

**Policy Department
Economic and Scientific Policy**

**Climate change legislation and initiatives
at international level and
design options for future
international climate policy**

This study was requested by the European Parliament's temporary committee on climate change.

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EXECUTIVE SUMMARY

This paper provides background information for the Conference of the Parties to the UNFCCC (COP) and the Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol (COP/MOP) in December 2007 in Bali, Indonesia.

Significant action is required at the highest urgency to ensure that global greenhouse gas emissions peak until 2015 and decline to at least half of current levels to prevent dangerous interference with the climate system (chapter 2). The next years will be decisive as to whether this turn can be accomplished.

The *current* international climate policy (chapter 3) does not yet reflect that urgency. The Kyoto Protocol currently only defines rules until 2012. The commitments need to be extended and strengthened. This paper includes a review of policies of major countries (European Union, USA, Japan, Russia, China, India, Brazil) and private and non-governmental initiatives. Countries are implementing their existing commitments under the Kyoto Protocol to a varying extent. While some countries have implemented effective and innovative national policies and are well on track to meet their commitments, others are far behind their target. None of the countries is yet on track to make its contribution to limiting temperature increase to 2°C after 2012.

The CDM is the Kyoto mechanism that is used most to date. Its volume is increasing fast, but there is also some room for improvement, e.g. in the area of its contribution to sustainable development and ensuring that projects are additional.

Future international climate policy is discussed in various international processes in addition to the UNFCCC (chapter 4). They include the Gleneagles G8 plus 5 process, the Asia-Pacific Partnership (AP6), the United Nations High-Level Climate Change Talks, the US major emitters initiative and the Greenland/South Africa/Sweden Ministerial dialogue on climate change. Most of these processes reinforce each other and have led to increased awareness of the issues at stake among decision makers. The diplomatic effort on climate change has never been as great as it is currently, with the regular involvement of heads of states. Preparation for the Bali conference has been better than ever with officials completing a marathon of meetings. This pace has to continue if a global agreement is to be reached by 2009.

The major issue at the COP, COP/MOP in Bali in December 2007 is to start an official negotiation on an international framework post 2012 (chapter 5). Many hope that the conference in Bali can agree on the process of how to negotiate (how many meetings and in which form), the topics of the negotiations and the end date for such negotiations (e.g. 2009). The conference is hence not heading for a final agreement on a post 2012 framework. Such agreement is planned for 2009.

Two major stumbling blocks need to be overcome to reach an agreement: First, the USA has to be integrated into the future negotiations while dealing with the outgoing President and the possible successors at the same time. And second, developed countries need to show willingness to reduce their emissions substantially and to provide substantial financial support to developing countries so that they agree to engage in negotiations with a particular end date.

The mandate for negotiations is expected to evolve from a follow-up of the UNFCCC dialogue, but also other parallel strands of discussions are relevant. The additional strands include the Ad hoc Working Group under the Kyoto Protocol and the review of the Kyoto Protocol, the Russian Proposal on voluntary commitments and reducing emissions from deforestation in developing countries. Eventually, all strands will be agreed on in a package at the end of the conference.

As a future international climate regime will be agreed after the Bali conference, this paper provides an overview of the approaches that can be taken in a future international agreement on climate change (chapters 6 and 7). Taking the current negotiations and the current sequential decision making into account, it is the authors' view that the final system is an incremental evolution, based on the current structure with the following enhanced elements:

Participation in stages (e.g. current Annex I, intermediate stages, current Non-Annex I): Countries' national circumstances and interests are too diverse for a "once size fits all" solution. Instead, it should be a system composed of different stages to be attractive for as many countries as possible. Determining a countries' participation level is likely to be based on its responsibility (historical emissions), capability (GDP and human development) and potential (current emissions levels). Large countries (USA, China) may have "stages" of their own.

Differentiation of emission targets based on sectoral considerations: Of the many options to share emission allowances between countries, no single one will receive the support by all countries. It is, however, likely that a formula that is based on sectoral considerations (as opposed to simple formulas based on one indicator such as GDP or population) can best accommodate the different national circumstances of countries. The outcome of such sectoral considerations will only be an input into the discussion; the final numbers will be determined by negotiation.

Sectoral no-lose targets for advanced developing countries and registry of sustainable development policies and measures for other developing countries: A major issue is to incentivise the participation of developing countries. The option of sectoral no-lose targets for advanced developing countries seems to be very promising as it is a middle ground between the current CDM of developing countries and absolute emission reduction targets of developed countries. It ensures financing through the carbon market but entails no penalties for the participating developing countries if the targets are not met. Action by other less advanced developing countries can be encouraged by a registry of sustainable development policies and measures.

Defining adaptation activities: Adaptation as an element of a future regime is well accepted. Further work is necessary to define exactly which adaptation activities should be supported by the international system and how this should be accomplished. A major bottle neck is finding financial resources for adaptation activities (see below under financing).

Technology cooperation supplemental to emission targets: Technology cooperation is essential, but cannot solve the problem alone.

Creating constant flows of financial resources: A major bottle neck of the current process is finding the financial resources for climate change activities. Automatic mechanisms that are independent of government budgets have to be found.

Climate change is a complex problem that requires a complex solution. It is the hope of the authors that this paper can provide some insights into the current international discussions to facilitate an agreement on future international climate policy.

1. INTRODUCTION

Further action beyond what is agreed today under the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol is needed to “prevent dangerous anthropogenic interference with the climate system”, the ultimate objective of the UNFCCC. Developed countries (Annex I countries) will have to take a leading role. They will have to commit to substantial emission reductions and financing commitments due to their historical responsibility and their financial capability. However, the stabilisation of the climate will require global greenhouse gas emissions to peak and reduce well below current levels by the middle of the century. It is hence a global issue and, thus, depends on the participation of as many countries as possible.

The objective of this paper is to provide background information for the Conference of the Parties to the UNFCCC (COP) and the Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol (COP/MOP) in December 2007 in Bali, Indonesia.

This paper first provides the status and trends in global greenhouse gas emissions (chapter 2). It continues with an evaluation of *current* international climate policy (chapter 3). It includes a review of the UNFCCC, its Kyoto Protocol and the Kyoto mechanisms and policies of major countries (European Union, USA, Japan, Russia, China, India, Brazil) and private and non-governmental initiatives.

The paper then turns to *future* international climate policy. It describes which international discussion processes cover future international climate policy (chapter 4) and which issues are discussed at the conference in Bali (chapter 5).

As a future international climate regime will be agreed on after the Bali conference, the paper provides an overview of the literature on how such a regime could be shaped. An international agreement on climate change will consist of several elements that form an overall package. The many proposals on a future framework address only some of these elements. As a first step we describe the single elements of a future framework (chapter 6) and in a second step we list recent proposals that combine several elements (chapter 7). We finally provide some conclusions (chapter 8).

2. STATUS AND TRENDS IN GLOBAL EMISSIONS

This chapter gives an overview of the current status of global greenhouse gas emissions as well as future trends and trajectories necessary to meet the 2°C target.

2.1 Historic emissions

Global greenhouse gas emissions have been rising constantly over the last decades. Figure 1 includes global anthropogenic greenhouse gas emissions (GHGs) between 1970 and 2004 per gas and sector. Part (a) shows that global emissions in 2004 amounted to nearly 50 Gt CO₂ equivalents (CO₂ eq.). This is nearly 25% above the 1990 emission levels and 70% above the 1970 emission levels, which is an annual increase of 1.6%.

Carbon dioxide (CO₂) is the most important anthropogenic greenhouse gas. Its annual emissions increased by about 80% between 1970 and 2004 (IPCC 2007b). Part (b) of Figure 1 shows the split of emissions per gas in more detail for 2004 in CO₂ eq. CO₂ from fossil fuel combustion makes up the major part (about 57%). Other big shares result from CO₂ from deforestation and decay of biomass (17%), methane (CH₄, 14%) and nitrous oxide (N₂O, 8%). F-gases and CO₂ from processes account for only for minor shares.

About one fourth of the global emissions originate from the energy supply sector (see Figure 1 (c) for 2004). This is followed by emissions from industry (19%), forestry, including deforestation (17%), agriculture (14%) and transport (13%). Emissions from the residential sector and commercial buildings are responsible for 8%. Emissions from waste and waste treatment make up about 3%. Thus, after fossil fuel combustion, land-use-change and agriculture are the most important sectors contributing to climate change.

Energy supply and transport are the fastest growing sectors. This growth is due to a global increase in electricity demand and rapidly increasing activity in transport. The agricultural and waste sectors increased by about 15-16% each. Land use change decreased slightly by about 12% but there are substantial uncertainties in the emission estimates of this sector. (Höhne et al. 2007c).

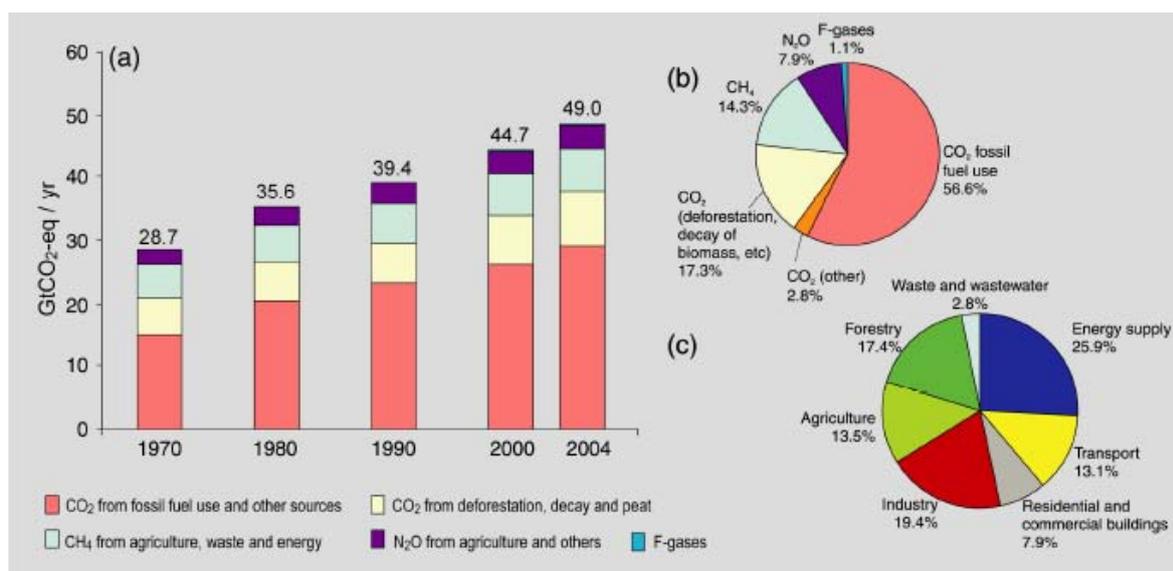


Figure 1. Global anthropogenic GHG emissions between 1970 and 2004 per gas and per sector. (IPCC 2007b, figure SPM.3). (a) Global annual emissions of anthropogenic GHGs from 1970 to 2004, (b) Share of different anthropogenic GHGs in total emissions in 2004 in CO₂ eq. (c) Share of different sectors in total anthropogenic GHG emissions in 2004 in CO₂ eq. (Forestry includes deforestation).

2.2 Future pathways to meet the 2°C target.

Future emissions are expected to rise fast and constantly. Figure 2 describes illustrative ways of development of GHG emissions between 1990 and 2050. The figure includes a corridor for business-as-usual (BAU) emissions, based on the standard set of future emissions scenarios from the Intergovernmental Panel on Climate Change (Nakicenovic et al. 2000). It further includes three emission reduction scenarios to stabilise global emissions at 550, 450 or 400 ppmv CO₂. These stabilisation levels correspond to ~650, 550 and 450 ppmv CO₂ eq. Under the BAU scenario (red area) no special emission reduction efforts are assumed for the future. The three emission reduction scenarios illustrate which global emission reduction efforts could be needed compared to the BAU case to reach different emission stabilisation levels.

The long residence time of CO₂ in the atmosphere (in the order of 100 years) means that at the first approximation, the cumulative emissions, irrespective of the time of emission, define the concentration level. This means that many alternative pathways are permitted, which all lead to the same concentration level but which may have significant differences in the timing of required emission reductions. For example, a possible emissions pathway may be that global emissions increase rapidly, peak and then decrease rapidly. Alternatively, emissions could rise slowly and then decline slowly (e.g. thick green lines in Figure 2). Both lead to the same long-term stabilization level. Therefore, the spread of emissions pathways that lead to the same concentration levels can be large (shaded corridors in Figure 2). However, emissions will have to peak early, around 2010-2020, for a low stabilisation level. In order to stabilise global emissions at higher levels, a later peak of emissions, around 2030, would be sufficient.

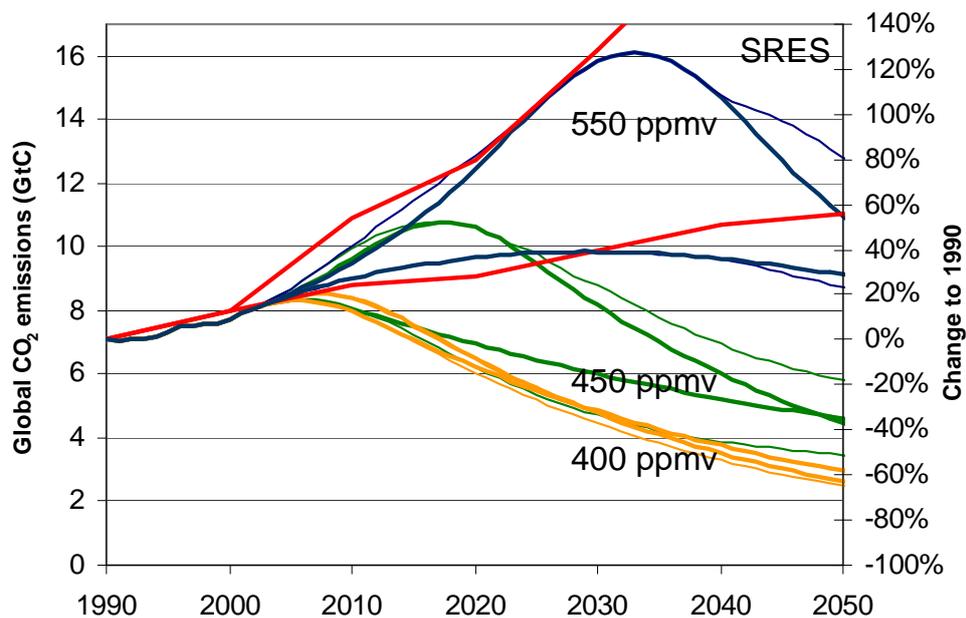


Figure 2. Illustrative global CO₂ emission pathways until 2050: Reference emissions and emission corridors towards stabilisation at 400 ppmv CO₂ (~450 ppmv CO₂ eq.), 450 ppmv CO₂ (~550 ppmv CO₂ eq.), and 550 ppmv CO₂ (~650 ppmv CO₂ eq.) (Höhne 2006).

Figure 2 includes results of only one single calculation model only for CO₂ to illustrate the principles. The authoritative information on the required emission paths to meet temperature stabilization limits comes from the International Panel on Climate Change (IPCC 2007a). It gathered and compared a lot of information from recent analyses shown in Table 1.

As shown in the table, the necessary stabilisation level will need to lie around 445-490 ppmv CO₂ eq. (column 2) to reach 2°C in the long term (column 3). Higher levels would lead to a higher increase in temperature. In order to achieve such a low stabilization level, and thus have a realistic chance of meeting the 2°C target, global emissions would have to be reduced by 85-50% below the 2000 emission level in 2050 (column 4).

Table 1 also includes information on the approximate level of GHG emissions allowed for industrialized countries (so called Annex I parties) under different methods of allocating GHG emissions. The analysis covered a broad spectrum of national and regional parameters and assumptions, such as population, GDP, GDP growth and global emission pathways that lead to climate stabilization as well as a wide range of methods of allocating GHG emissions. Emissions from Annex I Parties would need to be reduced 25-40% below 1990 levels in 2020, and 80-95% below 1990 levels in 2050 (column 6 and 7) to be consistent with the 2°C limit. It should be noted that most methods of allocating GHG emissions assume trading of emission allowances at the global level and, therefore, actual GHG emissions may be different than the figures contained in columns 6 and 7 of **Table 2**.

Table 1 also provides some information on the global costs of such reductions (column 5). In 2050, estimated global average macroeconomic costs to achieve the four lowest stabilization levels will range between a 1 per cent gain and a 5.5 per cent decrease in global gross domestic product (GDP). It should be noted, however, that costs vary significantly across countries and sectors.

Table 1. Characteristics of greenhouse gas stabilization scenarios

Category of stabilization scenarios	CO ₂ equivalent concentration (parts per million CO ₂ equivalent)	Global mean temperature increase above pre-industrial at equilibrium using 'best estimate' climate sensitivity ^a (°C)	Change in global CO ₂ emissions in 2050 (% of 2000 emissions)	Range of reduction in GDP in 2050 because of mitigation (%)	Allowed emissions by Annex I Parties in 2020 (% change from 1990 emissions)	Allowed emissions by Annex I Parties in 2050 (% change from 1990 emissions)
I	445-490	2.0-2.4	-85 to -50	Decrease of up to 5.5	-25 to -40	-80 to -95
II	490-535	2.4-2.8	-60 to -30			
III	535-590	2.8-3.2	-30 to +5	Slight gain to decrease of 4	-10 to -30	-40 to -90
IV	590-710	3.2-4.0	+10 to +60	Gain of 1 to decrease of 2	0 to -25	-30 to -80
V	710-855	4.0-4.9	+25 to +85			
VI	855-1,130	4.9-6.1	+90 to +140			

Source: IPCC (2007a), columns 1-4, table SPM.5; column 5, table SPM.6, columns 6 and 7, box 13.7.

^a According to the AR4, the best estimate of climate sensitivity is 3°C.

3. EVALUATION OF CURRENT INTERNATIONAL CLIMATE POLICY

3.1 UNFCCC and Kyoto Protocol

This section provides an overview of the current commitments of countries under the UNFCCC and the Kyoto Protocol. It is based on Höhne et al. 2007a. Additional information can be found in Depledge 2000, Oberthür and Ott 1999, Yamin and Depledge 2004 and Höhne 2006.

The ultimate objective of the UNFCCC is to stabilize greenhouse gas concentration at a level that would prevent dangerous anthropogenic interference with the climate system (see Box 1).

To reach this goal, the UNFCCC builds upon the principle of common but differentiated responsibilities and capabilities of Parties. Accordingly, countries are divided into three groups for the purpose of differentiating the obligations or commitments under the Conventions and later the Kyoto Protocol (see also Table 2 and Figure 3):

- *Parties included in Annex II to the Convention* encompass the countries that were members of the Organization for Economic Co-operation and Development (OECD) in 1992.
- *Parties included in Annex I to the Convention (Annex I Parties)* encompass both the Annex II Parties and countries with “economies in transition” (EITs); the Russian Federation and several other Central and Eastern European countries.
- *Parties not included in Annex I to the Convention (non-Annex I Parties)* encompass those countries that are not listed in Annex I, including all newly industrialized countries and developing countries.

Under the Convention, *all* Parties have certain general commitments (Article 4.1, UNFCCC), some of which are further specified for some Parties:

- To prepare national inventories of greenhouse gas emissions
- To implement measures to mitigate climate change
- To promote and cooperate in the development, application and diffusion, including transfer, of technologies, practices and processes that reduce greenhouse gas emissions
- To preserve sinks and reservoirs of greenhouse gases
- To cooperate in preparing for adaptation to the impacts of climate change
- To promote and cooperate in research on climate change
- To exchange information related to climate change
- To promote and cooperate in education, training and public awareness related to climate change
- To report information related to the above in “national communications”

“The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.”

Box 1. Article 2 of the UNFCCC

Table 2. Members of Annex I and their commitment under the Kyoto Protocol (Annex B)

Country	Member of Annex I	Member of Annex II	Economy in transition	Commitment inscribed in Annex B (within parenthesis the outcome of the EU burden sharing agreement)
Australia	X	X		108
Austria	X	X		92 (87)
Belarus	X		X	92 ****
Belgium	X	X		92 (92.5)
Bulgaria	X		X	92
Canada	X	X		94
Croatia	X*		X	95
Czech Republic	X*		X	92
Denmark	X	X		92 (79)
Estonia	X		X	92
European Community	X	X		92
Finland	X	X		92 (100)
France	X	X		92 (100)
Germany	X	X		92 (79)
Greece	X	X		92 (125)
Hungary	X		X	94
Iceland	X	X		110
Ireland	X	X		92 (113)
Italy	X	X		92 (93.5)
Japan	X	X		94
Kazakhstan	X**		X	To be negotiated
Latvia	X		X	92
Liechtenstein	X*			92
Lithuania	X		X	92
Luxembourg	X	X		92 (72)
Monaco	X*			92
Netherlands	X	X		92 (94)
New Zealand	X	X		100
Norway	X	X		101
Poland	X		X	94
Portugal	X	X		92 (127)
Romania	X		X	92
Russian Federation	X		X	100
Slovakia	X*		X	92
Slovenia	X*		X	92
Spain	X	X		92 (115)
Sweden	X	X		92 (104)
Switzerland	X	X		92
Turkey	X	***		*****
Ukraine	X		X	100
United Kingdom	X	X		92 (87.5)
United States of America	X	X		93

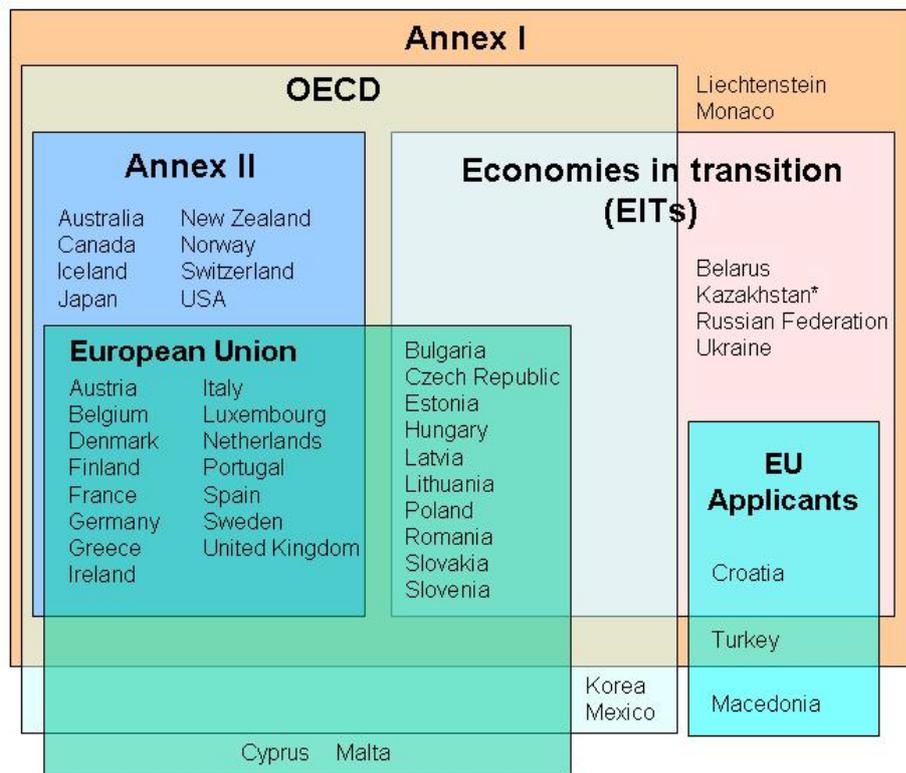
* Added to Annex I at the third Conference of the Parties in Kyoto 1997 (COP 3)

** Added at COP7 only for the purpose of the Kyoto Protocol (see FCCC/CP/2001/13/Add.4, section V.C)

*** Deleted from Annex II by decision 26/CP.7

**** Belarus had not ratified the Convention when Kyoto Protocol was adopted. A commitment was agreed as an amendment to the Protocol at COP/MOP 2 by decision 10/CMP.2. Belarus has to maintain a reserve of an additional 7% at the end of the first commitment period. The amendment and the target will only enter into force once ratified by at least three fourths of the Parties to the Protocol.

***** No limit specified. Country had not ratified the Convention when Kyoto Protocol was adopted



*: Added to Annex I only for the purpose of the Kyoto Protocol at COP7

Figure 3. Country groups

In addition to those general commitments, certain groups of countries have additional obligations or rights under the UNFCCC:

- Annex I Parties are to take the lead in modifying longer-term trends in emissions by adopting national policies and measures with the (not legally binding) aim of returning their greenhouse gas emissions individually or jointly to 1990 levels by the year 2000 (Article 4.2, UNFCCC).
- The Parties included in Annex II have the further commitment to provide new and additional financial resources to meet the agreed full costs incurred by developing country Parties in complying with their obligations (Article 4.3, 4.4, 4.5, UNFCCC).
- Economies in transition (EITs) are allowed a certain degree of flexibility in implementing their commitments (Article 4.6, UNFCCC), for example, several of those countries have chosen a base year other than 1990.
- Developing country Parties (a term which the COP has historically been unable to define so that it now simply means any Party not included in Annex I) are eligible for funding for the implementation of their general commitments (Article 11, UNFCCC). The extent of their implementation must take into account both the availability of funding from Annex II Parties and that development and poverty reduction are the overriding priorities of developing countries. The requirements of the regular reports (“national communications”) for developing countries is also conditional on receipt of full funding and their content and frequency is less than required for Annex I Parties. The guidelines for the preparation of national communications for non-Annex I Parties, for example, do not speak of ‘policies and measures’ but of ‘steps taken or envisaged to implement the Convention’.

The Kyoto Protocol, adopted in 1997, adds new commitments for Annex I Parties and confirms the general commitments from the Convention for non-Annex I Parties without modifying them in any significant respect.

Under the Kyoto Protocol, Annex I Parties agreed to reduce aggregated emissions of carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆) together for the period 2008 to 2012 relative to 1990 levels. Annex I Parties have individual limitation or reduction targets as provided in **Table 2**.

To a certain extent, countries can reach their targets by trading emission allowances with other countries or by implementing emission reduction projects in other Annex I countries (Joint Implementation) or in developing countries, which do not have quantified targets themselves (Clean Development Mechanism) (for details see chapter 3.2).

Countries may also choose to implement the commitments jointly as a group. The European Union has chosen to do so and has internally negotiated revised national targets that will be the basis for the assessment of their individual compliance with the Kyoto Protocol (see also Table 1).

Since the text of the Kyoto Protocol left some questions unanswered, the COP agreed on a substantive package further clarifying the conditions of the implementation of the Kyoto Protocol in Marrakech in 2001, the “Marrakech Accords” (UNFCCC 2001).

Entry into force of the Kyoto Protocol required ratification by 55 Parties including Annex I Parties responsible for 55 % of the Annex I CO₂ emissions in 1990. As the USA (responsible for 36%) rejected the Kyoto Protocol in 2001, it was the Russian Federation (responsible for 17%), which had the decisive vote.¹ In October 2004, Russia ratified, which allowed the Kyoto Protocol to enter into force on 16 February 2005.

3.2 Evaluation of the Kyoto mechanisms

This chapter gives an overview of the current state implementation of the mechanisms in the Kyoto Protocol that allow Annex I Parties to reach their emission reduction targets in a flexible manner: the Clean Development Mechanism (CDM), Joint Implementation (JI) and international emissions trading.

The Clean Development Mechanism (CDM) allows that GHG emission reductions from projects in countries without a Kyoto target (non-Annex I countries) to be used by Annex I countries to achieve their Kyoto target. A country can finance emission reductions outside of its territory and would be allowed to increase its domestic emissions above its Kyoto target. Certified Emission Reductions (CERs) are issued according to the amount of reductions achieved. Both countries have an incentive to overestimate the reductions achieved by the projects. For the investor country it would lower the price of the reductions. The host country does not have a Kyoto target to comply with and could sell more allowances. Therefore procedures are in place to ensure that CDM projects lead to “real” emission reductions in the host country, i.e. reductions which would not have taken place without the CDM (so called “additionality”). Furthermore, CDM projects have to contribute to sustainable development in the host country. In order to assure that these requirements are met and the correct amount of reductions is determined, a complex project cycle for the CDM was created involving various institutions with supervisory and supporting functions.

¹ For an analysis on the voting power of countries to bring the Protocol into force see Wagner and Höhne 2001

Joint implementation serves the same purpose as CDM but between Annex I countries. As both countries have emission targets, there is no risk of overall emissions increasing when a JI project is implemented (the project will only change the location where the emissions take place). As this requires less stringent supervision than in the case of the CDM a different mechanism has been set up for this situation. Two project cycles for JI exist. The first variant (Track I) is simple and but can only be applied by host countries that report their national greenhouse gas emissions in good quality. If this is the case, the host country itself can decide to approve the project. If the host country does not report its national greenhouse gas inventories in good quality, the second variant (Track II) must be followed. In this case, the project cycle is very similar to the CDM cycle, requiring approval by an international committee for JI, the so called JI supervisory committee (JISC, see also below).

International emission trading allows countries that over achieve their emission target to sell emission allowances to countries that are not achieving their target (as of 2008). As a preparation for this planned system, the EU implemented its separate but linked EU emission trading scheme. Many eastern European countries and the Russian Federation will over achieve their targets under the Kyoto Protocol and could sell surplus allowances (also called “hot air”). However, only a very limited number of countries have signalled that they are not willing to do so. Countries that are likely to need additional emission allowances could be Canada, Japan or New Zealand. Some countries like Bulgaria started “Green Investment Schemes”, where the probable income from the sale of surplus allowances is invested in awareness programmes and the implementation of policies that have an indirect effect on greenhouse gas emissions. Most international emission trading is likely take place towards at the end of the commitment period (2012) when countries will have more information on the distance to their Kyoto target. Institutions necessary for international emissions trading are already in place: requirements for national greenhouse gas inventories, regular review of these inventories, procedures to correct errors and a compliance committee that settles disputes.

The following sections concentrate on CDM and JI as procedures are most developed.

3.2.1 Project cycle

Both the CDM and JI require several steps from the project idea all the way to a registered project that creates emission reduction credits. Several institutions were created to support these steps.

The most important steps in the CDM project cycle are the validation, i.e. the check whether a project complies with all requirements, carried out by a Designated Operational Entity (DOE). The registration, carried out by the Executive Board of the CDM, is the formal approval of a project as a CDM project. In the verification, the amount of emission reductions generated is annually checked and certified by a second Designated Operational Entity. Finally Certified Emission Reductions (CERs) are issued on behalf of the Executive Board.

The project cycle for JI is very similar but steps and institutions are called different. Under Track I, the host country first makes a “determination” whether the project is according to the rules. Verification during the project lifetime is also carried out according to the host country procedures. Under Track II, the “determination” is carried out by so called Accredited Independent Entities, comparable to the DOEs of the CDM. Verification of the reductions during the lifetime of the project are delivered by the Accredited Independent Entities and accepted by the JI Supervisory Committee (JISC), comparable to the CDM Executive board.

3.2.2 Institutions

The supervisory body of the CDM is the CDM Executive Board (EB). The EB consists of 20 Members selected by the UNFCCC and is to meet at least three times a year. In practice it has been meeting far more frequently. Since the EB was set up in 2001, 35 meetings have taken place. Among its responsibilities are decision-making on CDM rules at a practical level, the strategic decisions are still taken by the COP/MOP. The Executive Board approves of new baseline and monitoring methodologies (rules on how to calculate reductions and to monitor them) and the accreditation of operational entities (certification companies that verify and certify the reductions).

The support structure currently consists of the following panels/working groups/teams:

- **Accreditation Panel:** preparation of the decision making of the Executive Board with regards to the accreditation of operational entities.
- **Methodological Panel (MethPanel):** development of recommendations on guidelines for methodologies for baselines and monitoring plans as well as preparation of recommendations on submitted proposals for new baseline and monitoring methodologies.
- **Afforestation and reforestation working group:** preparation of recommendations on submitted proposals for new baseline and monitoring methodologies for afforestation and reforestation (cooperation with Meth Panel).
- **Small scale working group:** operational from April 2002 to August 2002, recommended draft simplified modalities and procedures for small-scale CDM project activities.
- **CDM Registration and Issuance Team:** Assistance by evaluating requests for registration of project activities and requests for issuance of CERs.

At the national level, CDM coordination is carried out by Designated National Entities (DNAs). The DNA of the host country needs to approve a project before it is registered by the EB. The decision on the approval is based on the project's compliance with the host country's sustainable development requirements for CDM projects as well as other factors.

Designated operational entities (DOEs) must safeguard the transparency and environmental integrity in several phases in the life-cycle of a CDM project. One of their key functions is the *validation* of project activities before they are implemented and forwarding the subsequent registration request to the EB. During the operational phase of registered project activities, the role of a DOE is the *verification* and certification of the emission reductions and forwarding the request for issuance of the respective CERs. Usually, validation and verification must be carried out by different DOEs.

DOEs are accredited by the EB. Currently, 17 DOEs are accredited and 23 more have applied for accreditation. Only seven DOEs are accredited for conducting both validation and verification, one DOE only for verification, the remaining nine only for validation. The accreditation applies for a number of scopes, i.e. project types.

JI modalities and rules were developed later than those for the CDM and its institutional setup is therefore very similar to the existing CDM structure. The supervisory body is the JI supervisory committee (JISC, consisting of 20 members), which was formed in 2006 and has held nine meetings since that date. Regarding the JISC support structure, so far only an accreditation panel has been set up.

Accredited Independent Entities (AIE) support the JI project cycle analogous to DOEs in the CDM. The exception is that an AIE can generally cover both validation and verification for the same project, because the risk of increasing global emission levels does not apply for JI-projects. 15 AIEs have applied for accreditation, but none have been accredited yet.

At the moment, the respective AIE tasks can be carried out by DOEs provisionally acting as AIEs. There is no institution for approving baseline and monitoring methodologies. Methodologies approved under the CDM can be used

3.2.3 Experiences with CDM and JI

Currently, far more experience exists with the CDM than with JI, as detailed discussions as well as project development of large numbers of projects started considerably earlier for the CDM. Therefore, the experiences presented below relate mainly to the CDM.

A major requirement of a CDM project is that it is “additional”. It is considered as additional if it would not have taken place without the existence of CDM. This is fundamental because CERs can be used by Annex I countries to fulfil their reduction target. The CDM itself does not lead to an emission reduction at a global level. If business-as-usual projects lead to new allowances (CERs), global emissions can be increased. It is however complex to prove that a project would not have happened otherwise. The CDM Executive Board has therefore developed an “additionality tool” which supports the testing based on identification of alternatives, investment analysis, barrier analysis, etc.²

Nevertheless, additionality remains a difficult issue and there is criticism that a number of the registered projects are not truly “additional”. Michaelowa and Purohit (2007) have analyzed the additionality testing of 52 Indian CDM projects registered as of May, 20, 2006. They found that less than half of large projects provide the relevant information on additionality in their PDD. Within a sub-sample of 19 projects analyzed regarding detailed argumentation of barriers and consideration of additionality test by the validators, it appeared that only one third of projects use independent data sources and that validators seem to have difficulties in assessing the provided additionality argumentation.

It is currently being discussed whether and how to change the rules to ensure that all projects are additional. It seems difficult to ensure that in future only additional projects will be accepted.

Another requirement of a CDM project is that it should contribute to sustainable development in the host country. Criticism has been voiced that this is not always the case. E.g. Umamaheswaran and Michaelowa (2006) state that “[...] additionality and sustainable development are often assessed in a cursory manner [...]” They find that with energy efficiency projects sustainable development is focused on energy savings and economic wellbeing. Sizeable socio-economic effects like local poverty alleviation and infrastructure development are not expected. Technology transfer was the exception as indigenous technology development took place in only 2 projects. A paper by Boyd et al. (2007) concluded that project type and sustainable development benefits are not necessarily linked. The main sustainable development outcome is often increased employment at the project site. The paper finds that sustainable development effects strongly depend on the sustainability criteria chosen by the host country. Countries like Brazil, China, India and South Africa apply checklist-like sets of criteria, which can be fulfilled with business-as-usual projects.

² See http://cdm.unfccc.int/methodologies/PAmethodologies/AdditionalityTools/Additionality_tool.pdf.

While both CDM and JI were created under the assumption of resulting in bilateral agreements³, as of October 2006 56%⁴ of CDM projects were unilateral projects, i.e. the host government of an Annex I country was not involved. In this case, project developers in the respective developing countries provide up-front financing for the projects themselves.

CERs are then later sold to industrialized country governments, or transferred to these governments in the context of private entity climate change obligations. This applies more to large size industrial projects.

3.2.4 CDM Statistics

The number of CDM projects has increased considerably since 2005 after a relatively slow start. Currently 827 projects are registered⁵. Emission reductions were issued for 259 projects, totalling 85 Mt CO₂eq. An additional 1666 projects are in the validation process and 154 in the registration process.

Not all projects generate the reductions as planned. The issuance rate (number of issued certificates compared to the number of requested certificates) was 90% on average. Only projects in the areas on energy efficiency in power and heat generation and N₂O emission reduction performed above expectations. Projects in the areas of landfill gas recovery and utilisation, geothermal energy and agriculture showed an issuance rate below 50%.

The CDM will make a significant contribution to the reduction of greenhouse gas emissions in developing countries: assuming the future performance of projects, one can estimate the cumulative emission reductions until 2012 from currently known projects to 2288 MtCO₂ eq. This will be sufficient to compensate a significant part of the reduction requirements of the countries committed to the Kyoto Protocol. However, if all reductions are used to increase emissions in Annex I countries above their targets, the global sum of emissions is not decreased.

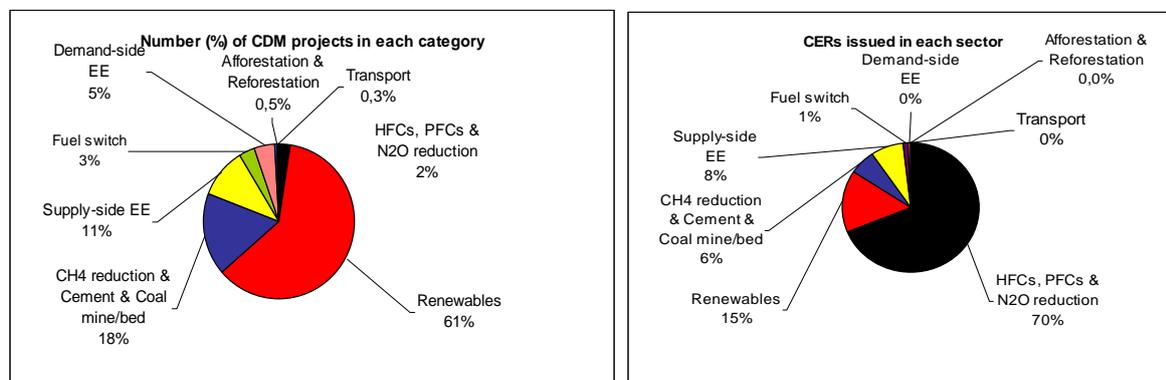


Figure 4. Projects by category as percent of projects (left) and percent of emission reductions (right)

The distribution of projects over categories is very uneven. The majority of projects stems from the renewables sector. 90% of projects can be found in the areas of renewables, CH₄ reductions and supply side energy efficiency (Figure 4). At the same time, the total amount of issued CERs is dominated by CERs from HFCs, PFCs and N₂O-reduction (70%). This is due to the high global warming potentials (GWPs) of these gases and the large project sizes. Renewables projects account for only 15% of issued CERs.

³ i.e. agreed upon up front by both the host country and the country that would ultimately use the credits for its target.

⁴ See IPCC 2006 Guidelines.

⁵ Numbers in this section stem from UNEP/RISOE www.cdmpipeline.org as of 1.11.2007, unless stated otherwise.

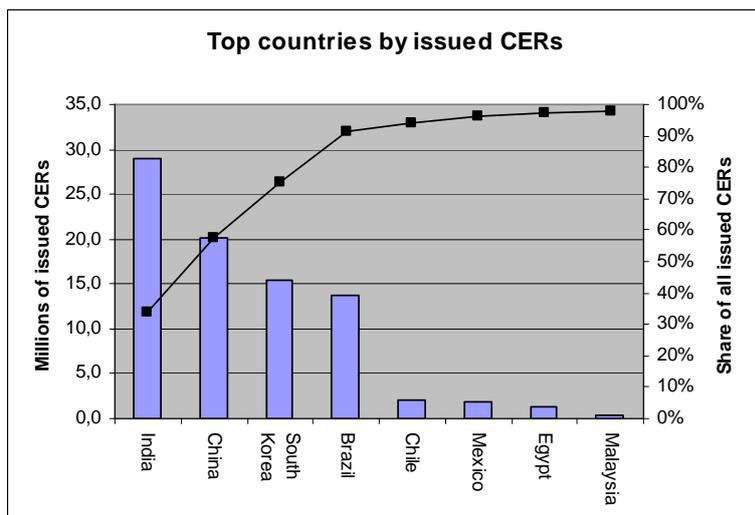


Figure 5 Distribution of Issued CERs by Countries (UNEP Risoe Centre 2007a)

Figure 5 shows, that regional distribution of CDM projects is very uneven, i.e. concentrated on a small number of countries. Around 90% of CERs have been issued in only four countries: India, China, South Korea and Brazil. India and China together account for nearly 60% of issued CERs. Currently, only 1.9% of issued CERs stem from other countries than the ones included in Figure 5. Africa in particular currently profits very little from CDM activities, currently holding less than 4% of issued CERs. The pipeline for 2012 shows a similar picture.

3.2.5 JI Statistics

The JI pipeline is currently rather small compared to the CDM pipeline with a ratio of 1:10 until 2012. This is due to several factors. On one hand, emission reductions from JI projects can only be issued for reductions having occurred from 2008 onwards, while CDM projects can generate projects as of the year 2000. In addition, Track 2 criteria were only agreed on in 2006 and a number of project types in the new EU Member States are no longer attractive due to the EU emission trading scheme. The potential problems regarding double-counting need to be clarified. Currently, 197 projects are in the pipeline, 1 registered, 88 at the determination stage, the rest in earlier stages. These projects amount to 207 Mt CO₂ eq. until 2012. 46% of projects are Track 2 projects, representing 75% of reductions to be issued until 2012.

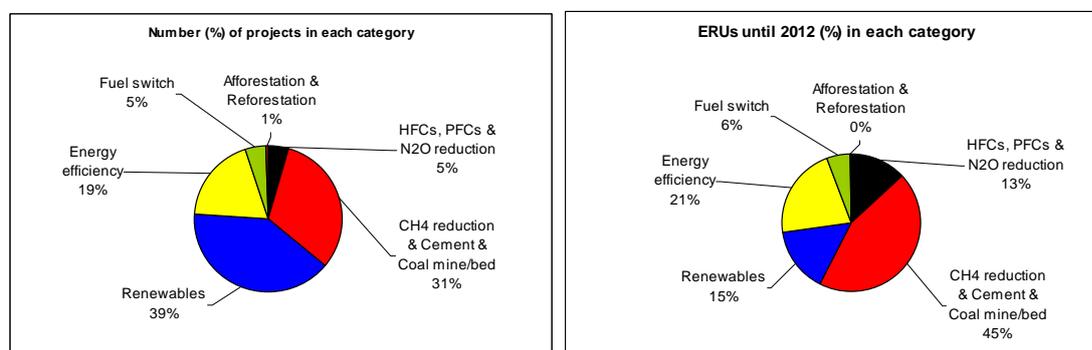


Figure 6 Projects per category ERUs issued per category (UNEP Risoe Centre 2007b)

In contrast to the CDM pipeline, figures about project numbers do not differ so strongly to amounts of CERs issued. 89% of projects are in the categories of CH₄ reduction, renewables and energy efficiency. These categories also represent 81% of reductions to be issued until 2012. HFCs, PFCs and N₂O reduction projects only account for 13% of total reductions issued until 2012.

JI projects are currently mainly found in the so called economies in transition. 70% of ERUs to be issued until 2012 come from Russia and the Ukraine, and 28% from new EU Member States. The rest comes, surprisingly, from Germany (mostly coal mine methane projects) and New Zealand (landfill gas and wind power).

3.2.6 Example projects

This section includes three CDM and two JI projects. The example CDM projects are all based on the so called Gold-Standard⁶, setting strict requirements regarding additionality, sustainable development and stakeholder consultation. The three CDM projects presented are already registered. In the JI-pipeline currently only one project has passed the determination stage, one is under review for determination.

Eecopalsa biogas project: In this project, biogas is recovered from palm oil mill effluent ponds at the PALCASA palm oil mill in Honduras. Electricity is generated from the biogas and provided to the grid, replacing electricity from the otherwise GHG-intensive energy mix in Honduras. The project contributes to sustainable development by resolving the environmental problems originating from the effluents from the palm oil mil PALCASA (soil pollution, odours and emission of methane into the atmosphere), by generating new jobs for the people living in the surrounding communities and by transferring state of the art technology into Honduras.

Malavalli biomass power plant: The aim of the Malavalli 4.5 MW low-density biomass residue power plant in India is to generate power by using biomass fuels like low-density crop residues (cane trash/coconut fronds) and other biomass fuels in the region. The biomass residue supply chain of the 4.5 MW power plant is run by local farmers, enabling them to generate additional income from waste that is normally burnt on the fields. The project makes a significant contribution to employment generation and poverty alleviation in the region. The project creates around 500 new jobs within the biomass supply chain. The power plant also helps to reduce the ever-increasing demand and supply gap of electricity. The project produces organic fertilisers (with ash from the biomass residues burnt in the power plant) and distributes it to farmers from whose fields the crop residues are collected.

Kuyasa Low-Cost Urban Housing: The Kuyasa Low-Cost Urban Housing Service Upgrade project in South Africa aims to improve the thermal performance of the existing and future housing units and improve lighting and water heating efficiency. This will result in reduced current and future electricity consumption per household, causing avoided CO₂ emissions per unit. Other co-benefits of the project activity include a reduction in local air pollution with subsequent decreases in pulmonary pneumonia, carbon monoxide poisoning and other respiratory illnesses as a consequence of paraffin burning. A decrease in accidents and damage to property as a result of fire is also anticipated.

Dolna Arda Hydropower: The JI project rehabilitation of Dolna Arda Hydropower Cascade in Bulgaria is currently under review for determination. It includes both refurbishing and expanding the generation capacity of a hydro power plant, thus displacing power generation on fossil fuels. The refurbishment will increase the efficiency of the existing hydropower units substantially.

Podilsky Cement: The first and only JI project past determination is located in the Ukraine. The project named “Switch from wet to dry process at Podilsky Cement” aims at increasing energy efficiency at a cement plant, by switching from the wet production process to the far more energy efficient dry process.

⁶ See www.cdmgoldstandard.org.

3.2.7 Summary and outlook

From the three mechanisms, CDM is currently the one most used. The numbers of CDM projects and thus also project experiences have increased considerably over the last years. The institutional structure of CDM is rather developed and being strengthened through setting up CDM management plans. The institutional structure for JI is still in the development process. International emission trading is not happening yet, but may be more important at the end of the commitment period in 2012.

While the CDM is further developing, there is some room for improvement. It appears that considerable attention could be given to increasing the contribution of CDM projects to sustainable development, which is currently the responsibility of the host countries. Furthermore there are indications that non-additional projects were also accredited. This could be overcome by requiring the use of the EB's additionality tool, clearer indication of additionality reasoning when describing the project and clear guidance for validators regarding additionality checking. Measures to enhance an even distribution of project regions and types could be developed.

3.3 Major public climate policies and implementation of commitments

In this chapter we provide a brief overview of the climate policies implemented in the EU, US, Japan, Russia, China, India and Brazil. We first provide a general overview on the status of climate policies in a given country. Second, a rough judgement is made whether the country is on track to achieve its Kyoto commitment (in case of Annex 1 countries) or whether or not the country is generally proactive in implementing climate policies (in case of all countries). Thirdly, positive national (or supranational, in the case of the EU) policies are introduced and evaluated briefly using the scheme listed below.

Basis for the evaluation is the historical data, including greenhouse gas emissions, national communications of these countries to the UNFCCC and Climate Scorecards that evaluate the climate performance of countries (Höhne et al. 2007b).

For the major climate policies we assess the following aspects:

- **Goal/ Target of the policy:** What is the stated aim of the policy, what does the policy maker want to achieve with this policy? This could include an aimed reduction in greenhouse gas emissions or a goal of achieving a certain amount of energy technology penetration of for instance renewable energy technologies or energy efficiency technologies at a given point in time.
- **Structure/Description:** What is the structure of the policy? This gives a very rough overview of how this policy is structured and tries to put it in a context with other similar policies.
- **Status of implementation/ Success:** Has the policy been able to fulfil its stated aim? Does it seem reasonable that the aim can still be achieved in the time left? This should also include some indicators on the performance (economic efficiency, environmental effectiveness) as far as these are available and if it was possible to evaluate the effects of the policy.
- **Problems:** Are there any major problems with the implementation of the policy? Was it possible to overcome them?

3.3.1 European Union

Emissions in the EU 15 decreased by 2% between 1990 and 2005, which is 6% from the Kyoto target of -8% below 1990 emissions. Emissions in the EU 27 have decreased by 11% from the base year while the accumulated target for EU 27 is -8% (European Environment Agency 2007). The European Union is a front runner in climate negotiations. It has been very proactive in promoting climate change mitigation and setting ambitious goals and has presented itself as an international negotiation leader. The EU has an ambitious target to reduce emissions by 20% by 2020 and is even willing to reduce them by 30% if other industrialized nations are making a comparable effort. In addition, the EU has set targets for the extension of renewable energy and energy efficiency for 2020. This ambitious policy framework is laid down in the European climate change programmes and is currently further specified in an energy and climate package.

One of the most relevant EU policies on climate change is the **Emission Trading Directive** (Directive 2003/87/EC). Currently, a total of 11,500 installations covering 45% of the overall CO₂ emissions in Europe are taking part. The goal of the system is “to promote reductions of greenhouse gas emissions in a cost-effective and economically efficient manner” (European Commission 2006). In order to achieve this goal, the EU emission trading scheme (ETS) is established where emission certificate can be traded among the participating installations. The trading is separated into 2 phases: Phase 1 lasts from 2005 – 2007 and Phase II from 2008 – 2012. As was expected, the first phase of the EU ETS was a learning phase during which the EU ETS was established and capacities were built and various challenges were faced. Some of the lessons learned and problems faced as reviewed in a Communication by the European Commission⁷ are that an overestimation of baseline emissions led to unsatisfying environmental outcome, that in some sectors the value of allowances could be passed through to the customer and that volatile market prices bring uncertainties in investment. The “linking directive” (Directive 2004/101/EC) allows the use of the Kyoto project-based mechanisms to fulfil the targets under the EU ETS (European Commission 2004).

Another important European legal framework is the **Directive on Electricity Production from Renewable Energy Sources** (Directive 2001/77/EC), which aims at the European-wide share of electricity from renewable sources of 21% by 2010. Within this directive the EU gives MS indicative targets and requires them to implement national renewable energy promotion schemes. It is expected that with currently implemented measures a share of 19% of electricity from renewable energy sources will be reached by 2010⁸ The measures implemented differ from country to country and one in particular (the German EEG) will be described in more detail below.

Besides those directives mentioned above, further directives exist, that are relevant to climate policy. These are the directive for the promotion of combined heat and power (CHP) (Directive 2004/8/EC), the directive aiming at the improvement of the energy performance of buildings (Directive 2002/91/EC), and the directive aiming at promoting the energy end-use efficiency and energy services (Directive 2006/32/EC). Besides, there is currently a voluntary agreement between the EU and the car industry in place which aims at reducing the average fleet emission of new cars to 140 g CO₂/km by 2008 for European car manufacturers, by 2009 for Japanese car manufacturers. This voluntary agreement was made between the European Commission and the European, Korean and Japanese car manufacturers. The effect of this agreement was that from 1995 till 2004 emissions were reduced from 186 g CO₂/km to 163 g CO₂/km. It is currently under heavy discussion whether the target set within the voluntary agreement will be reached.

⁷ COM(2006)676 final (European Commission 2006)

⁸ COM(2006) 849 final (European Commission 2007, p. 5)

Besides those policies implemented on an EU level, there are also major policies implemented in the member states. Some of these are the outcome of the policies on the EU level while others stand for themselves. As an example, the German Renewable Energy Sources Act for the promotion of renewable energy, which is considered an effective support scheme, and the British climate change levy known for reflecting the economic considerations of the government such as household vulnerability.

The **German Act on Granting Priority to Renewable Energy Sources (Renewable Energy Sources Act, EEG)** is the renewable support system in place in Germany. Originally the EEG aimed at reaching a share of 12.5% of renewable electricity supply by the year 2010. This share was already reached in mid-2007 and the target has to be revised. For 2020 the target is to reach at least a share of 27% of renewable electricity supply. The EEG requires that a fixed price is paid for electricity from renewable energy sources fed into the grid for a fixed time period. This fixed price is differentiated by various factors, such as technology and time of connection to the grid. The costs are shared among all electricity users. In the year 2005, 45 Mt CO₂ were mitigated through the EEG (German BMU 2007). There is an ongoing debate as to whether the feed-in tariff or alternatively other support systems are better for the promotion of renewable energy. Generally, two different factors are looked at to evaluate the different schemes: economic efficiency and environmental effectiveness. The high number of installations and the avoided CO₂ emissions prove the environmental effectiveness of the EEG, yet it is being discussed controversially whether the economic efficiency of the EEG is lower than that of other support systems such as renewable energy quotas as economic theory claims. (see for instance Mitchell et al. 2006).

Another successful policy implemented by a member state is the **UK climate change levy and climate change agreements**. The policy is targeted to contribute to the British government goal of reducing CO₂ emissions by 20% by 2010 and was implemented in 1997. It is made up of a levy paid by energy users in the industry, not energy extractors, and excludes households and transport. It is structured to provide incentives for using renewable energy and not nuclear energy as the users of nuclear electricity have to pay a tax but those of renewable electricity not. An 80% discount on the levy can be achieved if the industry enters into a climate change agreement. In case of over compliance of their agreement, credits can be traded in the EU ETS. All in all it leads to no increase of tax burden on the industry on the whole. Concerning the current status, econometric analysis estimated the impact of this policy to be a reduction of 2% in the CO₂ emissions in 2002 compared to the reference case (Gupta et al. 2007). There are various problems with the policy such as limited coverage (only the energy use in the industry is considered), a strong influence of interest groups on the design of the policy, and that it is not as effective as a pure tax. Nevertheless the climate change levy has achieved to over-comply with the set targets. (OECD Environment Programme 2005) Concerning the climate change agreements (CCA), 32 out of 49 sectors met their targets. (UK DEFRA 2007). Part of the revenue from the climate levy is financing the Carbon Trust, a non-profit company set up by the UK government to reduce carbon emissions. It provides assistance e.g. on reducing the carbon footprint or indentifying low carbon technology options, investment funds and other services to companies on emission reduction strategies.⁹

Norway, not being a member of the European Union, has a **carbon tax** in place. This tax aims at being a cost-effective method to limiting greenhouse gas emissions. It is a cross-sectoral instrument (meaning that it covers various sectors) and consists of a specific tax in NOK/l on non-renewable energy sources that release CO₂ to the atmosphere. It covers 68% of Norway's CO₂ emissions. The evaluation of environmental effectiveness is difficult.

⁹ See <http://www.thecarbontrust.co.uk/>

Estimates suggest that the carbon tax resulted in an emission reduction of 2.3% between 1990 and 1999 in Norway. There are several problems connected with the tax that limit its success. Some of the most relevant are: relatively high number of exemptions made for internationally competing companies and the missing alternatives to car transport mode. (Norwegian Ministry of the Environment 2005, Bruvoll and Larsen 2004)

3.3.2 USA

The US climate policy changed with the respective administrations: President Bush (Sr.) signed the UNFCCC in 1992. In 1993, President Clinton unveiled the US climate change action, which had the goal of returning US emissions to a 1990 level by 2000. In 1997, the USA indicated that it would not achieve the target. In the same year the Kyoto Protocol was signed but not ratified by the congress. As a reason for not ratifying the Kyoto protocol, a meaningful contribution from key developing countries was requested (Leaf et al. 2003). The current government administration proposed an alternative national approach stating that climate change is a serious problem. This approach resulted in rising emissions (Höhne et al. 2007b).

Greenhouse gas emissions of the USA in 2005 were 16.3 % above the emissions in the base year (1990) and 23.3% above the original Kyoto target (UNFCCC 2007d). Current trends even suggest that CO₂ emissions could rise 54% above the 1990 level in 2020 (Byrne et al. 2007).

For the US national approach, the most relevant climate policies are the Climate Change Science Program (budget ~\$2 billion/year), the Climate Change Technology Program (budget ~\$3 billion/year) as well as an action plan for reducing GHG Intensity by 18% over a 10-Year Period (2002-2012) (Watson 2005), which would include a moderate reduction of 1,833 MtCO₂ eq by 2012. As energy policy in the US (as well as Canada) is often prepared on a state level, a variety of regional “bottom-up” policies exist in different states and regional policies which are much more aggressive than the federal policies (Höhne et al. 2007b). These “bottom-up” policies could lead to a decrease in the national CO₂ emissions by 65% below the baseline projections (Byrne et al. 2007). 29 states have climate action targets in place (PEW Center on Global Climate Change 2007).

In California, the **Low carbon fuel standard** is currently being developed. In a state where 40% of the CO₂ emissions stem from transport, this is an important step toward GHG emissions reductions. The goal of the policy is to reduce carbon intensity of passenger vehicles sold by at least 10%. It is composed of a CO₂ g/unit of energy standard that is declining over the years and applies to fuel providers selling fuel into the California market. In addition, a certificate market is proposed, where those who over achieve the target can trade the excess. The Low carbon fuel standard is considered as an early action item under AB 32, which is described below. The policy has not been implemented yet. By 30 June 2007 a draft of compliance was developed to meet the above-mentioned target and a policy and technical analysis were published. It is expected that the regulatory progress should be completed no later than December 2008 (California Energy Commission 2007, Office of the Governor 2007a)

The **Global warming solution act of California (AB 32)** has the goal of capping California’s GHG emissions to 1990 levels by 2020. It is the first enforceable “state-wide program in the U.S. to cap all GHG emissions from major industries that includes penalties for non-compliance” (PEW Center of Global Climate Change 2007a). This cap will be phased-in starting in 2012 (Nunez and Pavley 2006). In order to achieve this, appropriate regulations (e.g. market mechanisms) have to be developed. A plan of measures should be adopted by 1 January 2009 together with mandatory GHG emission reporting. (Office of the Governor 2007b).

Several US member states have been also proactive in implementing **Renewable Portfolio Standards (RPS)**. These renewable electricity incentive schemes establish renewable energy penetration figures. Currently, 23 states have implemented different schemes and another 14 states are considering such regulation. Some of the most successful schemes are those in California, Texas and New Jersey. The goals of penetration level and the time frames differ from state to state. For instance, Wisconsin has a goal of 10 % penetration of renewable electricity by 2015, and California a target of 20% by 2020 (Byrne et al. 2007).

There are several regional greenhouse gas initiatives in the U.S. that typically consist of various states. Among the most important is the **Regional Greenhouse Gas Initiative** that consists of 9 Northeast and Mid-Atlantic U.S. States. It aims at discussing the design of a regional cap-and-trade scheme that would cover CO₂ emission from power plants in the region in a first step and would include further greenhouse gases in the future.¹⁰

The **U.S. Conference of Mayors Climate Protection Agreement** is an agreement made between various mayors of U.S. cities. Those participating in the agreement have to take 3 different actions: strive to beat the Kyoto target in their own communities, urge their state and the federal government to meet or beat the Kyoto target and urge the Congress to establish an emission trading scheme. To date a total of 740 mayors have signed the agreement. The program started in February 2005 and was endorsed by the Conference of Mayors in June 2005. (Byrne et al. 2007)¹¹

3.3.3 Japan

Japanese Emissions in 2005 were 6.9% above the 1990 base year emissions and 12.9% above the Kyoto target emissions (UNFCCC 2007d). The government currently has a “Kyoto Target Achievement Plan” in place. Under this plan the emission reduction target for the industry is set to 8.6% of 1990 emissions by 2010, to 16.1 % of 1990 by 2010 for the Energy Sector and to 3.9% of 1990 emissions by forest sinks (IEA 2007a). Major parts of the plan are a mandatory emission monitoring system, a voluntary emission trading scheme and an upfront payment system for CDM/JI projects.

In general, it can be stated that Japan’s efforts to a great extent rely on voluntary measures, buying of external credits and expansion of nuclear capacity. In Japan, voluntary measures are not the same as they are in Europe, though. For instance, the below-mentioned Top Runner Approach is a voluntary instrument, yet the business ethics in Japan would forbid not complying with the standard. The aim of buying CERs can be explained by the claim that Japan faces the highest GHG emission abatement costs (Pizer and Tamura 2005) which in turn is partly explainable by the fact that Japan has already a highly efficient industry (Höhne et al. 2005b; Höhne et al. 2007b). Even against this background it should be noted here that there is still some potential left for improving energy efficiency (IPCC 2001).

Major Japanese voluntary action is coordinated through the **Keidanren Voluntary Action Plan**, an agreement between the Japanese government and the Industry association Keidanren. It aims at reducing emissions in various sectors (not only the manufacturing and energy sector) in 2010 below 1990 level by allowing the industries to set voluntary targets (e.g. absolute CO₂ emissions, CO₂ intensity, energy consumption, energy intensity targets). The Keidanren Voluntary Action plan is a voluntary agreement between the national government and 34 industrial and energy converting sectors and 137 organizations that made up 45.3% of Japan’s total CO₂ emissions in 1990.

¹⁰ <http://www.rggi.org/>

¹¹ <http://usmayors.org/climateprotection/agreement.htm>

Under the plan, industries take on different voluntary targets. On a yearly basis, emissions are reported and the plan is being reviewed by a 3rd party who then makes suggestions on how the plan can be improved. The plan is structured as to include a continuous improvement process by including a 4-step process of establishing goals, identifying measures, monitoring progress and publishing results. Under the Japanese “Kyoto Protocol Target Achievement plan” it is stated that this plan plays the most important role in reducing emissions in the industrial and energy-converting sector. The plan was initiated in 1997, ahead of the adoption of the Kyoto Protocol. Monitored emissions in 2005 were 505.07 MtCO₂ or 0.6% under the 1990 level. This was the 6th consecutive year that the target was achieved. A major problem of the plan is that transparency yet has to improve. (Gupta et al. 2007, World Energy Council and French Environment and Energy Management Agency (ADEME) 2004).

Another major policy is the **Top Runner Approach**. Its goal is to contribute towards achieving Japan’s Kyoto target through emission reduction in manufacturing and non-manufacturing sectors. There are no quantifications made as to how much GHG emissions will be mitigated as the policy only aims at product performance. Under the Top Runner Approach 21 different appliances are covered. For each appliance voluntary standards on the product energy performance are set by the most efficient product in a given category. This ensures that there is an incentive to develop very efficient products, as these will be the standard for all other competitors. The weighted average of the efficiency of the products sold in a given category by a given manufacturer has to meet these standards. Although standards are only voluntary, compliance is high since no manufacturer would risk negative publicity due to compliance failure (IEA 2007b). The approach is generally viewed as a success and has been copied repeatedly. Reasons for its success among others are its effectiveness in increasing energy efficient appliances, the close connection between policy regulators in Japan and industry stakeholders, and the fact that those who are subjects to the regulations are themselves involved in the target setting. While it is difficult to monitor success as penetration rates of the products are not published it is expected that the Top Runners approach will contribute substantially to emission reductions in the residential, commercial and transportation sectors and only minimally in the industry sector. The most prominent criticism is that only incremental technical improvements are encouraged and that innovations receive no incentives under the scheme (Nordqvist 2006).

The **voluntary emission trading system in Japan (JVETS)** was established in order to accumulate knowledge and experience with emission trading schemes and to enable cost effective emission reductions. An open screening was performed where companies could apply for participation in the JVETS by pledging emission reduction targets. From the applicants a total number of 32 entities that faced the lowest GHG mitigation costs were chosen. The total emission reductions of these companies together amount to 21% of their base year emissions in fiscal year 2006 from the base year emissions, which are the average of the fiscal years 2002 till 2004. The mitigation measure taken by these companies were subsidized through the government by providing for 1/3 of the costs of the measure. If the entity failed to achieve the self-set target, the subsidies had to be returned to the government. In order to achieve cost effective emission reductions, the entities were allowed to trade the emission allowances in fiscal year 2006 and a final trading during one week in June 2007. The total government budget for the subsidy amounts to U.S. \$23.6 million. The total emission reductions for 2006 of these companies amounted to 276 kt CO₂. This relatively low number reflects that the coverage of the scheme at this point is relatively low. Together with the fact that no major emitting industries participate, this is probably the biggest drawback of the scheme how it is currently in place. (Jung et al. 2005; SHIMADA 2005)

3.3.4 Russia

Due to the economic downturn between 1990 and 1999, emissions in Russia decreased. This trend has been reversed and now emissions are steadily increasing. Nevertheless, the emissions between 1990 and 2005 declined by 27.8%, which also equals the current distance from the Kyoto target (=1990 level).

This might also be the reason why Russia's current climate mitigation efforts basically do not exist (Höhne et al. 2007b). There are only a limited number of policies in place, which primarily focus on other issues and only affect the climate. As an example, one could mention the long term loans for Russian hydro power amounting to 185 million which were granted by the European Bank for Reconstruction and Development EBRD in September 2006 (IEA 2007a). Currently, a total of 51 JI projects are in the pipeline while a majority of them is at determination (UNEP Risoe Centre 2007b).

Russia ratified the Kyoto Protocol in late 2004, enabling its entry into force in February 2005.

3.3.5 China

Since 1990, China's GHG emissions have grown by about 80%. It is foreseen that this will continue in the future and that the emissions will grow by another 65% to 80% till 2020. Currently, there are various policies in place that might help counteract this trend. These are to a large extent not primarily driven by an interest in mitigating climate change but instead from a focus on energy security, resource saving or other aspects (PEW Center of Global Climate Change 2007b).

China is the second largest source of the currently available CERs (25,34%) and has a total of 131 CDM projects registered (UNFCCC 2007b) and is expected to play an even increasing role in the future.

Here two major policies will be introduced briefly: the energy intensity target and its accompanying measures as well as the renewable energy promotion law.

The **energy intensity target** has as a goal the reduction of the Chinese energy intensity (energy consumption per unit of GDP) to 20% below the 2005 levels by 2010. Government projections suggest that this would reduce China's GHG emissions by 10% below business as usual projections. The target is allocated among provinces and industrial sectors. In order to achieve the above-mentioned target, various programmes and policies were launched. Among the most relevant is the Top 1000 Enterprises program which aims at improving the energy efficiency of China's 1000 largest emitters which together consume 1/3 of China's primary energy, the closing of inefficient power and industrial plants and the promotion of end-use energy efficiency. While from 2003 to 2005 the energy intensity increased, energy intensity declined by 1.23% in 2006. Yet this is short of the goal set for that year which was a decline of 4%. Therefore, major improvements have yet to happen. The recent historical trend does not suggest such energy intensity improvements. Besides, local government seem to fail to contribute to the extent wished for by the Chinese national government¹² (PEW Center of Global Climate Change 2007b).

The **renewable energy promotion** has a target of supplying 16% of China's primary energy demand by renewable energy sources in 2020, up from 7% today. For the electricity sector this target translates into 20% of the capacity which is supposed to be achieved through the installation of 30GW wind power, 20 GW biomass power and 300 GW of hydropower.

¹² http://www.chinadaily.com.cn/bizchina/2006-12/18/content_761668.htm

The above mentioned targets are accompanied by various incentive schemes which consist of a mix of feed-in tariffs, Renewable Portfolio Standard and tenders which most likely will be differentiated over time (feed-in tariffs short term, standards long term) as well as a renewable energy development fund. The law came into effect on 1 January 2007. Up to this point the generation from renewables remains low, though. Reasons are in particular the high cost of renewables in China and grid access among others. With the current reforms taking place in China it is difficult for policy maker to implement the Renewable Energy Promotion Law. This also deters investors as this brings great uncertainties with it. (Cherni and Kentish 2007, PEW Center of Global Climate Change 2007b).

3.3.6 India

India has the world's second largest population and total GHG emissions were at 1740 MtCO₂eq in 2004. A major GHG source is coal as it accounts for over half of the total primary energy consumption (Höhne et al. 2007c). The Industrial energy intensity of India has declined since 1995, but total carbon emissions have grown by 63% over the last decade (Chandler et al. 2002).

India currently generates the largest number of CERs in the world from projects that have already been approved under the UNFCCC (34,69% of all the credits) and has a total of 289 CDM projects in place (UNFCCC 2007b).

Renewable Energy policy has a strong history in India. A sizeable renewable energy program has existed in India for 20 years covering for instance 1406 MW of small hydro projects, 3.26 million small biogas plants, etc. (MEF 2004). It is supported by the **IREDA Renewable Energy Financing**, a financial support program for Renewable Energy, new energy and energy efficiency commercial projects. With the aid of this program, India aims at a goal of 10% of newly built power generation capacity in the electricity sector from renewable sources by 2012. This should be reached with the help of the Indian Renewable Energy Development Agency Ltd. which "promotes, develops and extends financial assistance for Renewable Energy and Energy Efficiency/Conservation Projects". (IREDA 2006). Under IREDA up to 80% of the project costs are supported with an interest rate between 0 and 12 % and a Repayment period of 5 to 12 years. Under the IREDA currently a total capacity of 2927 MW of power generation have been supported (IREDA 2006). Besides, push subsidies enabled the penetration of otherwise too expensive solar technologies (Chandler et al. 2002) All in all the share of renewable energy based power generation currently accounts for 5% of the installed capacity.

3.3.7 Brazil

Brazil has seen an increasing emissions trend. Emissions in Brazil saw a hike of 40.7% between 1990 and 2004 (Höhne et al. 2007b). Emissions from land use change and forestry made up the major share of the 63% emission share of Agriculture in Brazil in 2003 (Höhne and Moltmann 2006). In addition, Brazil has high emission rates per GDP but a low emission rate per capita. The electricity sector, due to the relatively large share of hydro power plants has a relatively low emission intensity (Höhne et al. 2007b).

Currently, a total of 15.2% of all CERs issued by host parties come from Brazil. A total of 113 CDM projects currently register Brazil as a host country (UNFCCC 2007b).

Biofuel incentives in Brazil have a long tradition. In the 1970s the PROALCOOL program was established which aimed at an increase in the production of ethanol and its use in the transport sector as a reaction to the oil crisis. The PROALCOOL program ended officially in 1991 but parts of the program still existed in 1998 (Rosillo-Calle and Cortez 1998).

Recently a new Biofuel incentive scheme has been added: the National Biodiesel Production & Use Program (PNPB) that aims at increasing the share of production as well as use in diesel engines of vegetable oil. The PROALCOOL program covered a portfolio of policies including regulation to shift to alcohol fuelled cars and price control which was especially relevant for the incentives. The National Biodiesel Production & Use Program (PNPB) consists of a blending quota for the share of biodiesel to be added to the regular diesel (2% by 2008 and 5% by 2012). The policy also takes account of regional social justice issues through the introduction of a “social fuel” label (Brazilian Ministry of Mines and Energy 2007). The success of the Brazilian PROALCOOL program is that approx. 20% of the vehicle fleet in Brazil today are fuelled by ethanol and that the ethanol content of regular gasoline is 25%. Yet especially during times when the oil price was low, the fixed price led to the fact that heavy government subsidisation was necessary (Puppim de Oliveira 2002).

3.4 Private and non-governmental initiatives

Apart from international climate change initiatives on the government level, several international corporate and non-governmental initiatives exist. These kinds of initiatives may play an important role in future emission reduction. Political drivers for private-sector initiatives can be the possible influence on future regulation as well as an improvement of the strategic position of corporations. Non-political drivers may be cost reductions or image reasons. Table 3 gives examples of private and non-governmental initiatives and an assessment of their impact on emission levels. Several of the below mentioned programmes support corporations or private persons to monitor and reduce their emissions.

Table 3. Examples of private partnerships and programmes (cp. IPCC 2007a, chapter 13.4.2)

Name	Scope
Business Leader Initiative on Climate Change (BLICC)	Under this corporate initiative, eleven European companies monitor and report their GHG emissions and set a reduction target. Emissions are calculated based on the international calculation tool Green House Gas Protocol, developed by the World Resources Development (WBCSD) and the World Resources Institute (WRI). The involved companies decreased their CO ₂ emissions by 5-50% between 2004 and 2006. ¹³
Carbon Disclosure Project	This non-profit organisation encourages companies to calculate and to publicly report their GHG emissions publicly. So far about 1300 are participating. The project is supported by institutional investors controlling about 25% of the global stock markets. ¹⁴
Cement Sustainability Initiative	The CSI was developed under the umbrella of the World Business Council for Sustainable Development (WBCSD). The 18 member companies account for more than 40% of the World’s cement production. The project covers climate protection and CO ₂ management, responsible use of fuels and materials, employee health and safety, emission monitoring and reporting, local impacts on land and communities, and reporting and communication. The companies report their emissions according to the GHG Protocol from WBCSD and WRI as well as their perform-

¹³ See

<http://www.respecteurope.com/DesktopDefault.aspx?tabindex=100&tabid=225&parentid=111&superiorid=225&pindex=2&bindex=33>

¹⁴ See <http://www.cdproject.net>

¹⁵ See <http://www.wbcscement.org/>

Name	Scope
	<p>ance data.</p> <p>Individual companies have set their own CO₂ reduction targets. The CSI is committed to improve the Clean Development Mechanism (CDM) process and to build closer links to other climate change initiatives, such as the Asia Pacific Partnership (AP6).¹⁵</p>
<p>Chicago Climate Exchange</p>	<p>The CCX is a financial institution for emission trading and offsets for all six greenhouse gases. The members make a voluntary but legally binding commitment to meet annual emission reduction targets. Those who reduce below the targets have surplus allowances to sell or bank; those who emit above the targets comply by purchasing CCX Carbon Financial Instrument contracts.</p> <p>Phase I (2003-2006): Members commit to reduce 1% per year below baseline (average of annual emissions from 1998-2001), for a total of 4% by 2006.</p> <p>Phase II (2007-2010): Members commit to annual reduction schedule that results in year 2010 emission reduction commitments of 6% below baseline (as above or the single year 2000).</p> <p>According to the last compliance report for the year 2005 all members achieved their reduction target.¹⁶</p>
<p>Offset Programmes</p>	<p>Braun and Stute (2004) identified 35 organisations that offer services to offset the emissions of companies, communities and private individuals. These organisations offer the service to calculate the emissions of the participants and to undertake emission reduction or carbon sequestration projects or acquire and retire emission reduction units or emission allowances.</p>
<p>Business Environmental Leadership Council</p>	<p>Under the BELC initiative of the Pew Center on Climate Change, 44 companies establish individual emissions reduction objectives, invest in new, more efficient products, practices, and technologies and support actions to achieve cost-effective emissions reductions.¹⁷</p>
<p>Top ten consumer information system</p>	<p>This NGO-sponsored online search tool provides consumers with information on the most efficient consumer products available in local markets. The service is or will soon be available in twelve European countries, with plans to expand to China and Latin America.¹⁸</p>
<p>WWF Climate Savers</p>	<p>The NGO World Wide Fund of Nature (WWF) has developed partnerships with individual leading companies that commit to reduce their greenhouse gas emissions worldwide according to individual reduction targets. Twelve companies participate in this programme and actively work on their emission reduction.¹⁹</p>

¹⁶ See <http://www.chicagoclimatex.com>

¹⁷ See http://www.pewclimate.org/companies_leading_the_way_belc/

¹⁸ See <http://www.topten.info>

¹⁹ See

http://www.panda.org/about_wwf/what_we_do/climate_change/solutions/business_industry/climate_savers/index.cfm

4. THE PROCESS TOWARDS FUTURE INTERNATIONAL CLIMATE POLICY

The UNFCCC is the primary international discussion forum on climate change, but the scope and timing of a future agreement to combat climate change at the international level is also being discussed in other political fora. Figure 7 includes a few of these, which are discussed in detail below. It is expected that in the long run, deliberations in all of these fora will lead to a more effective future international system to combat climate change.



Figure 7. Overview of different strands of activities relevant to future international climate policy

4.1 Activities within the UNFCCC

Many of the activities within the UNFCCC process are relevant for the development of the future agreement. The most important ones are discussed in further below and include:

- New commitments under the Kyoto Protocol
- The Convention dialogue

4.1.1 New commitments under the Kyoto Protocol

The first Meeting of the Parties to the Protocol (COP/MOP 1, 2005) initiated the process of establishing commitments for the post 2012 period to be inscribed in Annex B of the Protocol for Annex I Parties. An open ended ad hoc working group was formed (AWG). A deadline for its completion was not fixed. These discussions are under the legal authority of Kyoto Parties with non-Parties like the USA and Australia, having observer status.

At its first meeting in May 2006, the AWG did not set a deadline for decisions, but stated that it should be in time to avoid a gap between the first and second commitment periods (UNFCCC 2006b). The group is entered an analysis phase where countries are invited to present information relevant to reduction commitments including mitigation potential.

At COP/MOP 2 in November 2006, the AWG focused on the development of a work plan and a schedule for further meetings. The future work programme will include (FCCC/KP/AWG/2006/L.4):

- a) Analysis of mitigation potential and ranges of emission reduction objectives
- b) Analysis of possible means to achieve mitigation objectives
- c) Consideration of further commitments.

During its third session in May 2007 a round table took place to provide delegates an opportunity to discuss the current status of the scientific understanding and relevant experience.

At the first part of the fourth session in Vienna in August 2007, the AWG agreed for the first time an overall ambition level by recognizing the findings of the Intergovernmental Panel on Climate Change that emissions of global greenhouse gases need to peak in the next 10 to 15 years and be reduced to very low levels, well below half the level in 2000 by the middle of the twenty-first century. It also noted that Annex I Parties as a group would need to reduce emissions in a range of 25–40 per cent below 1990 levels by 2020. Taking these ranges as “useful initial parameters for the overall level of ambition”, the AWG now turns to the next item of its work plan, i.e. means of achieving the mitigation objective.

The COP/MOP 2 had agreed to have a second review of the Kyoto Protocol in 2008 and to discuss its scope in 2007. The decision states that “the second review shall not lead to new commitments for any party.”

4.1.2 Convention dialogue

A two-year process was launched at COP 11 (2005) to discuss “long-term cooperative action to address climate change”. This process took the form of an open-ended dialogue by the COP itself including the USA and Australia. The mandate speaks of sustainable development, adaptation, technology potential and market-based opportunities as topics, but does not speak explicitly of emission reductions. The mandate also states that the dialogue “will not open any negotiations leading to new commitments” but the two co-facilitators of the dialogue reported to COP-12 and will report to COP-13 (Decision 1/CP.11).

At the first meeting of the Convention dialogue, held in Bonn 15 to 17 May 2006, Parties exchanged their views openly. Countries emphasised which topics should be the focus of the discussions. The theme of positive incentives for action in developing countries was heard many times.

During the second workshop of the Convention dialogue during COP12 in November 2006 in Nairobi several topics were presented and discussed. These included e.g. the Stern Review on the Economics of Climate Change, the World Bank Investment Framework on renewable energies, positive incentives to reduce emissions from deforestation in developing countries and integrating climate change into development strategies. Discussions were held e.g. on advancing development goals in a sustainable way and realising the full potential of market-based opportunities.

The third workshop of the Convention dialogue took place in Bonn in May 2007. It focused on the realisation of technology potential and addressing action on adaptation. The fourth workshop in Vienna in August 2007 focussed on financial flows necessary to slow climate change and a possible future process.

The dialogue has ended. It did not result in formal decisions, but the co-facilitators prepared a report of the dialogue to be presented at COP-13 (2007) (UNFCCC 2007e).

4.2 Activities outside the UNFCCC

Outside the UNFCCC several processes with relevance to a future climate agreement have been initiated. Five are of particular relevance: the Gleneagles G8 discussions on climate change, the Asia-Pacific Partnership (AP6), the United Nations high-level climate change talks and the US major emitters initiative.

4.2.1 Gleneagles G8 plus 5 process

During the G8 meeting 2005 in Gleneagles, Scotland, at which five developing countries Brazil, China, India, Mexico and South Africa participated, the Gleneagles Communiqué and Plan of Action on Climate Change, Clean Energy and Sustainable Development was released. The G8 plus 5 group emphasized the need to stop and reverse the increase of greenhouse gas emissions. It includes three areas of future work: the Ministerial dialogue, cooperation with the IEA and with the World Bank.

A major commitment of the G8 Summit in Gleneagles was to “take forward a Dialogue on Climate Change, Clean Energy and Sustainable Development, and to invite other interested countries with significant energy needs to join.” This Gleneagles Dialogue is an informal forum for discussion. Its objective is to complement and reinforce the formal negotiations within the UNFCCC by trying to create the conditions necessary for successful agreement.

The dialogue includes 20 countries (G8+5 together with Australia, Indonesia, Nigeria, Poland, South Korea, Spain), the European Commission and key international organisations including the World Bank and the International Energy Agency (IEA). The UNFCCC Secretariat also participates.

The July G8 Summit in Russia (2006) included a series of meetings with much of the focus on energy security and access to supplies. Nevertheless, the Russian Summit reaffirmed the G8’s commitments to meet the objectives of reducing greenhouse gas emissions and of dealing with climate change, including through promoting an inclusive dialogue on further action in the future. The second ministerial dialogue meeting was hosted by Mexico in October 2006 (Defra 2005). A third meeting of the G8 took place in Germany in September 2007. The main focus laid on the realisation of the technology potential, up-scaling investment in climate protection and a policy framework post 2012. The next meeting will take place in Japan in March 2008 (G8 2007).

Under the German Presidency the G8 continued working on the Gleneagles Plan in June 2007. The G8 countries committed to reducing global CO₂ emissions by 2050 by at least 50%. This aim is to be reached within the UN process and in cooperation with emerging economies. It agreed to finalize an agreement of the large emitters by 2008 and a global agreement under the UNFCCC by 2009 (<http://www.g-8.de>).

The 2008 G8 Summit, presided by Japan, will conclude the G8 process on climate change with a final report on previous work under the dialogue being submitted for the consideration of G8 plus 5 leaders in Japan.

For the future cooperation between G8 and IEA the Gleneagles Communiqué describes the IEA as advisor “on alternative energy scenarios and strategies aimed at a clean clever and competitive energy future” (G8 2005).

As part of this work, the IEA has published a major new report called “Energy Technology Perspectives: Scenarios and Strategies to 2050” (IEA/OECD 2006). Another publication in this context focuses on energy efficiency in industry (IEA 2007c). The IEA’s key findings will be delivered at the G8 Summit in Japan in 2008.

In the Gleneagles Communiqué the participants described the future role of the World Bank as taking “a leadership role in creating a new framework for clean energy and development, including investment and financing” (G8 2005).

In response, the World Bank created the “Investment Framework for Clean Energy and Development” (World Bank 2007). It includes three pillars: 1. Meeting the energy needs of developing countries and widening access to energy services for their citizens in an environmentally responsible way, 2. Reducing greenhouse gas emissions and speeding up the transition to a low-carbon economy and 3. Helping developing countries adapt to climate risks.

Within this framework a Carbon Partnership Facility (CPF) is created that would purchase emission reductions from projects beyond 2012 and a Forest Carbon Partnership Facility (FCPF) that purchases reductions from piloting projects that reduce emissions from deforestation and land degradation.²⁰

The G8 process has created new momentum for the international discussions on climate change. It has raised the issue to the level of heads of states and gave new directions to already existing institutions such as the IEA and the World Bank. It is seen as a process that can reintegrate the USA and at the same time have a constructive dialogue with the largest developing countries. By creating the conditions under which any future agreement could be successfully implemented, the G8 activities can complement the UNFCCC process.

4.2.2 Asia-Pacific Partnership (AP6)

The Asia-Pacific Partnership on Development and Climate, also known as AP6, is an initiative by Australia, China, India, Japan, South Korea, and the USA (<http://www.asiapacificpartnership.org>). Countries first met under this non-legally binding framework in January 2006.

The purposes of this partnership are to “advance clean development and climate objectives [...] The Partners will enhance cooperation to meet both [...] their] increased energy needs and associated challenges, including those related to air pollution, energy security, and greenhouse gas intensities in accordance with national circumstances.”

The six partner countries represent about half of the world's economy, population and energy use. Globally, they are important production countries of coal (65%), cement (61%), steel (48%) and aluminium (35%) (AP6 2006).

The main institution of the AP6 is the Policy and Implementation Committee, which is chaired by the USA. It is responsible for management of the implementation of the cooperative activities of the partnership and its task forces. The Administrative Support Group will coordinate the communication and was also established by the USA. Eight government-industry task forces exist. They focus on power generation and key industry sectors of the partner countries: cleaner fossil energy (Chair: Australia, Co-Chair: China), renewable energy and distributed generation (Korea, Australia), power generation and transmission (USA, China), steel (Japan, India), aluminium (Australia, USA), cement (Japan), coal mining (USA, India), buildings and appliances (Korea, USA). The transport sector is not covered. Until mid 2006 they will formulate action plans that outline short and medium-term action necessary to reach the partnership's aims.

The task forces shall “drive improvements with regard to best practices and ensure that a range of technologies is developed and repeatedly demonstrated so that scale is increased and costs are reduced” (AP6 2006).

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http://carbonfinance.org/docs/Two_New_World_Bank_Carbon_Facilities_Will_Help_Fight_Climate_Change_And_Deforestation.pdf

The funding of this partnership is voluntary. So far the USA pledged to contribute up to US\$ 50 million in 2007 (US Government 2006). The Australian Government plans to invest a further A\$100 million (~US\$ 75 million) over five years (Australian Government 2006).

The Australian government economic research agency comes to the conclusion that the efforts from the Asian-Pacific Partnership could change the global emission path leading to 22 GtCeq. in 2050 under a reference case to 17 GtCeq., i.e. emission reductions of –23% compared to the reference case (ABARE 2006). The WWF criticises this as being far too little because the emissions would still lead to a global temperature increase of +4 °C (WWF 2006). A target of 2°C would require global emissions to be in 2050 below 1990 levels (7 GtCeq.).

The Asia-Pacific Partnership is seen by some of its members as an alternative to the UNFCCC and Kyoto process, and by others as a complement to it. Its impact alone does not seem sufficient to keep global average temperature increase below 2°C, which is the goal for several countries. It also still has to prove to be operational as a new institution. But so far its existence has not significantly influenced the UNFCCC process. Indeed, it could complement it well if it focuses on the development of particular technologies.

4.2.3 United Nations High-Level Climate Change Talks

UN Secretary General Ban Ki-moon announced in May 2007 that he hoped to bring the world's leaders together to discuss a future agreement on curbing greenhouse gas emissions "as recognition of the fact that climate change needed to be addressed at a higher level than that of environmental ministers, because the issue also had developmental and economic impacts". The meeting, on September 24, 2007, coincided with the UN general assembly. Top officials from over 150 nations, including 80 heads of State or Government attended the meeting. The UN Secretary General concluded after the meeting that "this event has taken us into a new era. Today I heard a clear call from world leaders for a breakthrough on climate change in Bali. And I now believe we have a major political commitment to achieving that." The meeting provided a major impetus to adopt a mandate for a future climate agreement at COP 13 in Bali, Indonesia in December 2007.²¹

4.2.4 The US major emitters initiative

In May 2007, just before the G8 summit in Germany, US President Bush announced a new initiative, in which he wants to bring together the largest emitters to agree on a framework on future action on climate change by the end of 2008. Under his guidance, each of the major emitting countries would establish its own greenhouse gas emission targets, goal and programmes according to national circumstances. The pledges would be reviewed regularly.²²

The timing of this initiative raised speculation, that it was initiated to distract from the G8 and the UNFCCC process. Many observers commented that such a voluntary pledge and review process could hardly achieve the significant reductions that would be necessary to limit global temperature increase to 2°C.

France, Germany, Italy, the UK, Japan, China, Canada, India, Brazil, South Korea, Mexico, Russia, Australia, Indonesia, South Africa and the UN were invited to the first meeting, held in Washington, D.C., on 27 and 28 September 2007.²³

²¹ <http://www.un.org/climatechange/2007highlevel/>

²² <http://www.whitehouse.gov/infocus/environment/>

²³ <http://www.state.gov/g/oes/climate/mem/>

At the meeting all speakers underlined the central role of the UNFCCC as the global forum for addressing climate change. The meeting focussed on identifying opportunities in key sectors and discussed a long term goal. It concluded to meet again after Bali.

4.2.5 Greenland/South Africa/Sweden Ministerial dialogue on climate change

Another international Ministerial dialogue of three to four day meetings started with the invitation of Denmark in June 2005: Representatives from 22 like-minded countries met in Greenland and informally discussed the development of an inclusive strategy beyond 2012. The second meeting took place in South Africa in June 2006 which also focussed on the special situation of Africa. Sweden hosted the third meeting in June 2007 (Riksgränsen 2007) where elements of an overall architecture of the post 2012 regime were discussed to include mitigation, adaptation, technology and financing. The next meeting will be in June 2008 in Argentina.

The informal setting for several days in attractive locations has proven to provide a constructive atmosphere among environmental ministers. While they did not make concrete recommendations on a future regime, the trust building and collection and convergence of ideas was very supportive in the past and can be in the future.

5. STATE OF THE INTERNATIONAL NEGOTIATIONS UNDER THE UNFCCC

International negotiations are at a turning point. No progress has been made in the past years to advance negotiations on future commitments. Today, public pressure and diplomatic efforts have increased considerably, making a breakthrough possible at COP 13 in Bali in December 2007.

The major issue is to start an official negotiation on an international framework post 2012. Many hope that the conference in Bali can result in agreement on the process of how to negotiate (how many meetings and in which form), the topics of the negotiations and the end date for such negotiations (e.g. 2009). The conference is hence not heading for a final agreement on a post 2012 framework. Such agreement is planned for 2009.

Two major stumbling blocks need to be overcome to reach an agreement:

- First, the USA has to be integrated into the future negotiations. With the USA rejecting the Kyoto Protocol, developing countries call for action by the largest emitter before they engage in negotiations. While the Bush administration insists that binding emission limits for the USA are not possible, all potential successor candidates of President Bush voiced their preference for national programmes in the USA that cap emissions. New elections in the USA are only in 2008. Hence, developing countries will have to trust that a new government will come back to the table. The opposition in the USA will also be present at the COP in Bali and will try to make this point behind the scenes, although they are not officially at the negotiation table.
- Second, developed countries need to show willingness to reduce their emissions substantially and to provide substantial financial support to developing countries so that they agree to engage in negotiations with a particular end date. The AWG already agreed that when deciding on Annex I countries' reductions, values of 25% to 40% below 1990 levels in 2020 are "useful initial parameters". This is an important first step. However, the USA was not part of this agreement of the AWG and indications on funding, for example, for adaptation are missing.

Some individual countries may deserve special attention when preparing for an agreement: In past conferences, the Russian Federation had received little attention during the meeting and then blocked an agreement at the end. Japan seems currently undecided on its position, but is very important for reaching a final agreement. India has voiced extreme positions, e.g. that no further negotiation process on non-Annex I participation is necessary, and therefore deserves special attention. Saudi Arabia, together with the OPEC countries, is generally slowing the process and needs to be accommodated.

A general observation is that countries' positions were very firm at the last meeting in Vienna, in August 2007. It seems as if countries were aiming to manifest a strong starting position so that they have negotiating chips for the discussions in December. In Bali, however, countries will have to move from their positions to some extent to make an agreement possible.

The mandate for negotiations is expected to evolve from a follow up of the UNFCCC dialogue, but also other parallel strands of discussions are relevant. Eventually, all strands will be agreed in a package at the end of the conference. The separate strands are described in the following sections.

5.1 Follow up of the UNFCCC dialogue

The UNFCCC dialogue ended with its last session in August 2007. The report of the Dialogue by the two co-facilitators (UNFCCC 2007e) could be the basis for a future mandate of the discussions. Several elements can be included in such a mandate:

The process for further discussions can take various forms as presented in the report by the co-facilitators (UNFCCC 2007e, para 64):

1. Extend the dialogue with a further report to the COP, similar to the present Dialogue or with further mandate and timelines.
2. Continue discussions under an item on the COP agenda and reorganize and consolidate the agendas of the subsidiary bodies (the Subsidiary Body for Implementation and the SBSTA) around the building blocks.
3. Establish a negotiating process to be undertaken in a working group or other negotiating body established under the COP, with a clear mandate and set time frames.
4. Establish a fully integrated negotiating process to be undertaken in a working group or other negotiating body established under both the COP (UNFCCC) and COP/MOP (Kyoto Protocol) with a clear mandate and set time frames.

In the final session of the UNFCCC dialogue in August 2007, countries voiced their preference for one or the other option. E.g. China proposed extending the dialogue for another two years (option 1), which was supported by Saudi Arabia and Iran. Qatar proposed continued discussion under a COP agenda item (option 2). Brazil, South Africa, Mexico, Uganda, New Zealand, Chile and Australia supported starting a new parallel formal process (option 3). Indonesia and Russia were undecided between option 2 and 3. Japan opted for a single track (option 4), while India opposed any negotiations on new commitments.

Based on the positions in Vienna, one could conclude that an agreement may be difficult. These public positions are however only the starting points and have deliberately been set far apart. If countries move, the option to establish a new negotiation process with mandate and timeframe under the COP (option 3) seems a possible outcome to our judgement. Such a decision critically depends on the role of the USA in such a future negotiation.

The **topics of the negotiations** need to be agreed on assuming that a new process with new mandate is launched. The topics seem to be concentrating on four elements: Mitigation, adaptation, technology and financing. These four elements appear in the report of the co-facilitators (UNFCCC 2007e) and were also the basis for the UN high level meeting on climate change in September 2007. A mandate is likely to include these four topics as there is broad agreement on them. The mandate may also start working groups on these topics. Countries' views however diverge on the content of these issues, so it is uncertain to what extent they would be specified in a mandate.

- *Mitigation* will include emission reduction efforts by Annex I taking the lead, but possibly also by advanced Non-Annex I countries taking their "fair share". It also includes the means of implementation (i.e. absolute emission targets as under Kyoto Protocol, CDM or other new types of commitments).
- *Adaptation* will include the next steps to intensify the existing support for developing countries to adapt to climate change.
- *Technology* will focus on means to develop, transfer and deploy greenhouse gas friendly technologies based on the ongoing activities under the UNFCCC.

- *Financing* will further elaborate on the means of providing the necessary financial resources within the international system to reduce greenhouse gas emissions and adapt to climate change.

One further possible topic includes the *management of unintended consequences* of response measures for the economies of other countries, i.e. reduced income from oil exporting nations due to climate policies. This point has consistently been made by OPEC countries, but many other countries have opposed adding it to the list. As the OPEC countries are usually very firm on their position, it seems likely that some concession will be made to include this element on the list.

A further element could be *capacity building and awareness raising*. These topics are already covered under the UNFCCC and are uncontroversial.

Some countries wish to see also a reference to a *long term goal* in the mandate. Many countries have often voiced their support to keep global average temperatures below 2°C (EU, Norway, Switzerland and others). The AWG already noted “that global emissions of greenhouse gases need to peak in the next 10 to 15 years and be reduced to very low levels, well below half of levels in 2000 by the middle of the twenty-first century” (UNFCCC 2007a, para 6) in order to stabilize greenhouse gas concentrations at 450 ppmv CO₂ eq., which is consistent with the 2°C limit. It also noted the concerns by small island developing states and some developing countries “with regard to the lack of analysis of stabilization scenarios below 450 ppmv CO₂ eq.”. Stabilization at 450 ppmv CO₂ eq. is unacceptably high for these countries. The G8 could not agree on a goal, but “will consider seriously the decisions made by the European Union, Canada and Japan which include at least a halving of global emissions by 2050.” (Chair’s summary). Advanced developing countries in general are against the notion of a long-term goal, as they see it as immediately constraining their emissions. With the diverse positions it is unclear, whether a mandate would include a reference to a long-term goal.

The **end date of the negotiations** could be agreed on assuming that a new process with a new mandate is launched. The G8 countries have agreed to make an agreement in 2008 amongst themselves and to turn it into a global agreement under the UNFCCC in 2009. In addition, the US major economies initiative aims at an agreement in 2008. However, the major developing countries that were also invited to the G8 summit in June 2007 have not yet agreed to this timeline. One could speculate that the compromise between the extreme positions of “no deadline” and “2009 as deadline” could be a deadline in 2010.

5.2 Agreement of the AWG and review of the Kyoto Protocol

The AWG had agreed three elements in its work programme (FCCC/KP/AWG/2006/4):

1. Analysis of mitigation potentials and ranges of emission reduction objectives of Annex I Parties.
2. Analysis of possible means of achieving mitigation objectives.
3. Consideration of further commitments by Annex I Parties.

With the session in August 2007, it completed the first item of mitigation potential and can now turn to the further items. It seems unlikely that progress will be made in Bali on substance, but agreement could be reached on process elements.

The AWG could define when to discuss and complete the second and third element of its work plan. The G77 had made a submission to the August meeting (FCCC/KP/AWG/2007/MISC.3) where it proposed the following:

- Outline and analyse the means, tools, technologies, policies and measures to achieve these potential commitments: AWG 5 (May 08)
- Set Annex I Party quantified emission reduction commitments for the 2nd commitment period; draft and adopt amendments to Annex B and related amendments to complete the work of the AWG: AWG 6 (Dec 08)
- AWG adoption of Annex B and related amendments: AWG 7 (May 09)
- COP/MOP adoption of Annex B and related amendments: CMP 4 (Dec 09)

So far Annex I countries have opposed a defined deadline to complete the work of the AWG, as they awaited a parallel or joint process on new commitments for developing countries (which is not within the scope of the AWG). However, if there is progress on the follow-up of the dialogue, it could be agreed that the AWG and the follow-up of the dialogue complete their work at the same time.

A further issue under the Kyoto Protocol is its review. The COP/MOP 2 had agreed to have a second review of the Kyoto Protocol in 2008 and to discuss its scope in 2007. The decision states that “the second review shall not lead to new commitments for any party.”

Views from Parties in submissions on this topic differed on the scope of the review (FCCC/KP/CMP/2007/INF.1). The review could focus on the past, i.e. the implementation by Annex I Parties of their commitments under the Kyoto Protocol, or it could focus on the future, i.e. architectural aspects and future developments of the Protocol. They disagreed further on the process of the review. It could take the form of a new process to end in 2008 or the relevant issues could be taken up by existing processes, i.e. the follow up of the dialogue or the work of the AWG.

The issue of the review of the Protocol will only be agreed on as part of the overall package across other items.

5.3 Russian Proposal

The Russian proposal on voluntary commitments was first launched during COP/MOP 1 in December 2005. Russia called for a process that countries could take on voluntary commitments. As the proposal was not clear to many, a workshop was held for clarification and exploration of the scope and implications of the proposal in May 2007. Two tracks of the proposal were identified:

- The Kyoto Track includes a simplification of the procedure for countries to join Annex B of the Kyoto Protocol. The voluntary commitments under the Kyoto Track can be interpreted as voluntarily accepted binding targets. The examples of Kazakhstan and Belarus have shown that the procedure can be cumbersome. Both countries tried to join, but have not yet fully succeeded.
- The Convention Track would support voluntary commitments of developing countries encouraged by financial and technology transfer incentives. These commitments could include absolute targets, relative targets, domestic policies and measures as well as technology targets, recognised under the UNFCCC. No sanctions would be imposed should the target not be met.

The Kyoto track of the proposal was received as uncontroversial. The process of joining Annex B of the Kyoto Protocol could indeed be simplified.

The Convention track of the proposal received the expected reactions: Several Annex I countries welcomed this approach as basis for discussion while many developing countries seemed sceptical towards it (IISD 2007; Korppoo 2007).

The COP/MOP in Bali will discuss the proposal under “other matters”. One option is that the Kyoto Track of the proposal would be continued under the COP or COP/MOP, while the element of the Convention track is included in the follow-up process of the Dialogue.

5.4 Reducing emissions from deforestation in developing countries

A variety of proposals has been made for including “reducing emissions from deforestation in developing countries (RED)” into the future climate regime. The first proposal was presented at a side-event of COP 9 in Milan. The main idea of this proposal of ‘compensated reduction’ was that developing countries reducing emissions from deforestation beyond an agreed national baseline would receive emission allowances, which they could sell on the international carbon market. The discussion on the inclusion of RED as a market-based mechanism gained further impetus at the UNFCCC Seminar of Governmental Experts in May 2005, when Papua New Guinea and Costa Rica, supported by several developing countries, voiced their support for market-based compensation of emissions reductions from deforestation in tropical countries. As a consequence of this proposal, a group of countries organised themselves in the ‘Rain Forest Coalition (RFC)’²⁴.

COP 11 invited Parties to submit their views on the issue and set up a working group which will report back to COP 13 in Bali. The following countries are generally supporting a RED trading scheme: Latin American countries (except Brazil), the Pacific countries (except Tuvalu) and the African countries. The Latin American countries in favour of market-based approaches for RED are pushing towards more project-based and sub-national approaches, while Costa Rica and Colombia are emphasizing the possibility of early action to be eligible in a future trading scheme. Brazil rejected a market-based approach and proposed a voluntary RED fund. This would be a non-market based approach under which countries reducing emissions from deforestation below a baseline would be compensated financially. Tuvalu rejected the trading scheme because of concerns over environmental integrity. In order to reconcile the different elements of earlier proposals, especially the Fund and the market-based approach, a new proposal was developed by the Center for Clean Air Policy, called the ‘Dual Markets approach’. This is a hybrid RED approach according to which the RED system would be a new and separate market from the current Kyoto carbon market, thus addressing concerns regarding a possible destabilization of the carbon market. To achieve the de-linking, Annex I countries would commit to post-2012 targets consisting of a Kyoto-type GHG reduction target *and* a RED goal, which could be achieved by RED credits as well as other Kyoto-type credits.

No final decision on reducing emissions from deforestation is expected Bali. It is likely that the outcomes of Bali will be a further process (until COP 15, 2009) to clarify open methodological questions with the view to developing modalities for a post-2012 period. In order to support this process by gathering practical experience, the establishment of a framework for a RED pilot-phase will be another issue on the negotiation table in Bali.

²⁴ Countries participating in the various activities of the RFC are: Bangladesh, Bolivia, Central African Republic, Cameroon, Chile, Congo, Colombia, Costa Rica, DR Congo, Dominican Republic, Ecuador, El Salvador, Fiji, Gabon, Ghana, Guatemala, Honduras, Indonesia, Kenya, Lesotho, Malaysia, Nicaragua, Nigeria, Panama, Papua New Guinea, Paraguay, Peru, Samoa, Solomon Islands, Thailand, Uruguay, Uganda, and Vanuatu.

6. ELEMENTS FOR A FUTURE INTERNATIONAL AGREEMENT ON CLIMATE CHANGE

This section provides an overview of elements of a future international climate agreement from the literature and public international discussions. It also draws upon earlier overviews (Bodansky 2004; Kameyama 2004; Blok et al. 2005; Philibert 2005a; Höhne 2006; Gupta et al. 2007).

Future international agreements on climate change can include the following major elements:

- 1. Participation:** A view of many experts in the science and research communities is that dangerous climate change can only be prevented if industrialised countries' emissions decline and developing countries' emissions do not rise as much as currently expected. Therefore, an increasing number of countries would need to take on increasingly stringent commitments.
- 2. Differentiation of emission targets – allocation:** For proposals that include emission reduction targets it is necessary to set the level of the reductions for individual countries. How should this “effort sharing” or allocation level be determined?
- 3. Types of commitments:** Currently, Annex I countries have committed themselves under the Kyoto Protocol to absolute binding emission reduction targets. Under an enhanced framework, other types of quantitative emission commitments could be applied as well, e.g. non-binding targets, intensity targets or sectoral baselines, or non-quantitative commitments such as the commitment to implement certain policies and measures.
- 4. Adaptation:** Even with stringent emission reductions, some level of adaptation to climate change will be necessary. A future climate agreement will include elements to support particularly vulnerable countries to adapt to climate change. Which countries receive support for adaptation, what kind of support and for which activities?
- 5. Technology:** It is the broad agreement that new technologies are to be developed and deployed to tackle the problem of climate change and that a future agreement should include elements of technology development and deployment.
- 6. Financing:** International activities on climate need financial resources. These can be implicitly included in emission targets (through emissions trading or project based mechanisms like the CDM) or explicitly expressed in the form of financial commitments or levies on emission intensive activities.

The numerous proposals are grouped below according to the main elements described above. We have also provided a first assessment of the elements by the authors.

6.1 Participation: Staged approaches

Several authors proposed that countries participate in a future regime in several stages with differentiated types and levels of commitments (Claussen and McNeilly 1998; Gupta 1998; Berk and den Elzen 2001; Blanchard et al. 2003; CAN 2003; Criqui et al. 2003; den Elzen et al. 2003; Gupta 2003; Höhne et al. 2003; Ott et al. 2004; Blok et al. 2005; den Elzen 2005; den Elzen et al. 2005b; Höhne et al. 2005a; Michaelowa et al. 2005; den Elzen et al. 2006; Höhne 2006). The current system which consists of essentially two stages (Annex I countries with emission reduction commitments and Non-Annex I countries with no emission reduction commitments), is expanded to include several intermediate stages.

Each stage has its stage-specific commitments. All countries agree to have commitments at a certain point in time and agree on certain thresholds when they would move to a next stage (e.g. emissions per capita or GDP per capita). A detailed system has been first proposed by Berk and den Elzen 2001.

An example of the types of different stages is provided from Höhne 2006:

- **Stage 1 – No commitments:** Countries with a low level of development do not have climate commitments. At minimum, all least developed countries (LDCs) would be in this stage.
- **Stage 2 – Enhanced sustainable development:** At the next stage, countries make a clear commitment to sustainable development. The environmental objectives are built into the development policies. Such a first ‘soft’ stage would make it easier for new countries to join the regime. Requirements for such a sustainable pathway would need to be defined, e.g. inefficient equipment is phased out and requirements and certain standards are met for any new equipment.
- **Stage 3 – Moderate absolute target:** In this stage, countries commit to a moderate target on absolute emissions. The emission level may be higher than in the starting year, but it should be below a reference scenario. The target could also be positively binding, meaning that allowances can be sold, if the target is exceeded. No allowances have to be bought, if the target is not achieved. An incentive to accept such a target would be the possibility of participating in emissions trading.
- **Stage 4 – Absolute reduction target:** Countries in stage 4 receive absolute emission reduction targets and have to reduce their absolute emissions substantially until they reach a low per capita level (essentially a fifth stage). How much each individual country has to reduce its emissions can be defined in different ways, e.g. converging per capita emissions, based on the Triptych approach (see section 6.2.7) or based purely on negotiations. As time progresses, more and more countries would enter stage 4.

In order to reach stringent, long term goals (such as maximum temperature increase of 2°C), additional countries, especially newly industrialised countries, need to participate relatively early, best would be soon after 2012, and before the middle of the century for major regions (East Asia and South Asia). These countries would start at significantly lower per capita emissions and GDP levels than industrialised countries.

Our assessment: It seems likely that any future regime will be staged in some form. Countries are very diverse. Hence, several types of targets are likely to exist in parallel. A staged or parallel setting is the most likely outcome of the sequential decision-making that is currently applied. The critical element of the approach is that additional countries participate early enough so that stringent environmental goals can be reached. Incentives for such participation (not just thresholds for participation) have to be included in the system.

6.2 Differentiation of emission targets - Allocation

Numerous proposals have been made to set the level of the reductions for individual countries. Most prominent options for “effort sharing” are described below.

6.2.1 Contraction and convergence

Contraction and convergence (C&C) was proposed by the Global Commons Institute (Meyer 2000; GCI 2005). Under this approach, all countries participate in the regime with quantified emission targets.

As a first step, all countries agree on a path of future global emissions that leads to an agreed long term stabilisation level for greenhouse gas concentrations ('Contraction'). As a second step, the targets for individual countries are set in such a way that per capita emissions converge from the countries' current levels to a level equal for all countries within a convergence period ('Convergence').

Current per capita emissions differ greatly between countries. Some developing countries could be allocated more emission allowances than necessary to cover their emissions. They could sell these allowances to developed countries, generating a flow of resources from developed to developing countries.

Under relatively strict long term targets (e.g. 400 ppmv CO₂eq.) and convergence by, e.g. 2050, not all developing countries would benefit from this approach. As the per capita emissions have to converge to a level below the current average of developing countries, those developing countries above or close to the average (e.g. Argentina, Brazil, Venezuela, Mexico, South Africa, Korea, Namibia, Thailand, China) will soon (e.g. 2020) be constrained and will not receive excess allowances, so called "hot air". More excess allowances would be available under a higher concentration target, e.g. 550 ppmv CO₂, or under earlier convergence, e.g. by 2030.

Our assessment: The concept of eventually converging per capita emissions in the long term could be part of a future regime. However, classic Contraction and Convergence seems too simple to accommodate the concerns of all countries. A decision that all countries participate at once could be seen as unrealistic.

6.2.2 Common but differentiated convergence

Common but differentiated convergence (CDC) is a new approach presented by Höhne et al. 2006a. Annex I countries' per capita emission allowances converge within, e.g., 40 years (2010 to 2050) to an equal level for all countries. Individual non-Annex I countries' per capita emissions also converge within the same period to the same level but the start of convergence is only delayed: from the date, when their per capita emissions reach a threshold (the gradually declining global average of per capita emissions). Non-Annex I countries that do not pass this percentage threshold do not have binding emission reduction requirements. Either they take part in the Clean Development Mechanism or they voluntarily take on "no lose" emission reduction targets. Under the latter, emission allowances may be sold if the target is overachieved, but no emission allowances have to be bought if the target is not reached.

The CDC approach, similarly to C&C, aims at equal per capita allowances in the long run. In contrast to C&C it considers more the historical responsibility of countries. Annex I countries would have to reduce emissions similarly to C&C, but many Non-Annex I countries are likely to have more time to develop until they need to reduce emissions. Non-Annex I country participation is conditional to Annex I action: Non-Annex I countries participate only once they reach the world per capita average, which is decreased by lowering emissions from Annex I countries. No excess emission allowances would be granted to least developed countries.

Our Assessment: The "Common but Differentiated Convergence" approach is likely to also meet resistance of some developed countries due to the element of per capita convergence. But even if it is not implemented in its entirety, future decisions could be guided by the principles provided in the approach: that developed countries' per capita emissions converge in the long term and that developing countries do the same but delayed and conditional to developed country action.

6.2.3 Other variants of the per capita concept

Another variant of the per capita concept is to allocate emission entitlements immediately based on their population and not allowing for a transition period as with the approach above (Agarwal and Narain 1991; Baer et al. 2000; Wicke 2005). Emission trading would be allowed to bridge the gap between the currently huge differences in per capita emissions (USA 25 tCO₂eq and Non-Annex I average of 3 tCO₂eq). This would result in a large stream of resources from industrialised countries to developing countries.

Others suggest that countries should be allocated the emissions necessary to satisfy their basic needs (Aslam 2002; Pan 2005) or GDP adjusted per capita emissions (Gupta and M Bhandari 1999).

6.2.4 Historical responsibility - The Brazilian Proposal

During the negotiations of the Kyoto Protocol in 1997, the delegation of Brazil proposed to share the burden of emission reductions according to the historical responsibility of countries to climate change. The proposal suggested using the impact of historical emissions on the global average surface air temperature as an indicator for historical responsibility for climate change and sharing the emission reduction burden among industrialised countries accordingly, assigning a higher percentage reduction to countries with a higher historical responsibility.

With the adoption of the Kyoto Protocol in 1997, the proposal was overtaken, but the consideration of its methodological and scientific aspects has been subject to continued debate within the international negotiations and in the scientific literature (UNFCCC 1997; Rose et al. 1998; Meira Filho and Gonzales Miguez 2000; Pinguelli Rosa and Ribeiro 2001; den Elzen and Schaeffer 2002; La Rovere et al. 2002; Andronova and Schlesinger 2004; Pinguelli Rosa et al. 2004; Trudinger and Enting 2004; den Elzen et al. 2005a; den Elzen et al. 2005c; Höhne and Blok 2005; Rive et al. 2006). A joint scientific effort is currently being organized by the Ad hoc group on the modelling and assessment of contributions to climate change²⁵.

Our assessment: It is very likely that the element of historical responsibility will play a role in the design of a future agreement. It is, however, unlikely that it will be the only parameter used for sharing emission reductions between countries. It is more likely that it will be used as one indicator to determine when a country would have to act. It could also be used to determine the share of financial contribution to adaptation activities.

6.2.5 Ability to pay

Emission reductions could be shared as a function of ability to pay (welfare) (Jacoby et al. 1998; Lecoq and Crassous 2003). Countries with higher GDP would have to reduce more compared to countries with lower GDP.

Our assessment: It is likely that the ability to pay measured in GDP will be one but not the exclusive element for sharing emission reductions between countries. Interests of countries are too diverse to agree on only one parameter for burden sharing.

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6.2.6 Equal mitigation costs

Emission reductions could be differentiated so that all participating countries have the same welfare loss. This has been proposed during the Kyoto negotiations and also in the scientific literature (Rose et al. 1998; Babiker and Eckhaus 2002). The implementation of the approach would require an agreed model that would calculate the welfare loss in advance.

Our assessment: At first sight it seems to be a fair solution to share the costs of reducing emissions. However, the implementation would be very difficult, as one would first have to agree a definition of “costs” and then on a model to calculate the welfare loss in advance of agreeing on emission reduction targets. Therefore, it is unlikely that mitigation costs are used as an official key for sharing the reduction effort. However, costs are a major parameter to all countries and negotiators will come prepared with national estimates of emission reduction costs (and that of the other countries) and will use this as background information.

6.2.7 Triptych

This approach was originally developed at the University of Utrecht (Blok et al. 1997) to share the emission allowances of the first commitment period of the Kyoto Protocol within the European Union. It has been updated and revised subsequently (Berk and den Elzen 1998; Groenenberg 2002; den Elzen and Berk 2004; Höhne et al. 2005a; Höhne 2006; Michel den Elzen et al. 2007). The approach was originally based on three sectors (electricity production, industrial production and domestic sectors) but has been extended to include all GHG emissions of all sectors.

The Triptych methodology calculates emission allowances for the various sectors which are added to obtain a national target. Only the national targets are binding, not individual sectoral targets. This allows countries the flexibility to pursue any cost-effective emission reduction strategy.

The emissions of the sectors are treated differently: For ‘electricity production’ and ‘industrial production’, a growth in the physical production is assumed together with an improvement in production efficiency. This takes into account the need for economic development but constant improvement of efficiency. For the ‘domestic’ sectors, convergence of per capita emissions is assumed. This takes into account the converging living standard of the countries. For the remaining sectors in the extended approach, fossil fuel production, agriculture and waste, similar reduction and convergence rules are applied.

Our assessment: The Triptych approach is a sophisticated approach to sharing emission allowances within any group of countries. It is therefore an excellent method for taking different national circumstances of countries into account, although it also has high data requirements. Especially the assumed future production growth rates are critical. The approach could be applied globally, but best would be on any subset of countries (e.g. in the group of reducing countries in a staged approach) where sectoral data are available.

6.3 Alternative types of commitments

In the Kyoto Protocol, industrialised countries have national absolute emission reduction targets. Developing countries have no quantitative emission targets, but can participate through emission reduction projects through the Clean Development Mechanism. Alternative types of commitments have been proposed, which are described in this section.

6.3.1 Absolute emission targets

Absolute emission reduction targets can be measured in Mt or as percentage of base year emissions. Such targets are included in the Kyoto Protocol where most Annex I countries have committed themselves to keep their absolute national greenhouse gas emissions in a target year below a fixed amount (a “cap”).

Such a target can be reached in a very flexible manner across greenhouse gases and sectors as well as outside of the national territory through emission trading and emission reduction projects outside of the country (Joint Implementation, JI, and Clean Development Mechanism, CDM). Each country determines its own national strategy to meet the target.

Some countries have criticised this type of target. The USA has rejected its Kyoto target as being too rigid and causing harm to the economy. But almost all nationally proposed policies include absolute caps for the USA, so it seems likely that if the USA would return to the international regime, it could be with an absolute emission reduction target.

In addition, most developing countries currently reject these targets as they are seen as limiting economic growth. But some Non-Annex I countries could also take absolute emission targets. Due to the principle of common but differentiated responsibility, this would only apply for countries with a level of development, economic power and historical responsibility similar to those of Annex I countries, e.g., those countries whose Human Development Index, GDP per capita and cumulative emissions per capita are in the range of Annex I countries.

Our assessment: Absolute emission targets have high environmental effectiveness as far as their implementation can be guaranteed. When combined with emission trading, they have high economic efficiency, as emissions can be reduced where it is most cost effective. Equity concerns are accommodated by the selection of countries that commit to such targets and the level of the required reduction per country. The technical feasibility of the approach depends on the institutional circumstances in the country. Generally, a large amount of data and data reliability are needed to assure the compliance with the target. Hence, it is very likely that the system of absolute emission targets will be continued at least for the current Kyoto parties, but possibly also in the long run for the USA and advanced developing countries.

6.3.2 National intensity targets

Intensity targets link the reduction of emissions to GDP (e.g. kgCO₂/\$)(Hargrave et al. 1998; Baumert et al. 1999; Lutter 2000; Müller et al. 2001; Bouille and Girardin 2002; Chan-Woo 2002; Lisowski 2002; OECD/IEA 2002; Ellerman and Wing 2003; Höhne et al. 2003; Müller and Müller-Fürstenberger 2003; Jotzo and Pezzey 2005; Philibert 2005b; Pizer 2005; Kolstad 2006). Therefore, intensity targets allow a high degree of flexibility to react to national circumstances. The target itself expressed as intensity is constant but the final outcome in emissions depends on the performance of the GDP. For example: the target of 4% improvement of intensity (greenhouse gas emissions per GDP) could be reached by a *reduction* of absolute emissions by 1% and an *increase* of GDP by 3%.

When the USA rejected its Kyoto target in 2001, it suggested an intensity target as an alternative, aiming to reduce its intensity by 18% in 10 years. If one assumes a 3% annual increase in GDP, this is equivalent to an *increase* in absolute emissions by 10% over the 10 years.

Intensity targets could be an option for some countries. But especially for developing countries the direct relationship between national emissions and GDP is not always apparent, thus increasing the uncertainty. For example, Argentina offered a voluntary target indexed to GDP in 1999, where a 1% increase in GDP would allow a 0.5% increase in emissions.

This was due to the fact that agriculture contributes significantly to the total emissions, but less significantly to the national GDP. Only for the few countries that are very advanced in their development and where the emissions are well correlated with GDP, intensity targets could be applied.

Our assessment: Intensity targets can be environmentally effective if set at stringent levels. A degree of uncertainty on the final emission levels is introduced due to the link to the unknown growth of the GDP. When combined with emission trading, intensity targets have high economic efficiency, as emissions can be reduced where it is most cost effective. The economic efficiency is less than for absolute targets, as the final level of emission allowances is not known. Equity concerns are accommodated by the selection of countries that commit to such targets and the level of the required reduction per country. The technical feasibility of the approach depends on the institutional circumstances in the country. Especially GDP growth rates can fluctuate considerably between years. Generally, a high amount of data and data reliability is needed to assure the compliance with the target.

6.3.3 Price cap

The price cap is a hybrid between a tax and emission trading. After the initial allocation of emission allowances, an unlimited amount of additional allowances can be sold at a fixed price. The price cap reduces economic uncertainties because emission reductions would only take place if they are cheaper than the price cap. Price caps could be available for all or only for a subset of countries in the system (Pizer 1999; Aldy et al. 2001; Pizer 2002; Jacoby and Ellerman 2004; Philibert and Reinaud 2004).

Our assessment: Targets with a price cap can be environmentally effective if the cap is set at a high level. A price cap would have a positive influence on economic efficiency as emission trading would be possible at prices below the price cap. At higher prices the cap could work like a tax, which would have negative impacts on economic efficiency. Equity considerations would depend on the level of the price cap. The technical feasibility of the approach depends on the institutional circumstances in the country. In any case, reliable data on marginal abatement costs would be necessary before fixing the cap.

6.3.4 Dual targets

A modified version of an absolute target would be the dual target. This provides two thresholds. The target is met if the national emissions are lower than the upper target. If they are reduced below the lower target, the country can participate in international emission trading and sell these additional reductions. The target is not met if the emissions exceed the upper target (Philibert and Pershing 2001; Kim and Baumert. 2002).

Our assessment: The environmental effectiveness is constrained because the resulting emissions are known only within a certain range. Dual targets may increase economic efficiency if they allow an increasing share of countries to participate in the emission trading system. Equity concerns are accommodated by selecting the countries that commit to such targets and the level of the required reduction per country. The technical feasibility of the approach depends on the institutional circumstances in the country. Errors made in the calculation of the emissions are less relevant compared to absolute targets, if the final emissions are within the target range.

6.3.5 No-lose targets

A weakened version of an absolute binding target would be a no-lose target (Philibert 2000). Under such a target emission rights can be sold to other countries (with binding absolute emission targets), if emissions are below the target. No additional rights have to be bought, if emissions are above the target. Therefore, participation in the climate regime by applying such a type of target can have advantages but has no disadvantages for the country. It can be set so that a first share of reductions is contributed by the country, while a second share is then supported by sales of allowances. As a variant, emission rights could be discounted when sold (e.g. 50%) to provide an incentive to take on an absolute target, where they would not be discounted.

Our assessment: This type of target is attractive to developing countries as incentive to participate without having to fear consequences in the case the target is not met. The environmental effectiveness depends on the level of the target. It is uncertain whether the target will be met and emission allowances generated by emission reductions exceeding moderate targets will be used by other countries to increase their emissions. No-lose or dual targets may increase economic efficiency of the global system if they allow an increasing share of countries to participate in the emission trading system that would not have otherwise. Equity concerns are accommodated by selecting the countries that commit to such targets and the level of the required reduction per country. The technical feasibility of the approach depends on the institutional circumstances in the country.

6.3.6 Indicative targets

Indicative targets include just the statement of any kind of goal. Reaching or not reaching the target has no consequences. This means that participation in emission trading is not possible.

Our assessment: The environmental effectiveness is very low because of the uncertainty whether the target will be met. The technical feasibility of the approach is high because monitoring is desirable but not necessary. The other characteristics depend on the actual type of indicative target.

6.3.7 Sectoral targets

Sectoral targets only consider sectors that are particularly suited for a sectoral approach, such as industrial or electricity production. In developing countries only part of the economy might provide the infrastructure or data availability that would be necessary to accept national reduction targets. However, single sectors might be able to do so. Focusing on one or two sectors would reduce the effort necessary to comply with a target. Sectoral targets could be designed as intensity targets. Only the relevant sectors would take part in international emission trading. Applied on the global level, sectoral targets might address competitiveness concerns within a global sector. (Philibert and Pershing 2001; Samaniego and Figueres 2002; Bosi and Ellis 2005; Ellis and Baron 2005; Sterk and Wittneben 2005; Watson et al. 2005; Höhne et al. 2006b; Schmidt et al. 2006).

Our assessment: Sectoral targets are very often mentioned in the international negotiations, but it is sometimes unclear whether global agreements for a sector or emission targets for only one sector within a country are meant. Targets for only one sector of a country seem to be a good stepping stone for newly participating countries to learn by doing. Global agreements for a sector seem to be only useful as a supplementary activity to nation based commitments. Sectoral targets can be environmentally effective if applied to as many sectors as possible.

They can be economically efficient if they are linked to the global carbon market. Equity concerns are accommodated if applied to particular countries. The technical feasibility of the approach depends on the sector. Sectoral approaches are well suited for homogeneous sectors with few participants (large industrial sectors) but possibly less so for sectors with heterogeneous and numerous participants (e.g. households).

6.3.8 Extended CDM

Another option for non-Annex I countries would be to extend the Clean Development Mechanism (CDM) from a project-by-project mechanism to include also sector-wide national emission reduction projects or reduction policies. It would then also include reductions as a result of sector policies. The amount of the reduction credits would be the difference between the sector's baseline level and the actual level. Any transfers would take place only after verification by an independent entity (Philibert and Pershing 2001; Samaniego and Figueres 2002; Bosi and Ellis 2005; Ellis and Baron 2005; Sterk and Wittneben 2005).

Extended CDM could be a big incentive for developing countries to commit to future action. This could be bound to further, more stringent contributions. As a variant, emission rights could be discounted (e.g. 50%) when sold to provide an incentive to take on an absolute target, where they would not be discounted. Another possibility would be to tie the extended CDM to a maximum amount of carbon credits that may be generated under the extended CDM within a country. If this amount is exceeded the country has to graduate to the next stage of more stringent contributions (BASIC team 2006).

Our assessment: Increased use of extended CDM has no direct influence on the environmental effectiveness of the system: Emission allowances generated from extended CDM will be used by other countries to increase their emissions. However, in the long term the development path of the host countries may be less carbon intensive, extended CDM could have a positive influence on the countries capability to mitigate emissions and these countries could be more easily integrated into the emission reduction system. Extended CDM may increase global economic efficiency as it includes capture low cost mitigation opportunities. Equity is addressed as the projects consider the needs and capabilities of the host countries. The technical feasibility seems high, particularly as many developing countries have already implemented a working CDM infrastructure. However, expanding the CDM to sectors and policies requires new methodologies. The related data must be very reliable because of the high number of credits (CERs) generated.

6.3.9 Sustainable development policies and measures

The sustainable development policies and measures (SD PAMs) approach is a pledge to implement development policies that have an additional climate benefit (Winkler et al. 2002; Baumert et al. 2005). This recognises the political reality that development has a higher priority than climate change for many developing countries. Countries could receive support for the implementation of these policies from other countries through e.g. Official Development Aid (ODA). Different levels of SD PAMs are currently discussed:

- *Registry of measures:* A set of SD PAMs is simply registered without any need for quantification of effects or monitoring (A proposal by South African, UNFCCC 2006a)
- *Complementary activities for reaching another type of target:* The major target of a country could e.g. be a no-lose target or a sectoral target. SD PAMs could be seen as a means to reach this target.

- *Effect of SD PAMs quantified and credited:* The emission reduction effects of SD PAMs could be quantified. For these reductions emission credits could be granted to sell on the international carbon market. This could serve as a stepping stone for developing countries to participate actively in the international climate regime.

Our assessment: The characteristics of SD PAMs as complementary activities depend on the type of contribution they are related to. The environmental effectiveness of the SD PAMs may be small in the short term, but SD PAMs can early lead to less carbon intensive development with important impacts on long-term emissions. SD PAMs may be economically efficient for the country depending on the package of policies. SD PAMs focus specifically on the equity aspect of the need for economic development. Technical feasibility regarding SD PAMs includes mainly the national infrastructure to implement policies and measures. Assessing the impact of the SD PAMS on emissions is methodologically challenging. For crediting of SD PAMs detailed information on the reduction effects are necessary.

6.3.10 Types of commitments for land use change and forestry

Emissions from land use change and forestry are only in part included in the emission targets of Annex I countries under the Kyoto Protocol. There is currently a debate on how to include the relatively high emissions from deforestation in developing countries in a future regime.

The range of incentive mechanisms for reducing emissions from deforestation can either be expressed as emission targets and linked to the global carbon market or treated separately from the carbon market. Market based options range from including these emissions as activity under the CDM or an expanded CDM to national sectoral targets (binding and no-lose, linked or not linked to the carbon market). Non-market based approaches include funds, transfer payments and Sustainable Policies and Measures (SD PAMs).

Our assessment: Reducing emissions from deforestation in developing countries is an important test case for new types of commitments for developing countries. The discussion started, because a group of developing countries proposed including their emissions from deforestation in the carbon market. The forestry sector is, however, the sector where accurate accounting for emissions is most difficult and many fear that inclusion of these emissions would risk bringing the carbon market out of balance by e.g. flooding the market with cheap credits. A final solution is not yet foreseeable, but an approach that loosely links these emissions to the carbon market by e.g. a separate target or a slow phase in could bridge the current gap between countries.

6.3.11 Most promising options/combinations of types of commitments

Many combinations of the types of commitments described above would in principle be possible. There are several combinations that are most discussed or most promising at this stage.

Absolute emission targets: Absolute emission targets are most likely retained for developed countries. Current parties to the Kyoto Protocol are determined to keep the system running with targets for developed countries and the option of CDM. Given the current national debate in the USA, it seems likely that if the USA returns to the international negotiations then it would also be with absolute emission targets. Absolute emissions targets could also be a suitable contribution for the most advanced developing countries, such as South Korea or Singapore. These countries have the capability to act due to a comparatively high per capita income. At the same time they have high emissions and the necessary infrastructure to implement and monitor this kind of target.

Dynamic sectoral no-lose targets: Dynamic sectoral no-lose targets could be suitable options for advanced developing countries, such as Mexico, South Africa or Brazil. These countries have higher per capita income than the average group of Non-Annex I. Their emissions are increasing considerably and some sectors might provide the necessary infrastructure for no-lose targets.

Registry of sustainable development policies and measures: The registry of SD PAMs might be suitable for medium developing countries, such as India. The advantages of SD PAMs could be combined with a first contribution to the international climate regime for those countries with fast increasing emissions and low capability. Exact quantification of the effects on emissions would be desirable but not necessary.

6.4 Adaptation

While a large body of work exists on commitments for mitigation (reduction of greenhouse gas emissions), far fewer ideas and proposals are available on how a future climate regime could assist vulnerable countries to adapt to the adverse effects of climate change. Existing greenhouse gas concentrations in the atmosphere and current emissions trends mean some impacts are unavoidable in the next 10-20 years. Hence, the inclusion of adaptation elements as part of a future international climate policy framework is now widely accepted.

Support for adaptation could take various forms: Information tools to assess vulnerability and adaptation are already available and their use is supported through the current UNFCCC system. Countries could be assisted in implementing regulatory measures such as improved building codes. Financial commitments of industrialized countries could support insurance mechanisms as well as concrete adaptation projects in developing countries. New sources of finance would be necessary to increase the volume of the already existing adaptation fund to address upcoming adaptation needs. Cooperation on technology research, development and deployment (e.g. drought resistant crops) could be another option.

Our assessment: Further work is necessary to define exactly which adaptation activities should be supported by the international system and how. A core element is unresolved: finding financial resources to fund adaptation activities.

6.5 Technology

It is widely agreed that new technologies are to be developed and deployed to tackle the problem of climate change and that a future agreement should include elements of technology development and deployment. Several proposals have been made for further technology cooperation. E.g. Sugiyama et al. 2003 suggested an “Orchestra of Treaties” with separate treaties, some among like-minded countries (Emission Markets, Zero Emission Technology, Climate-wise Development) and some among all parties to UNFCCC (Monitoring, Information and Funding). The Asia Pacific Partnership on Climate and Development²⁶ is an example of an existing separate agreement on technology cooperation.

During the UNFCCC Dialogue several options were mentioned (UNFCCC 2007e). Options include enhancing investment in well-structured research and development activities, replication of successful public-private partnerships and targeted capacity-building for developing countries. It was also suggested that pilot projects, and clean development partnerships and programmes are enhanced to demonstrate new climate-friendly technologies. Another option was a market-based technology transfer mechanism, which would provide incentives for investors to transfer clean technologies.

²⁶ <http://www.asiapacificpartnership.org/>

Our assessment: Technology cooperation on research and deployment of new technologies is essential for solving the problem of climate change. It can however only be a supplemental activity to a broader framework that includes other activities on mitigation to ensure reductions, also in the short term. Technology cooperation on its own will not be able to limit global emissions to keep the average global temperature rise below the limit of 2°C.

6.6 Financing

International activities on climate need financial resources. These can be implicitly included in emission targets (through emissions trading or project based mechanisms like the CDM) or explicit in the form of financial commitments or levies on emission intensive activities.

The South North Proposal (Ott et al. 2004, see also below) for instance explicitly proposes additional financial commitments by developed countries to finance emission reductions in developing countries.

A recent effort by the UNFCCC secretariat has lifted the issue of financing into the focus (UNFCCC 2007c). The paper proposes several new sources of financing: A levy on the emission trading, CDM and JI; auctioning of allowances from international transport (these emissions are currently outside of the Kyoto system); international air travel levy, allocation of foreign exchange reserves to fund mitigation projects; access of developing countries to renewable energy support systems in developed countries; debt-for-efficiency swap, tax on wholesale currency transactions; donating “special drawing rights” provided by the International Monetary Fund.

Our assessment: Direct financial commitments of government have not been successful in past climate negotiations. The current commitment that developed countries shall pay for the incremental costs of developing countries actions to mitigate climate change through inter-governmental funding²⁷ are not fully implemented. Financing efforts are more likely to be successful, if they can be implemented through private sector engagement and do not come from government budgets. As an example: the financial flows from the private sector through the CDM are orders of magnitude higher than the flows through government funds under the UNFCCC. Hence, indirect financing mechanisms are necessary, e.g. through emission targets, access to renewable energy markets, levies or the like.

27 Art 4.3. of the UNFCCC: “The developed country Parties and other developed Parties included in Annex II [...] shall also provide such financial resources [...] needed by the developing country Parties to meet the agreed full incremental costs of implementing measures that are covered by paragraph 1 of this Article [referring to measures to limit greenhouse gas emissions] [...]”

7. RECENT PROPOSALS OF A FULL FUTURE REGIME

Recently several prominent proposals for a full international climate regime have been made by various groups. All of these proposals are from non-governmental institutions but most were prepared with government input and therefore provide a good overview of the spectrum of options. This section presents the most prominent ones of them.

7.1 A Viable Global Framework for Preventing Dangerous Climate Change, Climate Action Network (CAN)

The worldwide network of 400 NGOs “Climate Action Network (CAN)” promotes action to limit human-induced climate change to ecologically sustainable levels. It issued its ideas for a global framework at COP-9 in December, 2003, parts of which were refined for later UNFCCC meetings.

CAN proposes a parallel three track approach to mitigating climate change which includes a Kyoto track, a ‘Greening’ (decarbonisation) track, and an Adaptation track on the same or a very similar timetable: The Kyoto track builds upon the UNFCCC and the Kyoto Protocol, with its system of legally binding absolute emission reductions and compliance regime. The legally binding tradable emission obligations are the core of a system that will drive rapid technological development and diffusion, and provide the technological basis for win-win solutions to climate and sustainable development objectives. The ‘Greening’ (decarbonisation) track would drive the rapid introduction of clean technologies that can reduce emissions and meet sustainable development objectives in developing countries. Industrialized countries would provide resources and technology to drive much of this track. The Adaptation track provides the resources to the most vulnerable regions (small island states, least developed countries) to deal with unavoidable climate changes. Countries receiving support under the Adaptation track could also operate in the Greening (decarbonisation) track.

The level and character of the mitigation actions within this framework would be determined by reference to an agreed level of per capita emissions, the ability or capacity to act (including measures such as per capita income) and the historical responsibility. In this context industrialized countries have the obligation to act first to reduce their emissions in absolute terms. The emission reduction targets in the emission reduction stage of the Kyoto track would be set with a strong reference to the need for per capita emissions to converge over the course of the 21st century. Other fairness criteria such as historical responsibility would also play a role in setting the overall timing, level and character of the emission action required of different countries. A combination of factors such as per capita emissions, ability or capacity to act and historical responsibility would be used to determine when and how countries move from the ‘Greening’ (decarbonisation) track to the Kyoto track.

Our assessment: The NGO network has presented a general framework, essentially a staged approach, but has not yet specified the elements within the framework. Questions are open on exactly which countries are part of the three tracks and how much individual developed countries need to reduce their emissions. These discussions are currently ongoing in the NGO community.

7.2 South North proposal – Equity in the greenhouse

A particular proposal for a staged system is the proposal of the South North Dialogue – Equity in the Greenhouse (Ott et al. 2004; Höhne and Ullrich 2005; Michel G.J. den Elzen et al. 2007).

Based on the three criteria that were applied for the differentiation of countries (responsibility, capability and potential to mitigate), a set of decision rules was developed to determine type(s) of commitments for each of the six groups of countries identified. Applying these decision rules to the six country groups results in (strict) reduction commitments for Annex I countries, but also implies quantifiable mitigation obligations for some non-Annex I countries assisted by financial transfers from the North.

Annex I countries retain Kyoto-style quantitative commitments, i.e. quantified (absolute) emissions reduction obligations with targets for OECD countries within Annex I (so called Annex II countries) being more demanding than Kyoto levels. The latter would also be committed to financial and technological transfers to those non-Annex I countries with low-to-medium capability to mitigate.

Countries belonging to the group of “Newly Industrialised Countries (NICs)” and “Rapidly Industrialising Countries, (RIDCs)” would have to take on quantitative mitigation commitments as well – although subject to the condition that all major Annex I countries (including the USA) take on quantified emission reduction commitments and fulfil their commitments to provide financial and technological resources. NIC countries, due to their high level of responsibility and potential to mitigate, would have absolute limitation or reduction commitments, but will also have access to financial and technological resources (from Annex II countries) to help them fulfil the commitments. RIDC countries would also take on absolute limitation targets, and would have access to an even greater share of resources, consistent with their lower capacities.

Qualitative mitigation commitments (policies and measures) will also be obligatory for the group of ‘other developing countries’, but quantifiable mitigation commitments for these countries and the group of least developed countries (LDCs) would not be justifiable (until their status changes).

The proposal also suggests commitments on adaptation relating to capacity building, international funding and insurance mechanisms.

Our assessment: The South North Proposal was ground breaking at the time of its publication: the group of authors (a good mix of researchers from developing and developed countries) proposed for the first time a concrete split of countries into groups with differentiated commitments. It also proposed the first full system of emission targets, financial commitments and actions on adaptation. Later analyses of the proposal specified the amount of necessary reductions of the various groups not originally included in the proposal.

7.3 International Climate Efforts Beyond 2012: Report of the Climate Dialogue at Pocantico

The Pew Center is a non-profit, non-partisan and independent organization whose mission is to provide information, analysis and solutions in the effort to address global climate change. The Pocantico Report (PEW 2005) reflects the spirit and the outcome of a high level dialogue exploring options for advancing the international climate effort beyond 2012. Government, business, and civil society from 15 countries participated in the dialogue. The dialogue ended in 2005. Working papers examining some elements have since been elaborated on.

The Pocantico Report lists a set of criteria for an effective framework, elements of it and a process to reach it, without specifying a full, detailed package. According to the proposal, the international framework must:

- Engage major economies
- Provide flexibility
- Couple near-term action with a long-term focus
- Integrate climate and development
- Address adaptation
- Be viewed as fair

The report lists as elements of the future international effort:

- Long-Term, Aspirational Goal: Governments continue to articulate their own visions of a long-term objective to possibly be merged into a more concrete common view informally guiding the international effort.
- Adaptation: New assistance could support national adaptation strategies.
- Targets and trading: Emission targets (varied in time, form and stringency) coupled with international emissions trading.
- Sectoral Approaches: Commitments structured around key sectors such as power, transportation or land use could take a variety of forms: emission targets, performance- or technology-based standards, or “best practice” agreements.
- Policy-based approaches: Countries could commit to broad goals integrating climate and development objectives, then pledge national measures to achieve them and report periodically on implementation and results.
- Technology Cooperation: Governments could coordinate and increase support for research and development of long-term technologies. Stronger cooperation also is needed to facilitate the deployment of clean technologies in developing countries.

The report also makes two suggestions on the process: the initiation of a dialogue among major economies and attempts to link approaches.

Our assessment: The report of the dialogue provides general elements of a future framework without specifying the elements. This may be an illustrative example of how difficult it may be to get an agreement among a small group of stakeholders on a future approach.

7.4 Sao Paulo Proposal of the BASIC project

The Sao Paulo Proposal (SPP) (BASIC team 2006) is one output of the BASIC Project, a capacity strengthening project – funded by the European Commission– that supports the institutional capacity of Brazil, India, China and South Africa. The proposal is not a consensus document of the individuals, organizations or countries participating in the BASIC project. Its purpose was primarily to elicit discussion of future climate policy issues by project participants and the wider climate community.

The proposal mixes elements to conceptualize a stable, long-term, universal regime that reflects the principles of equity and common but differentiated responsibilities and respective capabilities. The proposal tries to foster the fundamental technological changes and structural shifts necessary to stabilize GHG concentrations in the atmosphere as well as provide adequate financial resources for adaptation by vulnerable countries.

The Proposal establishes a long-term (indefinite) regime whose performance is assessed at 5 year intervals against agreed climate and development goals. Annex I Parties would negotiate annual commitments for 2013-2018 covering all national emissions, but have flexibility to choose the form of the commitment. Each year the commitments of all Annex I Parties are extended by one year (2019 is set in 2013, etc.) The commitment becomes slightly more stringent (a 1% reduction) if compliance has been relatively easy (units carried over has increased or real price has not increased). Non-Annex I Parties have a choice of participating in the CDM as at present, reporting the emissions reductions achieved by their sustainable development (SD) policies (but with no possibility of credits), or adopting a “no lose” target, which can generate credits. Each non-Annex I Party is allocated a share of a global limit on CDM transfers based on a formula that reflects its population and the principles of responsibility, capacity and opportunity. The allocations are adjusted at five year intervals to reflect changing circumstances. When a non-Annex I Party reaches its limit on CDM transfers or the limit drops to zero, it is expected to become an Annex I Party.

Existing carbon markets are maintained and the 2% levy currently applied to CDM projects is extended to international transfers of other units with the revenue going to a technology fund. Allowances for emissions from international aviation and shipping (currently outside of the Kyoto system) are auctioned with the revenue used for adaptation. A new Adaptation Committee of Experts (ACE) is established to advise on implementation of adaptation activities. A prompt start for implementation of adaptation activities is launched. All parties update design criteria and standards for infrastructure and equipment regularly to “climate proof” new facilities. A financial mechanism to address extreme events is established. And criteria are developed to fund adaptation by the most vulnerable human populations and natural ecosystems. Funds are available to assist developing country participation in technology R&D and deployment. A mechanism is proposed for technology transfer to settle disputes over e.g. intellectual property rights.

In order to broaden coverage, a memorandum of understanding can be approved to cover emissions outside the boundaries of parties (international bunkers), sub-national governments of non-parties, the national government of a non-party, or with an industry sector (subject to resolving the associated accounting issues). The SPP allows Parties to impose economic sanctions against non-parties who refuse to enter into a memorandum of understanding.

Our assessment: This very recent proposal inspired the debate as it provided the most comprehensive proposal to date. It included all elements of a future regime in a balanced way. As such a package deal it started a discussion on how to fit the many pieces of proposals together in a full system.

7.5 Policy Directions to 2050, A Business contribution to the dialogues on cooperative action

The World Business Council for Sustainable Development (WBCSD) is a CEO-led, global association of some 190 companies dealing exclusively with business and sustainable development whose mission is to provide business leadership as a catalyst for change toward sustainable development. The publication Policy Directions to 2050 (WBCSD 2007) is the third in the Energy & Climate series. The intention of the series is to engage governments on future climate policy by translating the scale & complexity of future challenges into simple, illustrative pathways to 2050.

The WBCSD's publication identifies policy options to sustain economic growth while transforming the ways energy is accessed, produced and consumed. It sets out an illustrative road-map from which routes must be chosen for the transition to a low greenhouse gas (GHG) economy. The WBCSD's main contribution is to energy use and infrastructure, rather than to deforestation and adaptation which need separate policy frameworks.

Whilst not endorsing any particular pathway, technology or specific atmospheric concentration target, the WBCSD, puts forward policy options in the context of a long term atmospheric concentration of CO₂ of no more than 550 ppm.

The WBCSD contribution calls for the development and deployment of leading-edge technologies through partnerships and incentives and an approach to mitigate long-term market risk and deliver secure benefits for large-scale, low-carbon, new-technology projects. The four policy priorities are:

Establishing by 2010 a quantifiable, long-term (50-year), global emissions pathway for the management of GHG emissions.

Beyond 2012, using the existing international framework as a basis, and modifying it to build up from local, national, sector or regional programs. Allow for broadening of CDM to sectoral level.

Building robust programs at the national level to encourage energy efficiency; broaden the range of fuels in the transport sector; and country-wide boosting of awareness and incentives for consumers across all levels of society toward low-carbon products, services and lifestyles.

Developing and commercializing a number of low- and zero-GHG technologies over the coming decades, including through enacting supporting policies and programs to address technical and cost challenges.

The approach allows industry sector participation across multiple facilities or technology platforms at the national level and trans-nationally and enhancing GHG project mechanisms (like the CDM). It aims to progressively including all countries, developing and developed.

Our assessment: Industry is taking an active role in shaping the discussion on a future framework. It is remarkable that industry proposes an approach that is driven by national programmes, not "top down" from the international level.

7.6 Global leadership for climate action: Framework for a Post-2012 Agreement on Climate Change

Global Leadership for Climate Action (GLCA) was convened by the United Nations Foundation and the Club of Madrid to mobilize political will for far-reaching, long-term action to prevent catastrophic climate change. It consists of six former heads of state, seven former heads of government, and 12 leaders from government, business and civil society, who together represent more than 20 countries.

The GLCA framework proposes (GLCA 2007) four pathways to be addressed in upcoming negotiations:

Mitigation – Targets, Timetables, Market-Based Mechanisms: To collectively reduce global emissions by at least 60% below 1990 levels by 2050, developed countries, including the United States, should adopt effective targets and timetables for reductions. As a first step, this could include a commitment to reduce emissions by 30% by 2020. Rapidly industrializing countries, including China and India, should commit to reduce their energy intensity by 30% by 2020 (an average of 4% per year) and agree to emissions reduction targets afterwards.

Other developing countries should commit to energy intensity targets differentiated by their responsibilities and capabilities. A carbon price should be set through carbon taxes or trading. The preferable mechanism would be a system of harmonized, universal carbon taxes, but it is recognized that many in industry prefer a cap and trade system. Cap and trade systems should be financially linked across the globe with auctioning of emission allowances.

Adaptation: Adaptation to the effects of climate change must be addressed and should be seen as part of sustainable development and strategies to alleviate poverty. Centres for Adaptation in Agriculture should be established, particularly in Africa.

Technology Development and Cooperation: In order to encourage collaboration on a “clean technology revolution,” the formation of a Consultative Group on Clean Energy Research should be considered. Recent global declines in investments for energy research and development should be reversed. Aggregate public expenditures should be increased to US\$20 billion per year.

Finance: A climate fund of additional resources, starting at US\$10 billion and growing to US\$50 billion per year, should be established to support climate change activities in developing countries (adaptation, avoided deforestation, and clean energy development and deployment). The Clean Development Mechanism (CDM) should be reformed in order to deliver its full potential. In addition, a new market mechanism should support transformation of whole sectors of rapidly industrializing countries.

Our assessment: This proposal receives a lot of weight through the participation of well recognized world leaders in the process. It highlights the areas where agreement is necessary: Mitigation, adaptation, technology and finance. It however does not go into much detail in these four elements. It is remarkable that a harmonised carbon tax is proposed, as this option did not receive much support in the past. The report however also elaborates further on a possible cap and trade system as alternative.

8. CONCLUSIONS

This paper provides background information for the Conference of the Parties to the UNFCCC (COP) and the Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol (COP/MOP) in December 2007 in Bali, Indonesia.

We conclude from chapter 2 that significant action is required at highest urgency to ensure that global greenhouse gas emissions peak until 2015 and decline to at least half of current levels to prevent dangerous interference with the climate system. The next years are decisive whether this turn can be made.

The *current* international climate policy (chapter 3) does not yet reflect that urgency. The Kyoto Protocol currently only defines rules until 2012. The commitments need to be extended and strengthened. Countries are implementing their existing commitments under the Kyoto Protocol to a varying extent. While some countries have implemented effective and innovative national policies and are well on track to meet their commitments, other are far behind their target. None of the countries is yet on track to make its contribution to limiting temperature increase to 2°C after 2012.

The CDM is the Kyoto mechanism that is used most to date. Its volume is increasing fast, but there is also some room for improvement, e.g. in the area of its contribution to sustainable development and ensuring that projects are additional.

Future international climate policy is discussed in various international processes in addition to the UNFCCC (chapter 4). Most of the processes reinforce each other and have led to increase awareness of the issues at stake among decision makers. The diplomatic effort on climate change has never been so high as currently, involving regularly heads of states. Preparation for the Bali conference has been better than ever with officials completing a marathon of meetings. This pace has to continue if a global agreement is to be reached by 2009.

The discussions at the COP, COP/MOP in Bali in December 2007 will most prominently cover a mandate to complete a future international agreement by (presumably) 2009 (chapter 5). Two major stumbling blocks need to be overcome to reach an agreement: First, the USA has to be integrated into the future negotiations. And second, developed countries need to show willingness to reduce their emissions substantially and to provide substantial financial support to developing countries so that developing countries agree to engage in negotiations with a particular end date.

This paper provides an overview of the approaches that can be taken in a future international agreement on climate change (chapters 6 and 7). Taking the current negotiations and the current sequential decision making, it is the authors' view that the final system is an incremental evolution, based on the current structure with the following enhanced elements:

- **Participation in stages** (e.g. current Annex I, intermediate stages, current Non-Annex I): Countries' national circumstances and interests are too diverse for a "once size fits all" solution. It will rather be a system composed of different stages to be attractive for as many countries as possible. Determining a countries' participation level is likely to be based on its responsibility (historical emissions), capability (GDP and human development) and potential (current emissions levels). Large countries (USA, China) may have "stages" on their own.

- **Differentiation of emission targets based on sectoral considerations:** Of the many options to share emission allowances between countries, no single one will receive the support by all countries. It is however likely that a formula that is based on sectoral considerations (as opposed to simple formulas based on one indicator such as GDP or population) can best accommodate the different national circumstances of countries. The outcome of such sectoral considerations will only be an input into the discussion; the final numbers will be determined by negotiation.

Sectoral no-lose targets for advanced developing countries and registry of sustainable development policies and measures for other developing countries: A major issue is to incentivise the participation of developing countries. The option of sectoral no-lose targets for advanced developing countries seems to be very promising as it is a middle ground between the current CDM of developing countries and absolute emission reduction targets of developed countries. It ensures financing through the carbon market but entails no penalties for the participating developing countries, if the targets are not met. Action by other less advanced developing countries can be encouraged by a registry of sustainable development policies and measures.

- **Defining adaptation activities:** Adaptation as an element of a future regime is well accepted. Further work is necessary to define exactly, which adaptation activities should be supported by the international system and how. A major bottle neck is finding financial resources for adaptation activities, see below under financing.
- **Technology cooperation supplemental to emission targets:** Technology cooperation is essential, but cannot solve the problem alone.
- **Creating constant flows of financial resources:** A major bottle neck of the current process is finding the financial resources for climate change activities. Automatic mechanisms independent of government budgets have to be found.

Climate change is a complex problem that requires a complex solution. It is the hope of the authors that this paper can provide some insights into the current international discussions to facilitate an agreement on future international climate policy.

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