by sectors (pp. 4-5).

[2] Recent results from climate modelling show an increased probability of high temperature increases at a specific level of greenhouse concentration reached due to anthropogenic emissions. To be sure that temperature increase is kept below a certain level, emission reductions have to start earlier and to be much stronger than thought previously. See e.g. the outcomes from the Exeter conference on dangerous climate change reported at www.stabilisation2005.com.

[3] See also Aaron Cosbey et al.: Which way forward? Issues in developing an effective climate regime after 2012, IISD 2005.

The "Matryoshka" Style of International Climate Policy Agreements

The international climate policy process can be compared to a set of the famous Russian wooden dolls set inside each other. The outermost shell is the UN Framework Convention on Climate Change (UNFCCC) negotiated between 1991 and 1992 which entered into force in 1994. It defines the principles of climate policy. Atmospheric concentrations of greenhouse gases shall be stabilised at a level which does not lead to dangerous impacts for humanity. Countries have common, but differentiated responsibilities to prevent dangerous climate change. Negotiations from 1995 to 1997 led to the second layer, the Kyoto Protocol, which is a treaty explicitly based on the UNFCCC. Its main achievement is the definition of legally binding emission targets for industrialised countries and countries in transition (the so-called Annex 1 countries). Moreover, it recognised the importance of efficiency in greenhouse gas reductions by introducing three international market mechanisms. However, it took more than seven years[4] for the Kyoto Protocol to become international law and for a lengthy period it even seemed that the Protocol would remain dead letter. Again, a new agreement was necessary to break the deadlock, the "Marrakech Accords". This agreement, which was achieved in 2001, developed detailed definitions and rules for each element of the Kyoto Protocol.

As the Kyoto Protocol has defined a five-year "commitment period" for Annex B countries starting in 2008 and ending in 2012, the agreement de facto ends in 2012.[5] In the Protocol, it is thus stated that negotiations on post-2012 climate policy should start by 2005. But no one negotiating that clause had thought that the Protocol might not have entered into force by that time …

Approaches on the Table

Since the negotiation of the Kyoto Protocol, more than 50 proposals for an international climate policy regime have been published by researchers, non-governmental organisations and other stakeholders.[6] They can be differentiated into the following large groups which are not mutually exclusive.

- *Expansion of the Kyoto-style emission targets to further countries.* A key proposal in this group is the multi-stage approach in which countries get an emission target of a different nature depending on their per capita emissions level, per capita income and human development index level. One of the few post-2012 proposals that involved collaboration of researchers from developing and industrialised countries is the "North South Dialogue" proposal that suggests differentiation of developing countries according to quantitative criteria and acceptance of emission targets by "Rapidly Industrialising Developing Countries" such as China.[7] A common feature of many of these approaches is that they propose new types of targets for developing countries taking up targets.
- *New types of emission targets*. A large number of approaches wish to substitute absolute emissions targets by intensity targets or weaken the target if the price for emission allowances rises above a pre-defined level ("price cap" or "safety valve"). Also, "dual targets" are being discussed that allow emissions trading but are not binding.[8] While some approaches propose that intensity/dual targets are only used for developing countries taking up a target for the first time, others want to use them for industrialised countries.
- *Equity-based climate policy.* The "grandfather" of this category is "Contraction and Convergence" which proposes an equal per capita allocation at a certain year in the future and proportional contraction of emissions budgets from the current level to the convergence level. Another approach, which is not based on targets, suggests that developing countries specify "sustainable development policies and measures".
- *Emissions reductions based on ability of specific sectors to reduce emissions.* Examples of this approach are the Global Triptych that determines emis-

[4] The Protocol entered into force on 16 February 2005. The delay was due to the fact that countries representing at least 55% of the emissions of Annex B had to ratify the Protocol before its entry into force. As the USA had declared its opposition to the Protocol in early 2001, ratification by Russia was a necessary condition. Russia wavered for a long time. Only the EU's strong diplomatic pressure linking support of Russian accession to the World Trade Organisation to its ratification of the Kyoto Protocol proved a sufficiently compelling incentive for Russia to ratify.

[5] However, several rules of the Kyoto Protocol such as Art. 3.9 clearly refer to subsequent commitment periods.

[6] See Daniel Bodansky: International climate efforts beyond 2012: a survey of approaches, Pew Center 2004. Some approaches such as Contraction and Convergence had already been presented before 1997. Onno Kuik: Post-2012 climate policy: assessing the options, Amsterdam 2005, evaluates the different approaches.

[7] See Harald Winkler, Bernd Brouns, Sivan Kartha: Future mitigation commitments: differentiating among non-Annex I countries, in: Climate Policy, Vol. 5, No. 5, 2006, pp. 469-486.

[8] Cedric Philibert: New commitment options: compatibility with emissions trading, OECD, Paris 2005, discusses in detail how these target types can still accommodate emissions trading.

Figure 1
Montreal Post-2012 Negotiation Tracks and Countries in Each Track

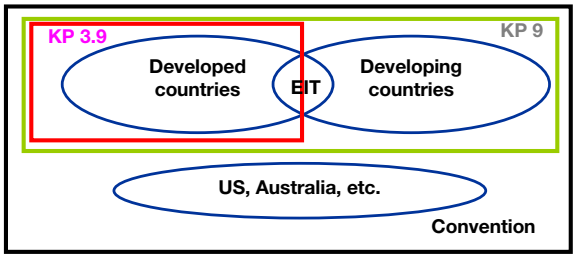


Table 1
Negotiation Positions at the Montreal Conference

		Developing countries	Developed countries	USA
KP 3.9	End date	2008	"No gap"	–
	Process	Ad-hoc group	Joint WG of SB	
KP 9		Negative	Positive	–
Convention		Positive	Positive	Negative

sions targets on the basis of emissions intensities of sectors and the multi-sector convergence.

- *Technology agreements*. Such an approach would focus on large-scale technology development financed by public funds; one is tellingly called "Climate Marshall Plan".
- *Adaptation-oriented climate policy.* This includes proposals to finance adaptation measures through a compulsory insurance-type mechanism or a tax on emissions trading.
- *Emission taxes.* A small group of proposals wishes to shift the regime from its current quantitative focus to a price-based one.

Combinations of these approaches have been suggested, for example the "orchestra of treaties"[9] where each country can choose from a menu of agreements covering targets, technology collaboration and adaptation.

While governments so far have not formally endorsed any of these approaches, it is clear that those countries critical of the Kyoto Protocol are likely to favour approaches with new types of targets or the technology-based ones. The "Asia Pacific Partnership", agreed in 2005 by Australia, China, India, Indonesia, Japan and South Korea, shows some characteristics of a technology agreement but does not really mobilise significant resources.

The SOGE and Montreal Processes

A surprisingly successful, informal start into post-2012 climate negotiations was the "Seminar of Government Experts" (SOGE) held in May 2005 before the classical spring round of climate negotiations. Presentations showed that some developing countries were willing to open the discussion on their participation in the future regime. For example, South Africa proposed a Montreal Mandate. "All nations should join and support the international effort to reduce greenhouse gases emissions" with "non-Annex 1 actions designed to support sustainable development". The regime should be inclusive, multilateral and balance adaptation and mitigation. However, India showed a less open stance bluntly stating that "India is doing enough in mitigation of GHGs" and stressing that Annex I commitments were not met.

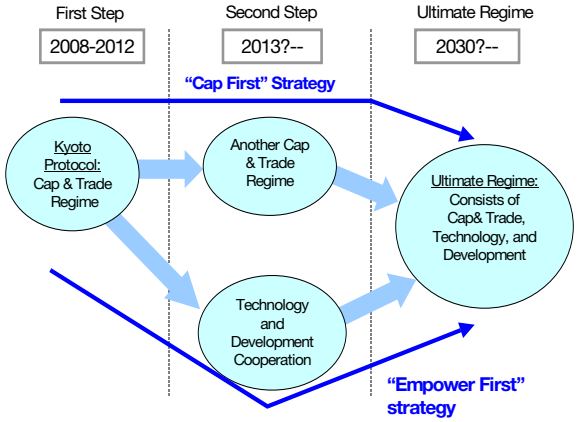
In preparation for the Montreal Conference of the Parties, which was the first Meeting of the Parties to the Kyoto Protocol (COP/MOP1), the Canadian hosts embarked on an intensive dialogue with many countries. This was a key founding block of the eventual success of the Montreal Conference.[10] While it was not possible to agree on a Montreal Mandate with clear timetables, a roadmap for the post-2012 negotiations was agreed. Two tracks of negotiation were defined.

- The Kyoto track, which is based on Article 3.9 of the Kyoto Protocol regarding the specification of Annex I countries' emissions targets for the second commitment period. The second basis is Art. 9 on review of the Kyoto Protocol. This article relates to all Kyoto Protocol member countries and could serve as the starting-point for developing country emission targets. However, the exact design of the Art. 9 negotiations remains to be defined.
- The Convention track, which applies to all countries that have ratified the UNFCCC and thus also includes the USA and Australia. It allows the discus-

[9] See Taishi Sugiyama, Jonathan Sinton: Orchestra of treaties: a future climate regime scenario with multiple treaties among like-minded countries, in: International Environmental Agreements, Vol. 5, No. 1, 2005, pp. 65-88.

[10] For a detailed analysis of the Montreal Conference see also Joanna Depledge, Michael Grubb: COP/MOP1 and COP 11: a breakthrough for the climate change regime, in: Climate Policy, Vol. 5, No. 5, 2006, pp. 553-560.

Figure 2
Ultimate Re-convergence to a Regime with Absolute Targets



Source: Taishi Sugiyama: Where to? Future steps for the global climate regime, in: Taishi Sugiyama (ed.): Governing climate, IISD 2005, p. 8.

sion of new approaches to the international regime that could take the form of additional protocols to the UNFCCC. An analogy for this approach is the Vienna Convention on Ozone Protection, which now has half a dozen protocols. So far, only "dialogue" workshops are scheduled.[11]

While developing countries wanted to put a clear deadline to the negotiations about the second commitment period targets, Annex 1 countries did not want to bind themselves to a specific date but confirmed that the second commitment period should start immediately after the end of the first one. A major reason was to allow enough time for a post-Bush US administration to seriously engage in the negotiations. On the other hand, Annex I countries wanted to conduct the negotiations within a joint working group of the Subsidiary Bodies of the UNFCCC while developing countries preferred a more low-key "ad hoc group". Developing countries objected to negotiations under Art. 9. The negotiation positions are summarised in Table 1 and the outcome is circled.

Overall, the negotiations can build upon a relatively solid foundation. It is noteworthy that the USA was isolated at the COP/MOP and finally had to give in;[12] Australia always participated constructively. The last minute obstructionism of Russia concerning "voluntary commitments" under Art. 3.9 was not able to derail the process. The concession to developing countries regarding the "ad hoc group" is not really problematical, given that it was possible to negotiate the Kyoto Protocol within such a framework (the "Ad Hoc Group on the Berlin Mandate").

Growing Gap between Long-term Targets and Short-term Action

A disturbing trend of international climate policy is the tendency to agree on more and more ambitious targets for the far distant future while greenhouse gas emissions continue to rise and policymakers do not dare to introduce effective policy instruments. Short-term targets that are out of reach are shelved without much ado. For example, the German government unceremoniously buried its target of 25% CO_2 reduction from 1990 until 2005 from 2002 onwards while stressing that Germany was on track to reach its Kyoto target. Currently, several EU governments are discussing ambitious targets for 2050 but the same governments accepted a business-as-usual allocation for the industry covered by the EU emissions trading scheme. Here, the Goliaths still tower over the Davids of renewable energy.

There is an indication that many stakeholders want the second commitment period to be longer than the first one, reinforcing the trend to move difficult issues to the future.

Another trend of diversion is to focus on "miracle technologies". The current hype in this context is carbon capture and sequestration (CCS). While we shall need all technologies that allow us to reduce greenhouse gas emissions to achieve the far-reaching reductions, it is unlikely that CCS will provide the magic bullet given its huge energy penalty and questions of permanence of storage. Even ardent technology treaty supporters like Sugiyama recognise that eventually the climate regime has to be built on targets coupled to market instruments (see Figure 2).

The challenge is now to strengthen stakeholders who support absolute targets and trade. This would avoid a costly detour towards a relatively inefficient regime which at a later point in time would have to be scrapped hastily in favour of a Kyoto style approach due to unbearable climate impacts.

[11] The direction which could be taken by such workshops is illustrated by the outcome of the climate dialogue at Pocantico reported in Daniel Bodansky, op. cit.

[12] Nevertheless, the US intransigence led to the insertion of a clause stating that the Convention track should "not open any negotiations leading to new commitments". As this question is at the heart of the process, it remains to be seen how this wording is going to be interpreted. One could argue that "new" relates only to commitments of a new nature, which would ironically rule out intensity targets and other innovative approaches supported by the USA.

Simon Schmitz*

The Tipping Points of the Climate, Technology and Business

Energy is the single most important enabler of economic development, and its production and use will surge in the coming decades, especially in developing countries. Actually making this energy available and affordable in itself represents a crucial challenge for society. But it will most likely also bring further adverse impacts on our global environment.

Global temperatures could rise by a further one to four degrees by the end of the 21st Century, "tipping" the climate over to a trajectory of impacts that could accelerate beyond our control.

The Scale of the Energy and Climate Challenge

With its recent publications "Facts and Trends to 2050"[1] and "Pathways to 2050",[2] the World Business Council for Sustainable Development (WBCSD) seeks to create factual platforms for action by translating the scale and complexity of the energy and climate challenges into simple, illustrative pathways.

"Pathways to 2050" in particular illustrates the sectoral and regional changes needed for a global emissions path to be in line with the IPCC's 550ppm stabilisation scenario,[3] which would bring emissions back down to roughly current levels in 2050, after a moderate increase by 2025.

As expressed by the "Kaya identity", global CO_2 emissions are influenced by four key factors: population, GDP per capita, energy use per unit of GDP, and emissions per unit of energy: CO_2 Emissions = Population x (GDP/Person) x (energy/unit GDP) x (CO_2/unit energy).[4]

Reductions in population or economic growth can hardly be relied on as drivers for reduced emissions (even though they can turn out to be). The two factors that climate policy will have to focus on are the energy intensity of our economies and the carbon intensity of energy. Given the build-up of our energy system, this will have to happen in five key sectors, as illustrated in Figure 1.

The "megatrends" to 2050 identified by WBCSD in these different sectors include a doubling of average vehicle efficiency, tremendous energy savings in industry and buildings, the large-scale introduction of biofuels and hydrogen in transport (15% and 25% respectively of the fuel mix for road transport), and an increased use of electricity as part of overall carbon management.

This electricity would be generated increasingly with low-carbon technologies, including a tripling of nuclear and gas capacity until 2050, a massive deployment of wind, geothermal, wave and tidal (at combined annual growth rates of 11%, implying a growth of a factor 160) and solar power (at an annual growth rate of 20%), and large-scale use of carbon capture and storage (CCS), at 9% of the global coal-based power generation (or 100 plants of 1GW) in 2025 and 50% in 2050.

Emissions in the USA and Europe would be half of today's by 2050, and China's would only be up by 40%, largely thanks to carbon capture and storage at coal power plants. This compares to more than a doubling of China's emissions already by 2030 in the IEA Reference Scenario.

At the same time, this so-called "9 Gt world" (9 gigatonnes carbon of global CO_2 emissions including those from land use change) would most likely not be without climate impacts, as we are already observing major shifts today.[5]

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[1] WBCSD: Facts and Trends to 2050: Energy & Climate Change, 2004.

[2] WBCSD: Pathways to 2050: Energy & Climate Change, 2005.

[3] See Intergovernmental Panel on Climate Change (IPCC): Climate Change 2001: Mitigation, 2001.

[4] CO_2 emissions from fuel combustion represent around 60-70% of global GHG emissions, depending on estimates of CO_2 emissions from land use change and non-CO_2 emissions of GHGs such as methane.

[5] World Resources Institute: WRI Issue Brief: Climate Science 2005: Major New Discoveries, 2005.

Figure 1
How Energy Flows Through Our Economy

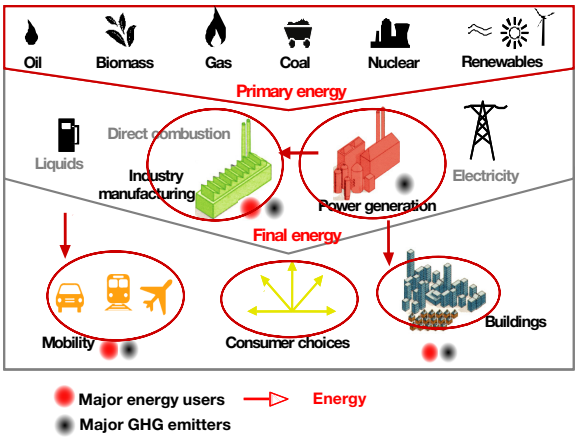
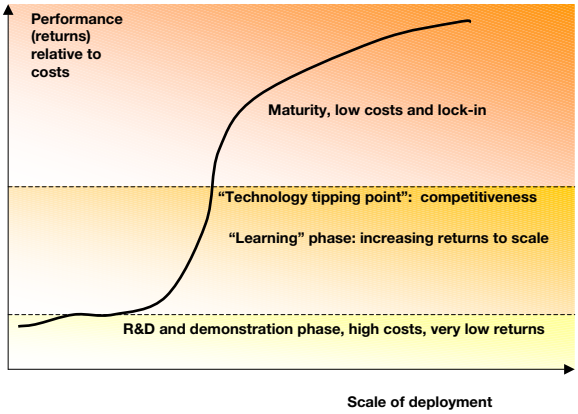


Figure 2
Stages of Technology Development



Source: Adaption from G. Unruh: Understanding carbon lock-in, in: Energy Policy, Vol. 28, No. 12, 2000, pp. 817-830.

The Nature of Technological Change

A sober look at the types of changes needed and at the factors that influence global energy-related CO_2 emissions will be enough to convince us that the immense challenge at hand is fundamentally a technological one.

The Schumpeterian theory of technological change describes a linear process from science to technology, from ideas through innovation (the transformation of ideas into products), to diffusion, which is the spread of use and ownership of new technology. This description focuses on "technology-push" factors such as R&D investments that drive the process.

Neo-classical approaches[6] on the other hand emphasise the influence of the market and consumer preferences ("demand-pull"), including feedback loops to the earlier stages of innovation.

Both of these approaches dismiss the importance of institutional and social factors, and Evolutionary Economics was "fit" enough to remedy this failure. Based on Nelson and Winter[7] and Dosi[8], Kemp[9] developed an evolutionary theory of technical change based on the concept of the "selection environment" as a whole system involving the economy, technology and social institutions.

"Pushed" by R&D, and "pulled" along the way by market incentives and consumer preferences, new technologies can develop in surprising directions. Thomas Watson, the Chairman of IBM said in 1943, "I think there is a world market for maybe six computers". In the 1990s, the convergence of developments in high-speed computing and network capabilities spurred the explosive growth of the Internet.[10]

It is however worth noting that the Internet took effectively around 50 years to evolve from its beginnings to the opportunities that we have now and that are still far from being exploited. Major transformations in technology, even when they become "unstoppable", take time to implement. This will most certainly be the case in the energy sector, where the long lifetime of existing assets such as power plants is a major hurdle for change in itself.

In addition to time, another crucial hurdle to change is cost. While initial costs of a "new" technology are crucial in deciding its path, even more important is how costs will change over time and when the technology gets employed at larger scales.

Bill Clinton said in his speech at the most recent UN climate change conference in Montreal (December 2005) that, "wind and solar are more like blackberries, cell phones and flat-screen televisions – the more you use the cheaper it gets. Every time [wind capacity] doubles, the price drops 20 per cent. […] It's just not

[6] E.g. C. Freeman: The Economics of Industrial Innovation, London 1994, Pinter Publishers.

[7] R. R. Nelson, S. G. Winter: Dynamic Competition and Technical Progress, in: B. Balassa, R. R. Nelson (eds.): Economic Progress, Private Values, and Public Policy: Essays in Honor of William Fellner, Amsterdam 1977, North-Holland.

[8] G. Dosi: Technological Paradigms and Technological Trajectories, in: Research Policy, Vol. 11, No. 3, 1982, pp. 147-162.

[9] R. Kemp: An Economic Analysis of Greener Technology, in: J. Schot, K. Fischer: Environmental Strategies for Industry, 1993, Island Press.

[10] WBCSD: Facts and Trends to 2050, op. cit.

true you can't take any of this to scale. It's just that we are sort of rooted in old patterns of organisation and financing."

What Clinton was referring to was technological "path dependence", a concept that has been much discussed in the economic literature, building on the pioneers Arrow[11] and Arthur.[12] During the early stages of adoption of a new technology, increasing returns to scale entail a self-reinforcing mechanism where the very fact of being on the path accelerates further development. Thus, changing course becomes increasingly difficult, and once a technology has moved beyond a certain "tipping point", it becomes fully competitive and can often be regarded as "locked in" to the system (see Figure 2).

As can be seen from Figure 2, path dependence is part of both the problem and the solution. New technologies (such as solar) that are just at the beginning of their path are struggling to reach the level where path dependency really kicks in, as the incumbent technologies have already gone through this process and their low level of costs is difficult to reach.

Based on the theoretical framework outlined above, it can be summarised that:

- Much of our current energy infrastructure is currently "locked into" an energy and carbon-intensive system, as the costs of most of the alternatives are catching up. Consequently it will be necessary to break this lock-in to transition to a low-energy, low-carbon infrastructure. Breaking technological lock-ins by definition involves short-term costs compared to staying within the existing system.
- Both R&D support ("technology-push") and incentives for early market deployment ("demand-pull") are necessary from a policy perspective.

Key Policy Principles from a Business Perspective

As a starting-point in outlining certain key policy principles, let us consider the importance of investment. Since substantial upfront expenditure is the pre-condition for the deployment of virtually all types of energy technology, investment is probably the most important enabler of technological change.

Much of this investment is going to be made by business, as business operates or produces a large part of the world's energy infrastructure.

Businesses make investment decisions:

- with a long-term time horizon on adequate returns, including the assessment of associated risks;
- with a strategic perspective on what their competitors are doing;
- with a strong focus on what their customers want;
- with a view to whether they can secure capital on a cost-effective basis for their projects.

1. Direct government support for research and development

- Government spending on energy R&D has decreased in many countries. But R&D for technologies that are at the early stage of development are often not attractive enough for private investors. Their benefits and costs are uncertain, and investors are primarily looking for short-term benefits.
- This area demands new partnerships between governments and industry to engage in sharing risks and the large investments necessary to bring new technologies up to the "learning phase".
- There is no "market-based" approach to direct technology R&D, as it can only rely on a judgement as to market potential in the future. Nevertheless direct R&D support is an important element of climate policy.

2. Significance and simplicity

- Any incentive for early market deployment needs to be sufficiently strong to overcome initial cost barriers of less carbon-intensive technologies. This also means that transaction costs that need to be born in order to qualify for the incentive need to be as low as possible.
- The adjustments to the CDM process recently agreed in Montreal were strongly endorsed by business, even though further streamlining seems necessary.
- The key issue here is that there is often a trade-off between simplicity and technical accuracy (e.g. of "baseline" estimates for CDM projects). The advantages of simplicity, and its positive side-effects for reproducibility, auditability and transparency are too often underestimated.

[11] K. Arrow: The economic implications of learning-by-doing, in: Review of Economic Studies, Vol. 29, No. 3, 1962, pp. 155-173.

[12] W. B. Arthur: Self-Reinforcing Mechanisms in Economics, in: W. B. Arthur: Increasing returns and path dependence in the economy, Ann Arbor 1994, University of Michigan Press.

3. Predictability and objectives

- As asset lifetimes as well as project lead times tend to be extremely long in the energy sector (and especially in the power generation sector, which makes up 40% of global CO_2 emissions from fuel combustion), it is crucial that incentive mechanisms are signalled a very long time in advance of when they actually apply. An example would be a global emissions target for 2050, or even a second commitment period for the Kyoto Protocol that reaches out to beyond 2025.
- The Kyoto Protocol was agreed in 1997, with the commitment period ending in 2012, which provides 15 years. The problem was that it only entered into force in 2005, leaving no more than 7 years with increased certainty that it is a binding target.
- Targets for the following two or three years will only yield marginal improvements in technology and only provide weak incentives for R&D.

4. Wider participation

- Climate change is an international collective action or free-rider problem that can only be addressed through international cooperation.
- Concerns over international competitiveness are perhaps the most important hurdle to wider participation in international efforts today. These concerns are essentially rooted in the worry that carbon restrictions will raise energy prices. This is currently being debated even in Europe in relation to the second phase of the EU's Emissions Trading System.
- Participation and predictability are strongly linked. Once the participation problem is solved, the framework starts to become much more credible.
- Common but differentiated responsibilities must be part of any future agreement, and what is needed is a more detailed indicator of what this means which is acceptable to the major developing country emitters.

5. Market based mechanisms and instruments

- Framework conditions must create market forces such as those put in place by the Kyoto Protocol, which allow the establishment of a long-term value for carbon while providing sufficient flexibility in reaching targets.
- A broad range of innovative mechanisms, policy interventions and voluntary measures should be used to remove barriers to investment in new technologies.
- Properly designed and interlinked emissions trading systems will steer demand for cost effective emission reductions. Global companies need to be able to invest in carbon emission reductions where they achieve the greatest leverage.

6. Changing consumer behaviour

- Mere changes in behaviour, e.g. through driving less, clearly have their limits.
- The more important role for consumers comes in choosing less energy and carbon intensive products.
- Policy will not only be about incentives and institutions to enforce them, but also about how to change the preferences of consumers. Increased awareness and access to transparent information through expansion of education tools and product certification programmes will thus play a key role.
- If choices in favour of climate protection are good for the customer, they will be good for the business that supplies this customer. The power of incentives on customers should not be underestimated, especially in strongly customer driven technology markets such as that for cars.

7. Engaging the capital markets

- Mechanisms and instruments must send economic signals strong enough to engage capital markets, the means by which business and government can finance the transition to a carbon-constrained future.[13]
- Cost of capital is part of investment cost, and financing is a crucial part of the "selection environment". Investors and analysts must play their part in designing innovative financing solutions for low carbon and more energy efficient infrastructure, and in approving projects that push the boundaries in this regard.
- The financial sector's contribution to change will depend in large part on the predictability of policy mechanisms and to the extent these drive financial indicators.[14]

[13] S. Schmidheiny, F. J. L. Zorraquin: Financing Change: The Financial Community, Eco-efficiency, and Sustainable Development, 1996, MIT Press.

[14] A recent UNEP Finance Initiative side event at COP11 called explicitly for a global long-term target on GHG emissions to enhance investor confidence.

How to Implement these Principles? A Few Thoughts on Next Steps

To at least begin to take the debate around the principles to the next level, it seems appropriate to cite Sir Nicholas Stern, Head of a Major Review on the Economics of Climate Change in the UK: "If you are thinking about investments in the kinds of infrastructure and durables that we're talking about, it must be the case that the incentive structure is clear, long term and credible. *And putting those kinds of incentive structures together is actually quite difficult.* You have to try to bind yourself going forward in a way that governments find it quite difficult to do."[15]

This article is not to suggest a final solution to these difficulties but simply share some thoughts on the way forward.

Climate policy and energy security: First of all, it should be obvious that focusing on where the global system has the biggest leverage makes economic sense. This is why it is so important to turn our attention to countries with particularly high emissions growth, such as India and China.

Recently announced inter-governmental technology partnerships with these countries reflect a burning priority that is of key relevance to the climate debate: energy security. Both China and India are facing extremely high growth in energy demand, and the risk of not being able to meet this demand quickly enough is now one of the biggest threats to their economic development.

High oil prices are a strong driver of innovation in the transport sector, where energy security drives the system in the same direction as climate policy would (e.g. hybrids, biofuels). However, the same is not necessarily true for the power sector, where we are now seeing a renewed interest in coal generation as a result of higher gas prices (e.g. in Europe but also the USA). Granted, we see renewed interest in nuclear power, too. It clearly provides both climate and energy security benefits, even if other issues such as high capital costs, waste disposal and proliferation risks are far from solved.

However, increased use of coal can be regarded as a given – it is practically inevitable in China, which is where it really makes a difference to global emissions. There is thus a very urgent need to accelerate more efficient coal technologies such as ultra-supercritical coal and IGCC plants, to bring their investment costs down. Once the costs come down sufficiently, these solutions can form part of the international win-win opportunities that serve both energy security and climate objectives, at least until CCS technologies leave the demonstration phase.

Energy efficiency and other ancillary benefits: Energy security also provides a strong push to turn attention to the efficiency of the energy system, and especially its demand side. It is estimated that new air conditioners could reduce energy consumption in China by around 0.5 EJ in 2010, which would equal about 1.1% of total Chinese energy consumption in that year, or, for comparison, about 20% of Germany's electricity consumption in the year 2002.[16] The potential indicated in IEA studies[17] suggests that energy efficiency is half the solution to climate change. It is the one technology area which provides pure international win-win opportunities, and deserves far more international attention than it currently gets.

It will be critical to focus international mechanisms on "ancillary benefits", that is to align climate interests with other development objectives. This can be done for example through sustainable transport policies that reduce congestion, or programmes that aim to reduce local air pollution.[18] It should be noted that the current interpretation of the additionality principle of the CDM is not exactly helpful in this regard, as it discourages such bundling of policies.

Energy efficiency targets on the other hand may be effective tools in making developing countries participate in international regimes. Such targets would provide major climate benefits and promote growth at the same time. If they come in the form of technology standards (such as efficiency standards for air conditioning units or standby in appliances), they may even provide streamlined benchmarking procedures for CDM projects.

Sectoral approaches: At COP11 and the lead up to it there was ample discussion of international sectoral approaches that agree on targets, which countries as a whole cannot agree on due to concerns over international competitiveness.

[15] Remarks by Sir Nicholas Stern at the Oxford Institute of Economic Policy Distinguished Lecture: "What is the Economics of Climate Change?", 31 January 2006.

[16] WBCSD: Pathways to 2050, op. cit.

[17] International Energy Agency (IEA): World Energy Outlook 2004.

[18] World Resources Institute: Growing in the Greenhouse: Protecting the Climate by Putting Development First, 2005.

Business views offered in these discussions revealed that homogenous and consolidated sectors that are exposed to international competition (such as the cement sector) are much more suited to international sectoral approaches than others (such as the power sector).

However, sector self-regulation is most likely not an option, as the authority of governments is likely to trump agreements between businesses. There is also a need for a regulatory driver to provide predictable incentives and enforcement. The lack of global governance bodies for most industry sectors further reinforces this point.

Having said that, some sectors can address technology transfer very effectively, and sectoral benchmarks (e.g. as part of the CDM) or no-lose targets could be employed to enhance the use of BATs (or BATEAs, best available technology economically achievable) in high-growth developing countries.

The nature of targets: From a business perspective, emissions per unit of some output can be forecast with much more certainty than absolute emissions. For example, Royal Dutch Shell's internal GHG target-setting procedure involves setting absolute targets only at the highest level of the organisation. Business units operate on intensity targets, as they have less influence over decisions that affect growth. This shows that intensity targets do have their role to play in reaching absolute targets.

Reviving R&D: The American focus on "technology" is often criticised by Kyoto supporters, since it does not provide any certainty of outcome in terms of absolute emissions. However, it should be highlighted that the Kyoto Protocol does not create any international cooperation on direct technology support, and it provides only weak indirect incentives for R&D. The newly formed Asia-Pacific partnership would be helpful if it became a new R&D driver complementary to Kyoto-style efforts.

The special case of CCS: The recent IPCC report[19] has clearly underlined that carbon capture and storage represents one of the major large-scale emission reduction options. In the short-term, this technology will be implemented mostly in combination with early opportunities for Enhanced Oil Recovery.

It is important to exploit these types of win-win situations for technological learning. However, in the medium to long term carbon capture and storage, much like scrubber technologies for coal power plants, and unlike most other energy technologies, will represent a pure cost. It does not present an alternative value proposition such as energy security and independence.

Therefore, in order to mobilise the required investments, including in promising gasification technologies such as IGCC, clear methodologies will be needed for calculating the value of carbon reductions achieved, including predictable rules for treating the risk of carbon leakage.

The role of business in policy development: As in any collective action problem, all actors need to make somewhat daring steps in the right direction. In this sense, there is clearly a case for business to take leadership in publicly supporting initiatives undertaken by governments to accelerate policy development. Naturally, climate policy, like any policy that intervenes in a market or introduces new incentives, will have its winners and losers.

But before the climate reaches a tipping point that brings non-linear and increasingly irreversible changes, we need to push new technologies towards market maturity and pull them up the curve of increasing returns to scale.

To make huge transformations like this happen was already recognised as a problem hundreds of years ago: "There is nothing so difficult in human affairs than to change the established order of things, because those who will be hurt by the change are quite certain of their loss, while those who will benefit are uncertain of their gain."[20]

But there are positive signs, as potential winners in business are beginning to speak up. As Wayne H. Brunetti, CEO and chairman of Xcel Energy Inc., the fourth-largest electricity and gas utility in the USA, recently said, "Give us a date, tell us how much we need to cut, give us the flexibility to meet the goals, and we'll get it done."

The more companies like Shell and BP invest their oil revenues in renewable energy, the more they will develop a vested interest in climate policy, and the more shall we see them actively support policy development. Here, the tipping point will be reached when the influence of these "winners" on policy becomes stronger than that of the losers.

[19] IPCC: Special Report on Carbon Capture and Storage, 2005.

[20] Quote from Machiavelli, as cited in former US President Clinton's speech in Montreal at COP11, December 2005.

Preety M. Bhandari*

Negotiating Future Climate Policy: The Role of Developing Countries

The future of climate change negotiations is delicately poised, even though at CoP 11/MoP 1 there have been signals that the global community is willing to move forward despite the non-participation of the biggest emitter. However, to designate the Conference as an unequivocal success may be overstating the achievements.

Underlying the agreed text on the future course of action, there was some intensive bargaining and positioning. The developing countries had to thwart attempts to bring them under the umbrella of commitments to reduce GHGs, while at the same time asking for a Review of commitments under Article 3.9 of the Kyoto Protocol. The fact that it did not unravel into an ugly situation may be perceived as willingness to take the Kyoto process forward and to ensure that the long, assiduous and arduous process in which the global community has engaged for over a decade to deal with the issue of climate change, is not reduced to naught.

But will new scientific information and growing evidence spur countries to be more proactive and transparent in their willingness to take measures? In 1997, the commitments that were brokered at Kyoto were purely political, with little or no emphasis on their intended impact on GHG concentration levels. They were intended as a first step. Subsequently, IPCC's third assessment report has clearly indicated that there is clear evidence of dangerous anthropogenic interference with the climate system. There is also a better understanding of regional impacts, and awareness that climate change could be manifested not just as gradual mean changes but also increased variability and more extreme events. And obviously much more needs to be done than was agreed at Kyoto in 1997. The EU is of course supporting the upper limit of 2°C change in temperature target, but there is still no agreement on how to define dangerous anthropogenic interference to the climate system, and the level at which GHG concentrations should be stabilised.

Even though science and scientists have not been able to convince everyone of the clear and present danger, unprecedented events like the heat wave and floods in Europe and hurricanes in America may have raised public awareness on climate change, which may bring to bear upon policy-making.

How will a new deal be brokered? Should we nurture the hope that the USA and other Parties that have rejected the Protocol will come back to the fold? Will the EU continue to hold the moral high ground on the environment and agree to deeper commitments? Will the future climate regime be broadened to include a formal role for developing countries? How will adaptation be placed in the future climate regime? These are questions that have emerged in recent years and are yet unresolved.

In this paper, the scope is limited to analysing the role of developing countries, both in the context of willingness to mitigate and raising red flags for recognising their developmental aspirations, and also how these could be dampened by both mitigation obligations and adaptation needs. Much of the analysis is also driven by the Indian position and data.

The Willingness to Mitigate: the Rhetoric and the Reality

The developing countries' position has in the past relied heavily on the principles enshrined in the UNFCCC, which clearly enunciated the principles of historical responsibility, common but differentiated responsibility and the right to development.

And in this context they have argued against any commitments for developing countries, and also called for a renewed commitment to financial and technology transfers.

Further, the claim that large developing countries such as China, India and Brazil will become major emitters in the future is thwarted by the fact that on

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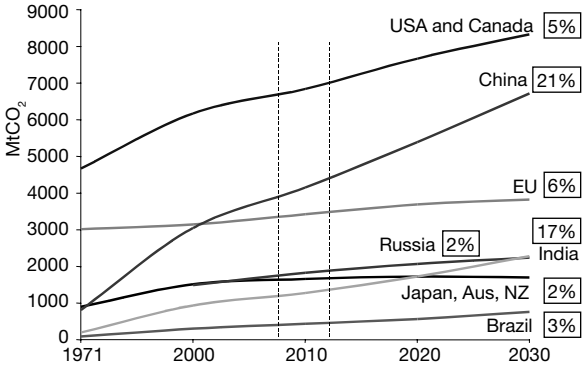
Recalling the UN Framework Convention on Climate Change

"the largest share of historical and current emissions of greenhouse gases has originated in developed countries, [and] that per capita emissions in developing countries are still relatively low and that the share of global emissions originating in developing countries will grow to meet their social and development needs."

"the global nature of climate change calls for the widest possible cooperation by all countries, and their participation in an effective and appropriate international response, in accordance with their common but differentiated responsibilities and their respective capabilities and their social and economic conditions."

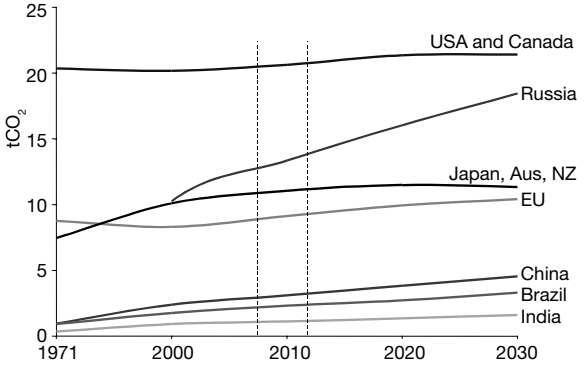
Figure 1
Beyond 2012



Note: Figures in brackets show percentage of world population.

Source: IEA: World Energy Outlook, 2002.

Figure 2
Per Capita Emissions



Sources: IEA: World Energy Outlook, 2002; World Bank: World Development Report 2002.

a per capita basis these countries will be much below the developed nations.

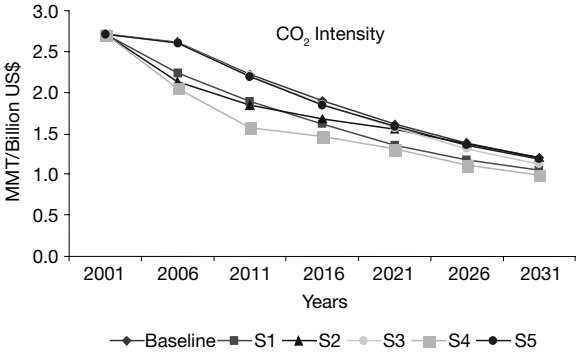
In the above context the development debate assumes significance, and developing countries often state that to achieve reasonable rates of growth, they will require more energy, and that the per capita energy consumption is currently woefully low and will necessarily grow in the future. This debate is further exacerbated by the sustainable lifestyles argument, and the need to distinguish between "survival" emissions of developing countries and "luxury" emissions in developed countries.

The position of developing country Parties draws inspiration from the UNFCCC provisos, and has consistently argued that the developed country Parties, which bear the historical responsibility, need to take the lead in mitigating emissions. They also take recourse to Article 4.7 of the UNFCCC, which specifies that "the extent to which developing country Parties will effectively implement their commitments under the Convention will depend on the effective implementation by developed country Parties of their commitments under the Convention related to financial resources and the transfer of technology and will take fully into account that economic and social development are the first and overriding priorities of the developing country Parties".

However, what is not very often publicised or reiterated is that the UNFCCC also recognises that "the various actions to address climate change can be justified economically in their own right and can also help in solving other environmental problems". Further, it emphasises that "all countries, especially developing countries, need access to resources required to achieve sustainable social and economic development and that in order for developing countries to progress toward that goal, their energy consumption will need to grow taking into account possibilities for achieving greater energy efficiency and for controlling greenhouse gas emissions in general, including through the application of new technologies on terms which make such an application economically and socially beneficial". This being the case, why are we still at loggerheads on what actions need to be taken? Are not there enough win-win opportunities to be exploited, both in developed and developing countries?

In the seminar of governmental experts held in June 2005, several countries outlined initiatives that high-

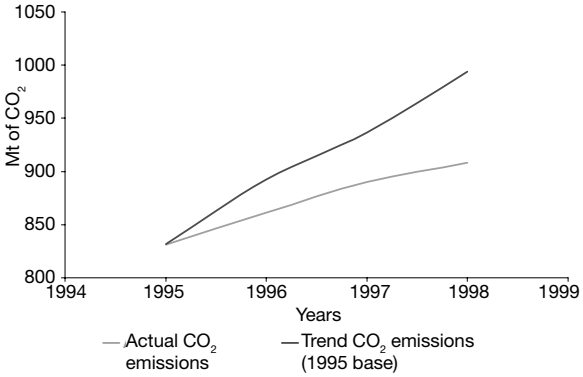
Figure 3
Change in India's CO_2 Intensity as a Result of Government Policy Initiatives



Sources: Results of Policy Scenarios from MARKAL, presentation made by Ritu Mathur at the India side event "Energy, environment and development: perspectives from India" at SBSTA/SBI 22, May 19, 2005; and UNFCCC: Proceedings of the Seminar of Governmental Experts, issued by the Climate Change Secretariat, Bonn 2005.

Baseline: Base year 2001, GDP growth 8%, official demographic projections, IPCC emissions factors, 8% discount rate.
S1: Cleaner fuels for power generation.
S2: Electricity for all by 2012, with decentralised renewable options, efficient cook stoves.
S3: 20% increase in share of public road transport, greater use of CNG in buses, taxis, 3-W vehicles.
S4: S1+S2+S3.
S5: Average annual GDP growth rate 6.7%.

Figure 4
"Meaningful Participation" by India



Source: IEA: World Energy Outlook, 2002.

lighted significant climate change co-benefits from sectoral policies which are under way (cf. Figure 3 for India).

China and other countries also outlined their plans in the next 20-30 years for the energy sector that would also help in meeting the climate change challenge. The energy intensity in China is expected to be reduced from a current level of 2.68 tce/10,000 yuan in 2003, to 2.25 in 2010 and 1.54 in 2020 and to effect an energy saving rate of 2.2% per year till 2010 and 3% per year in the period 2010-2020. The enactment of the Renewable Energy Law seeking a role of 10% for renewables in total energy consumption in 2020, and relatively higher reliance on nuclear power were also cited as mitigation options.[1] In earlier research undertaken for China[2] it is estimated that economic restructuring, efficient technology, use of more natural gas and renewable energy could contribute equally to an aggregate mitigation potential of 800 million tonnes of carbon by 2030.

Even the US presentation at the SoGE highlighted the programmes underway in that country to mitigate emissions including the target to reduce GHG intensity of the economy by 18% by 2012, a $5 billion climate change programme including science and technology initiatives, and the potential of the 500 MtC reduction by 2012 through over 60 mandatory, voluntary and incentive based federal programmes.[3]

The above country examples were chosen deliberately, as these are the countries which are perceived as impervious to any engagement in the climate change debate.

However, if the existing programmes and initiatives are implemented in each of these countries, they can clearly claim that they are meaningfully participating in the regime to address climate change (cf. stylised Figure 4 for India).

So why are major developing countries such as India and China not claiming emphatically their willingness to engage provided their developmental goals are not compromised, and also emphasising that they are not oblivious of their obligations? Are they unsure about the intentions of the developed country Kyoto Parties to meet their commitments, or is it the recent intensification of pressures to draw in the future "big emitters" that is making us wary, or is it just marking time to see where the international regime is heading towards, assessing the solidarity and the sincerity of the "committed", before making any type of commitment?

[1] UNFCCC: Proceedings of the Seminar of Governmental Experts, issued by the Climate Change Secretariat, Bonn 2005.

[2] C. Chandler, R. Schaeffer, Z. Dadi, P. R. Shukla, F. Tudela, O. Davidson, S. Alpan-Atamer: Climate change mitigation in developing countries: Brazil, China, India, Mexico, South Africa and Turkey, Pew Centre Report, 2002.

[3] UNFCCC, op. cit.

Engagement of the Developing Countries: the Way Ahead

Several initiatives have been taken over the last few years to assess what shape a future regime may take.[4] In a dialogue conducted in the Asia Pacific region recently, the participants highlighted the need to mainstream climate change in developmental policies in developing countries, while arguing for demonstrable leadership by developed countries.[5] They also reiterated their commitment to the principle of common but differentiated responsibility, reliance on market mechanisms, technology development and diffusion, financing clean development and capacity building. While all these elements do constitute a package for the future, the key elements need to be gleaned out of this wish list, and prioritised.

The foremost requirement at this juncture in the climate change negotiations is to build a climate of trust. This may sound rather clichéd, but before the lines get completely drawn on "Beyond 2012" issues, some gestures will have to be made by developed country Parties to dispel the suspicions of developing country Parties. One immediate response could be the opportunity under the Dialogue on long-term cooperative action agreed at CoP11/MoP 1. The four issues identified include sustainable development, adaptation, technology and market based opportunities.

If the dialogue is initiated with developmental issues, then it may send a clear signal that these issues are of paramount importance, and the developed world recognises the same. It may also bring forth a wish-list from developing countries on what they want to pursue on the developmental front, which may not be in complete conflict with environmental goals in general and climate change in particular. It may also bring forth the immediate technology needs in developing countries, and the resources required for such technological deployment. It may open new market opportunites, rather than a protracted dialogue on technology transfer, resources transfer and the unfathomable issue of IPRs. In this context, a real opportunity that could play a significant role is the Clean Development Mechanism. Although there were significant strides made at CoP 11/MoP 1 to revitalise and simplify this mechanism, a serious attempt by developed countries to catalyse the CDM market would not only pave the way for developing country participation in global efforts to mitigate emissions, but also help them move to a less GHG intensive development pathway. This, of course, would underline a greater role for programmatic CDM vis-à-vis project based CDM, but a serious and an urgent attempt needs to be made to energise CDM in this form, and ensure a lifetime for such programmes beyond the Kyoto Protocol's mandate. In this context the linkage with the EU-ETS which has a "life" beyond 2012 is seen as a positive development. But to what extent CDM will play a significant role in EU-ETS in the immediate future remains to be seen, and any aspirations for the long term will be tempered by outcomes in the short term.

The other intractable issue is that of adaptation. Adaptation is a key element for the "beyond 2012" climate change agenda, and it was India that hosted the COP 8 that brought adaptation back to prominence after negotiations had skewed towards mitigation and CDM. The Delhi Declaration focused the attention of the international community squarely on adaptation, and in Montreal the five year work programme on adaptation was adopted, although the programme is primarily geared towards technical papers, expert groups and workshops to support adaptation planning, experience sharing, adaptation technologies and economic diversification. There is, however, a growing need to link the adaptation agenda with the development agenda. The Secretary of the Ministry of Environment & Forests of the Government of India, at a side event at CoP 11/MoP 1, said that "… development is the best form of adaptation". This statement, however, has to be contextualised, lest it is assumed that with development, resilience and coping capacities will be automatically enhanced, and there are no additional measures or resources that are required to deal with climate variability and climate change. It has been opined that to include adaptation in the future regime it may be more relevant to base it on the UNFCC (rather than the Kyoto Protocol) and also non-UNFCCC instruments such as existing international disaster relief arrangements.[6]

There exists a clear need to classify adaptation measures by the nature of services they provide, and devise suitable financing mechanisms accordingly.[7] It has been argued that adaptation measures that

[4] D. Bodansky, S. Chou, C. Jorge-Tresolini: International Climate Efforts Beyond 2012: a survey of approaches, Pew Centre Report, December 2004.

[5] IGES: Asian Perspectives on Climate Regime Beyond 2012: Concerns, Interests and Priorities, 2005.

[6] S. Winnie, A. Haxeltine, W. Kersten, M. Berk: Towards a long term Europen strategy on climate change policy, in: Climate Policy, Vol. 5, No. 3, 2005, pp. 244-250.

provide regional/global public goods (early warning systems, disease surveillance systems, climate monitoring systems) require new financing, whereas additional financing to top up development aid programmes needs to be provided to support programmes that enhance adaptive capacity at the country level. A special compensatory financing for the least advantaged in developing countries is suggested even though there is a "privateness" to the adaptation measures that it may entail, such as weather insurance and alternative livelihood training, on the basis of fairness and polluter pays principles.[8]

The adaptation agenda will need further honing and clarity, and attempts to differentiate between countries on the basis of how intensely they would require adaptation (with LDCs and AOSIS countries claiming first rights) may fissure the unity in the larger group of developing countries. This also has a bearing on the mitigation side – in that there have been attempts to segregate the "large"/ "major" developing economies into joining the fraternity of those with formal commitments, which may not play out well. The developing countries are largely devoted to multilateralism and also find comfort in the numbers to be able to negotiate better.[9] Any attempts at isolating some countries, be it for mitigation commitments or for distributing the "adaptation largesse", would undermine all that has been achieved thus far, however insignificant that may be.

Finally, the EU has to play a more significant and conciliatory role in the future discussions on a climate regime. It is the EU that has taken the mantle of ensuring that the Kyoto Protocol comes into force, and this commitment to the climate change regime in a continuum, and leading by example may aid in a revival of the EU-developing country combine of the early days, which effected the Berlin mandate.

In Conclusion

Any future climate regime will be contingent on the play-off between EU and developing countries, and will heavily depend on EU leadership. A reaffirmation to the development cause will dispel the notions that any commitment to mitigate emissions will necessarily come at the cost of development. Also, a strengthening of CDM may be required in this context. Further, adequate and timely emphasis on adaptation will display willingness to deal with the clear and present danger that may unfold.

[7] K. Anantram, L. Noronha: Financing adaptation, discussion paper prepared on the occasion of the 11th Conference of the Parties to the UN Framework Convention on Climate Change, TERI 2005.

[8] Ibid.

[9] F. Biermann: Between the USA and the South, Strategic Choices for European Climate Policy, in: Climate Policy, Vol. 5, No. 3, 2005, pp. 273-290.

Henrik Hasselknippe*

The Role of the Carbon Market in Future Climate Policy

The first commitment period of the Kyoto Protocol is approaching rapidly and countries and companies are preparing for life in a carbon constrained future. At the same time, the negotiations on a future climate agreement that will follow Kyoto in 2013 are in an early phase. Meanwhile, a multi-billion euro market for trading of greenhouse gas allowances and credits has established itself, providing incentives for the private sector to reduce internally or invest in projects abroad. What is the role of the carbon market in the development of international climate policy, and are there alternatives that could provide larger reductions in the short to medium term?

First, what are the criteria that need to be fulfilled for an international climate agreement to be successful? Here, we shall use the following as measures of effectiveness for such an agreement: 1) Large scale reductions must be met at an achievable cost. 2) All countries, both industrialised and developing, must be involved. 3) The private sector must be involved and given opportunities to invest where the carbon effectiveness, i.e. GHG reduction per euro invested, is greatest. This article will explore these questions by looking at the current state of the carbon market in

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general and the involvement of developing countries in particular.

Market Activity in 2005

The volumes and values presented in this article are based on observed trends in Point Carbon's proprietary databases, interviews with market participants, and our assessment of policy developments and their potential market impacts. The analysis of the size of the Clean Development Mechanism (CDM, project investments in developing countries) and Joint Implementation (JI, project investments in industrialised countries) market in 2005 is furthermore based on interviews with around 60 of the major players in the market, together with registrations in Point Carbon's transaction database, and Point Carbon's project database.

We find that the global carbon market did a total of 799 Mt CO2e in 2005, corresponding to a financial value of €9.40 billion. See Figure 1 for an overview of historic volumes in the carbon market. In comparison, the market saw an estimated 94 Mt, €377 million in 2004. The growth and speed in the carbon market has been quite extraordinary, with an eight-fold increase on the year in volumes from 2004, and about 25 times larger financial values in 2005 than the previous year.

The EU Emissions Trading Scheme (ETS) was the largest market segment in financial value, although not in terms of physical volumes. In total, 262 million EU allowances (EUAs), worth €5.4 billion were transacted through brokers and exchanges in 2005, 79% of this through brokers. In addition, we estimate that the bilateral market (company-to-company, not brokered or exchanged) did 100 Mt, €1.8 billion. In comparison, the EU ETS did an estimated 17 Mt, €127 million in all segments in 2004. Although growth slowed down towards the end of the year, each quarter saw record volumes and value. This growth has also continued in 2006, with the market trading 91 Mt, €2.3 billion year-to-date (10 February).

CDM is by far the dominant of the two project-based mechanisms, and we find that contracts for 397 Mt, €1.9 billion were entered into in 2005. JI saw 28 Mt, €95 million contracted in Central and Eastern Europe (CEE). Other carbon markets remain insignificant in the larger picture, and did 7.8 Mt, €52 million in 2005. The New South Wales trading system in Australia remains the largest of these, at an estimated 93% of the financial value.

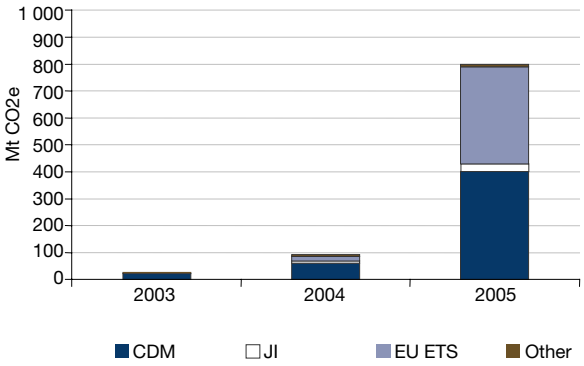
What were the main drivers for the price development over the year? As in any market, the price is set by supply and demand. The supply in EU ETS is determined first by the caps set under the different National Allocation Plans (NAPs), together with the amount of reserve allowances and CDM credits coming into the market. Demand is set by the amount of emissions through the year in relation to the overall allocation. Briefly put, the allowance demand can be measured by estimating the emissions from the different sectors under the EU ETS and subtracting the caps. This figure will change on a continuous basis due to a number of factors, but in particular weather, as temperature determines power/heat demand and precipitation the potential for hydropower production, and fuel prices, as the relative price for coal and gas will determine which of the fuels will be used for power production. In other words, if the winter is cold and the gas-to-coal price differential widens, emissions will increase as more power is consumed and coal, which emits more GHGs per unit of output than gas, is the preferred fuel source. Thus, carbon prices will also increase. A different situation would occur in a mild and wet summer, in which there is less demand for power and the rainfall increases the potential for hydropower production.

Have we seen evidence of the market reacting to these fundamentals? In fact, the first year of the EU ETS has shown that the market is indeed responding to changes in fuel prices and weather. Nevertheless, policy decisions still have the potential to shift prices. However, some would still argue that the current price neglects fundamentals, in the sense that "switching prices" in the UK are well above the European Union Allowances (EUA) prices. Hence, one would need higher EUA prices and/or lower gas prices to trigger substantial switching from coal to gas.

Volumes in the project markets also increased considerably in 2005. The lion's share of transactions still takes place in developing countries, where CDM contracts worth 397 Mt CO2e were registered by Point Carbon, corresponding to an estimated financial value of €1.9 billon (7% discount rate). Thus, CDM accounted for 93% of the physical volumes transacted in the project market and 95% of the total financial value. The JI market is still considerably smaller than CDM, but nevertheless almost tripled in volume in 2005, growing to 28 Mt CO2e, €95 million, worth of reported transactions.

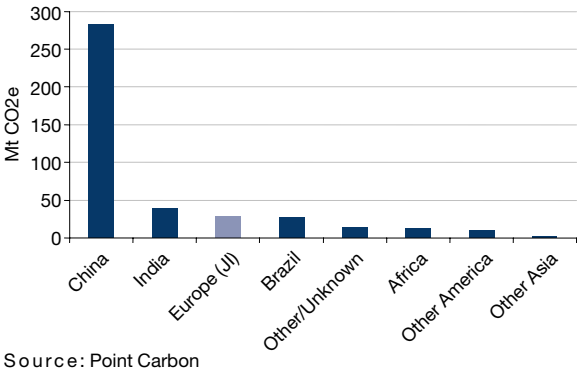
In 2005, future delivery of in total 397 million certified emission reductions (CERs), at a volume weighted

Figure 1
Contracted Volumes 2002-2005, Mt CO2e



Source: Point Carbon

Figure 2
Contract Volumes Registered in Different Host Countries in 2005, in Mt CO2e



Source: Point Carbon

average price of 6.7 €/t, were contracted. As for JI, the volume of emission reduction units (ERUs) contracted more than doubled, to 28 Mt, while the average price increased slightly to 5.1 €/t.

There are several reasons for the substantial increase in the volume transacted throughout 2005. The most obvious reason is that the supply of potential projects has increased. By the end of 2005 there were more than 900 CDM and JI projects that had reached the public validation stage. Several host countries have shown increased support for the project base mechanisms, in particular China and Brazil. Also, large-scale projects are contributing significantly.

China, India and Brazil are the main seller countries when it comes to numbers of CDM projects. The large volumes in China are primarily due to a few large projects, but there are several smaller projects currently in preparation. For the JI market, Romania has been an active seller, but volumes become small when compared to CDM market volumes. In fact, Brazil alone is about the same size as the total JI market.

On the demand side EU ETS installations have the ability to use CERs directly for compliance. With increasing prices for EUA delivery it is evident that this has contributed to the demand for project credits. The increasing number of carbon funds has added further to the demand. This sector includes governmental procurement funds, private sector investment vehicles, and private-public funds (e.g. all World Bank funds). While CDM investment is now increasingly being dominated by private investors and funds, JI is still mainly attracting governmental buyers.

What Does the Future Hold?

Trading is already well under way in the second year of the EU ETS, and new projects are coming into the CDM and JI pipelines on a regular basis. But where will the carbon market go in the future? The market for EUAs with 2008 delivery has not yet fully taken off, and there are very few CDM/JI projects that extend beyond 2012. What are the challenges and opportunities that market participants will face in the years ahead, and what is the importance for the development of international climate policy?

Everything should now be in place for countries to start talks on a second commitment period under the Kyoto Protocol, starting in 2013. Furthermore, a number of countries have signalled that their domestic initiatives will have a lifetime well beyond 2012, clearly indicating that carbon emissions will have a cost (and reductions a value) also from 2013 and onwards. This must now be taken into account by anyone undertaking new investments in industry and the power sector, even if the regions where the investments will take place do not currently operate under carbon restrictions. Certain non-Annex I countries have also arisen as prime candidates for taking on reduction targets in the future, such as South Korea, Mexico, South Africa and Argentina.

The EU ETS has established itself as the only truly commoditised segment of the global carbon market. This is, however, likely to change in the not too distant future. What other developments might we see in the next years? While we shall most likely see a commoditisation of CERs over the next couple of years, it is clear that the project market has some way to

go. A well-functioning CDM market will bridge the international market segments and lead to an internationalisation of the EU market. Thus, project credits will constitute the link between the markets, and there might not be the need to develop direct links, i.e. through mutual recognition of different trading systems, before post-2012.

Still, given the size and liquidity of the EU market, it could remain the main driver of the carbon market in many years ahead, by setting the reference price for other carbon markets, possibly even beyond 2012. This implies that the carbon market is currently very vulnerable to changes in the EUA price. If the EU ETS prices should collapse, this would remove much of the drive for market activity in the other market segments.

As we have shown in this analysis, countries are very far from meeting their Kyoto commitments even when taking into account their planned policies and measures, as well as current purchase programmes. This will have direct implications for the negotiations on a post-2012 climate agreement. While we believe it is currently unrealistic in light of the major challenges posed by the on-going negotiations, clarity about post-2012 commitments would be advantageous (to put it mildly) for fostering abatement measures that will deliver long-term reductions.

What role will CDM and JI investments play in future climate policy? Point Carbon's forecast for the CDM and JI markets indicated that total volumes could grow to more than 2,100 Mt CO2e by the end of the Kyoto period. 88% of this will come from CDM investments in developing countries. If our forecasts hold true there would be consequences for the negotiations on a future international climate regime, and thus the future of the carbon market and international climate policy.

First, with a carbon market that has developed rules, regulations and processes for producing such substantial reductions, it would be obvious to parties that they could trust in continued deliveries of such volumes also in the future. The sooner the market can get strong signals on the continued demand for such credits in the long term, the sooner post-2012 project contracts can be signed. While the public sector and multilateral buyers have a special responsibility to kick-start the market, it is important also to include the private sector early on in the process.

Once a critical mass of such contracts has been signed there will be a signal to the policy-makers that the private sector has confidence in the ability of the market to reduce emissions also in the future. This should provide negotiators with much needed support in creating a market that will function also in the long run.

Secondly, the volumes produced through CDM in our 2012 forecast will provide developing countries with evidence that they are indeed contributing in a meaningful manner to the reduction of global greenhouse gas emissions. Granted, the reductions will have come about as a function of industrialised countries taking on commitments first, but in the end this is how the market has been created.

Finally, the amount of reductions that will have been produced in developing countries should tell them that it is indeed possible to take on some sort of commitment for the future, without jeopardising economic growth, as long as there is a carbon market in which these reductions can be sold. In fact, taking on a target, either for the whole economy or selected sectors, might make even more reductions available than under CDM as it would remove the need for elaborate additionality tests and international approval on a project-by-project basis.

Alternatives to the Kyoto Protocol will no doubt be flaunted in the years to come. The most talked-about candidate is the Asia-Pacific Partnership on Clean Development and Climate (AP6). The group, which consists of the USA, China, Japan, India, South Korea and Australia, has launched eight public-private sector task forces, which will look into ways to reduce emissions in various sectors of the economy. There are a number of reasons indicating that AP6 is not a viable solution to the global climate problem. It sets no target for emissions, a measurement for success is not in place, and it does not place a cost on emissions or a value on reductions.

In order to have a cost-effective international framework for emission reductions there need to be cheap reductions available abroad for those countries which don't have sufficient domestic reduction options. This analysis shows that the price of carbon will have made this option available for industrialised countries, while at the same time ensuring investments and technology transfer for developing countries. Through this mutually beneficial mechanism the world should be able to arrive at a new and improved framework for the climate regime. Now somebody just needs to tell this to those countries still refusing to sign an international agreement without commitments from developing countries.