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Rio, Kyoto, Marrakesh – groundrules for the global climate policy regime

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Abstract

After four years of intense negotiations that tethered on the brink of failure, the design of the international climate policy regime that is formed by the U.N. Framework Convention on Climate Change, the Kyoto Protocol and the Marrakesh Accords is now sufficiently clear to be implemented. Apart from the U.S. and Australia, all industrialised countries have now stated that they will ratify the Kyoto Protocol. Industrial countries are subject to binding greenhouse gas emissions targets for the commitment period 2008-2012. Several countries profit from exceptions that weaken the targets. The availability of forestry and agricultural sinks will further lower the necessity for emission reductions. A world market for emission rights will form as the Kyoto Mechanisms can be used without limits; the only category apart are sinks CDM credits that are capped. Given the U.S. position to stay out of the Kyoto Protocol, overall demand for emission rights is likely to be lower than supply of "hot air" from Russia and Ukraine. Thus the world market price will be very low, probably between 1 and 5 € / t of CO_2. The price could be higher if sellers form a cartel or some sellers are excluded from the market when they do not fulfil the relatively strict reporting rules agreed in Marrakesh. Under a low price the CDM whose institutional structure is rather cumbersome will only have a chance if it concentrates on the cheapest project types and most effective host countries. Especially attractive are projects collecting and burning landfill methane while most renewable energy projects are too expensive, unless they are implemented in very favourable locations.

Zusammenfassung: Nach vier Jahren aufreibender Verhandlungen ist mit den Beschlüssen von Marrakesch das internationale Klimaregime hinreichend klar, um umsetzbar zu sein. Außer den USA und Australien haben alle Industrieländer angekündigt, das Kyoto-Protokoll zu ratifizieren. Die Industrieländer unterliegen damit für die Verpflichtungsperiode 2008 – 2012 verbindlichen Treibhausgasemissionszielen. Einige Länder werden durch Ausnahmeregeln begünstigt, die die Ziele abschwächen. Die Verfügbarkeit von forst- und landwirtschaftlichen Kohlenstoffsenken wird die Notwendigkeit von Emissionsverringerungen weiter reduzieren. Ein Weltmarkt für Emissionsrechte entsteht mit der unbeschränkten Nutzbarkeit der Kyoto-Mechanismen. Die einzige beschränkte Kategorie sind Senkenkredite des CDM. Vor dem Hintergrund der US-Erklärung, das Protokoll nicht ratifizieren zu wollen, ist die Nachfrage nach Emissionsrechten voraussichtlich geringer als das Angebot an “Heißer Luft” aus

Russland und der Ukraine. Daher wird der Weltmarktpreis sehr niedrig liegen, wahrscheinlich zwischen 1 und 5 € pro t CO_2. Der Preis könnte höher liegen, falls die Anbieter ein Kartell bilden oder aus dem Markt ausgeschlossen werden, wenn sie den strengen, in Marrakesch vereinbarten Berichtspflichten nicht nachkommen. Bei einem so niedrigen Preis hat der CDM mit seiner relativ schwerfälligen institutionellen Struktur nur dann eine Chance, wenn er sich auf die billigsten Projekttypen und effektivsten Gastländer konzentriert. Besonders attraktiv sind Projekte, die Methan von Müllkippen auffangen und verbrennen, während die meisten Projekte zur Nutzung erneuerbarer Energien zu teuer sind, sofern sie nicht an sehr günstigen Standorten stattfinden.

Key words: International climate policy, Kyoto Protocol, Marrakesh Accords, sinks, Kyoto Mechanisms, emissions trading, CDM

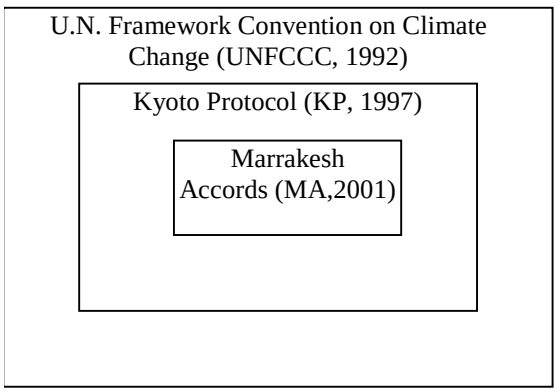
1 Introduction

After four years of intense negotiations that tethered on the brink of failure, the design of the international climate policy regime is now sufficiently clear to give a go-ahead. Apart from the U.S. and Australia, all industrialised countries have now stated that they will ratify the Kyoto Protocol. The following guide elaborates on the different areas covered by the regime with a view to explain opportunities and risks to the private sector. Furthermore, an outlook for the international greenhouse gas market will be made with a particular focus on the role of the CDM.

2 Agreements involved

The political process led to a sequence of agreements that to some extent form a set of Russian dolls. The sequence started with the U.N. Framework Convention on Climate Change (UNFCCC, 1992), continued with the Kyoto Protocol (KP, 1997) and currently ends with the Marrakesh Accords (MA, 2001) concluded in November 2001. The agreements have become much more specific over time and further, even more detailed agreements will be elaborated in the future when new political questions arise from the implementation of the existing rules.

Figure 1: Set of global climate change agreements

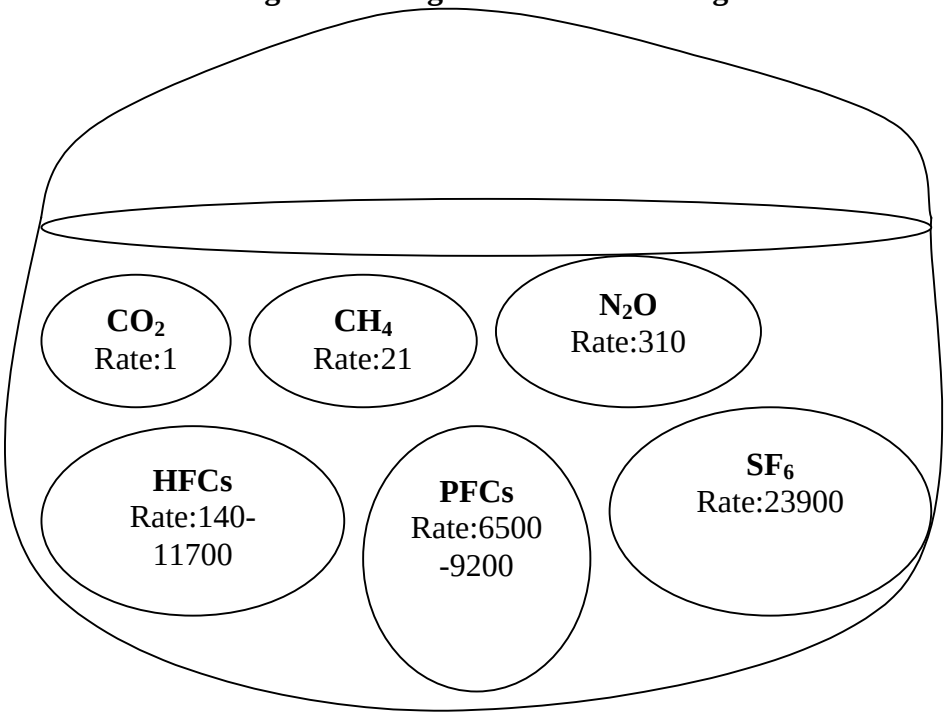


3 Emission targets as driving force

Greenhouse gas emission targets have evolved over time (see Figure 3):

- a non-binding target to reduce CO_2 emissions to 1990 levels in 2000 agreed in the UNFCCC by 39 industrialised countries and countries in transition listed in Annex I. This target was only reached by countries in transition, Germany, Luxembourg and the UK.
- binding targets to reduce a basket of six greenhouse gases (see Figure 2)during a "commitment period" 2008-2012 compared to the base year 1990. These emissions do not cover sequestration in forests and other land use, except for the case that this leads to net emissions (see discussion on Australia clause below). These targets are part of the KP where they are listed in Annex B for 38 industrialised countries and countries in transition (Table 1). Compared to Annex I of the UNFCCC Belarus and Turkey are missing in Annex B. In 2005, it shall be determined whether countries have achieved "demonstrable progress" towards their targets. Emissions from international air and sea transport as well as multilateral U.N approved military and humanitarian operations are exempt.

Figure 2: The "basket" of greenhouse gases and the exchange rates



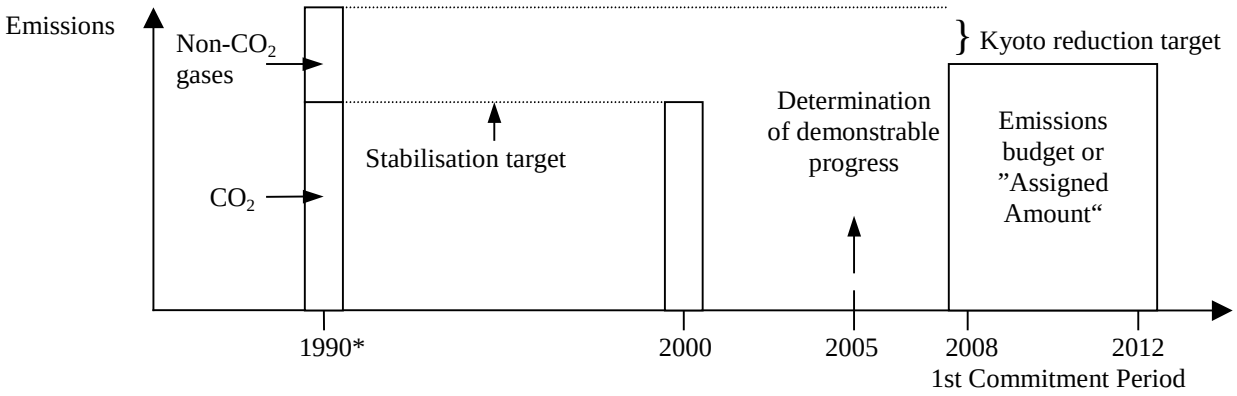
1 molecule of the respective gas is valued according to the rate listed. HFCs and PFCs encompass a range of gases and thus do not have a single rate. The rates are the 100-year Global

Warming Potentials listed in the Second Assessment Report of the Intergovernmental Panel on Climate Change (1995) and decided by the Kyoto Conference of the Parties (Decision 2/CP.3).

Table 1: Emissions targets under the Kyoto Protocol

Country	Target (compared to base year)
EU, Baltic states, Bulgaria, Czech Republic, Romania, Slovakia, Slovenia, Switzerland	- 8%
USA	- 7%
Canada, Hungary, Japan, Poland	- 6%
Croatia	- 5%
New Zealand, Russia, Ukraine	0%
Norway	+ 1%
Australia	+ 8%
Iceland	+10%

Figure 3: Principle of emission targets under the UNFCCC and the KP



* different for some countries in transition

Some peculiarities exist that are due to the insistence of countries to get a less stringent target without having this recognised by the general public:

3.1 Later base year for industrial gases

For the three categories HFCs, PFCs and SF_6, countries can choose 1995 instead of 1990 as base year. Due to the strong increase of emissions of these gases in some countries, a choice of 1995 will weaken the overall emissions targets.

3.2 Earlier base year for countries in transition

In the UNFCCC, countries in transition were allowed to choose a base year different from 1990. As emissions had been falling since the mid-1980s, several countries chose the peak emission year: Bulgaria: 1988, Hungary: average of 1985-87, Poland: 1988, Romania: 1989, Slovenia: 1986

3.3 Australia sink clause

While base year emissions do normally not include emissions from deforestation and land-use change, Australia managed to include a rule into the KP that countries with net emissions from land use change and forestry (LULUCF) have to include them. This only applies to Australia and to a small extent to the UK. Australian net LULUCF emissions had already fallen by 37 million t CO_2 between 1990 and 1997, which amounts to 8.8% of Australian base year emissions without LULUCF (Hamilton 2001, p. 100).

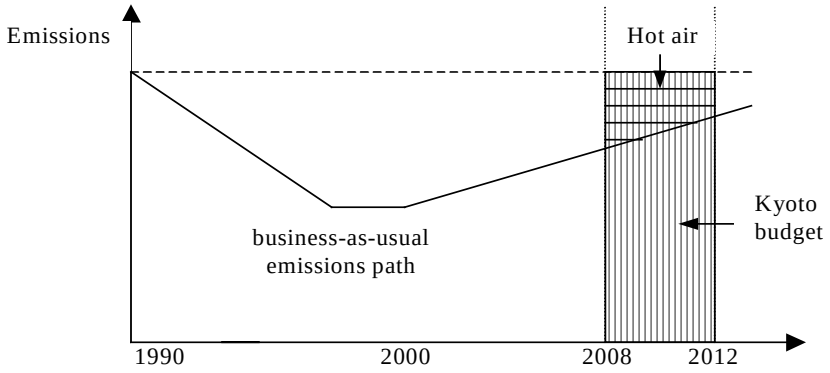
3.4 Iceland exception

Iceland is planning to build a large aluminium smelter that will increase its greenhouse gas emissions by a double-digit percentage figure. Under the MA, it won a clause that states that the emissions from this project will not be counted as part of its emissions budget as long as they stay below 1.6 million t CO_2 equivalent p.a.. This threshold would be equivalent to 64% of base year emissions!

3.5 The “Hot air” issue

Due to prolonged economic recession, some countries currently have emissions that are much lower than their emissions targets and are unlikely to reach the target level during the commitment period. This applies primarily to Russia, Ukraine and some East European states. The difference between the target and the business-as-usual emissions during the commitment period is commonly called “Hot air” (see Figure 4). “Hot air” has a strong influence on the world market price for emission rights.

Figure 4: “Hot air”



3.6 New countries taking up targets

In the past, Argentina and Kazakhstan have argued that they would like to take up an emissions target under Annex B. The MA allows Kazakhstan to do so but it will remain outside Annex I of UNFCCC to minimise financial outlays. This is a bad precedent as it allows a menu approach where countries can choose those activities that are likely to be profitable and skip those that entail financial burdens.

Kazakhstan has argued in its national communication that its baseline emissions will be at 1990 levels in 2011 even if 1998 emissions were 45% below. This nourishes expectations that Kazakhstan will argue for a 0% target like Russia and the Ukraine. Given similar economic development paths, it is likely realistic baseline emissions will be around 30% below 1990 level. Kazakh “Hot air” would then amount to 80 million t CO_2 equivalent per year, only 50% less than the Russian sink under Appendix Z (121 million t). The negotiation on the Kazakh target will thus be crucial to show whether the international regime is capable to reduce “Hot air” or even to expand it further. Belarus

could follow quickly as it is already part of Annex I but had not participated in negotiation of Annex B targets.

Furthermore, the MA calls for a “special treatment” of Turkey that had never ratified the UNFCCC as it did not want to be part of the countries with targets. If Turkey gets an emissions target, will this create additional “Hot air “? If done in a creative way, it could show the bridge for integration of Newly Industrialised Countries into Annex B.

4 Sinks

Sinks create “removal units” (RMUs) that cannot be banked into future commitment periods. RMUs can only be created if adjustments to sinks inventories are below thresholds that remain to be defined and where no deadline for the decision has been set.

4.1 Mandatory sinks accounting

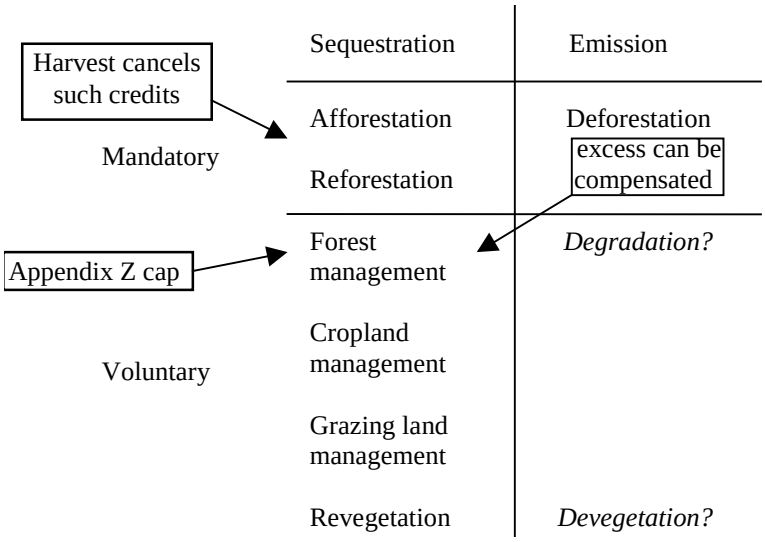
The KP states that countries with emissions targets shall calculate carbon sequestration from afforestation and reforestation (area with less than 50 years without forest) and emissions from deforestation. Reforestation applies only to areas that had no forest cover by 1990 to avoid a perverse incentive for cutting existing forests. Harvest of a forest will always only be accounted as emission only as far as sequestration credits have been granted. Thus it becomes decisive to clearly differentiate harvest from deforestation; the latter will be accounted fully.
Countries have a leeway to set parameters that define a “forest”; once chosen, they have to remain fixed:

- minimum area: 0.05-1 ha
- mimimum tree cover: 10-30%
- minimum tree height: 2-5 m

4.2 Additional sinks for voluntary accounting

The MA allows to add from the following categories: forest management, cropland management, grazing land management, revegetation (see Figure 5).

Figure 5: Different levels of sinks



Once a choice on the categories to be included has been made, it has to be adhered to throughout the first commitment period. Land once accounted for has to be accounted forever through "contiguous" commitment periods. All above- and below-ground carbon pools have to be accounted for, except if it can be proved that they are a net sink. Sequestration from forest management can only be accounted until the thresholds of Appendix Z are reached (see Table 2). Beyond these thresholds, countries can offset excess deforestation by forest management sinks up to 33 million t CO_2 per year. It is envisaged to differentiate between natural and human-induced effects factoring out of CO_2- and N fertilisation as well as age structure effects. A biome-specific forest definition for the second commitment period shall also be defined. Both shall be decided in 2004

Table 2: Forest management thresholds

Country	Annual maximum (Mt CO_2)	% of base year emissions**
Australia	0	0
Austria	2.31	3.1
*Belarus**	*?*	*?*
Belgium	0.10	<0.1
Bulgaria	1.36	0.9
Canada	44.00	7.3
*Croatia**	*?*	*?*
Czech Republic	1.17	0.6
Denmark	0.18	0.3
Estonia	0.37	0.9
Finland	0.59	0.8
Germany	4.55	0.4
Greece	0.33	0.3
Hungary	1.06	1.0
Iceland	0	0
Ireland	0.18	0.3
Italy	0.66	0.1
Japan	47.67	4.1
Latvia	1.25	3.5
Liechtenstein	0.04	14.1
Lithuania	1.03	2.0
Luxembourg	0.04	0.3
Monaco	0	0
Netherlands	0.04	<0.1
New Zealand	0.73	1.0
Norway	1.46	3.1
Poland	3.01	0.5
Portugal	0.81	1.3
Romania	4.03	1.5
Russia	121.00	4.0
Slovakia	1.83	2.4
Slovenia	1.32	6.9
Spain	2.46	0.8

Sweden	2.13	3.1
Switzerland	1.83	3.5
Ukraine	4.07	0.4
UK	1.36	0.2
*USA**	*102.66 ?*	*1.7*
Total Annex B	**355.63**	**2.0**
Total Annex B *without USA*	**252.97**	**2.1**

* Countries whose threshold has not yet been fixed

** Excluding HFCs, PFCs and SF_6. Thus actual shares will be somewhat lower.

Appendix Z can still be renegotiated until 2006 which introduces a considerable uncertainty. The precedent of Russia getting almost double the original proposal in Marrakesh will not remain unnoticed.

The regime is still asymmetrical and incomplete concerning the additional categories. Rules for accounting of degradation and devegetation remain to be defined and shall be decided in 2004. Otherwise, we would get a bias in showing sequestration even if there are net emissions. Example: Party A with an area of 1 million ha has 100% agricultural soil. 50% are being degraded with an emission of 5 t CO_2 per ha while 50% are undergoing no-till agriculture sequestering 0.5 t CO_2 per ha. Under the current rules the country can credit a sequestration of 0.25 million t CO_2 p.a. while in reality it is emitting 2.25 million t CO_2. Moreover, reliable base year data for land management will not be available. First crude estimates for cropland and grazing land sinks are listed in Table 3.

Table 3: Maximum annual agricultural sinks potential under different scenarios (million t CO_2) and percentage of base year emission (in brackets)

Country	**Cropland (million ha.)**	**Grazing land (million ha)**	**CO_2 seq.** LOW SCENARIO	**CO_2 seq. Medium scenario**	**CO_2 seq. High scenario**
EU	**85.8**	**57.4**	**147.1 (4.1%)**	**336.3 (9.5%)**	**609.7 (17.2%)**
Australia	**48.2**	**405.5**	**17.7 (4.2%)**	**184.0 (44.0%)**	**499.1 (119.3%)**
Bulgaria	4.5	1.6	5.8 (3.7%)	12.8 (8.2%)	22.3 (14.2%)

Country	Cropland (million ha.)	Grazing land (million ha)	CO_2 seq. LOW SCENARIO	CO_2 seq. Medium scenario	CO_2 seq. High scenario
Canada	**45.7**	**29.0**	**76.1 (12.6%)**	**156.6 (26.0%)**	**288.1 (47.8%)**
Croatia	1.6	1.6	3.5 (n.a.)	8.1 (n.a.)	14.9 (n.a.)
Czech Rep.	3.3	1.0	3.8 (2.0%)	8.4 (5.2%)	14.3 (8.9%)
Estonia	1.1	0.3	1.3 (3.8%)	2.8 (8.1%)	4.7 (13.7%)
Hungary	5.0	1.1	1.8 (1.5%)	4.2 (3.4%)	6.8 (5.4%)
Iceland	0.0	2.3	3.3 (127%)	8.3 (319%)	16.7 (650%)
Japan	4.9	0.4	4.2 (0.4%)	8.6 (0.7%)	13.7 (1.2%)
Latvia	0.2	0.6	1.0 (2.8%)	2.5 (7.0%)	4.9 (14.0%)
Lithuania	3.0	0.5	2.9 (5.6%)	6.2 (12.0%)	10.3 (20.0%)
New Zealand	**3.3**	**13.3**	**21.9 (30.1%)**	**53.6 (73.7%)**	**104.7 (144.0%)**
Norway	0.9	0.2	0.9 (1.6%)	1.8 (3.2%)	3.0 (5.0%)
Poland	**14.4**	**4.0**	**16.5 (2.9%)**	**35.9 (6.4%)**	**61.3 (10.9%)**
Romania	**9.8**	**4.9**	**14.5 (5.5%)**	**32.5 (12.3%)**	**57.9 (21,9%)**
Russia	**126.8**	**90.0**	**93.0 (3.1%)**	**172.5 (5.7%)**	**308.2 (10.1%)**
Slovakia	1.6	0.8	2.4 (3.2%)	5.4 (7.1%)	9.7 (12.8%)
Slovenia	0.2	0.3	0.6 (3.1%)	1.4 (7.3%)	2.6 (13.5%)

Country	Cropland (million ha.)	Grazing land (million ha)	CO_2 seq. LOW SCENARIO	CO_2 seq. Medium scenario	CO_2 seq. High scenario
Switzerland	0.4	1.1	2.0 (3.8%)	4.8 (9.1%)	9.3 (17.6%)
Ukraine	**33.6**	**7.8**	**36.1 (3.9%)**	**78.0 (8.5%)**	**131.4 (14.3%)**
USA	**179.0**	**239.3**	**273.9 (4.6%)**	**675.4 (11.3%)**	**1305.0 (21.9%)**
Sum Annex B	***523.3***	***832.4***	***730.2 (4.1%)***	***1800.2 (10.0%)***	***3498.7 (19.5%)***

The table uses the cropland/grassland sequestration rates per hectare listed in Sampson and Schole (2000, p. 199) for the whole cropland/grassland (data from FAO 2001) of the respective country. Obviously, only a small part is likely to be managed for carbon storage by the time of the commitment period. Still, the table shows that the amounts can be staggering. Even if only 10% of available agricultural land are managed, about 1% of total Annex B base year emissions would be covered under the medium variant. In the U.S., currently already 17.5% of cropland are managed in this way compared to just around 6% in 1990 (Anonymous 2001).

5 The Kyoto Mechanisms

To reach their emission targets, countries can use domestic policy instruments as they wish. They can also use the four "Kyoto Mechanisms" to cooperate with other countries:

- "bubbles": a group of countries defines a joint target which is the sum of the original country targets and then redistributes the target among its members
- "Joint Implementation" (JI): a country invests in emission reduction or sequestration projects in other countries with emissions targets and thus earns "emission reduction units" (ERUs)
- "Clean Development Mechanism" (CDM): "certified emission reductions" (CERs) created through projects in countries without targets

- “International Emissions Trading” (IET): transfers of “assigned amount units” (AAUs) between countries with emission targets

To participate in the mechanisms, countries have to fulfil the following rules:

- Have ratified the KP
- Have established their emissions budget
- Have a national system to collect data for inventories
- Have a national registry for transactions in emission rights
- Have an up-to-date reviewed inventory

If there has been no challenge by the enforcement branch of the compliance committee for 16 months after the submission of the report on establishment of the emissions budget, a country is eligible.
Annex B countries “refrain” from using nuclear power projects to generate ERUs and CERs.

5.1 Bubbles

The EU has formed a bubble: while all member states had a –8% reduction target, under the bubble the targets have been redistributed (see Table 4) . The bubble has to be notified when the KP is ratified and remains valid for the whole commitment period.

Figure 6: Setting up a bubble and internally redistributing targets

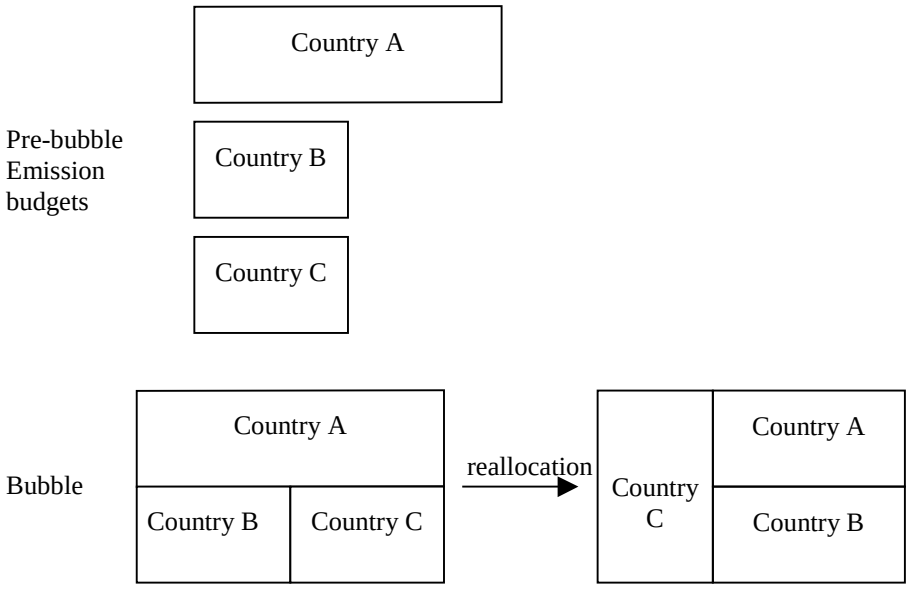


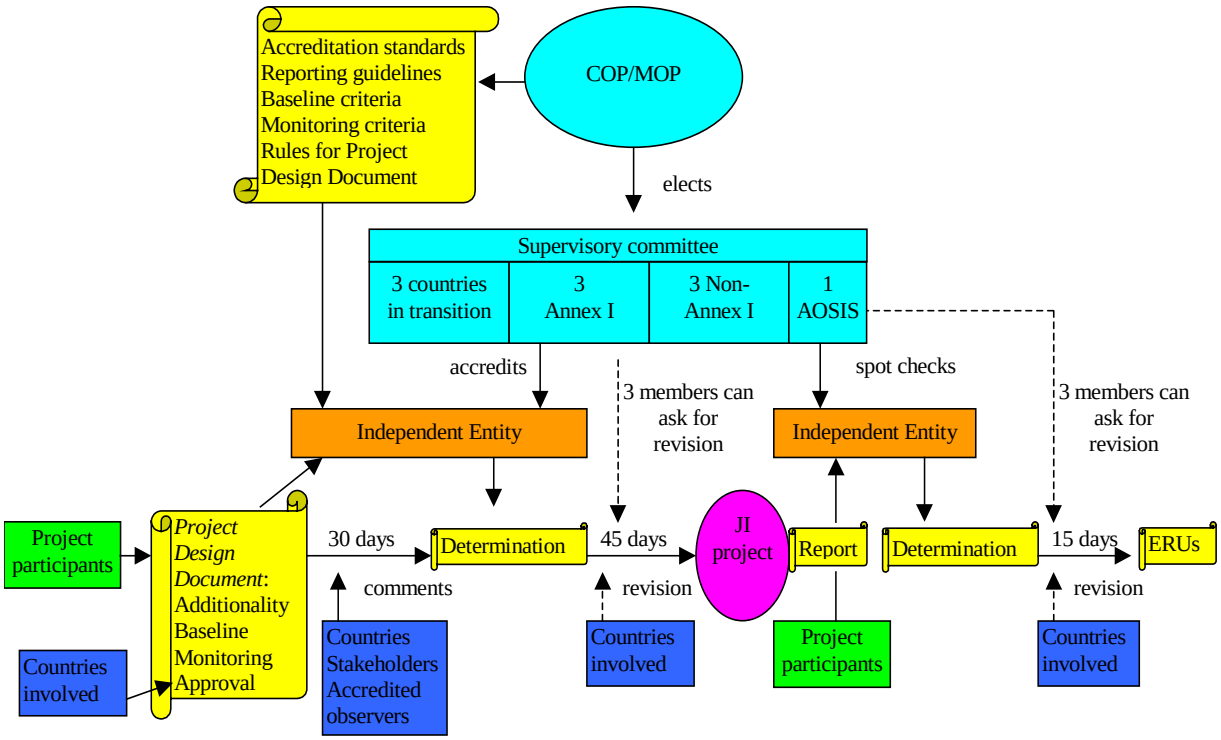
Table 4: Reallocation of targets under the EU bubble

Country	Target within the bubble (%)
Austria	-13
Belgium	-7.5
Denmark	-21
Finland	0
France	0
Germany	-21
Greece	+25
Ireland	+13
Italy	-6.5
Luxembourg	-28
Netherlands	-6
Portugal	+27
Spain	+15
Sweden	+4
UK	-12.5
Total EU	**-8**

5.2 Joint Implementation

There are two tracks for JI. Track one can be used if all eligibility criteria listed above are fulfilled. Then the host country can define its own criteria for baseline setting and granting of ERUs. There is no mandatory independent verification.
Track two applies if the host country would not be eligible for the mechanisms and has many similarities with the CDM procedure (see Figure 7). However, the sale of ERUs from second track JI is only possible if the inventory has been reviewed, thus undoing most of the advantage to the host country.

Figure 7: Second track JI



Data on baselines and environmental impact assessment are not confidential. In contrast to the CDM multi-project benchmarks can be used as a baseline. One independent entity can be involved in all steps. Decreases in activity levels “outside project activity” or due to force majeure cannot generate ERUs. IEs are liable for “significant deficiencies” and have to restitute faulty ERUs if the SC decides.

5.3 Clean Development Mechanism

The CDM is by far the most elaborate mechanism with a wealth of procedural and institutional detail (see Figure 10). However, this detail may be a mixed blessing as it increases the transaction costs for project proponents.

The Marrakesh meeting elected the 10 members of the Executive Board (EB), thus setting a clear sign that the CDM shall start quickly. The EB has 6 Non-Annex I representatives (one from AOSIS) and 4 Annex I representatives. It decides with a ¾ majority. Members from countries that do not ratify the KP will be thrown out.

The EB has the following tasks

- Definition of rules for baselines and monitoring plans
- Accreditation of "operational entities" (OEs); final decision rests with the COP that shall try to promote OEs from developing countries
- Definition of simplified rules for small scale projects until 2002

Small scale projects are:

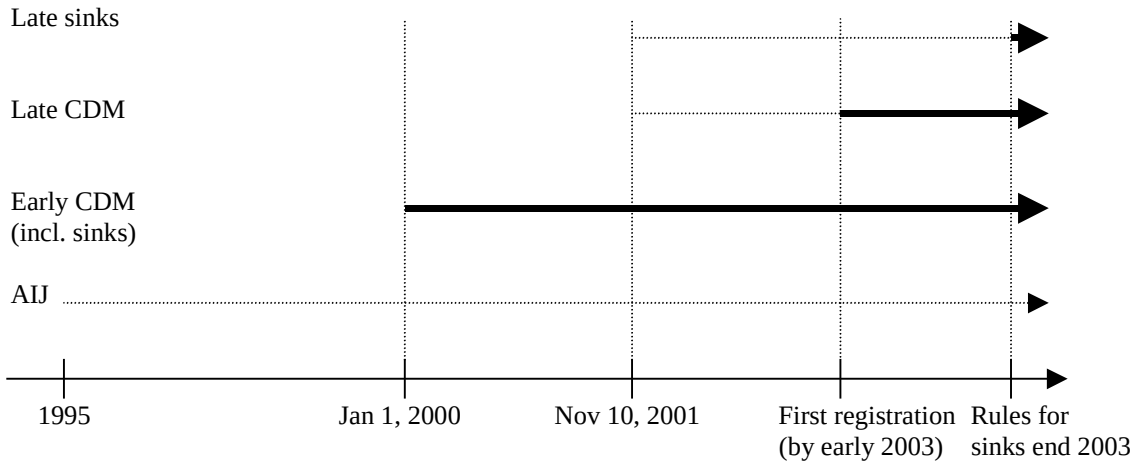
- Renewables <15 MW
- Energy efficiency increases < 15 GWh/year
- Other projects with emissions of < 15,000 t CO_2/year

CDM can be implemented unilaterally, i.e. without an investor country. Host countries have to have ratified the KP. CDM projects shall not lead to "diversion" of development aid; however, the term is not defined. Annex B countries can only "use" CERs if they fulfil the eligibility criteria described above; this means that they can buy CERs in periods of non-eligibility. However, private entities can only buy and sell CERs when their home country is eligible (see Figure 8).

Figure 8: Eligibility for CER trades by governments and companies

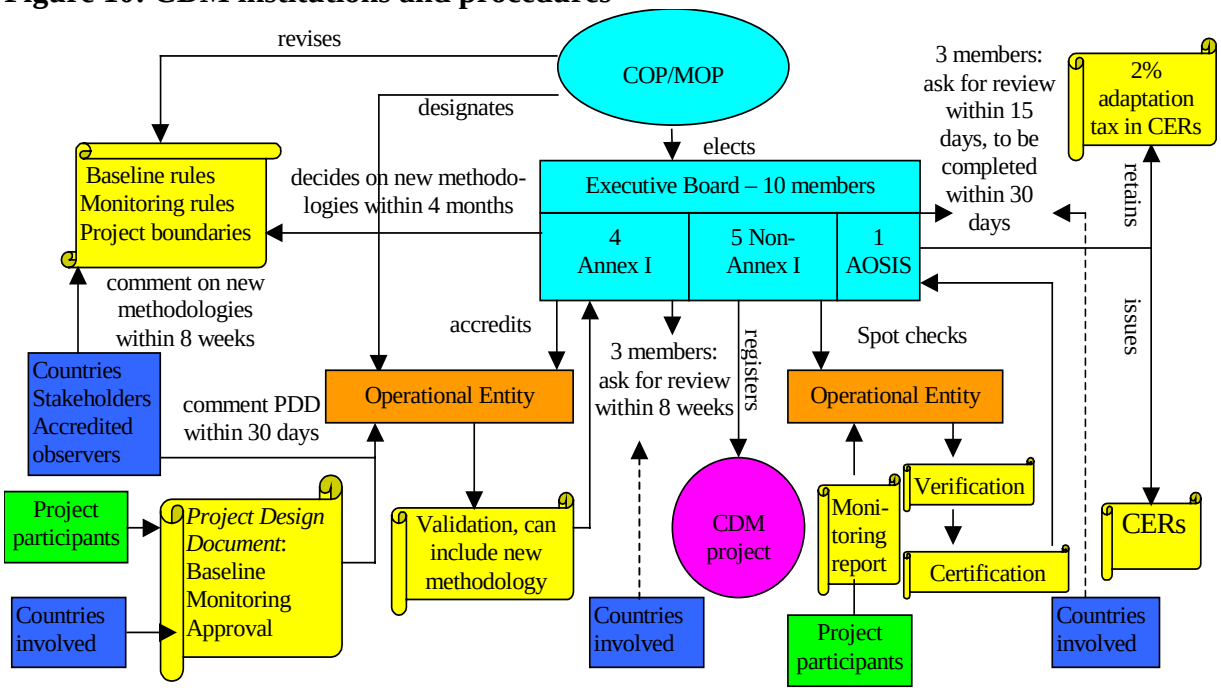
Only projects "starting as of" 2000 shall be eligible to earn CERs; those that started before Nov. 10, 2001 can apply for CERs covering the period before formal registration, all future projects have to wait until registration has been done (see Figure 9). Afforestation and reforestation projects are allowed but CERs from those projects can only be used up to 1% of the base year emissions of each Annex B country, limiting overall sinks CERs to 183 million t CO_2 per year. The rules for sinks projects shall only be decided in 2003, effectively blocking CER allocation to such projects until then. They shall address the issues of permanence, additionality, leakage and biodiversity protection.

Figure 9: CER accrual depending on different starting dates of projects



Projects are subject to an in-kind adaptation tax of 2% that is waived for projects in LDCs. Another tax shall cover CDM administration costs but its rate remains to be specified. Until then, project participants will have to pay a fee for administration.

Figure 10: CDM institutions and procedures



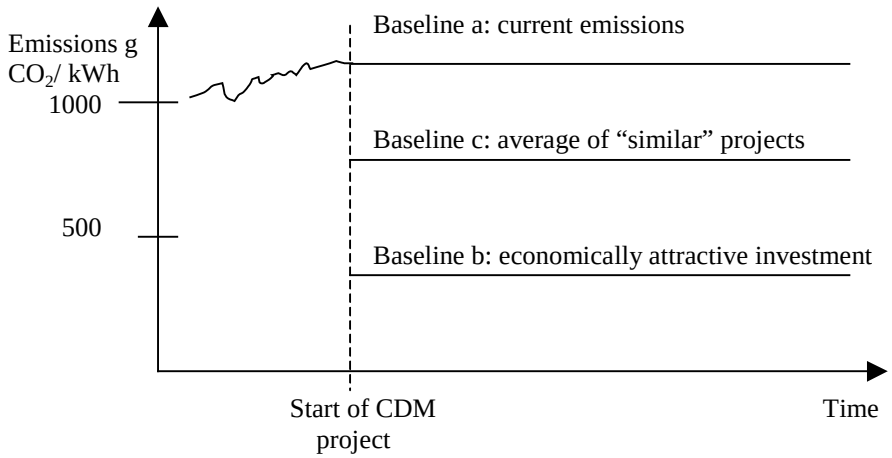
Reaccreditation of operational entities shall be done every 3 years. They are liable for "significant deficiencies" and have to restitute faulty CERs to the EB. This amounts to a seller liability. The same OE can get a special licence from the EB to both validate and

verify but generally they should be different. OEs have to submit an annual report to the EB and publish a list of all CDM projects they have been involved in.
Baselines automatically define project additionality. They have to be set on a project-by-project basis. They can allow for emissions increases. As the text currently stands, there is a free choice among three baseline options:

- Current or historical emissions
- Emissions of an economically attractive investment, taking into account investment barriers
- Average emissions of "similar" projects undertaken in the last five years in "similar" social, economic, environmental and technological circumstances as long as they belong to the top 20% of their category

This menu will lead to moral hazard (see Figure 11). Every project participant will choose the baseline maximising the CERs. It is doubtful that certifiers will be able to prevent this fully. Moreover, there is no differentiation between retrofit and greenfield projects nor any adjustment of the baseline to changes in the activity volume of the project. However, changes in activity levels outside the project and due to force majeure lead to baseline adjustments.

Figure 11: Baseline options for the CDM



A CDM project upgrades a coal-fired power station whose emissions per kWh have been increasing due to its growing age. Current emissions that constitute baseline a) are 1200 g CO_2/kWh. Similar upgrades in comparable countries in the past five years (baseline c)) have led to emissions of 850 g CO_2/kWh. The economically most attractive investment would be a gas

turbine with emissions of 450 g CO_2/kWh. Obviously, the repercussions of baseline choice are huge.

The project boundary shall be set to include all activities “under control” of project participants.
Leakage is defined as “measurable and attributable” net change of emissions outside the project boundary. This means that CERs can accrue for positive spillover effects.
The EB shall develop detailed baseline rules, defining

- Project categories
- Decision trees
- Appropriate levels of standardisation
- Project boundaries
- Leakage

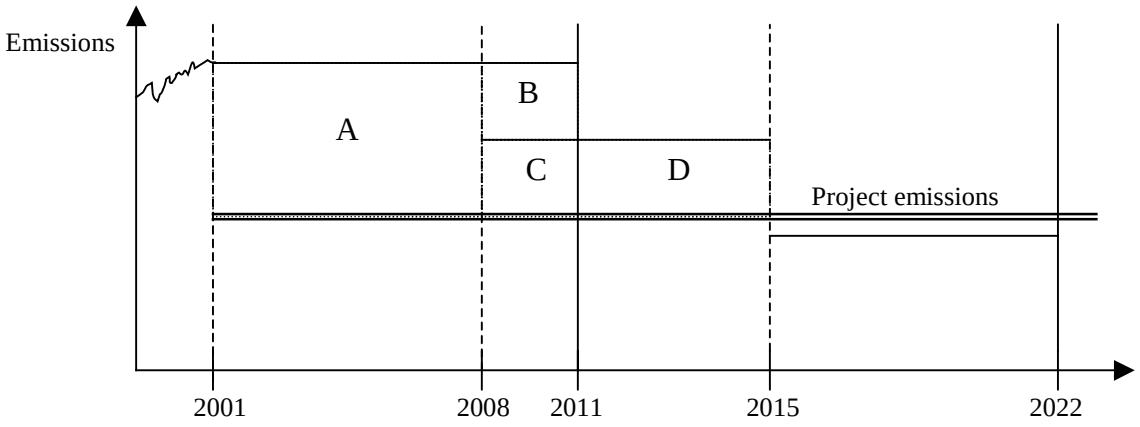
This shall take into account

- Current practices
- Observed trends
- Least-cost technologies

Thus it can be expected that there will be at least some rules to determine the choice between the different approaches.

Crediting periods are either 7 years, renewable twice or a single period of 10 years. At each renewal, the baseline will be revalidated by an OE (see Figure 12).

Figure 12: Crediting periods and baseline renewal



If a CDM project starts in 2001, it can choose either a crediting period until 2001 yielding a CER amount A+B+C or go for three crediting periods until 2022 with baseline updates. In the situation shown, in the third crediting period, the baseline emissions are below the project emissions and thus no CERs accrue from 2015. Overall CERs are A+C+D.

The monitoring plan has to include:

- Emissions data
- All relevant data for baseline assessment
- Data on increased emissions outside the project boundary that are "significant" and "reasonably attributable"

Revisions to the monitoring plan have to be validated by an OE.

The EB administers a CDM registry with the following account structure:

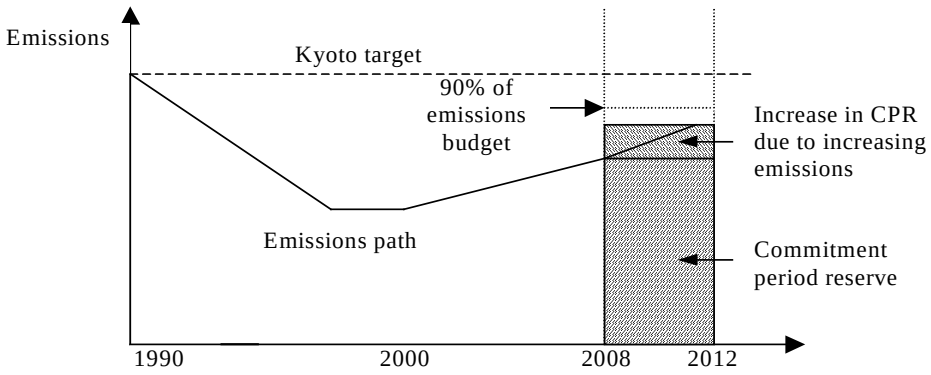
- EB account
- Accounts for host countries
- Account to cancel fraudulent CERs
- Account for CERs paid as adaptation and administration tax

It publishes approved rules, PDDs of registered projects and related comments as well as monitoring, verification and certification reports. All information related to baseline and additionality determination as well as relating to EIAs is not confidential. EB meetings are open to stakeholders "likely to be affected" and UNFCCC accredited observers.

5.4 International Emissions Trading

Eligibility is not only relevant for sellers but also buyers. Companies participating in IET have to be officially registered by the country where they are incorporated. Non-eligible Parties cannot register companies; this excludes U.S. companies. Countries have to hold a commitment period reserve (CPR) at 90% of their emissions budget or at 100% of their last reviewed inventory if this is lower. The latter applies to all countries whose "hot air" is higher than 10% of the emissions budget (see Figure 13). These countries effectively can only sell "hot air". If such a country is on an upward emissions trend and has sold all its free AAUs at the beginning of the commitment period, it has to re-buy permits to honour the increasing CPR. The opposite case of declining emissions progressively lowers the CPR and frees AAUs for sale.

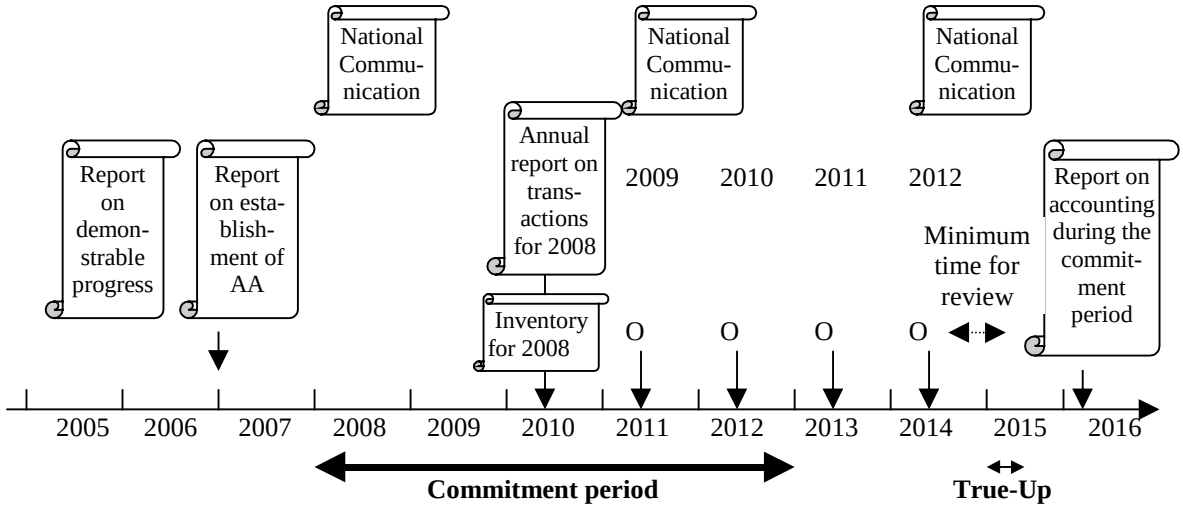
Figure 13: Commitment period reserve for "hot air" countries



6 Reporting

There is a wealth of reporting rules in the MA that lead to a number of different reports as time passes (see Figure 14). It is likely that the time periods involved will lead to a finalisation of first commitment period data and transactions only by 2016.

Figure 14: Reporting before, during and after the commitment period



The UNFCCC Secretariat publishes a summary of all reports

The report on establishment of AA is due Jan. 1, 2007 and includes:

- Set of inventories from 1990
- Base year for industrial gases
- Bubble agreement
- Volume of AA
- Calculation of CPR
- Definition of forest parameters
- Choice of sinks activities and identification of related land areas
- Choice of annual or once-per-commitment-period accounting for LULUCF
- Description of national system to derive emissions inventories
- Description of national registry

Thus the national system has to be in place well before 2007. A national entity coordinates

- Responsibilities for methods used to set up the inventory and collect data
- A quality assurance plan
- A procedure for official approval of the inventory
- The national system should "preferably" undergo third party review.

The ***national system*** will be reviewed by an expert review team (ERT) once; the process takes 20 weeks. ERT members have to undergo training and an examination. The ***report on establishment of AA*** will be reviewed within one year. The ERT makes an in-country visit, identifies flaws and suggests adjustments to the reported figures. Adjustments accepted by the country or mandated by the enforcement branch of the compliance committee will be used to calculate the final volume of AA that remains unchanged for the commitment period. The rules for adjustments shall be set in 2003, those for forestry and agricultural sinks in 2004. Adjustments shall be "conservative".

The ***annual inventories*** will also be reviewed. An initial review shall be done within 10 weeks. If changes in national systems or national registries have been made, an in-depth review including an in-country visit will be done. From the point of raising questions to

the final declaration of adjustments, 22 weeks are needed (26 for countries that do not use one of the UN languages). Here, adjustments can be revised if the ERT that did the adjustment or the compliance committee accepts. RMUs can be created annually or once at the end of the commitment period.

Reporting requirements that determine Kyoto Mechanisms eligibility are deemed not to be fulfilled if

- the inventory is more than 6 weeks late. As the submission date is April 15, this means May 27 (decision 11.CP4). For example, the inventory for 2008 is due on April 15, 2010 and it is late if not submitted by May 27, 2010.
- a source category is missing which encompassed more then 7% of the total emissions in the last submitted inventory
- adjustments lead to an increase of more than 7% in total reported emissions
- the sum of adjustments since the start of the commitment period is bigger than 20 percentage points
- for three years in a row adjustments are calculated for a key source category that is responsible for over 2% of total emissions. This trigger does not apply if the country has asked the facilitative branch for help to resolve this problem, is thus weaker than it appears.

Countries can request an expedited review with a duration of 10 weeks to get reinstated mechanisms eligibility.

Finally, ***national communications*** whose submission dates have not yet been determined but are likely to be due once or twice during the commitment period are subject to one review with a duration of 16 weeks that shall take place within 2 years after submission.

Annually the UNFCCC Secretariat will report the following data and adjustments for the year as well as the sum since the start of the commitment period:

- Emissions
- Net emissions from forests and agriculture
- Sales and acquisitions of RMUs
- Net acquisition of CERs from forestry projects
- Creation and cancellation of RMUs
- Non-compliance penalty
- Voluntary cancellation

The true-up period lasts 100 days and starts on the date the COP has set for the completion of the review of the inventories of the last year of the commitment period, i.e. at the earliest on Jan 1, 2015. The final report after the true-up period has the following structure:

AA

+ ERUs bought

+ Net balance of CERs

+ AAUs bought

+ RMUs bought

+ RMUs issued for LULUCF sequestration

+ ERUs, CERs, AAUs banked from previous commitment periods

- ERUs sold
- AAUs sold
- RMUs sold
- ERUs, CERs, AAUs, RMUs cancelled to cover emissions from LULUCF
- ERUs, CERs, AAUs, RMUs cancelled as non-compliance penalty
- ERUs, CERs, AAUs, RMUs voluntarily cancelled

= AA relevant for compliance assessment

The country retires units to cover all emissions and can bank CERs and ERUs up to a limit of 2.5% of a country´s emissions budget. RMUs are not bankable. As there is no rule that prevents using up RMUs, CERs and ERUs first, it is very unlikely that the banking restriction will be binding.

Overall, there will be a long lag to actually close the books on the first commitment period and the effects on trading in the second commitment period will be considerable as the exact amounts banked will only be known more than three years into the second period.

7 Registries

National registries can be administered by any private organisation. Several of them can be kept in the same location. They have to contain the following accounts:

- Party holding account
- Legal entity holding accounts
- Cancellation account for sinks that have become sources
- Cancellation account for non-compliance penalty

- Voluntary cancellation account
- Retirement accounts for each commitment period

A country can authorise private actors to voluntarily cancel emission units. Thus NGOs can reduce the overall emissions budget available.
The UNFCCC Secretariat tracks all transactions using a transaction log. Transaction volumes and participants in all transactions are published as well as account holdings.

8 Compliance rules

Compliance rules are stronger than anticipated, especially as Umbrella group countries had made strong demands for limiting access to information and tried to water down eligibility rules for the mechanisms. The adoption refers to Art. 18 of the Protocol and shall be confirmed by a COP/MOP decision. There is a clause that allows a favourable treatment of countries in transition.

The compliance committee consists of a facilitative and enforcement branch with 10 members each; the quorum is ¾ and the enforcement branch decides with ¾ majority and a double majority of Annex I and Non-Annex I countries. Chairs and vice-chairs alternate between Annex I and Non-Annex I. The facilitative branch covers supplementarity and reduction of impacts of Annex I policies and measures on developing countries. Moreover, it addresses questions concerning national reporting systems and definition of the initial assigned amount, but only before 2008. It has no powers to enforce its decisions and just gives recommendations.

The enforcement branch covers emissions targets, reporting and inventories during the commitment period, adjustments to inventories in case a country does not accept the judgement of the expert review team and eligibility for use of the Kyoto Mechanisms. The last point had long been fought against by Umbrella Group countries. The branch opens a case on demand of any party; Umbrella group countries had wanted to limit this to the party itself. Documents in general are published but can be kept confidential if the branch decides so. In a normal case, the time span between initiation of the case and the final ruling amounts to 35 weeks. There is a fast track procedure for mechanisms eligibility taking 16 weeks. Appeal can be made to the COP which decides by ¾ majority. These spans can be extended if necessary.

After a determination of non-compliance with reporting, the party shall submit a plan with a one-year timetable for improvement. If a country does not comply with its targets, it pays an in-kind penalty of 30% and cannot sell emission rights under Art. 17. It is astonishing that sales of ERUs are not covered. It shall submit a compliance action plan with a priority on domestic policies and a timetable (3 years or until the end of the commitment period in question) for remediation. Penalty rates for future commitment periods shall be determined by amendment.

9 Adaptation

A LDC expert group has been set up which consists of 5 representatives of Africa, 2 from Asia, 2 from AOSIS and 2 from Annex II. The first task it oversees is the development of "national adaptation programmes of action" (NAPAs) that shall define adaptation needs, develop a set of criteria for selection of adaptation activities and list prioritised activities. NAPAs will be instrumental to guide distribution of adaptation funds if the voluntary pledge by the EU and other OECD countries is honoured.

10 How will the international greenhouse gas market look like?

The overall design of the Kyoto Mechanisms goes a long way towards those who have argued for a truly global market in greenhouse gas emission rights. The different units are fully interchangeable and de facto bankable for future commitment periods. There are no thresholds for use of the mechanisms apart from the threshold on sinks CERs. Strong reporting rules and transparency will benefit the market.

However, the question remains whether this good groundwork will see a high turnover. Kyoto targets have been weakened considerably by the rules on sinks. Moreover, the declared unwillingness of the U.S. to ratify the KP has strongly reduced demand for emission rights. Current estimates of business-as-usual emission paths conclude that there is an excess supply of "Hot air". So the market price crucially depends on the behaviour of Russia and Ukraine. If they can credibly reduce supply, a healthy market is likely but prices will be volatile depending on the likelihood that additional supply

enters the market. Depending on the price, the CDM could play a major role if host countries are able to keep transaction costs down and concentrate on the most attractive project types. The elaborate structure of the CDM project cycle will certainly make it impossible to reduce transaction costs below a certain level. It is unlikely that small-scale projects become attractive on their own merits, even if they benefit from simplified rules.

Another, more problematic and volatile situation would come up if the big potential sellers are not able to fulfil their reporting requirements and thus get excluded from the mechanisms with the exception of second-track JI. Then JI and CDM would compete on equal footing. However, for political reasons it is unlikely that the big sellers would be excluded for the full commitment period; they would surely get technical aid to improve their reporting. One could thus maximally expect a reporting failure for one or two years at the beginning of the commitment period – a risky gamble for today´s CDM project planners.

In the time remaining until the commitment period, the market will be driven by the first attempts for early implementation. There are three major developments with a strongly differing framework

- The EU plans to set up an internal emissions trading system by 2005. There is still strong political fighting whether it will be mandatory or voluntary and how targets will be allocated to sectors but currently it is likely that its features will be relatively stringent, including monetary penalties for non-compliance with targets. If it will be linked with the Kyoto Mechanisms which is not obvious due to EU fears about a low environmental integrity of CDM rules, it would create a demand for high-quality CERs. An extension of the system beyond the EU in envisaged which would have different impacts on residual demand: if Eastern Europe is quickly integrated, some “Hot air” enters the system while if other European countries enter, demand would increase. A crucial question would be the integration of Russia through green investment schemes or buydown and cancellation of “Hot air”.

- Some smaller OECD countries are introducing domestic policy instruments that allow for Kyoto Mechanisms use, e.g. the Swiss CO_2 law. It is also likely that some countries will continue tendering for emission rights either directly on the Dutch ERUPT model or indirectly, as the Prototype Carbon Fund does.

- A potentially large demand at low prices could come from domestic U.S. policy instruments not linked to the international climate regime. Especially those companies betting on a U.S. reinsertion in the regime would hedge by buying options on CERs, ERUs or AAUs. They cannot buy CERs directly due to the rule that companies from non-eligible countries are excluded from CER trade.

There are now some modelling studies that have tried to estimate market prices under the Bonn Agreement of July 2001 that has been reflected in the Marrakesh Accords (Jotzo/Michaelowa 2001, den Elzen/de Moor 2001, .Grütter 2001, Jakeman et al. 2001). Their results are summarised in Table 5.

Table 5: Global greenhouse gas market characteristics under full competition

Source	Jotzo/ Michaelowa	Grütter	Jakeman et al.	Den Elzen/ de Moor
Aggregate OECD Annex B (without US) including sinks	907 Mt CO_2 p.a.	NA	1,266 Mt CO_2 p.a.	1,679 Mt CO_2 p.a.
United States	1,792 Mt CO_2 p.a.	NA	2,872 Mt CO_2 p.a.	1,888 Mt CO_2 p.a.
EIT countries ("Hot air" + sinks)	-1,343 Mt CO_2 p.a.	NA	-905 Mt CO_2 p.a.	-1,184 Mt CO_2 p.a.
Aggregate OECD Annex B without US	-436 Mt CO_2 p.a.	negative	355 Mt CO_2 p.a.	495 Mt CO_2 p.a.
Price at full competition without the U.S.	0 $/ t CO_2	0 $/ t CO_2	NA	2.5 $/ t CO_2
CDM volume	0	0	NA	88 Mt CO_2 p.a.
Aggregate OECD Annex B with US	1,356 Mt CO_2 p.a.	1,500 Mt CO_2 p.a.	NA	2,883 Mt CO_2 p.a.
Price at full competition with the U.S.	1.6 $/ t CO_2	4.9 $/ t CO_2	NA	7.8 $/ t CO_2
CDM volume	900 Mt CO_2 p.a.	1150 Mt CO_2 p.a.	NA	279 Mt CO_2 p.a.

It becomes clear that under the lower business-as-usual assumptions a situation of full trading and without participation of the U.S. leads to a price of zero. U.S. participation will always lead to a positive price that is however much lower than in pre-Marrakesh

modelling studies. In this case, annual CDM revenues would amount to 1.5 –5.5 billion $.

Table 5: Global greenhouse gas market characteristics under different supply restrictions and no participation of the U.S.

Source	Jotzo/ Michaelowa	Grütter	Jakeman et al.	Den Elzen/ de Moor
Hot air sales volume	400 Mt CO_2	~500 Mt CO_2	500 Mt CO_2	592 Mt CO_2
Price	0.9 $/ t CO_2	~1.1 $/ t CO_2	13 $/ t CO_2	5.4 $/ t CO_2
Volume CDM	294 Mt CO_2 p.a.	~200 Mt CO_2 p.a.	50 Mt CO_2 p.a.	194 Mt CO_2 p.a
Revenues from adaptation tax	5.4 million $ p.a.	4.4 million $ p.a.	13 million $ p.a.	21.0 million $ p.a.
Hot air sales volume	200 Mt CO_2	~250 Mt CO_2	NA	118 Mt CO_2
Price	1.1 $/ t CO_2	1.9 $/ t CO_2	NA	6.9 $/ t CO_2
Volume CDM	457 Mt CO_2 p.a.	~500 Mt CO_2 p.a.	NA	246 Mt CO_2 p.a
Revenues from adaptation tax	10 million $ p.a.	19 million $ p.a.	NA	34 million $ p.a.

For the case without the U.S., oligopolistic maximisation of revenue by "Hot air" sellers changes the picture. A restriction of hot air sales by 50% leads to a price in the range of 1-5 $/t CO_2; the result of Jakeman et al. is clearly an outlier due to very low CDM potential assumed. Annual CDM revenues would be in the range of 200 to 1000 million $.

The distribution of CDM projects in such a case has been modelled by Jotzo and Michaelowa (2000) (see Table 6).

Table 6: Global distribution of non-sink CDM

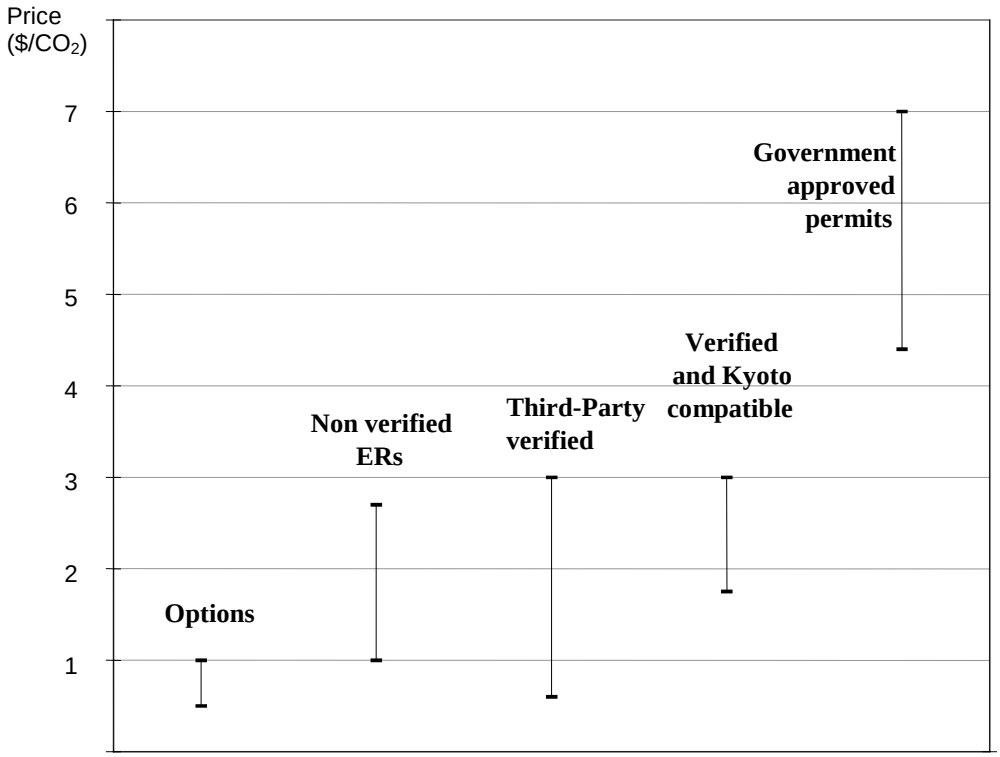
	CER sales, excluding sinks projects (Mt CO_2/year)	Share of global non-sinks CDM volume	Share of non-Annex B emissions at 2010 (CO_2 from combustion)	Share of non-Annex B GDP at 2010
China	120	52%	41%	23%
India	29	12%	11%	8%
Indonesia	5.6	2.5%	2.0%	1.9%
Other Asian countries	24	10%	16%	28%
Middle East	18	8%	12%	7%
Africa	25	11%	8.0%	7.3%
Brazil	1.3	0.6%	4.0%	13.3%
Other Latin American countries	7	3.2%	7.0%	11.3%
Total	230	100%	100%	100%

Source: Jotzo/Michaelowa (2001, p. 25)

11 Recommendations for CDM development

Given the prospects for the development of the international market, the short-term perspective would look at international tender programmes to buy CERs as well as voluntary acquisitions of CER-type rights. CER demand currently comes from the Dutch CERUPT programme opened in November 2001 (tender for about 13 million t CO_2; long-term financing volume about 200 million $) and the Prototype Carbon Fund which has an overall investment volume of 145 million $, part of which is used to fund JI projects. Both PCF and CERUPT announce in their documents that they are looking for prices in the area 3-4 $/t CO_2. For an overview of prices paid on different market segments before the Marrakesh Accords see Figure 15.

Figure 15: Prices paid on the international greenhouse gas market prior to Marrakesh



Source: World Bank (2001)

PWC (2000) try to estimate transaction costs for CDM projects. They found values of around 0.5 million $ for small-scale and 0.75 million $ for large projects. Given CER prices of 1-5 $/t CO_2, minimum sizes for projects thus range from 100,000 to 500,000 CERs just to recoup transaction costs. For PCF projects, transaction costs are estimated to be lower, around 0.35 million $, lowering the threshold to 70,000 CERs. It is likely that learning effects reduce transaction costs considerably the more projects have been implemented.

11.1 Attractive project types under low CER prices

11.1.1 Electricity sector supply and demand

The CERs will give an additional revenue per kWh generated / saved depending on CER price and CER per kWh. The latter value depends on the baseline emission factor

and the project emission factor (see Table 7). CERs will only create revenues of a fraction of a cent per kWh and can thus not overcome the cost differential of several cents between renewables and standard fossil fuel technologies. Only in situations with an excellent renewable energy resource, CERs can make a difference. Modern wind power plants can have costs below 4 cents/kWh at places with average wind resources of 10 m/s. In such a case a difference of 0.5 cents can shift the decision.

In the context of large-scale efficiency programmes looking at "no-regret" opportunities, CER income could provide an extra incentive to finance such projects. However, these projects face the transaction cost barrier.

Table 7: CER revenue (cents) per kWh

CER price ($/t) → Reduction ↓ (g CO_2/kWh)	*Project types*	1	2	3	4	5
400	Coal-to-gas conversion	0.04	0.08	0.12	0.16	0.2
500	Renewables against gas baseline	0.05	0.1	0.15	0.2	0.25
700	Energy efficiency against average grid intensity in many countries	0.07	0.14	0.21	0.28	0.35
800	Renewables against new coal baseline	0.08	0.16	0.24	0.32	0.4
1100	Renewables against old coal baseline	0.11	0.22	0.32	0.44	0.55
1700	Renewables against inefficient diesel baseline	0.17	0.34	0.51	0.68	0.85

11.1.2 Waste management

A big, well-managed landfill with an annual intake of 1 million t of waste generates approximately 50 kt of methane emissions per year. If these emissions are collected and flared, this would lead to an emission reduction of 1 Mt CO_2 equivalent p.a. and related revenues of 1-5 million $. This is likely to be the cheapest project type as installation of collection equipment would only cost around 3 million $; the ratio of revenue to investment would thus be 30 to 150%. If the methane is used to generate electricity, the same discussion applies as in the case of the electricity sector projects discussed above as the costs per CER are much higher.

11.1.3 Gas flaring reduction

A World Bank and ADB-financed gas flaring reduction project in India had investment costs of 1.9 billion $ and recovers 5 billion m^3 of gas per year. Assuming that the baseline fuel substituted was coal and that efficiency of fuel use remains constant, annual emissions reductions reach 8.6 million t CO_2. Using the CER price range 1-5 $, annual CER revenue would reach 8.6 – 43 million $, i.e. 4 to 20% of the gas sales revenue and 0.5-2.5% of the initial investment.

A project utilising gas for methanol production that had been previously flared in Equatorial Guinea reports investment costs of 450 million $ and annual emissions reductions of 2.85 million t CO_2 (UNFCCC 2001), i.e. a revenue stream of 2.85 to 14.25 million $, again equal to 0.5 to 2.5% of the investment.

11.1.4 Collection and use of coalbed methane

A large-scale coal-bed methane recovery project in China has investment costs of 120 million $ (World Bank/USEPA 1998) and reduces emissions by 0.3 million t CO_2 per year; another smaller one costs 6.7 million $ while annual emission reduction is 88,000 t CO_2. The ratio of revenue to investment is 0.25 to 1.25% in the first and 1.3 to 6.5% in the second case. This type of projects is thus much less attractive than landfill methane collection.

11.1.5 Forestry

As rules for CDM forestry projects will only be fixed years from now, investing in afforestation and reforestation projects is a risky venture and thus not overly attractive.

11.2 Comparative analysis

The only comparative analysis with realistic CER prices on the basis of both project costs and revenues has been done by the PCF (see Table 8).

Table 8: Impacts of CERs on revenues of PCF projects

Project type	Host country	Costs (million $)	CERs generated (million)	IRR without CERs	IRR increase at 3 $/t CO_2
Wind	Costa Rica	19	0.2	9.7	0.9
	Jamaica	26	1.3	17.0	1.0
	Morocco	200	4.7	12.7	1.3
Hydro	Chile	37	1.3	9.2	1.2
	Costa Rica	1.3	0.03	7.1	2.6
Bagasse	Guyana	50	2	7.2	0.5
	Nicaragua	3.1	0.1	14.6	3.6
Biomass	Brazil	53	4.3	8.3	5.2
Landfill methane	India	40	2.7	13.8	4.9

Source: World Bank (2001)

It becomes obvious that the electricity sector which had long been seen as the primary target of the CDM is less attractive than the biomass and landfill methane projects, underlining the analysis made above.

11.3 Unilateral policies

Policies such as implementation of a renewables quota could become interesting cases of unilateral CDM. However, they pose big problems for baseline setting. It would obviously be inadequate to take the share of renewables before the announcement of the quota as the baseline. The baseline should be the expected growth of the renewables share. The next problem would be the question which technologies would have filled the gap between the quota and the expected renewables share. It is unclear how the EB would treat policies in general.

12 Conclusions

The international climate policy regime is strong from an institutional point of view but weak concerning the emissions targets that are likely not to go beyond business-as-usual for the aggregate of all countries with targets. Russia and the Ukraine have a considerable market power and the price level on the international greenhouse gas market depends on their actions. The CDM is hostage to this development; the low price around 1 to 5 $/ t CO_2 that is likely will limit CDM investment to few project types in attractive locations. Host countries that want to benefit from CDM projects have to be institutionally efficient. A U.S. reentry would change this picture considerably; already now expectations of a domestic U.S. programme bolster international market transactions.

13 References

Anonymous (2001): In global warming war, ploughshares are swords, in: Chicago Tribune, Sept. 5

Den Elzen, M; de Moor, A. (2001): Evaluating the Bonn Agreement and some key issues, rivm Report 728001016/2001, Bilthoven

FAO 2001, Land use data, FAOSTAT database, http://apps.fao.org/page/collections?subset=agriculture

Grütter, Jürg (2001) The GHG market after Bonn, mimeo, Andwil

Jakeman, Guy; Heyhoe, Edvina; Pant, Hom; Woffenden, Kate; Fisher, Brian (2001): The Kyoto Protocol. Economic impacts under the terms of the Bonn Agreement, Abare Conference Paper 2001.28, Canberra

Jotzo, Frank; Michaelowa, Axel (2001): Estimating the CDM market under the Bonn Agreement, HWWA Discussion Paper No. 145, Hamburg

Kyoto Protocol (1997): http://www.unfccc.int/resource/docs/cop3/07a01.pdf

Marrakesh Accords (2001): http://www.unfccc.int/COP7/documents/accords_draft.pdf

Price Waterhouse Coopers (2000): A business view on key issues relating to the Kyoto Mechanisms, London

Sampson, Neil; Schole, Robert (2000): Additional human induced activities- Article 3.4, in: IPCC, *Special Report on Land Use, Land-Use Change And Forestry*, Intergovernmental Panel on Climate Change, Geneva, p. 181-281

SENTER (2001): Carbon prices in Erupt 2000 high, but not too high, http://www.senter.nl/asp/page.asp?alias=erupt&id=i001210

UNFCCC (1992): U.N. Framework Convention on Climate Change, http://www.unfccc.int/resource/docs/convkp/conveng.pdf

UNFCCC (2001): Atlantic Methanol Production Company (AMPCO) – Environmentally Responsible Gas Processing on Bioko Island, http://www.unfccc.int/program/aij/aijact01/gnqusa-01-01.html

World Bank (2001): COP 6 bis outcomes clinic – implications for the global carbon market, Washington

World Bank; USEPA (1998): Seminar and roundtable on coalbed methane development and potential – China, Washington