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Long-term prospects of CDM and JI

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16. Abstract

This study analyses whether Germany should use the flexible mechanisms under the Kyoto protocol or whether it should continue to achieve its greenhouse gas reduction targets by dint of domestic policies and measures. It estimates the future potential of the project-based Kyoto mechanisms (CDM and JI) and the impacts of its use on the German and the global economy, using an integrated-assessment model. In a Delphi survey, the expectations of international experts on the future prospects of the project-based Kyoto mechanisms are assessed. The study finishes with an analysis of options for promoting the use of the flexible mechanisms in Germany and concludes that the Federal Government of Germany should establish a project-based mechanisms fund of 25 to 50 million Kyoto units to cover the compliance uncertainties due to unexpected temperature or business cycle variations.

17. Keywords

Flexible Mechanisms, project-based mechanisms, CDM, JI, Clean Development Mechanism, Joint Implementation, Emissions Trading, Kyoto Protocol, greenhouse gases, mitigation costs, transaction costs, risks, integrated assessment, computable general equilibrium model, Delphi survey, Germany, Europe, China, India, Brazil

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Abbreviations

AAU	Assigned Amount Units
ADB	Asian Development Bank
BaU	Business as Usual
CCS	Carbon Capture and Storage

CDM	Clean Development Mechanism
CDM EB	CDM Executive Board
CER	Certified Emission Reduction
CES	Constant Elasticity of Substitution
CHP	Combined Heat and Power
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide equivalent
COP	Conference of the Parties
CP	Commitment Period
DC	Developing Countries
DNA	Designated National Authority
DOC	Degradable Organic Carbon
EIA	Energy and Information Administration
EIT	Economies in Transition
EPA	Environmental Protection Agency
ERPA	Emission Reduction Purchase Agreement
ERU	Emission Reduction Unit
EruPT	Emissions Reduction Procurement Tender
ET	Emissions Trading
ETS	Emissions Trading Scheme
EU	European Union
GEF	Global Environmental Facility
GHG	Greenhouse Gas
GIS	Green Investment Scheme
GWP	Global Warming Potential
HCFC	Hydro chlorofluorocarbon
HEV	Hicksian Equivalent Variation
HFC	Hydro fluorocarbon
IAM	Integrated Assessment Model
IC	Industrialised Countries
ICAM	Integrated Climate Assessment Model
IEA	International Energy Agency

IET	International Emissions trading
IPCC	Intergovernmental Panel on Climate Change
JI	Joint Implementation
lCER	Long-term Certified Emission Reduction
ITCs	Implementation Transaction Costs
ITL	International Transaction Log
LULUCF	Land Use, Land Use Change and Forestry
MAC	Marginal Abatement Cost
MERGE	Model for Evaluating Regional & Global Effects of GHG Reduction Polices
MP	Methodological Panel
MRV	Monitoring, Reporting and Verification
MSW	Municipal Solid Waste
MTACs	Market Transaction Costs
Mt CO_2e	Megatons of carbon dioxide equivalents
NAP	National Allocation Plan
NGO	Non-Governmental Organisation
NIES	Japanese Centre for Environmental Research
ODS	Ozone-Depleting Substance
PDD	Project Design Document
PET	Pelangi's Emissions Trading
PFC	Per fluorocarbon
PITCs	Pre-Implementation Transaction Costs
ppm	parts per million
ProMechG	German Project Mechanisms Act
PTFE	Polytetrafluoroethylene
PV	Photovoltaics
RAND	Research and Development Project
RICE	Regional Integrated Model of Climate & Economy
SF_6	Sulphur Hexafluoride
SRES	Special Report on Emissions Scenarios
SWDS	Solid Waste Disposal Site
TAA	Trexler and Associates, Inc.

TACs	Transaction Costs
TAR	Third Assessment Report
tCER	Temporary Certified Emission Reduction
UBA	Umweltbundesamt, Germany's Federal Environmental Agency
UNDP	United Nations Development Program
UNFCCC	United Nations Framework Convention on Climate Change
US	United States of America

1 Background and Introduction

The international community has acknowledged climate change as one of the major global challenges by agreeing upon the United Nations Framework Convention on Climate Change (UNFCCC) and by adopting the Kyoto Protocol. When the latter came into effect at the beginning of 2005, emission reduction and stabilisation commitments became legally binding. Moreover, talks have been held on how a future climate regime could be negotiated. Debates on emission targets in the second commitment period are gaining momentum.

Against this background, a discussion about future mitigation options for Germany's emissions commitments is necessary. It must be decided whether emission targets are to be met by domestic measures alone or whether the so-called flexible mechanisms under the Kyoto Protocol – namely International Emissions Trading (ET), Joint Implementation (JI) and the Clean Development Mechanism (CDM) – should be used and to which extent. These mechanisms allow for commitments to be partially fulfilled by the acquisition of emission certificates (ET), or by initiating climate mitigation projects in developed (JI) or developing countries (CDM). Thus, cost benefits could be tapped which would not be tapped when using domestic measures alone.

Germany has always – on an international as well as on a European level – advocated strict commitments and a climate system which has ecological integrity. The EU is currently debating on the introduction of an emission reduction target of up to 30 % by 2020 in comparison to 1990 levels (CEU 2005, p. 15f). The German government has agreed to reduce Germany's GHG emissions by more than 30 %, if the EU commits itself to reducing its GHG emissions by 30 % (CDU/CSU/SPD 2005, p. 54). Scientists advocate a reduction of 80 % by 2050 (Enquete-Kommission 2002, p. 74f). German companies are already using, or are planning to use, flexible mechanisms for compliance under the European Emissions Trading Scheme (EU ETS). The role of flexible mechanisms should, therefore, be discussed in the light of further ambitious climate mitigation targets as well as in terms of strategic aspects.

This research project can contribute to the discussion of the role of CDM and JI within the German commitment to climate protection. Moreover, by demonstrating cost-effective reduction potentials, the probability of an ambitious climate regime can be increased and the acceptance of binding targets by economies in transition and developing countries can be enhanced. These aspects could contribute to forging a global alliance against climate change, and could re-integrate the US in the process.

In order to address these issues, the research project investigates the future potential of project-based mechanisms (CDM and JI) by means of a literature review as well as by conducting our own projections (Chapter 2). The analysis encompasses both the medium-term potential, spanning to the end of the first commitment period, as well as the long-term potential beyond this point. Both projects mitigating CO_2 and other greenhouse gases are examined. Project categories are discussed according to both economic and ecological criteria.

Following this analysis, model simulations are carried out in order to determine potential cost reduction effects arising from the use of flexible mechanisms (Chapter 3). The scenarios encompass several emission paths leading to different greenhouse gas stabilisation levels – which mainly focus on stabilising the global temperature increase at a maximum of 2° C – and regional distribution of emission reductions. The contribution that flexible mechanisms make to reaching these targets is then assessed. Several economic and environmental indicators are used to evaluate the obtained results, and the climate impacts of the stabilisation scenarios are determined.

Chapter 4 presents the results of a Delphi survey carried out among international experts working in the field of flexible mechanisms. The issues raised in the questionnaire include barriers to CDM and JI projects, the costs, risks and forecasts of the future climate regime and the role of CDM and JI amongst others.

In Chapter 5, framework conditions and instruments that can be deployed to foster the use of CDM and JI in Germany are analysed. Instruments to remove barriers standing in the way of industry making use of CDM and JI are evaluated. Moreover, governmental programs are discussed; within this discussion, the question as to whether the German government should purchase credits from CDM and JI projects in the medium term and, if so, in what quantity, is especially addressed. Finally, the main findings are summarised in order to deduce political recommendations for the future use of credits from project-based flexible Kyoto mechanisms in Germany.

2 The future potential of CDM and JI – A review of literature and calculation of our own projections

In this chapter, we provide an overview of the future potential for projects under the Clean Development Mechanism (CDM) and Joint Implementation (JI), based on a literature review and our own calculations.

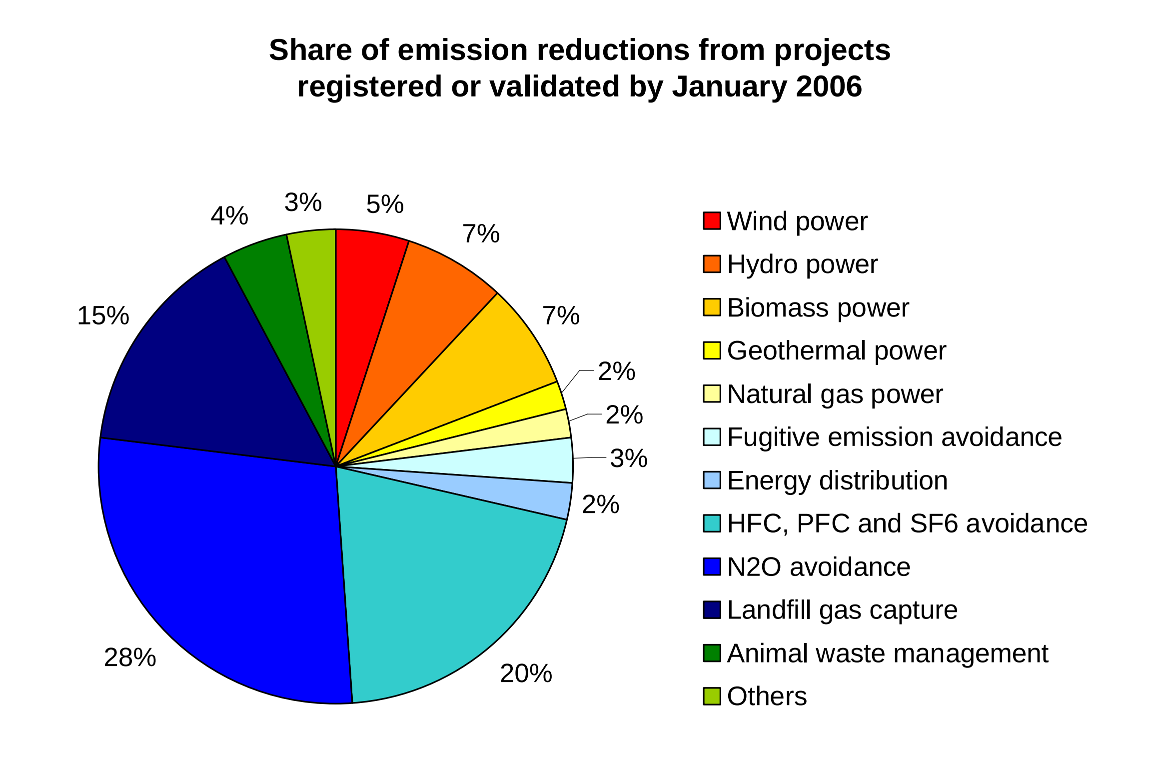
Existing projections of the future potential of JI and the CDM in the literature chiefly look at a time horizon stretching up to 2012. Based on a literature review and data on the development of JI and CDM project activities, we provide an estimate on the potential use of JI and CDM up to 2012 – the end of the first commitment period – in Section 2.1.

Beyond 2012, there are hardly any projections available for the project-based mechanisms; various studies do, however, estimate the mitigation potential based on economic models. For CO_2 emissions, we use model results from the literature to provide an overview of the mitigation potential for the most important countries, China and India (Section 2.2). Furthermore, based on the model results from Chapter 2 we provide our own estimates as to what extent the project-based mechanisms JI and CDM could make use of this mitigation potential, taking into account transaction costs and methodological requirements for project development.

The current project portfolio under the CDM shows that projects reducing greenhouse gases other than CO_2 are quite promising in terms of their potential and mitigation costs (Figure 1). This refers in particular to the destruction of methane from landfills, the destruction of nitrous oxide in the waste gas from adipic acid production and the destruction of HFC-23 in the waste gas from HCFC-22 production. Since these measures appear particularly important for the CDM and since they are usually not reflected well in economic models, we estimate the potential of these abatement measures by making our own calculations (Section 2.3). These calculations are based on statistical data, the underlying approved CDM baseline and monitoring methodologies as well as methodologies outlined in the *1996 Revised IPCC Guidelines for National Greenhouse Gas inventories* and the *2000 IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*.

Finally, we summarise the overall future potential for CDM and JI and provide conclusions (Section 2.4).

Figure 1: Distribution of CDM and JI projects across project types



Source: Calculations by Öko-Institut based on a database maintained by UNEP RISOE

2.1 The CDM and JI potential up to 2012

The CDM and JI potential up to 2012 can be estimated from the demand or the supply for CERs and ERUs. Most studies estimate the market potential from the demand side: subtracting the assigned amount of Annex B countries from the demand for Kyoto units by these countries gives the potential market size of CDM or JI projects. Conversely, estimates on the supply side of the CDM market are very rare, for different reasons: reliable (cost) data on realistic CDM project portfolios in developing countries is only available for a few countries. Furthermore, the transaction costs and barriers to the CDM are difficult to take into account. Finally, baseline and monitoring methodologies for estimating emission reductions have only emerged in the last two years.

In the following, we provide an overview of estimates of the market size to be found in literature, as a first step. These estimates are mostly based on models that use emission projections of Annex B countries (Section 2.1.1). We then analyse information on public procurement tenders for CERs and ERUs, as reported in national communications and in national allocation plans (NAPs) under the European Emissions Trading Scheme (Section 2.1.2). On the supply side, we analyse the current project portfolio (Section 2.1.3). Finally, based on these model results and the observed activities, we provide an estimate of the actual potential for CDM and JI up to 2012 (Section 2.1.4).

2.1.1 Literature review

Estimates on the potential for CDM and JI are either based on modelling results or on information contained in national communications submitted to the UNFCCC. The scope of the models differs with regard to regions and sectors which are covered and the factors which are included. Some models estimate business-as-usual emissions for 2010 without considering technology changes and climate change policies, while others take these into account. Different model structures, varying business-as-usual assumptions and differences in data used (GDP, energy intensity etc.) add up to significant differences in business-as-usual emissions and the extent to which the flexible mechanisms are used. The different studies are therefore not fully comparable. Nevertheless, the following overview shows which factors influence the potential market for CDM and JI and illustrates the range of the market size.

The main factors influencing the market size for CDM and JI are:

- Trading of hot air from Russia and Ukraine;
- The role of the United States;
- Emission reductions undertaken by Annex B countries by implementing policies and measures;
- Use of sinks to fulfil the commitments;
- Socio-economic factors affecting business-as-usual emissions in Annex B countries, such as economic growth, fuel prices, technological innovation, etc.

To calculate the prices and quantities of Kyoto units traded under different scenarios, the models use marginal abatement cost curves (MACs) for different countries or regions. Most models assume that trading is not limited and that the market results in an economically optimal allocation of emission reduction measures. Some scenarios assume trade restrictions.

Hot Air

Most Eastern European countries with economies in transition (EIT countries), in particular Russia and the Ukraine, will be far below their Kyoto target in 2010. The surplus of Kyoto units (so-called "hot air") can be traded with countries that are short of Kyoto units. The price for hot air is expected to be very low, as no emission reductions have to be undertaken. The market potential for CDM and JI depends mainly on the amount of hot air that is traded. The amount of hot air is uncertain, since it in turn depends significantly on the paths of economic recovery in the economies in transition. Assuming strong economic growth and continued use of outdated technologies, emissions in 2010 could be close to the allowed emission budget, with only small amounts of hot air being available on the market. However, most studies expect less economic growth, coupled with a modernisation of the energy sector, resulting in a significant amount of hot air. Banking Kyoto units to subsequent commitment periods is another option for EIT countries and makes projections on the amount of hot air even more difficult.

US Participation

Most studies published between 1998 and 2001 still assume the participation of the United States in the Kyoto Protocol. As GHG emissions of the United States were rising dramatically during the 1990s, the US would be far behind in achieving its Kyoto target. The participation of the United States would considerably increase the demand for Kyoto units.

A thorough study which includes US participation is provided by Zhang (1999). Zhang compares other modelling results with his own calculations and analyses the influence of trade restriction on the market size for CDM and JI within four different scenarios. He uses emission projections from national communications in order to determine business-as-usual emissions in 2010. Zhang's study shows the lowest demand for Kyoto units in Annex B countries.

Other models assume GHG emissions mostly to be higher than projected in national communications. The results of these projections should be handled with care, since some basic assumptions used in the models may be unrealistic in practice. The results from different studies which assume the participation of the US are summarised in Table 1. As the demand for Kyoto units would be very high with US participation, the CDM would constitute 40% of overall emission reductions on average.

Table 1: Estimated market size for CDM in 2010, assuming the participation of the US in the Kyoto protocol, in Mt CO_2e

Model or study	Annex B Demand	Supply hot air	Supply CDM
		- Mt CO_2e -	
EPPA - Ellerman et al. 1998	4,811	407	2,651
Haites 1998	3,667	-	971 - 2,108
G-Cubed - Mc Kibbin 1999	4,041	-	1,815
Green - van der Mensbrugghe 1998	4,759	477	1,456
SGM - Edmonds 1998	3,861	1,060	1,665
Vrolijk 1999	2,453	-	245 - 517
Zhang 1999	2,276	257 - 385	484 - 1,312
Average	3,932	-	1,897

Source: Summary of literature studies

Without the participation of US

As a result of the United States and Australia not ratifying the Kyoto Protocol, it is estimated that the demand for Kyoto units will decrease by more than 70%. Under these circumstances, the market potential for CDM and JI depends considerably on whether the purchase of hot air is accepted politically and is undertaken by the key demand countries. Several recent studies estimate the market size without the US participation.

A very comprehensive study is provided by Haites (2004). Haites summarises different estimates on the demand and supply of Kyoto units, which are either based on emission projections or on model results. Emission projections which estimate the demand for

Kyoto units by Annex B countries are available from national communications, the International Energy Agency (IEA) and the Energy and Information Administration (EIA) of the US. Based on information in national communications, Haites (2004, p. 9) still calculates a net demand for Kyoto units in Annex B countries, whereas according to model results by Haites (2004, p. 14) – where the US and Australia are excluded and hot air is fully traded – the demand for Kyoto units is lower than the supply of hot air. In this case, CERs or ERUs are not required and no market would exist for CDM or JI. Only by restricting the sale of hot air, a market for CDM and JI would be created, since the purchase of CERs or ERUs would become cheaper than emission reductions brought about by domestic action (Haites 2004, p. 16).

Inclusion of sinks according to Article 3.3 and 3.4

The use of Article 3.3 and 3.4 of the Kyoto Protocol, as specified in the Marrakech Accords, will further reduce the effective emission reduction by Annex B countries.

Jotzo and Michaelowa (2002) and Blanchard et al. (2002) consider the use of removals by sinks in their estimates on the potential size of the CDM and JI market. The study by Jotzo and Michaelowa (2002) is based on the PET (Pelangi's Emissions Trading) model. Emission data for projecting business-as-usual emissions in 2010 is based on estimates from the US Department of Energy (EIA). A basic assumption in the calculation is that the sale of hot air is limited to 400 Mt CO_2e per year. A sensitivity analysis is included in the study, showing that the share of CDM in the global carbon market increases along with economic growth. Assuming high economic growth, the share of CDM can amount for 45% of the total required emission reduction, while in a low economic growth scenario, the CDM contributes only 17% of the required emission reduction.

Similar to the model results given by Haites (2004), Blanchard et al. (2002) show that the supply of Kyoto units from Annex B countries is greater than the emission reduction requirement without the participation of the US and with the possibility of using removals by sinks.

Table 2: Estimations of the demand for CERs in 2010 after the withdrawal of the US

Model or study	Without restriction of hot air: Annex B Demand	Without restriction of hot air: Supply hot air	Without restriction of hot air: Supply CDM	With restriction of hot air: Annex B Demand	With restriction of hot air: Supply hot air	With restriction of hot air: Supply CDM
	- Mt CO_2e -					
Jotzo & Michaelowa 2002				744 - 1,103 [3)]	400 [1)]	81 - 387
Blanchard et al. 2002	623[3)]	1,293	0	623 [3)]	0 [2)]	99
Eyckmans et al. 2001 [7)]	1,731	1,470	261	1,414	915	499
Grubb low 2003 [7)]	807	1,123	0	807	473 [4)]	55
Grütter 2001 [7)]	1,100 - 1,500	700 - 1,500	0 - 500	1,000 - 1,200	250 - 300 [5)]	250 - 500
Jakeman et al. 2001 [7)]	2,372	1,074	0	935	500 [6)]	<49
Hagem und Holtsmark 2001 [7)]	900	825	75			
National Communication	869	689	180			
Average	1,229	990	109	967	458	218

[1)] hot air trading is restricted to 400 Mt CO_2e/year; [2)] hot air is not traded at all; [3)] sinks are included; [4)] only 56% of hot air will be sold; [5)] sale of hot air is limited to 25%; [6)] only 45% of hot air will be sold; [7)] cited in Haites 2004

Source: Summary of literature studies

Supply of CERs

Estimating the potential of the *supply* of CERs is very difficult, since information on emissions and emission reduction potentials in developing countries is less reliable and complete. In estimating the potential CDM supply, Haites (2004) refers to two studies. Sijm et al. (2000) estimate the potential of CER supply at 800 Mt CO_2e per year for the period from 2008 to 2012 (Sijm et al. 2000 in Haites 2004, p. 24). These estimates are very high compared with the estimates from Trexler and Associates (TAA 2003, cited in Haites 2004) which are based on the IPCC Third Assessment Report (TAR). Trexler and Associates developed supply curves by project types and regions and estimated the market size with different scenarios regarding the requirements for additionality. This ‘additionality rank’ is used to distinguish between emission reductions that would have happened anyway (additionality 1) and emission reductions that are truly additional (additionality 5). The potential size of the CDM market under the “additionality 3” scenario is much higher than under “additionality 5”. In this regard, the actual criteria on how to demonstrate additionality may play an important role with respect to the supply of CERs.

In summary, a great range emerges in estimations of the market potential of Kyoto units generated by the CDM and JI. Due to the withdrawal of the US, the potential market for CDM and JI decreased considerably. The possibility of including sinks further reduces the emission reduction demand. According to most of the modelling results, no potential market for CDM or JI could exist, since the supply is already greater than the demand due to the surplus of hot air from EIT countries and the use of sinks. The market size for CDM and JI chiefly depends on the restriction on hot air trading.

2.1.2 Recent information on public procurement programs of Annex B countries

As indicated above, there will be a considerable demand for Kyoto units from Annex B countries during the first commitment period from 2008 to 2012. A key question is to what extent these countries will make use of hot air and the project-based mechanisms. The ongoing activities of Annex B countries indicate that most countries prefer to purchase CERs and ERUs, rather than hot air. This also explains the difference between the model results – which suggest that the hot air could be sufficient to satisfy demand by Annex B countries – and the considerable CDM and JI project portfolio that is currently being developed and implemented.

According to a report by the European Environment Agency (2005), at least nine EU Member States (Austria, Belgium, Denmark, Finland, Ireland, Italy, Luxembourg, the Netherlands and Spain) intend to use project-based mechanisms. These nine Member States intend to purchase 106.8 Mt CO_2e altogether in each year of the first commitment period of the Kyoto Protocol.[1] This amount corresponds to over 30% of the total required emission reduction for the EU-15 of about 250 Mt CO_2e per year during the first commitment period, or 2.5 percentage points of the EU-15 Kyoto target of -8%.

The total budget allocated by all those EU Member States who provided respective information amounts to about € 2,730 million. Assuming a price of € 7.40 per t CO_2e – which is the average implied price level that the Commission used in its decision on the national allocation plans of Austria, Denmark and the Netherlands – these resources would be able to contribute 74 Mt CO_2e to the EU-15 Kyoto target for each year of the commitment period.

In addition, the European Emissions Trading Scheme (EU ETS) permits companies to use CERs or ERUs to fulfil their commitments, whereas the direct use of excess AAUs (hot air) is not possible. The demand from this sector will strongly depend on the stringency of national allocation plans for the period from 2008 to 2012; it is, however, to a certain extent dependent on the demand for Kyoto units from governments. Less stringent national allocation plans require additional mitigation efforts in other sectors of the economy or additional public purchase of CERs and ERUs.

Currently, prices for allowances in the ETS are well above prices for CERs. Once CERs and ERUs will be available for trading, it is expected that a significant amount of CERs and ERUs will also be used in the ETS market. This is supported by a number of private carbon purchase funds that have been set up in the last year. The size of this market is difficult to estimate, since national allocation plans for the period from 2008 to 2012 are not yet available.

The only major non-EU countries with a considerable demand for Kyoto units are Japan and Canada. Japan intends to fulfil 1.6% points of its national target by using flexible mechanisms, while the remainder of the total emission reduction (of about 12% from business-as-usual emissions in 2010) will be undertaken by using Art. 3.4 and 3.4 and

[1] Although Sweden already provided funds for pilot projects and has begun acquiring Kyoto units, it is not included in this figure. A final decision has not been taken by the Swedish government and the total quantity of units used – if any at all – is not yet known.

domestic policies and measures (IGES 2005). This means that about 20 Mt CO_2e annually will be purchased by Japan. It is not yet clear, however, to what extent CDM and JI will be used.

Canada also plans to reduce GHG emissions in a predominantly domestic fashion and by using Art. 3.3 and 3.4 activities. In Canada's national climate change plan, only a "minimum" of 12 Mt CO_2e are envisaged for the international market (Canada 2002). However, taking into account Canada's GHG emission trends, it seems likely that more Kyoto units will be bought on the market. Canada has recently engaged in the support of EIT countries in setting up Green Investment Schemes (GIS). As a result, it is likely that Canada will not only make use of the CDM and JI, but will also buy hot air via Green Investment Schemes.

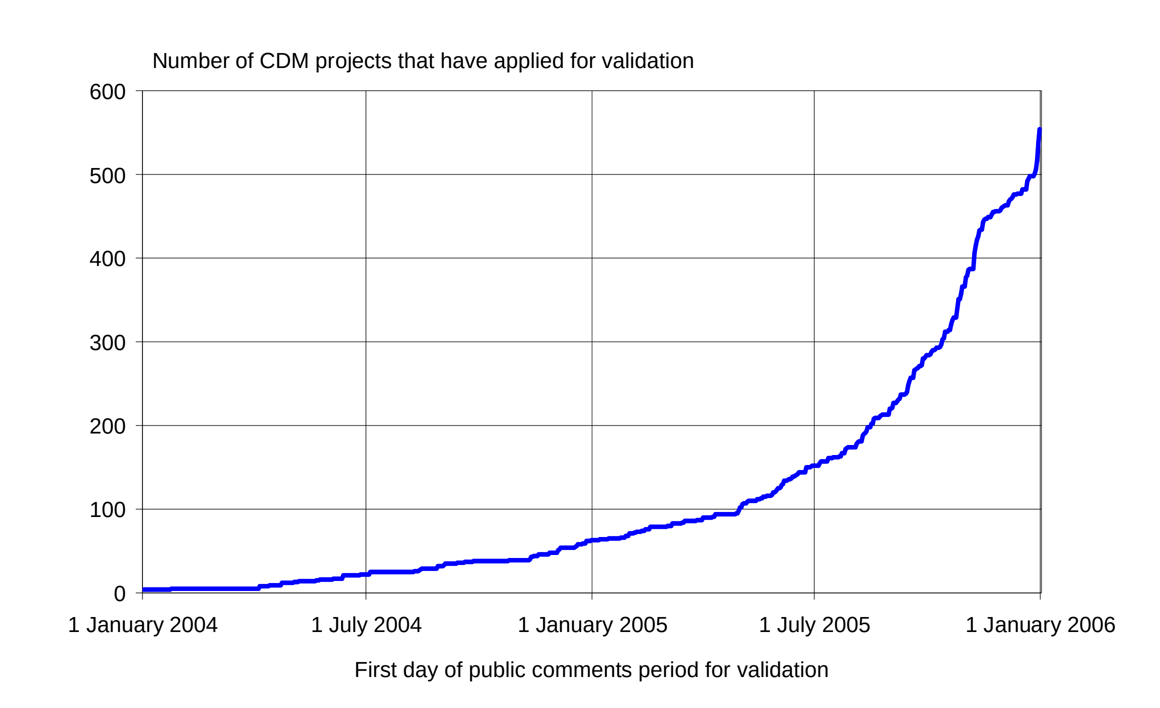
2.1.3 The supply of CERs and ERUs

By 1st July 2006, 226 CDM projects had been registered which had a mitigation potential of more than 1,000 Mt CO_2e up to 2012.

According to market information supplied by PointCarbon (2006b) about 3,400 JI and CDM projects had been proposed globally by July 2006, about 1,300 projects of which are at a more advanced state of development, including the elaboration of a Project Design Document (PDD), potentially yielding about 1,500 Mt CO_2e of emissions reductions up to 2012.

Figure 2 below shows that the development of CDM and JI projects has grown exponentially in the last two years. We expect, therefore, that a significant number of projects still will be developed in the next few years (Section 4.2.14). However, a key prerequisite for a continuous supply of CERs will be that investors are assured of the post-2012 use of CERs (Section 4.2.1). We expect that the number of projects being registered will increase steadily over the next two years and will decrease thereafter.

Figure 2: *Validation of CDM projects over time*



Source: UNFCCC

2.1.4 Conclusions

A number of studies suggest that without any restrictions on the trade of hot air, the market potential for the CDM would be very small or even zero. However, it seems likely that hot air will not be traded in full. For example, the EU Linking Directive allows only CERs and ERUs (Emission Reduction Units) to be exchanged for EU allowances. In addition, most countries currently still refrain from directly buying hot air.

Some Eastern European countries (Bulgaria, the Czech Republic) have started to set-up Green Investment Schemes (GIS), where the revenues from selling AAUs are used for climate protection purposes. The revenues are not necessarily used for mitigation of GHG emissions in isolation, but are also applied in capacity building efforts or for compliance with reporting requirements under the Kyoto Protocol.

We anticipate that Canada (predominantly) and Japan (to a certain extent) will make use of hot air, probably via Green Investment Schemes. In addition, some European Member States who have a large gap and who have not yet made significant efforts to purchase CERs or ERUs may buy hot air at the end of the commitment period (e.g. Italy, Spain, Portugal). In this case, it is unlikely that the hot air would be traded in full in the first commitment period.

Based on the ongoing activities in the area of CER and ERU purchase, and based on the project portfolio currently under development, we expect JI and CDM projects to deliver at least about 1,000 Mt CO_2e up to 2012 (Section 4.2.12), with the largest share being made up by CDM projects. Realistically, 2,000 to 3,000 Mt CO_2e up to 2012 can be expected, if Annex B countries make further efforts to fulfil their commitments by usig project-based mechanisms, and if prices provide sufficient incentives for further projects to be developed. In this context, the future perspectives on the use of CERs and ERUs after 2012 are also important.

2.2 The CDM potential beyond 2012: CO_2 projects

The long-term potential of CDM projects mitigating CO_2 is predominantly estimated with the help of the PACE-IAM model, which is described in detail in Section 3.3. We assume that the JI potential (i.e. single projects amongst Annex B countries) is substantially diminished by the broad introduction of emissions trading and policies and measures to realize mitigation potential in Annex B countries.

To provide an overview of the long-term CDM potential for CO_2, we use the results of other emission and mitigation scenarios that focus on the energy sector, alongside these model results. These mitigation scenarios chiefly are the results of economic models applied to different countries or regions.

Both the model results of PACE-IAM and the mitigation scenarios from other studies cannot reflect the transaction costs and actual opportunities of project-based mechanisms in their entirety. For example, the implementation of project-based mechanisms is more problematic in the case of a number of measures or sectors, such as the transport sector or energy efficiency improvements. Therefore, the actual potential for project-based mechanisms can be expected to be considerably smaller than the mitigation potential generated by model results. Nevertheless, model results can provide an overview of the range and type of the mitigation potential and costs.

We focus our analysis of other studies on China and India, which are expected to have the largest mitigation potential from a longer-term perspective.

Various emission and mitigation scenarios have been published in the last years. As different methodological approaches, underlying assumptions and models are used, a great range in the quantitative results emerges. Some studies focus only on the development of business-as-usual emissions, while others include mitigation scenarios. For example, the UNEP financed 10 GHG abatement cost studies, seven of which are for developing countries. For Asian countries, least-cost GHG abatement strategies have also been developed by the Asian Development Bank (ADB 1998a, ADB 1998b), the Global Environmental Facility (GEF) and the United Nations Development Program (UNDP). To make information more accessible, the Centre for Environmental Research (NIES) in Japan integrated many of these studies in an IPCC database, including scenarios from the IPCC Special Report on Emission Scenario (SRES) as well as more recent scenarios (NIES/CGER 2006).

This database includes more than 250 studies on GHG emission scenarios with a time horizon ranging from 1985 to 2100. The studies differ with regard to the regions, sectors and emissions which are covered. There is currently a call for new emission scenarios, since an assessment of the most recent literature on emission scenarios is planned as part of the fourth assessment report of the IPCC.

In assessing the CO_2 mitigation potential in China and India, we use some country studies which include more detailed country-specific information on mitigation options, in addition to these model results.

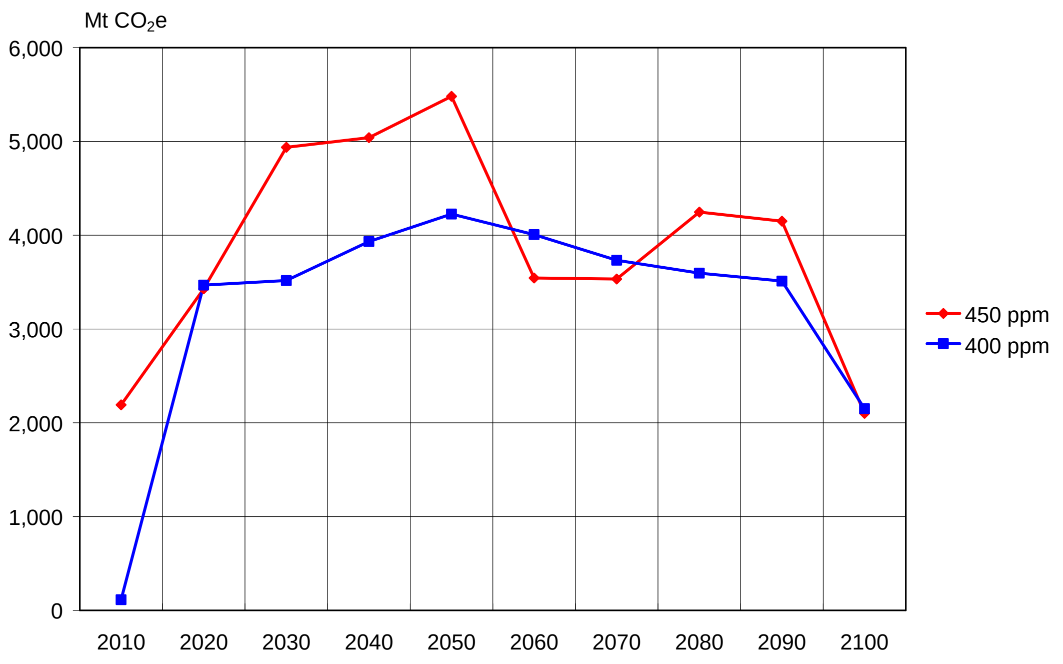
2.2.1 Global assessment with PACE-IAM

The potential CDM market volume up to 2100 was simulated with the help of the PACE-IAM model (see Section 3.3 for a detailed description) and is calculated as the sum of CER exports from developing countries. Figure 3 presents total net permit exports (i.e. exports of emission permits minus the imports) of developing countries to other world regions for two alternative stabilisation targets (400 and 450 ppm).[2] The figure shows that up to the year 2050, the CDM market volume rises and is larger for the 450 ppm stabilisation target. The 450 ppm stabilisation target shows a larger volume because developing countries take on stricter commitments in the 400 ppm scenario and can therefore export less emission permits. From 2050 onwards, the market volumes decreases in both scenarios, since it is assumed that developing countries will commit to relatively strict emission reduction targets in the second half of the century, according to the multi-stage approach (Chapter 2). As a general conclusion, the potential global CDM market volume is estimated to amount to a maximum of 5.5 Gt CO_2, a total which varies in accordance with different time horizons and stabilisation scenarios.

The model features transaction costs for CDM investments of 1 US$/tC or 0.27 US$/t CO_2. This scale is slightly higher than, but roughly in line with, the estimates based on the results of the Delphi survey that was conducted (see Section 4.2.4).

[2] These stabilisation scenarios were translated into regional emission reduction requirements according to a simplified *staged approach* (see Section 3.5); this should be interpreted as a simplified assumption of the distribution of global mitigation burdens in the long run, rather than as an elaborate proposal of global climate policy post-2012.

Figure 3: Global net export of CDM credits (CERs)

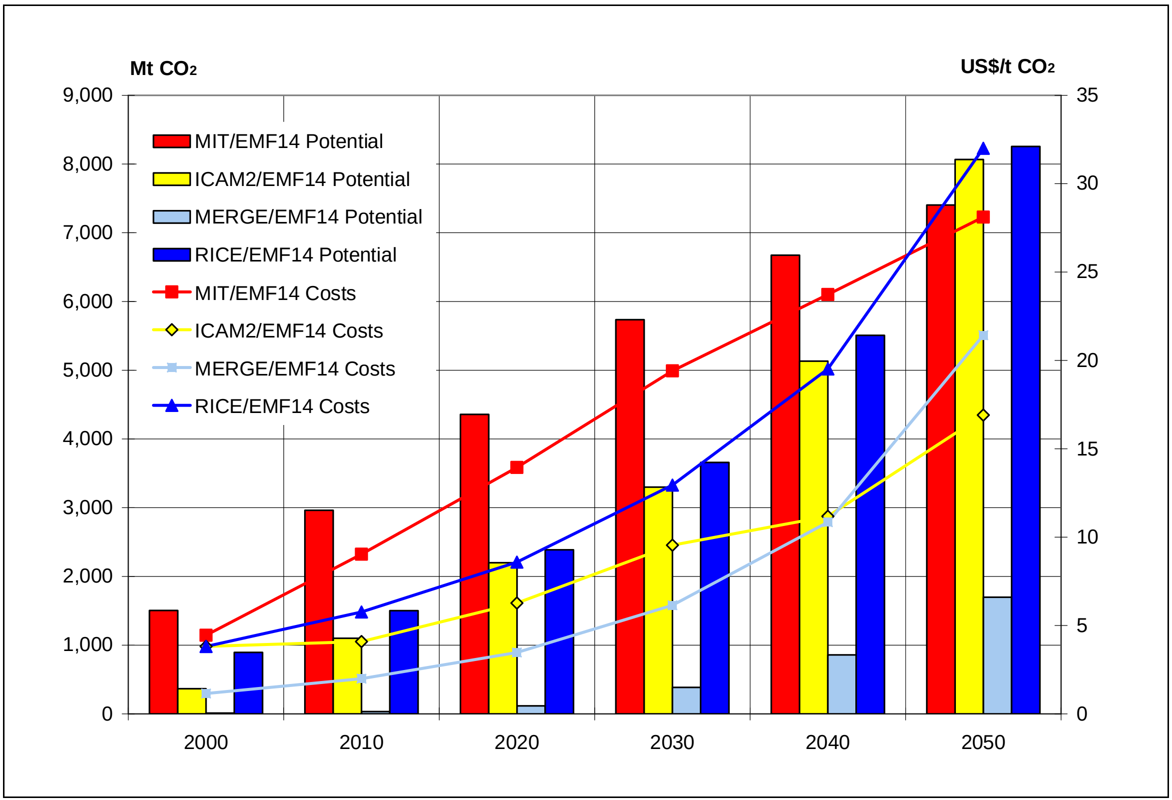


Source: ZEW

2.2.2 Mitigation scenarios for China

The database maintained by NIES (NIES/CGER 2006) provides more than 30 studies that focus on CO_2 emissions in China. Very few studies model CO_2 emissions explicitly for China, but most studies do model global CO_2 emissions and include China as one of the regions. Mitigation scenarios are included in about half of these studies. An overview of mitigation potential and abatement costs from selected scenarios is provided in Figure 4.

Figure 4: Mitigation potential and abatement costs for CO_2 emissions in China from selected scenarios



Source: NIES/CGER 2006 (ICAM2/EMF14 = Integrated Climate Assessment Model 2.0; MERGE/EMF14 = Model for Evaluating Regional & Global Effects of GHG Reduction Polices; MIT/EMF14 = MIT; RICE/EMF14 = Regional Integrated Model of Climate & Economy)

Due to differences in assumptions and models used, the scenarios show a relatively large range with regard to mitigation potential and abatement costs.

More detailed information on CO_2 emissions and mitigation options from China's energy sector is available from three country studies (van Vuuren et al. 2003, Hu 2001, ADB 1998b), covering a time horizon from 1990 to 2020, 2030 and 2100. According to these studies, China's energy production and consumption in the business-as-usual scenario will continue to be dominated by coal. Key emission sources in China are electricity and power generation (coal-fired plants), as well as coal use in industry. The studies analyse the effects of specific measures, available technologies and policy options. The key measures that are considered are energy efficiency improvements, effects of fuel switching among fossil fuels and the use of renewable energy. Introducing a carbon tax and other policy options are considered to constitute the most effective options for supporting energy saving and the implementation and development of cleaner technologies.

Table 3: Mitigation scenarios for CO_2 in China from selected studies/models

	1990	2000	2010	2020	2030	2040	2050
				- Mt CO_2e -			
PACE-IAM model							
CDM potential in 450 ppm scenario			1,906	2,904	3,926	3,596	3,511
CDM potential in 400 ppm scenario			2,903	2,598	2,365	2,280	1,684
AIM model							
Frozen technology scenario	1,833	4,400	6,233	7,883	9,533		
Market scenario	1,833	3,740	5,500	6,930	8,360		
Policy scenario	1,833	3,520	4,620	5,940	7,260		
Mitigation potential (Policy versus market scenario)	0	220	880	990	1,100		
IMAGE/TIMER scenarios for China							
A1b-C reference scenario	2,567	4,156	5,867	7,700	9,533	11,733	13,933
with mitigation	2,567	3,361	4,156	4,950	5,745	6,539	7,333
Mitigation Potential	0	794	1,711	2,750	3,789	5,194	6,600
B2-C reference scenario	2,567	3,850	5,133	6,233	7,333	8,758	10,182
with mitigation	2,567	2,934	3,300	3,667	4,033	4,400	4,767
Mitigation Potential	0	916	1,833	2,567	3,300	4,358	5,416
ALGAS China (INET energy system model)							
Reference scenario	2,079	3,355	4,840	6,215			
Abatement 0	2,079	3,139	4,052	4,609			
Mitigation Potential 0	0	216	788	1,606			
Abatement 1	2,079	2,981	3,399	3,857			
Mitigation Potential 1	0	374	1,441	2,358			
Average Mitigation Potential		504	1,637	2,253	2,896	3,857	4,303

Source: Summary of the PACE-IAM model results, literature studies and data from the NIES database

According to the AIM model (Hu et al. 2001), industry is the main emission sector, with a significant emission reduction potential in the steel-making sector (Hu et al. 2001 p. 85). The lowest abatement costs are estimated for the residential sector, where an emission reduction of 35 % compared to business-as-usual emissions is possible at a price of 16 US$/t CO_2. The potential for emission reductions in the industrial sector is estimated at 20 % at 32 US$/t CO_2. The Image/Timer study (van Vuuren et al. 2003) estimates that by introducing a carbon tax of 27 US$/t CO_2, business-as-usual emissions could be reduced by 25 % in 2010 and by 50 % in 2030.

2.2.3 Mitigation scenarios for India

Only a few studies provide CO_2 emission projections for India. The IPCC database maintained by NIES/CGER (2006) contains 10 studies for CO_2 emissions. Only three of these studies include intervention scenarios. Three country studies provide more detailed information on CO_2 emissions from the energy sector in India (ADB 1998a, Kapshe et al. 2002, Shukla et al. (2001). Results of intervention scenarios from the database and the country studies are summarised in Table 4.

Table 4: Mitigation scenarios for CO_2 in India from selected studies/models

	1990	2000	2010	2020	2030	2040	2050
				- Mt CO_2e -			
PACE-IAM model							
CDM potential in 450 ppm scenario			252	460	889	1,230	1,616
CDM potential in 400 ppm scenario			481	794	1,344	1,717	2,912
AIM model							
Reference scenario		983	1,556	2,189	2,945		
749 ppm		983	1,408	1,907	2,431		
Mitigation Potential		0	148	282	514		
649 ppm		983	1,327	1,775	2,229		
Mitigation Potential		0	229	414	716		
549 ppm		983	1,254	1,621	1,998		
Mitigation Potential		0	302	568	947		
Integrated modeling and analysis of long term energy and emission trajetory for india							
Answer Markal Model							
Reference		891	1,411	1,930	2,450	2,969	3,489
550 ppm		891	1,066	1,241	1,416	1,591	1,766
Mitigation Potential		0	345	689	1,034	1,379	1,723
650ppm		891	1,121	1,351	1,581	1,811	2,041
Mitigation Potential		0	290	579	869	1,159	1,448
ALGAS INDIA							
Markal model							
Reference	532	973	1,555	2,308			
5% Mitigation	532	964	1,452	2,154			
Mitigation Potential	0	9	103	154			
10% Mitigation	532	930	1,376	2,017			
Mitigation Potential	0	43	179	291			
15% Mitigation	532	920	1,279	1,801			
Mitigation Potential	0	53	276	507			
20% Mitigation	532	877	1,145	1,744			
Mitigation Potential	0	96	410	564			
NIES/CGER Database							
AIM/EMF16							
Reference	576	843	1,137	1,225	1,335	1,463	1,613
Annex I + India & China	576	843	1,041	1,078	1,122	1,170	1,228
Mitigation Potential	0	0	96	147	213	293	385
SGM97							
Reference	747	1,135	1,425	1,925	2,424	2,614	3,161
MID550 (full trade)	747	1,135	1,320	1,584	1,870	1,903	1,870
Mitigation Potentail	0	0	105	341	554	711	1,291
SGM99							
Reference	725	1,098	1,369	1,845	2,316	2,479	2,991
MID550 (trade)	725	1,098	1,177	1,389	1,643	1,617	1,545
Mitigation Potential	0	0	192	456	673	862	1,446
Average Mitigation Potential			227	416	705	919	1,353

Source: Summary of the PACE-IAM model results, literature studies and data from the NIES/CGER 2006

Emission estimates for 1990 are very similar in the scenarios, but projections for 2050 vary considerably due to various factors, such as underlying assumptions, the type of modelling approach and the ambitiousness of the mitigation scenarios. In contrast to our own IAM-PACE modelling approach, most other models assume less ambitious mitigation efforts which do not restrict the global temperature increase to 2° Celsius. Respectively, the range of the mitigation potential is very high (Table 4). The scenarios do not contain information on abatement costs.

The structure of the Indian energy sector is similar to that of China; coal is the main source for energy production and consumption. Large point sources, analysed in the AIM model (Kapshe et al. 2002), contribute to 65% of total CO_2 emissions. The focus of mitigation measures should, therefore, be placed on large point sources. In 2000, India's business-as-usual emissions from the energy sector were calculated at 983 Mt CO_2, with power plants contributing 41%, steel plants 12% and cement plants 9%. In 2030, CO_2 emissions from energy sector rose to 2,945 Mt CO_2, emissions of power plants are expected to increase to 48% of business-as-usual emissions, whereas steel and cement plants contribute only 8% and 7.5% respectively (Kapshe et al. 2002, p. 100). A very high mitigation potential is projected in the country studies that apply stabilisation scenarios in the calculation of abatement options (AIM model, Answer Markal Model). They provide stabilisation scenarios at 550, 650 and 750 ppm and allocate India 7.5% of global emissions. In the 550 ppm scenario, India's CO_2 emissions would need to be reduced by 50% of 3,489 Mt CO_2 business-as-usual emissions by 2050. Fuel substitution from coal to gas plays a major role in emission abatement. In order to fulfil the 550 ppm stabilisation scenario, a decline in gas consumption would need to occur by 2030. This involves increased penetration of carbon free technologies, such as renewables or nuclear power. Only a very small mitigation potential is identified in the transport sector.

The ALGAS mitigation study (ADB 1998a, 1998b) assessed different least-cost abatement options. Cogeneration, followed by clean coal, is the least-cost abatement option in the power sector. In rural areas, the use of solar cookers is the least-cost option for CO_2 reduction. Other scenarios consider the same mitigation measures as described above for China, including energy efficiency improvement, new technologies, and implementation of energy policies.

2.2.4 Conclusions

The long-term CO_2 mitigation potential in developing countries is, at several Gt CO_2 per year, very substantial and considerably larger than the mitigation expected from the CDM up to 2012. China and India have by far the largest potential, contributing to more than 70% of the potential in most scenarios. However, the results from diverse studies vary considerably, depending on model assumptions and approaches and the ambitiousness of the global climate mitigation policy.

Since most of these emissions occur at large point sources, they could in principle be mitigated by means of CDM project activities, although other instruments, such as emissions trading, may be more effective in realising the abatement potential.

2.3 The CDM and JI potential beyond 2012: Non-CO_2 projects

In this section, we estimate the long-term potential for JI and CDM up to 2050 for the following mitigation measures:

- Landfill gas capture,
- Destruction of nitrous oxide in adipic acid production, and
- HFC-23 destruction from HCFC-22 production.

These measures have been selected as they appear particularly promising under the CDM and JI for various reasons:

- The mitigation costs for these measures are very low (often below € 1 per ton of CO_2 equivalent). This renders these options particularly attractive economically.
- The project size in terms of CO_2 equivalents is quite large due to the high global warming potential (GWP) of the associated gases.[3] The project size is an important aspect of CDM projects, especially in the light of the significant transaction costs associated with the CDM project cycle.
- The demonstration of additionality is straightforward, since the destruction of these gases is usually not legally required and project developers do not have other economic revenues than the CERs. By contrast, project developers have other economic benefits from project activities in the case of energy efficiency or renewable energy projects, which makes the demonstration of additionality more problematic.
- The methodological requirements for determining and monitoring the business-as-usual scenario are relatively simple in comparison to energy efficiency or renewable energy project activities, leading to relatively low transaction costs and low registration risks.

2.3.1 Landfill gas capture

Methane emissions are produced when waste is deposited on landfills under anaerobic conditions. Abatement opportunities for methane generation on landfills are as follows: either the methane can be captured for flaring or energy use, or waste management practices can be changed and recycling, composting or incineration adopted instead of disposing waste on landfills. Capturing landfill gas is an important potential for CDM or JI projects. By November 2005, 8 % of the CDM project activities in the pipeline are landfill projects with a share of 12 % of the expected CERs or an annual mitigation of 11 Mt CO_2e respectively (UNEP/RISOE 2005). This mitigation potential may rise further, since global emissions are substantial: estimates of global methane emissions from solid waste disposal sites (SWDS) range from about 400 to 1,500 Mt CO_2e per year (Bingemer and Crutzen 1987). The US Environmental Protection Agency (EPA) estimates worldwide methane emissions from municipal solid waste disposal for the year 2000 at 842 Mt CO_2e (EPA 2005). Up to 2050, an increase of 19 percent is expected. Especially in developing countries, methane emissions from solid waste disposal on landfills are expected to rise due to population growth and a lack of regulations on waste management.

Only a few more recent studies about global methane generation from SWDS are available (EPA 2005; Michaelowa et al. 2005). The US EPA estimates the generation of

[3] Article 5.3 of the Kyoto Protocol and Decision 2/CP.3 establish that the global warming potentials (GWP) for a time horizon of 100 years from the Second Assessment Report by the IPCC should be used in the first commitment period. They correspond to 21 for methane, 310 for nitrous oxide and 11,700 for HFC-23. For future commitment periods, updated global warming potentials may apply, subject to the respective decisions made by the COP or the COP/MOP.

methane from landfills, analyses abatement opportunities and costs and provides a mitigation scenario for selected countries up to 2020. Marginal abatement cost curves (MACs) are developed for the United States, China, Mexico, the Ukraine and South Africa. In 2000, the break-even price for an emission reduction of 60 % from business-as-usual emissions in developing countries was estimated at 2.70 US$/t$CO_2$e, whereas in 2010 the break-even price for the same emission reduction equalled or was below zero, which demonstrates a no-regret option. This is possible due to technological improvements and better waste management practices. However, an emission reduction larger than 60 % quickly becomes very costly: even at a price of 13.60 US$/t$CO_2$e, only about 63 % of the business-as-usual emissions could be mitigated. The mitigation potential for Mexico, China and the Ukraine is estimated at 66 Mt CO_2e in 2005 and at 78 Mt CO_2e in 2020.

Michaelowa et al. (2005) use 2003 data from an IEA GHG database, resulting in a global emission reduction potential of 357 Mt CO_2e at a price of ≤ 10 US$ per t CO_2e.

Given the scant number of estimates on the future development of methane emissions from landfills, we make estimations of the potential for methane emission abatement up to 2050 on the basis of our own calculations. Since detailed data on waste generation, treatment and composition differs significantly between countries and is often not available, our own estimates and other estimates extracted from the literature involve great uncertainties and are relatively rough. Due to data constraints, we limit our calculations to municipal waste and do not include industrial waste.

2.3.1.1 Methodological approach

The basis for the calculation of methane emissions is the default method, described in Chapter 6 of the *1996 Revised IPCC Guidelines for National Greenhouse Gas Inventories* (UNEP/WMO/OECD/IEA 1996) and the *2000 IPCC Good Practice Guidance* (UNEP/WMO/OECD/IEA 2000). Key parameters for the calculation of emissions are

- population,
- quantity of municipal solid waste (MSW) generated per capita,
- fraction of MSW disposed on landfills,
- methane generation rate from landfills, which depends on the fraction of degradable organic carbon (DOC) and a number of other factors,
- quantity of methane already recovered, and
- typical size of the landfills.

Assumptions on the population growth up to 2050 are based on UN projections (UN 2002). For 2003, the quantity of municipal solid waste generated as well as the fraction of solid municipal waste disposed on landfills is based on country-specific UN statistics (UN 2005) and the Revised 1996 IPCC Guidelines.[4] The future development of waste

[4] Table 6-1 of the Reference Volume.

generation per capita is based on data on the relation between waste generation and GDP by the World Bank (1999). Data on GDP growth up to 2010 is taken from World Bank statistics and estimates up to 2050 are based on IPCC Scenarios. For the fraction of DOC dissimilated and the fraction of CH_4 in landfill gas default values provided in the Reference Manual of the Revised 1996 IPCC Guidelines are used.

Generated methane emissions from landfills are not analogous to the mitigation potential. Important factors for calculating the mitigation potential for methane emissions from landfills are the size and depth of the landfills as well as already existing methane recovery activities. In most developing countries, methane from landfills is usually not recovered. We ignore the small quantity of existing methane recovery facilities in our calculations. Furthermore, methane recovery is only viable in the case of managed landfills of a certain size and depth. In some developing countries, there is a large quantity of unmanaged and shallow landfill sites. Thus, we estimate the share of managed landfills in the corresponding countries based on the urban population and waste management practices.

2.3.1.2 Mitigation potential

The results of this calculation for different countries are illustrated in Table 5 below. In 2005, the potential for mitigating methane emissions from MSW disposed on landfills is estimated to amount to about 400 Mt CO_2e per year in developing countries in Asia, Africa and Latin America and in Russia and the Ukraine. This corresponds to about 50% of worldwide methane emissions from landfills, as estimated by the EPA (2005).

Table 5: Potential for mitigation of methane from landfills

	2005	2010	2020	2030	2040	2050
	- Mt CO_2eq/a -					
Sum	**400**	**479**	**654**	**851**	**1,002**	**1,160**
China	61	74	103	138	151	164
India	43	55	84	118	132	145
Indonesia	22	26	34	43	47	51
Rest of Asia and Oceania	74	89	122	157	196	239
Brazil	20	24	35	47	57	67
Mexico	17	22	33	46	57	69
Rest of Latin America	29	34	46	61	77	96
Africa	85	105	146	190	236	284
Russia	37	38	39	40	39	38
Ukraine	12	12	11	10	9	8

Source: Calculations by Öko-Institut

In the developing world, China is the largest emitter of methane emissions from landfills, followed by India. Emissions in these fast-growing economies are rising rapidly and consequently the mitigation potential will increase considerably in the long term. Certainly, the use of the flexible mechanisms will also substantially depend on the regulations for landfills in these countries. Emissions are not expected to rise in economies in transition, mostly due to an expected decrease in the population.

2.3.2 Destruction of nitrous oxide in adipic acid production

Adipic acid is a basic chemical for the production of polymers, in particular nylon. Worldwide, there are only few plants producing adipic acid. Most plants are located in industrialised countries; six plants are in developing countries (Singapore: 1, China: 3, South Korea: 1, Brazil: 1). Two plants are operating in the Ukraine. Global demand for adipic acid has risen from two million metric tons in 1998 to 2.6 million metric tons in 2005 (Chemical Week 1999, 2005) and a growth rate of 3.2% is expected in the next five years (Chemical Week 2005).

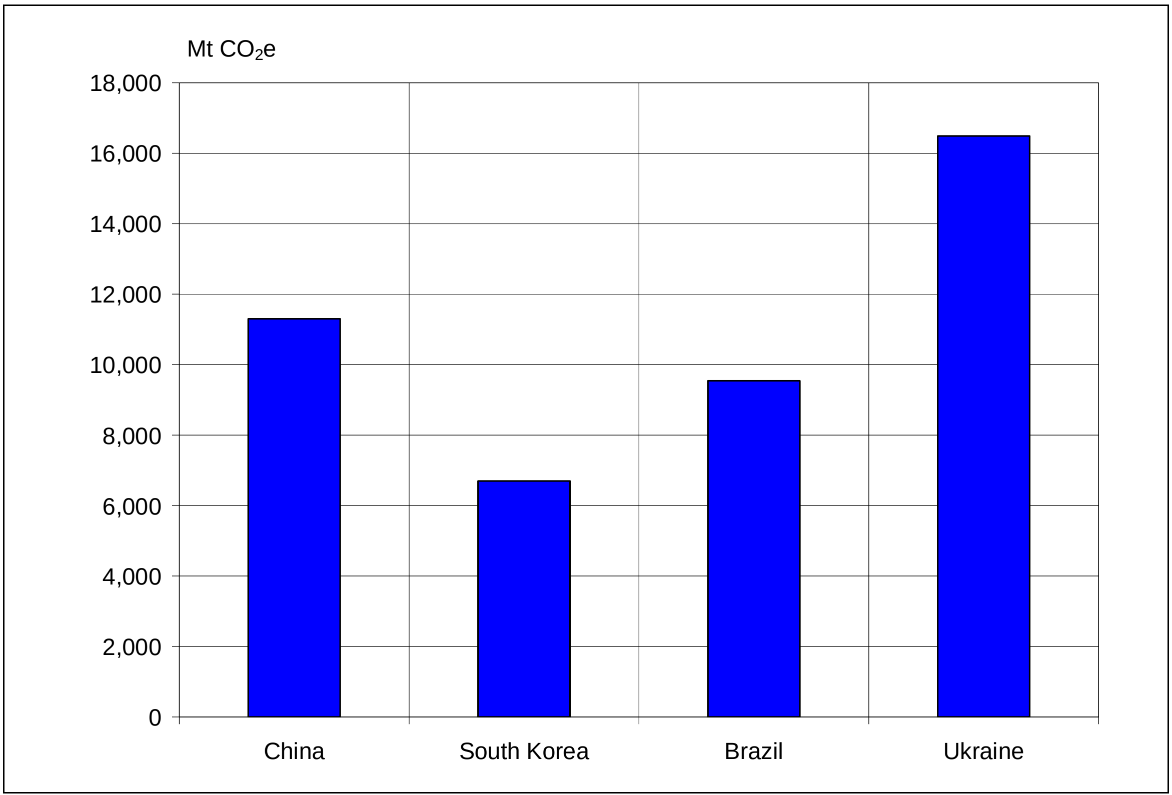
Nitrous oxide (N_2O) is produced as a by-product in the adipic acid production process. Abatement of nitrous oxide is possible due to thermal decomposition or catalytic destruction. In 1999, Chemical Week reported that all major adipic acid production plants will have implemented abatement technologies in 2000. However, it cannot be assumed that each plant has abatement technologies in place in developing countries. Abatement technologies can reduce nitrous oxide emissions from adipic acid production at 90-98%, with very low abatement costs of about 0.1 US$ per t CO_2e (Michaelowa et al. 2005).

2.3.2.1 Global N_2O emissions from adipic acid production

Global N_2O emissions from adipic acid production are calculated by EPA (2005) at 50.4 Mt CO_2 equivalent in 2000 and are expected to increase by 40% by 2020. Michaelowa et al. (2005) estimate that the mitigation potential in developing countries amounts to 30 Mt CO_2e in 2003 and 47 Mt CO_2e for 2005, based on the production capacities of actual plants.

It can be expected that adipic acid production will increase considerably in the next decades in developing countries. According to industrial sources, the adipic acid production plant in Singapore has already implemented abatement technologies. In Brazil and Korea, CDM projects to destruct N_2O emissions with an emission reduction potential of 15 Mt CO_2e/a are being undertaken. For Chinese and Ukrainian plants, it can be assumed that N_2O emissions from adipic acid production are not yet abated.

Figure 5: Estimated emissions from adipic acid production in developing countries and the Ukraine in 2005 (without abatement technology)



Source: Calculations by Öko-Institut

2.3.2.2 Business-as-usual emissions and mitigation potential

Since information on mitigation potential is scant and industry projections on future adipic acid production are not publicly available, we have calculated the business-as-usual emissions based on the production data of existing plants and assume a future production growth of 3.2% per year, according to the estimate given in Chemical Week (2005). Emissions from adipic acid production in Singapore are not included, as abatement technologies are already in place. A default business-as-usual emission factor is provided by the approved business-as-usual methodology AM0021 for decomposition of N_2O from existing adipic acid production plants. N_2O emissions are calculated by multiplying the total amount of adipic acid that is produced with an emission factor of 0.27 t N_2O/t of adipic acid[5] produced, with no N_2O control system in place. The global warming potential (GWP) of N_2O is 310, which is valid for the first commitment period of the Kyoto protocol.

Business-as-usual emissions for adipic acid production plants in developing countries and the Ukraine are estimated at 44 Mt CO_2e in 2005. Assuming a 3.2% increase in demand per year, business-as-usual emissions in 2050 are estimated at about 180 Mt CO_2e.

5 UNFCCC 2005: Approved business-as-usual methodology AM0021.

Table 6: Mitigation potential for adipic acid production in developing countries and economies in transition

	2005	2010	2020	2030	2040	2050
	- Mt CO_2e -					
N_2O mitigation potential	42	49	67	92	126	173

Source: Calculations by Öko-Institut

We assume in our calculations that about 95 % of the N2O emissions are abated. Taking into account the low mitigation costs of about 0.1 US$/t CO_2e, about 50 Mt CO_2e could be mitigated at a cost of only US$ 5 million in 2010. By 2050, the potential from CDM projects will reach about 170 Mt CO_2e.

2.3.3 HFC-23 destruction in HCFC-22 production

HCFC-22 is a good refrigerant which is mainly used in air conditioning as well as commercial and industrial refrigeration systems. In addition, HCFC-22 is used as feedstock for the production of polytetrafluoroethylene (PTFE).

HCFC-22 is an ozone-depleting substance (ODS) as well as a GHG with a global warming potential (GWP) of 1,700 (IPCC 2001a). It is controlled under the Montreal Protocol. Consumption of HCFCs for purposes other than feedstock use is gradually being phased out in accordance with the Montreal Protocol. Industrialised countries (non-Article 5.1 Parties) are committed to gradually reducing their consumption of HCFCs (e.g. by 90 % up to 2015; 99.5 % up to 2020 and 100 % up to 2030 – compared to the base level in 1989). Developing countries (Article 5.1 Parties) are committed to stabilising production and consumptions levels at the 2015 level from 2016 onwards. Consumption and production of HCFCs for purposes other than feedstock use will be phased out by 2040. The production of HCFC-22 for feedstock use is not limited under the Montreal Protocol.

HFC-23 is an unwanted by-product in the waste stream from HCFC-22 production. HFC-23 emissions can be abated by various means. Thermal oxidation of the waste stream is the most effective measure. HFC-23 is not an ODS, but a GHG and controlled under the Kyoto Protocol. It has a very high GWP of 11,700 for the first commitment period from 2008 to 2012.[3]

Abatement costs for HFC-23 destruction from HCFC-22 production are very low. Schneider et al. (2005) make calculations with abatement costs in the range of 0.20-1.00 €/t CO_2e, based on different values in the literature.

In industrialised countries, HFC-23 is already being oxidised in most plants. There are only very few plants without thermal oxidation of HFC-23 and it is expected that abatement will occur up to 2010 in all plants in Annex B countries that have ratified the Kyoto Protocol. In contrast, HFC-23 emissions are generally not yet abated in developing countries.

HCFC-22 is currently being produced in the following developing countries: China, India, South Korea, Mexico, Venezuela and Argentina. China is by far the most important producer. By July 2005, three CDM projects to destroy HFC-23 from HCFC-22 production have undergone validation; two of them have been registered. These three projects have altogether an emission reduction potential of about 9 Mt CO_2e annually. China has indicated that it intends to destroy HFC-23 under the CDM in all plants in China. Since abatement under the CDM is economically highly attractive and since operators who do not use the CDM accrue comparative disadvantages, it can be assumed that all plants in developing countries will use the CDM to destroy HFC-23 emissions.

The global potential for HFC-23 destruction under the CDM can be estimated based on projections for HCFC-22 production and the HFC-23/HCFC-22 ratio in these plants. In estimating this potential, we differentiate between existing HCFC-22 production levels on the one hand and the expansion of HCFC-22 production in existing or new plants beyond past levels, on the other hand. Currently, an approved business-as-usual and monitoring methodology (AM0001) is only available for historic production levels in existing plants.

For new plants or production expansions, a decision by the Conference of the Parties (COP) is pending on how perverse incentives from the CDM can be avoided from destroying HFC-23 in new HCFC-22 plants under the CDM. The background is that plant operators gain significant revenues from CERs, due to the high GWP of HFC-23. The revenues from CERs can easily be greater than the production costs of HCFC-22. As a consequence, HCFC-22 production and consumption may be increased through the CDM. As a consequence, additional HCFC-22 production might only occur as a result of the CDM. This would have negative implications for both the climate and the protection of the ozone layer. Whether and to what extent CERs can be generated from HFC-23 destruction in plants that produce HCFC-22 beyond past levels, is yet uncertain and will need to be decided by the COP and the CDM Executive Board in the future.

2.3.3.1 **Existing plants**

In order to determine the potential for existing plants, we estimate the current production levels in developing countries and then apply the methodological approach in AM0001 to calculate emission reductions.

AM0001 specifies that the HCFC-22 production level eligible for accounting emission reductions is limited „*to the maximum historical annual production level at this plant (in tonnes of HCFC-22) during any of the last three years between beginning of the year 2000 and the end of the year 2004, including CFC production at swing plants*[6] *adjusted appropriately to account for the different production rates of HCFC-22 and CFCs*“. Therefore, in addition to HCFC-22 production, CFC production in relevant swing plants needs to be taken into account when determining HCFC-22 production potential for existing plants.

Our estimations of current and future HCFC-22 production levels, as illustrated in Table 7 below, are based on projections in the IPCC/TEAP Special Report on Ozone and Cli-

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6 Swing plants can switch between HCFC and CFC production.

mate (IPCC/TEAP 2005), information on production levels reported by the Parties to the Montreal Protocol to UNEP in accordance with Article 7 of the Montreal Protocol (UNEP 2001/2002/2003/2004) and information provided by the experts we interviewed. We expect the production to continue to grow continuously until 2015. We assume that the dispersive use of HCFCs will only be phased out between 2030 and 2040, since further concrete phase-out schemes have not yet been agreed under the Montreal Protocol. This results in a significantly lower level in 2040, which then increases again due to continuous growth in production for feedstock purposes.

Table 7: Estimations of current and future HCFC-22 production in developing countries

	2000	2004	2010	2015	2020	2030	2040	2050
	- metric kilotons -							
Total HCFC-22 production (incl. for feedstock use)	**136**	**301**	**440**	**574**	**602**	**540**	**370**	**505**
China	112	262	-	-	-	-	-	-
India	15	27	-	-	-	-	-	-
Other developing countries	9	12	-	-	-	-	-	-
Production for feedstock use	63	120	145	170	198	271	370	505

Source: Calculations by Öko-Institut

HCFC-22 production has risen very rapidly during the last years in developing countries. China is, with more than 80% of HCFC-22 production, by far the largest producer. In 2004, about 300 kt HCFC-22 were produced in developing countries. We estimate that an additional 40 kt HCFC-22 can be accounted for CFC production in swing plants. For CDM projects in existing plants, this results in about 340 kt HCFC-22 production that is eligible for HFC-23 destruction using AM0001.

The quantity of HFC-23 generated per ton of HCFC-22 depends on the production process. In AM0001, the maximum HFC-23/HCFC-22 ratio is 3%, while a default value of 1.5% should be used when no other data is available. The three projects mentioned above all use values around 2.9% HFC-23 per HCFC-22. Applying this value, we achieve an annual emission reduction potential of 102 Mt CO_2e for all existing HCFC-22 production plants.

Assuming that most plants will be equipped with destruction technology from 2006 to 2009, we expect a cumulative emission reduction potential of roughly about 600 Mt CO_2e up to the close of the first commitment period of the Kyoto Protocol (31st December 2012). Over a crediting period of 21 years, the overall emission reduction potential from existing plants is projected to amount to about 2,100 Mt CO_2e.

2.3.3.2 New plants

To what extent new HCFC-22 plants will be built in developing countries, depends considerably not only on the policy of governments towards HCFCs and their alternatives, but also on technical innovations for using alternatives. Hence, it must be noted that any projections of HCFC-22 production are rather uncertain. For example, governments in producer countries may establish a regulatory framework that allows for the expansion of

HCFC production up to 2015, or may set incentives to phase out HCFCs and replace them well before the time schedules set under the Montreal Protocol. In some developing countries that produce HCFC, there are bilateral development cooperation projects currently underway, which aim at facilitating the phase-out of HCFCs.

Since no clear policies towards HCFCs can be identified in the most important producer countries up to now, we have based our projections up to 2015 on IPCC/TEAP (2005). Beyond 2015, we assume that HCFC-22 use for feedstock will continue to increase at the same rate, while HCFC-22 production for dispersive uses is assumed to remain constant at the 2015 level until 2025 and then will start to decline up to 2040. The overall production, resulting from production for dispersive and feedstock uses, is illustrated in Table 7. The overall HCFC-22 production is expected to increase considerably up to 2015 and could peak between 2020 and 2030, before HCFC-22 will be phased out under the Montreal Protocol. As noted earlier, the long-term time schedule for phase-out may differ considerably, depending in particular on the policy of governments towards HCFCs.

Although it is as yet unclear whether and to what extent the destruction of HFC-23 will be possible under the CDM for new plants, we calculate the potential for new plants using the same methodological approach as for existing plants based on AM0001. This results in an annual mitigation potential for new plants of about 93 Mt CO_2e in 2015 and about 183 Mt CO_2e in 2030. The overall mitigation potential for existing and new plants is illustrated in Table 8 below.

Table 8: Annual HFC-23 destruction potential for existing plants (using AM0001) and new plants in developing countries

	2010	2015	2020	2030	2040	2050
	- Mt CO_2e/a -					
Total HFC-23 mitigation potential	**149**	**195**	**204**	**183**	**125**	**171**
Existing plants (using AM0001)	102	102	102	0	0	0
New plants	47	93	102	183	125	171

Source: Calculations by Öko-Institut

2.3.3.3 Revenues and economic incentives from HFC-23 destruction under the CDM

Table 8 above shows that the overall mitigation potential for HFC-23 emissions from HCFC-22 production in developing countries is considerable, amounting to about 100 to 200 Mt CO_2e annually up to 2050. Since mitigation costs are quite low, there are considerable net profits if this potential is achieved with the CDM. These profits would be distributed among project participants. Assuming mitigation costs of € 0.50 per t CO_2e and a price range between € 5 and € 25 per CER,[7] we show in Table 9 the potential net profits from mitigation of HFC-23 in existing and new plants.

Table 9: Estimation of potential net profits for project participants from destruction of HFC-23 under the CDM

	Up to …		
	2012	**2020**	**2050**
	- Billion € -		
Total cumulative windfall profits at 5 €/CER	**4**	**11**	**34**
Existing plants (using AM0001)	3	6	10
New plants	1	5	24
Total cumulative windfall profits at 25 €/CER	**21**	**60**	**183**
Existing plants (using AM0001)	14	34	52
New plants	7	25	130

Source: Calculations by Öko-Institut

The table illustrates that potential windfall profits from HFC-23 under the CDM are enormous. They amount to at least a few billion € up to 2012 and could potentially result in more than € 100 billion in the long term. These large windfall profits could provide very strong economic incentives for companies and governments in developing countries to encourage production of HCFC-22 until 2015 and to delay the phase-out of HCFC-22 for as long as possible under the Montreal Protocol and the amendments to it. This is particularly sensitive, since only a future point in time – 2015 – will be the base year for production levels from 2016 through 2040 for non-feedstock uses. However, from a global environmental and economical perspective, it is probably more cost-effective to phase out HCFC-22 for non-feedstock uses as early as possible, well before 2040.

2.4 Conclusions

The future CDM market potential will depend considerably on a number of factors, in particular the future mitigation efforts and how the CDM will be further developed in a future climate regime. Based on an analysis of the potential and actual market developments, we expect that about 2,000 to 3,000 million CERs will be generated up to 2012, corresponding to a volume in the range of 300 to 500 Mt CO_2e in 2010. This volume is considerably smaller than the theoretical potential of several Gt CO_2e, but is still considerable compared with the Kyoto commitment and taking into account transaction costs and the delayed start of the CDM.

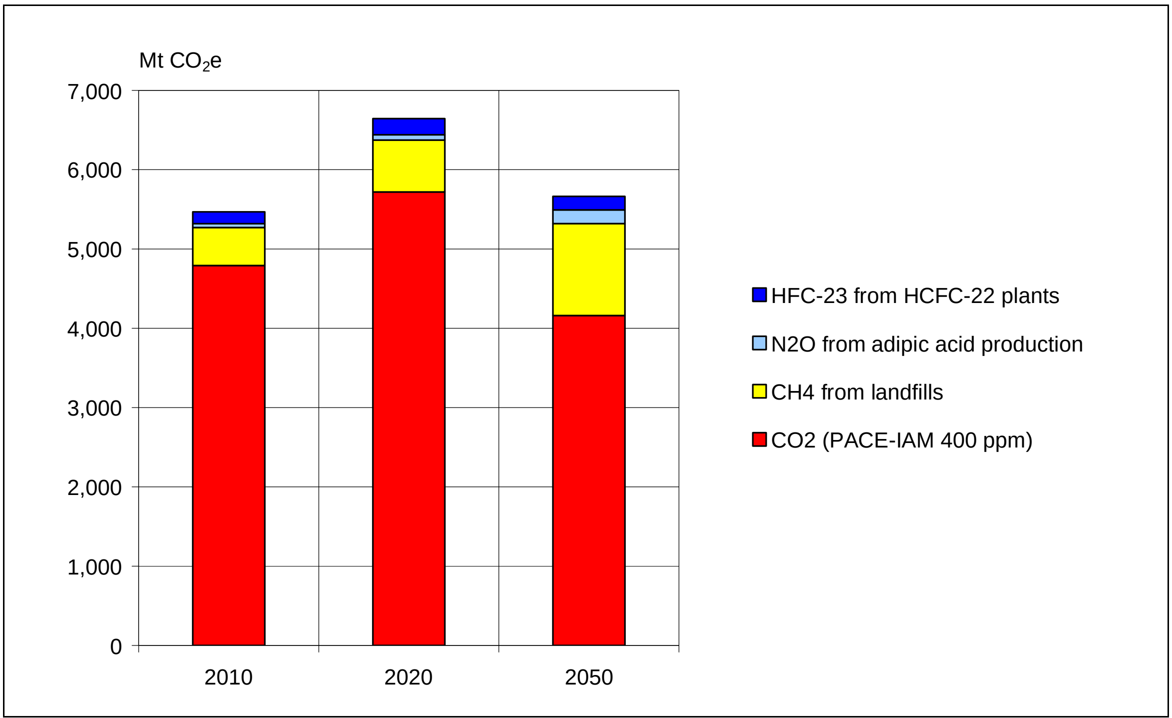
[7] According to market information by PointCarbon, CERs have been trading at around about € 5 for quite some time. In July 2005, the price for allowances in the European Emissions Trading Scheme is in the range of € 20-25. If CERs are directly sold to companies in the European Emissions Trading Scheme, this price could be achieved.

In a longer-term perspective, developing countries could deliver considerable amounts of permits with the CDM or a similar market mechanism. The theoretical global potential for mitigation of CO_2 emissions is estimated at several Gt CO_2 per year in a number of different studies and models. With more ambitious mitigation paths, the volume will fall in the second half of the century due to the assumption that more developing countries will take over commitments.

Calculations of abatement potential for CH_4 from landfills, N_2O from adipic acid production and HFC-23 from production of HCFC-22 show that the mitigation of non-CO_2 gases will continue to remain an important source of CERs.

Figure 6 illustrates the CO_2 potential, calculated with the PACE-IAM scenario with 400 ppm, and the non-CO_2 potential, calculated based on bottom-up data. Note that these calculations are not directly comparable, since rather different methodological approaches are used,[8] but can provide an indication of the theoretical potential of the different mitigation options.

Figure 6: Long-term mitigation potential for CO_2 and selected non-CO_2 sources



Source: CO_2 emissions from application of PACE-IAM with the 400 ppm scenario. For non-CO_2 sources, bottom-up calculations (Section 2.3).

The figure shows that the potential for mitigation of CO_2 is very large, but that some non-CO_2 emission sources may continue to deliver rather substantial abatement opportunities, in particular the destruction of CH_4 from landfills.

8 The PACE-IAM model only considers mitigation of CO_2 and potentially overestimates the actual mitigation costs (see Section 3.7).

3 Contribution of flexible Kyoto mechanisms to reaching global stabilisation targets – an integrated assessment analysis

3.1 Overview of the analysis

In this chapter, model simulations carried out by the ZEW, which assess the contribution of the flexible mechanisms of the Kyoto Protocol (international emissions trading, CDM and JI) to reaching long-term global stabilisation targets, will be presented. The goal of the present analysis is to identify climate policy strategies that minimize the economic costs of stabilizing CO_2 concentrations up to 2100. In this way, we aim to identify the macroeconomic cost savings for Germany from the use of the flexible Kyoto mechanisms. Moreover, we quantify environmental indicators (such as emission reductions), CDM market volumes and the climate impacts of a long-term stabilisation of CO_2 concentrations (such as global temperature increases).

With regard to the flexible mechanisms, we will concentrate on emissions trading for Annex I countries and CDM for developing countries. Although the simulation model covers several world regions, the regional focus of the analysis will be on Germany as a CDM investor country, as well as China, India and Brazil as CDM host countries.

This chapter is structured as follows. In Section 3.2, our economic approach of the present analysis is described. In Section 3.3, we present the simulation model PACE-IAM, i.e. the integrated assessment framework and the economic and climate sub-modules of the model. In Section 3.4, the model parameterisation and the model calibration to empirical databases is described. In Section 3.5, alternative scenarios of stabilising CO_2 concentrations until the year 2100 are presented, as well as the procedure of deriving CO_2 reduction requirements on the regional level. Finally, Section 3.6 summarises the simulation results of the quantitative analysis and, in Section 3.7, we draw conclusions.

3.2 Economic approach: cost-effectiveness versus cost-benefit

In the context of climate policy, economic efficiency in the use of scarce resources translates into questions of which anthropogenic greenhouse gas (GHG) emissions should be abated, in which amount, when, and where, and by whom. If complete information were available, comprehensive cost-benefit analysis could deliver precise answers to these questions. However, neither the costs, nor the benefits of GHG emission abatement are easy to quantify. In particular, there are large uncertainties in external cost estimates for climate change. The chain of causality – from GHG emissions to ambient concentrations of GHGs in the atmosphere, from temperature increase to physical effects, such as climatic and sea level changes – is very complex. Moreover, economists do not even agree on the methodology to be used for valuing such potential climate change impacts as the extinction of a species. The large uncertainties in predicting global climate change, as well as quantifying and monetising the associated biophysical impacts explain much of the controversy on the desirable long-term level of GHG concentrations in the atmosphere and the scope and timing of emission mitigation measures.

Presuming that the uncertain future outcome of climate change could be extreme and irreversible, risk aversion may justify the adoption of a precautionary cost-effectiveness approach, rather than depending on traditional cost-benefit analysis (Gollier et al. 2000). In this vein, the United Nations Framework Convention on Climate Change (UNFCCC) aims at establishing an ample margin of safety based on recommendations from natural science on “tolerable” emission levels. The UNFCCC’s stated goal is the “stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system” (UNFCCC 1992, Article 2). In its Third Assessment Report, the Intergovernmental Panel on Climate Change (IPCC) – which serves as the scientific advisory board to the UNFCCC – laid out several long-term stabilisation scenarios for greenhouse gas emissions with an associated range of expected increases in the global mean temperature (IPCC 2001b, Section 1.3.1). Given some stabilisation, or similar temperature targets, rational climate policy should minimise the net economic costs of limiting temperature change.

Cost-effectiveness suggests that the marginal costs of emission control should be equalised across all sources in space and time. This comes down to comprehensive “where“, “when”, and “what” flexibility. With the first, reductions should take place where it is cheapest for them to be introduced, regardless of geographical location. With the second, reductions should take place when the cost-benefit calculus yields a positive value. With the third, decisions can be taken on what greenhouse gas should be abated under cost-effectiveness considerations. For pragmatic reasons, the current analysis concentrates on “where” flexibility, suggesting that there is further potential to cut down global adjustment costs to the achieved stabilisation and temperature outcomes. With respect to cost-effectiveness in the context of meeting global emission caps, the Kyoto Protocol incorporates the flexible mechanisms which, for instance, allow global trade in CO_2 emission entitlements. International emissions trading will reduce the global costs of emission abatement to the extent that it exploits differences in marginal abatement costs across regions: emission reductions should take place *where* it is cheapest for them to be introduced, regardless of geographical location.

The goal of the present cost-effectiveness analysis is to spotlight climate policy strategies that minimise the net economic costs of stabilising CO_2 concentrations in the year 2100. The deliberate neglect of benefits from global warming implies that imposition of the stabilisation scenarios on the global economy will necessarily lead to positive *global* adjustment costs as compared to an unconstrained business-as-usual situation.[9] It is thus important to keep in mind that positive cost impacts of stabilisation scenarios do not provide an argument against its desirability from a more comprehensive economic perspective (i.e. including the benefits from avoided climate change). In the current context, the cost impacts should be rather interpreted as the money to be spent on purchasing a

[9] In theory, the incorporation of existing market imperfections might lead to economic gains due to emission constraints, even when abstracting from direct benefits of avoided greenhouse gas emissions (e.g. see Goulder (1995) for a comprehensive overview of the “double-dividend” literature).

target level of climate change insurance with the stabilisation strategy. The present analysis concentrates on relative, rather than absolute cost impacts.

Our analysis is based on the multi-regional, multi-period intertemporal simulation model PACE-IAM. The following section provides a detailed model description.

3.3 The simulation model PACE-IAM

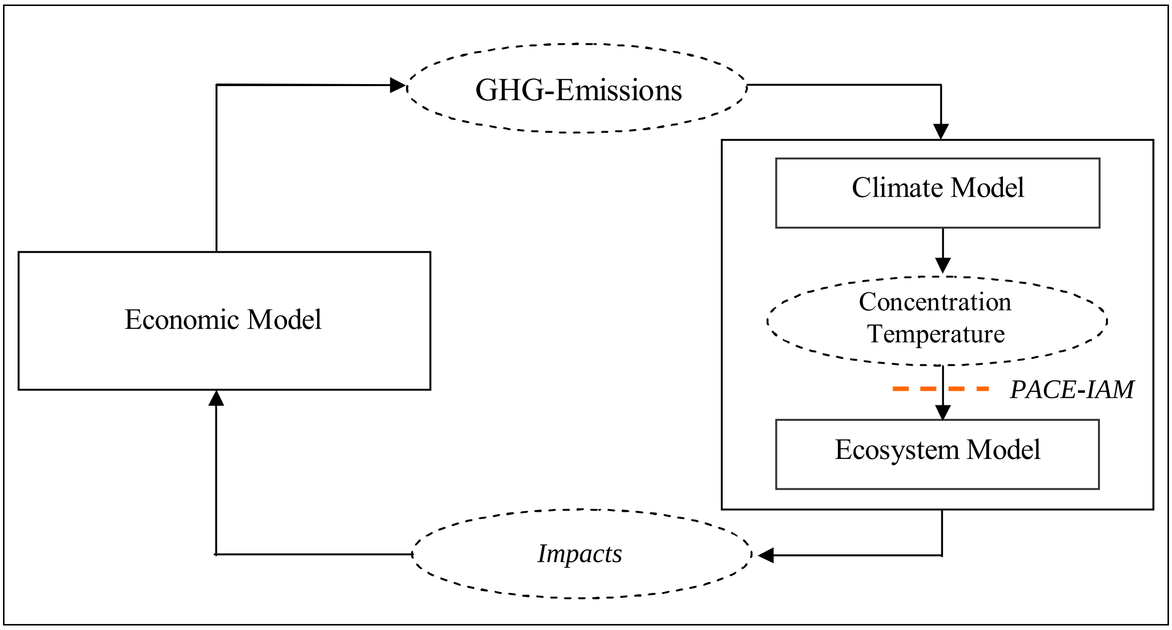
In this section, we present the integrated assessment model PACE-IAM, which serves as the methodological tool for assessing the economic and climate impacts of a long-term stabilisation of CO_2 concentrations. The model consists of an economic sub-module as a multi-sector, multi-region computable general equilibrium model of global trade and energy use, and a climate sub-module that represents geophysical relationships of different forces affecting climate change.

3.3.1 Integrated assessment

In order to quantify the economic implications and the climate impacts of policy proposals we use an integrated assessment model (IAM), which incorporates key elements of economic and biophysical systems into one integrated system (Kelly and Kolstad 1999). As sketched in Figure 7, IAMs capture the following causal chain: how (i) economic activities trigger anthropogenic greenhouse gas emissions, (ii) emissions of greenhouse gases translate into atmospheric concentration, temperature shift, and climate change, and (iii) climate change feeds back via the ecosystem into the economy.

The integrated assessment model PACE-IAM (Böhringer et al. 2005) links a dynamic macroeconomic model with a simple geophysical module of climate change. The latter corresponds to the climate component of the RICE-99 model (Regional Integrated model of Climate and the Economy) (Nordhaus and Boyer 2000). It contains a number of geophysical relationships that link together the different forces affecting climate change. The economic module of the integrated assessment framework is formulated as a multi-sector, multi-region computable general equilibrium model of global trade and energy use. Due to the large uncertainties in damage estimates for climate change, the current version of PACE-IAM does not attempt to translate global warming into market impacts (such as productivity changes, capital depreciation) and non-market impacts (such as biodiversity losses, natural disasters) (Manne et al. 1995): there is only a one-way link between economic variables and biophysical variables. Figure 7 shows the scope of analysis in PACE-IAM, covering the causal chain up to the temperature impact.

Figure 7: Schematic structure of Integrated Assessment Models for climate change



Source: ZEW

3.3.2 The climate sub-module

Climate-change modelling is based on the geophysical module of the RICE-99 model. It contains a number of geophysical relationships that link together the different forces affecting climate change. The geophysical relations are simplified representations of more complex models and provide a 'reduced form' description of emissions, concentrations, and globally-averaged temperature change. Economic activity leads to CO_2 emissions, which affect the climate by dint of their radiative forcing. The accumulation and transportation of CO_2 emissions is modelled as a linear, three-reservoir approach calibrated to existing carbon cycle models. The three reservoirs represent the atmosphere, a quickly-mixing reservoir in the upper oceans together with the short-term biosphere, and the deep oceans. The accumulation of CO_2 emissions in the atmosphere leads to an increase in radiative forcing. This relationship is derived from large-scale climate models: the radiative forcing equation includes the forcings of other greenhouse gases (CH_4, N_2O, CFCs and ozone) and aerosols as an exogenous component. The climate-change equations link radiative forcing and climate change, based on the three-box climate model representation. An increased radiative forcing warms the atmosphere with some time lag, due to the thermal inertia of the different ocean layers.

In the RICE-99 environmental module, only CO_2 is endogenously modelled. Other greenhouse gases and their radiative forcings are assumed to be exogenous. In PACE-IAM, CH_4, as the most important non-CO_2 greenhouse gas, is endogenised in order to accommodate multi-gas analysis. The calibration of the extended environmental module is based on the MERGE climate module (Manne et al. 1994). Methane emissions result from different sources and are linked to economic activities in the economic model. These emissions build up a CH_4 stock. Increase in the stock of methane leads to an increase in the radiative forcing of methane. The latter is proportional to the logarithm of the ratio of the current to the initial level and takes into account the interaction effects of CH_4 and N_2O. The aggregate radiative forcing is again the sum of the radiative forcing for CO_2, CH_4, and the other exogenous forcings. The temperature equations remain unchanged, i.e. the parameters in the function transforming variations in radiative forcing into temperature variations are unaffected by a multi-gas setting.

3.3.3 The economic sub-module

The economic module of the integrated assessment framework is formulated as a multi-sector, multi-region computable general equilibrium model of global trade and energy use.

Emission abatement policies do not only cause direct adjustments on fossil fuel markets, but produce indirect spillovers to other markets, which in turn feed back into the economy. In a world increasingly integrated by trade, policy-induced adjustments of domestic production and consumption patterns will also influence international prices (meaning the terms of trade) as a result of changes in exports and imports. Changes in international prices (i.e. the terms of trade) imply secondary effects, which can significantly alter the impacts of the primary domestic policy. There are several studies illustrating the importance of such indirect effects (e.g. Böhringer 2002, Böhringer and Rutherford 2002, Böhringer and Welsch 2004, 2006, or Babiker et al. 2004) already for relatively moderate greenhouse gas abatement policies, such as the implementation of the Kyoto Protocol.

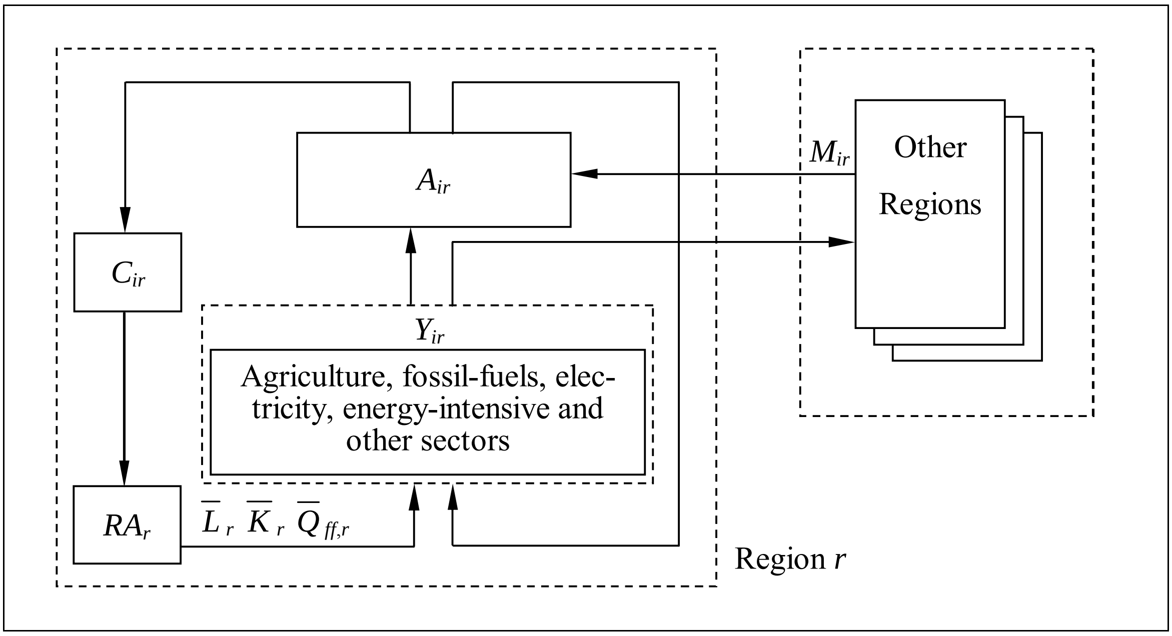
General equilibrium provides a comprehensive microeconomic-based framework for studying such price-dependent market interactions.[10] Furthermore, the simultaneous explanation of the origination and the spending of income of economic agents (in this case, regions) allows for both economy-wide efficiency as well as equity implications of policy intervention to be addressed. Therefore, computable (or applied) general equilibrium models have become a central method for assessing the economy-wide impacts of emission policies on resource allocation and the associated implications for incomes of economic agents (e.g. Weyant 1999).

Beyond the consistent representation of market interactions and income and expenditure flows, climate policy analysis calls for an explicit dynamic framework, since climate change is an inherently dynamic problem and happens on larger time scales. To build dynamic features in the modelling of the economic behaviour of households and firms

[10] Macroeconomic models mainly differ with respect to the emphasis placed on (i) econometric foundation of functional relationships, and (ii) the theoretical foundation of behavioural assumptions for economic agents. Referring to criterion (i), models can be classified as either econometrically estimated when driving equations are based on econometric techniques using mostly time-series data or as calibrated when parameters of functional forms are simply selected to fit a single empirical observation. Referring to criterion (ii), models may be distinguished between micro-/macro-founded approaches and simple accounting frameworks. The present approach represents a (i) calibrated and (ii) micro-founded model framework.

requires an assumption on the degree of foresight of the economic agents. In a deterministic setting, the only consistent approach is to assume that agents in the model know as much about the future as the modeller: agents have rational (intertemporal) expectations and consistently anticipate all current and future prices (Manne and Richels 1992). Figure 8 lays out the diagrammatic structure of the model's intraperiod structure.

Figure 8: Structure of the intraperiod sub-module



Source: ZEW

Primary factors of a region r include labour $\bar{L}_r$, capital, $\bar{K}_r$ and resources of fossil fuels $\bar{Q}_{ff,r}$ ($ff \in$ {coal, gas, oil}). The specific resource used in the production of coal, gas, and oil results in upward sloping supply schedules, consistent with exogenous fossil fuel supply elasticities.

Production Y_{ir} of commodities i in region r, other than primary fossil fuels, is captured by aggregate production functions which characterise technology by substitution possibilities between various inputs. Nested constant elasticity of substitution (CES) cost functions with several levels are employed to specify the KLEM substitution possibilities in domestic production sectors between capital (K), labour (L), energy (E), and non-energy intermediate inputs like material (M).

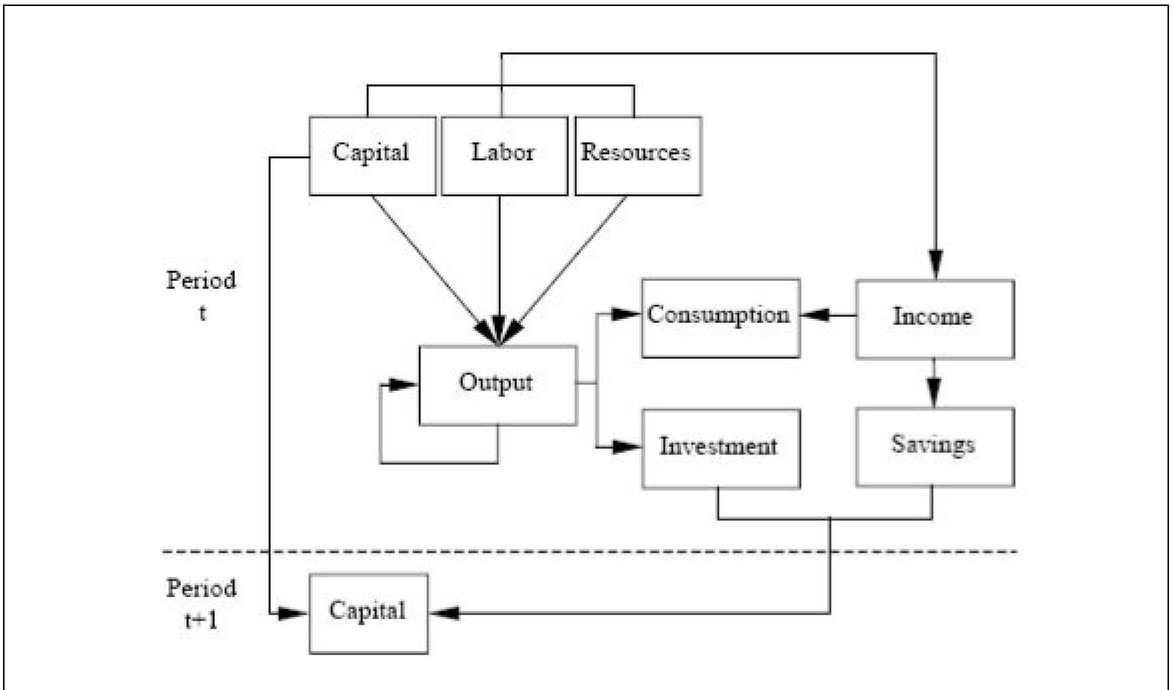
Final aggregate consumption demand C_r of the representative agent RA_r in each region is given as a CES composite which combines consumption of an energy aggregate with a non-energy consumption bundle. Nested CES functions describe the substitution patterns within the non-energy consumption bundle and the energy aggregate.

Non-energy goods used on the domestic market in intermediate and final demand correspond to a so-called Armington good (Armington 1969), i.e. a CES composite A_{ir} of the domestically-produced variety and a CES import aggregate M_{ir} of the same variety from the other regions. Domestic production either enters the formation of the Armington good or is exported to satisfy the import demand of other regions. Fossil fuels are treated as homogenous goods across regions.

Endowments of labour and the specific resources are fixed exogenously. Within any time period, we assume such competitive factors and commodity markets, so that prices adjust to clear these markets. Carbon emissions are associated with fossil fuel demand in production and final consumption.

As to the dynamic model setting, the representative household in each region chooses to allocate lifetime income, i.e. the intertemporal budget, across consumption in different time periods in order to maximise lifetime utility. In each period, the agent faces the choice of current consumption and future consumption purchased via savings. Investment takes place as long as the marginal return on investment equals the marginal cost of capital formation. The rates of return are determined by a uniform and endogenous world interest rate, so that the marginal productivity of a unit of investment and marginal utility of a unit of consumption is equalised within and across countries. Capital stocks evolve by dint of constant geometric depreciation and new investment. Note that technological change is assumed to be exogenous in the present model settings. Figure 9 sketches the basic dynamics of the economic module.

Figure 9: Dynamic model settings



Source: ZEW

3.4 Model parameterisation

In quantitative policy analysis, the effects of policy interference are measured with respect to a reference situation – usually termed business-as-usual (*BaU*) – where no policy changes apply. To perform numerical simulations, the concrete forms of the production functions (characterising the technological options in production) and the utility functions (characterising the consumption preferences of agents) must be specified.

The procedure most commonly used in CGE analysis to select parameter values is known as calibration (Mansur and Whalley 1984). Calibration of the free parameters of functional forms requires a consistent one year's data in prices and quantities (or a single observation represented as an average over a number of years), together with exogenous elasticities that are usually extracted from literature surveys. The calibration is a deterministic procedure and does not allow for statistical testing of the model specification.[11] Within the policy simulations, policy control parameters – such as carbon taxes or emission constraints – are assigned and a new (counterfactual) equilibrium is computed. Comparison of the counterfactual and the benchmark equilibrium then provides information on the policy-induced changes of economic variables, such as employment, production, consumption, relative prices, etc.

For the base-year calibration, we employ the GTAP-6 database which provides detailed input-output tables as well as bilateral trade flows for up to 57 commodities and 87 regions for the year 2001 (McDougall et al. 2005). The elasticities underlying our numerical analysis are based mainly on econometric evidence as summarised, for example, by Burniaux et al. (1992), Jomini et al. (1991) Sawyer and Sprinkle (1999), and Dimaranan et al. (2001).

In dynamic policy analysis, there is the need for additional information on the future business-as-usual development. Apparently, the business-as-usual projections are a crucial determinant for the overall magnitude of adjustment effects to policy interference. For example, the more exogenous policy constraints, such as long-term stabilisation or temperature targets, bind future economies, the higher the projected business-as-usual growth in greenhouse gas emissions will be. Substantial differences in model-based analysis can often be traced back to different assumptions about baseline development. In the present analysis, we will, however, concentrate on relative economic impacts rather than absolute numbers. With regard to long-term climate policy analysis, the issue of baseline projections becomes very critical in view of the tremendous uncertainties regarding business-as-usual developments over several decades. Not only is there the question as to why one baseline should be preferable over another, but official projections based on expert analyses often betray large internal inconsistencies, because the endogeneity of system relationships is not sufficiently incorporated.

Considering the regional resolution of the dynamic integrated assessment model, the most restrictive constraint comes from the availability of long-term baseline projections.

[11] Large-scale CGE models have many functional parameters, which must be specified with relatively few observations (as comprehensive time series are typically not available) This prevents the econometric estimation of the model parameters, as an econometric system of simultaneous equations.

PACE-IAM currently makes use of the WEC-IIASA database that includes projections for GDP, fossil fuel use and greenhouse gas emissions up to 2100 for eleven geo-politically important world regions and six alternative long-term futures (IIASA 1998). A second constraint regarding both the regional as well as sectoral model resolution is related to computational robustness and the speed of the numerical solution process. In order to reduce computational burden, the model dimensions for the current analysis have been aggregated to seven world regions and seven sectors including primary and secondary energy sectors as well as an aggregate of carbon-(energy-) intensive industries. Table 10 summarises the regional aggregation of the model that is adopted for the impact assessment.

Table 10: Model regions

Abbreviation	**Region**
OOE	Other OECD (USA, Canada, Japan, Australia, New Zealand, Former Soviet Union)
GER	Germany
EUR	Europe (EU-25 without Germany)
BRA	Brazil
IND	India
CHN	China
ROW	Rest of the World (Middle East and North Africa, Sub-Saharan Africa, Pacific Asia without Japan, Australia and New Zealand, Rest of Latin America)

Source: ZEW

Among the six possible futures up to 2100 that are provided in the WEC-IIASA database, scenario A1 serves as the central case reference scenario. The A1 scenario is based on technological progress that permits greater exploitation of conventional and unconventional oil and natural gas resources, so that they are phased out more slowly and their use is achieved without significant environmental or efficiency penalties (Jefferson 2000). Table 11 provides an overview of central indicators for the A1 reference scenario. Along the baseline, the regional economies are calibrated to potential GDP growth rates as provided by the WEC-IIASA database; economic growth is driven by (Harrod-neutral) labour-augmenting technical change. Harmonisation of GDP growth rates and emission projections is accommodated by an appropriate scaling of baseline cost shares in the production of energy services.[12] The exogenous business-as-usual emission trajectories determine the extent to which the emission caps translate into effective emission reduction

[12] Capital cost shares in the provision of energy services become inversely adjusted to energy cost shares, meaning that energy efficiency improvements are not without cost, but are linked to the increased use of capital.

obligations on a regional level. Beyond the baseline parameterisation, additional determinants of adjustment costs may include the explicit representation of initial market imperfections (e.g. market power and labour market rigidities) and the scope of endogenous system responses (e.g. exogenous technological change vis-à-vis induced technological change). Due to the level of aggregation and the lack of data, it is hardly possible within the global PACE-IAM model to represent country-specific market imperfections. Similarly, an appropriate treatment of induced technical change (with implicit externalities from knowledge spillovers) is constrained by a lack of comprehensive theoretical underpinning and of empirical data. Modelled exogenously, technical change may not be affected by environmental policies. In setting stringent climate policy strategies, this may lead to an underestimation of the rate of technical change over time.

Table 11: Main characteristics of WEC-IIASA scenario A1

	Scenario A1
Carbon emissions (Gt CO_2)	38.5 (in 2030) — 42.5 (in 2050) — 50.6 (in 2100)
World economic growth (%/a)	2.4
Environmental taxes	No
Carbon constraints	No

Source: IIASA 1998

3.5 Scenarios of stabilising CO_2 concentrations up to 2100

3.5.1 Overview of simulated scenarios

The future climate policy scenarios to be implemented in the simulation model PACE-IAM generally consist of two components: stringency of climate protection and instrument choice. As for the stringency of climate protection, two alternative stabilisation targets of CO_2 concentrations were analysed: 400 and 450 ppm CO_2, as these stabilisation targets are considered relevant for contributing to the goal of limiting future climate change to a global mean temperature increase below two degrees Celsius (IPCC, 2001b). In order to translate the two relevant stabilisation scenarios into emission reduction requirements, we followed a three-step procedure:

- ***Step 1*:** The ZEW calculated two intertemporally optimal CO_2 emission paths on the global level from 2010 to 2100, each of which is compatible with one stabilisation scenario
- ***Step 2*:** Ecofys regionally disaggregated these optimal global emission paths according to a *staged approach* (described in Section 3.5.3) and calculated the respective regional emission allowances from 2010 to 2100

- ***Step 3*: The ZEW transformed these regional emission allowances into regional CO_2 reduction requirements versus business-as-usual emission levels from 2010 to 2100

As for instrument choice, two cases of climate policy instruments are distinguished for Germany in each stabilisation scenario: the case of full use of the flexible mechanisms of the Kyoto Protocol by all regions, and a case whereby Germany unilaterally introduces a carbon tax to comply with its emission reduction requirements (whereas all other countries make full use of the flexible Kyoto mechanisms). Within the case of full use of the flexible Kyoto mechanisms, we concentrate on international emissions trading and the CDM. The two mentioned cases of instrument choice shall serve as platforms for examining the macroeconomic advantages for Germany from the use of flexible Kyoto mechanisms.

Combining the two components of our future climate policy scenarios (stringency of climate protection and instrument choice) yields four scenarios, which are implemented into the simulation model and are summarised in Table 12. Each of the four scenarios is contrasted to the business-as-usual scenario without any climate policy measures.

Table 12: Summary of scenarios

Scenario name	**Characteristics**
BaU	Business-as-usual without binding climate policies (reference scenario A1 as of WEC-IIASA (IIASA 1998))
FLEXIBLE MECHANISMS 450	Staged 450 ppm CO_2 stabilisation (Full use of Kyoto flexible mechanisms by all regions)
NO TRADE GERMANY 450	Staged 450 ppm CO_2 stabilisation (Full use of Kyoto flexible mechanisms by all regions except for Germany; domestic action by Germany)
FLEXIBLE MECHANISMS 400	Staged 400 ppm CO_2 stabilisation (Full use of Kyoto flexible mechanisms by all regions)
NO TRADE GERMANY 400	Staged 400 ppm CO_2 stabilisation (Full use of Kyoto flexible mechanisms by all regions except for Germany; domestic action by Germany)
Note: Transaction costs for CDM investments (but not for emissions trading) of 1 US$/tC or 0.27 US$/t CO_2 are incorporated in the model. This magnitude is slightly higher, but roughly in line with the estimates, which are based on the results of a conducted *Delphi* survey (Section 4.2.5). It is assumed that transaction costs are borne by the CER-demanding region.	

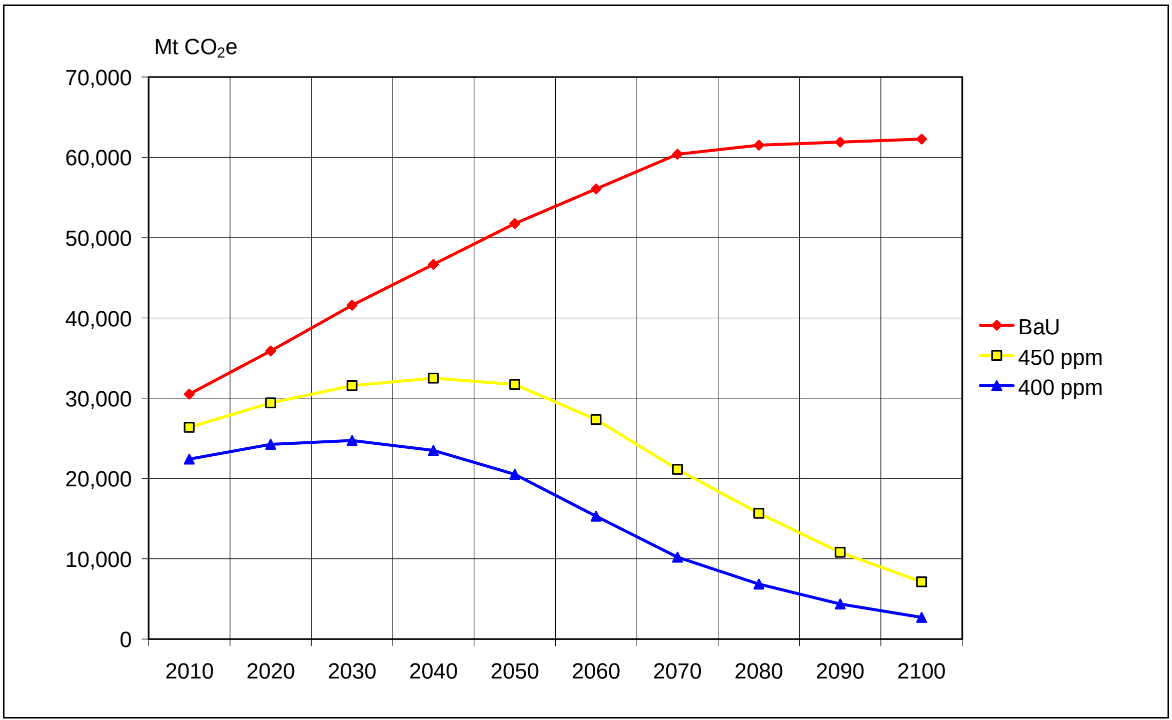
Source: ZEW

The three-step procedure for translating the two CO_2 stabilisation scenarios of the stringency of climate protection into respective emission reduction requirements is presented in the following three sections.

3.5.2 *Step 1*: Optimal CO_2 emission paths on the global level

The two intertemporally optimal CO_2 emission paths from 2010 to 2100 on the global level were simulated with the model PACE-IAM, each path being compatible with stabilising CO_2 concentrations at either 400 or 450 ppm CO_2 in the year 2100. Figure 10 shows the two resulting optimal CO_2 emission paths, as compared to the business-as-usual path.

Figure 10: Optimal CO_2 emission paths at the global level



Source: ZEW

3.5.3 *Step 2:* CO_2 emission allowances on the regional level

Ecofys derived regional emission allowances according to a simplified *staged approach*, consistent with the optimal long-term global emission paths provided by the ZEW.[13] All calculations include CO_2 alone. The global emission levels in 2010 of the ZEW emission paths for the 450 and 400 ppm case are lower than the levels reached if developing countries develop along their reference scenario and Annex I countries reach their Kyoto targets.

Rather than an elaborate proposal of global climate policy post 2012, the staged approach used for this analysis should be interpreted as a simplified assumption of the distribution of global mitigation burdens in the long run. Generally, countries move on to

13 The calculations were conducted by Sara Moltmann and Niklas Höhne.

next stages if their per capita emissions are above a threshold, the thresholds declining over time. Countries can only move up one stage per 10 year period and cannot move downwards. Base data and future reference emissions and population are those provided by ZEW. We considered only the regions provided by ZEW (OECD, Germany, Eastern Europe, Latin America, India, China, Rest of the World) and did not deploy country-specific data.

Regions participate in several stages with differentiated types and levels of commitments. We included three stages as follows:

- ***Stage 1 – No commitments:*** Regions with a low level of development would not have climate policy commitments. We implemented in the model that these countries follow their reference scenario as no emission reductions are required.
- ***Stage 2 – Stabilisation of emissions:*** At the next stage, all regions that exceed a certain per capita emission threshold have to stabilise their absolute emissions (Table 13).
- ***Stage 3 – Absolute reduction target:*** Regions in stage 3 receive absolute emission reduction targets and have to reduce their absolute emissions substantially until they reach a low per capita level (essentially a fourth stage). As time progresses, more and more regions enter stage 3. The percentage reduction of the emissions is equal for all countries in this stage. Annex I countries are in this stage from the beginning.

Regions move through these stages based on their level of emissions per capita. Since "followers do better" (they benefit from the technological developments of others), the threshold for entering the stages 2 and 3 decrease linearly with time. In following the ZEW paths, the thresholds decrease more slowly between 2010 and an intermediate year. Between this intermediate year and 2100 the thresholds decrease faster. The intermediate years are 2050 for the 400 ppm path and 2070 for the 450 ppm path.

After each 10 year step, it is assessed whether a region should move to the next stage. Ecofys introduced the condition that movement into stage 3 is only possible after a region has been in stage 2 for at least one decade. This is to avoid the possibility of a developing country region jumping directly from stage 1 to stage 3. Hence, all current non-Annex I country regions will be at best in stage 2 in 2020 and in stage 3 in 2030.

Free parameters (thresholds and reduction levels) are set in a way so that resulting global emissions are equal to the stabilisation scenarios given by the ZEW. For each 10 year step, the emissions of the countries in stages 1 to 2 are calculated first of all. Then the reduction percentage for the group 3 is set, so that resulting global emissions match the given level of the ZEW stabilization scenario. This percentage reduction is applied equally to all countries. Table 13 shows the parameters that are used.

Table 13: Parameters used for the simplified multistage approach

Parameter	**Unit**	**450 ppm**	**400 ppm**
Threshold to enter stage 2 (stabilisation of emissions)			
2010	tC/cap	1.4	0.9
Intermediate year (2050 for 400 ppm, 2070 for 450 ppm)	tC/cap	0.8	0.7
2100	tC/cap	0.0	0.0
Threshold to enter stage 3 (absolute reductions)			
2010	tC/cap	1.9	1.8
Intermediate year (2050 for 400 ppm, 2070 for 450 ppm)	tC/cap	0.9	0.7
2100	tC/cap	0.0	0.0
Emission reduction ranges in stage 3, reduction ranges compared to emissions of previous decades	%	9.1-56.3	2.5-58.9
Threshold for no further reduction in stage 3	tC/cap	0.15	0.05

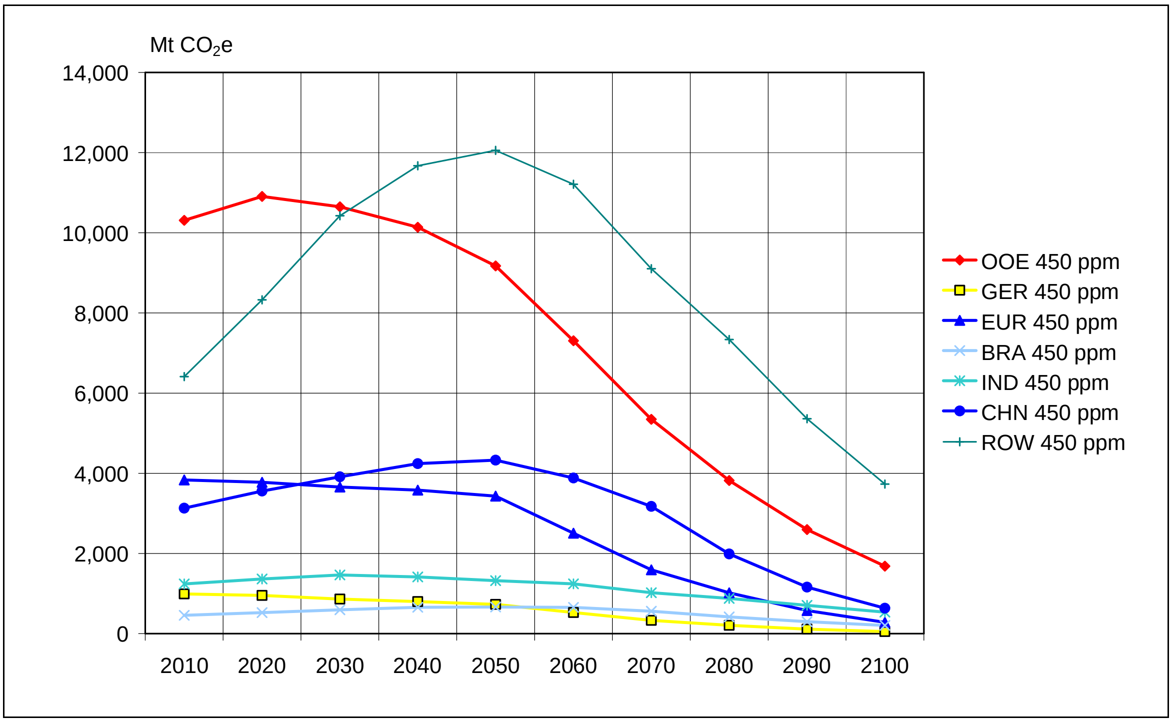
Source: Ecofys

The procedure has the following limitations:

- Countries are divided into a few groups only. The four developing country groups are very large. The global emission levels change dramatically if one group starts participating. Hence, the percentage reduction of the stage 3 countries may be large in one year and small in the next.
- The stabilisation pathways by ZEW are different already in 2000. The emission levels in 2000 depend, therefore, on the chosen stabilisation pathway.
- Emission levels in 2010 deviate from those required under the Kyoto Protocol.
- The analysis includes CO_2 only. The share of non-CO_2 emissions in non-Annex I countries is usually higher than in Annex I countries. The inclusion of non-CO_2 gases would lead to an earlier participation of the non-Annex I regions.

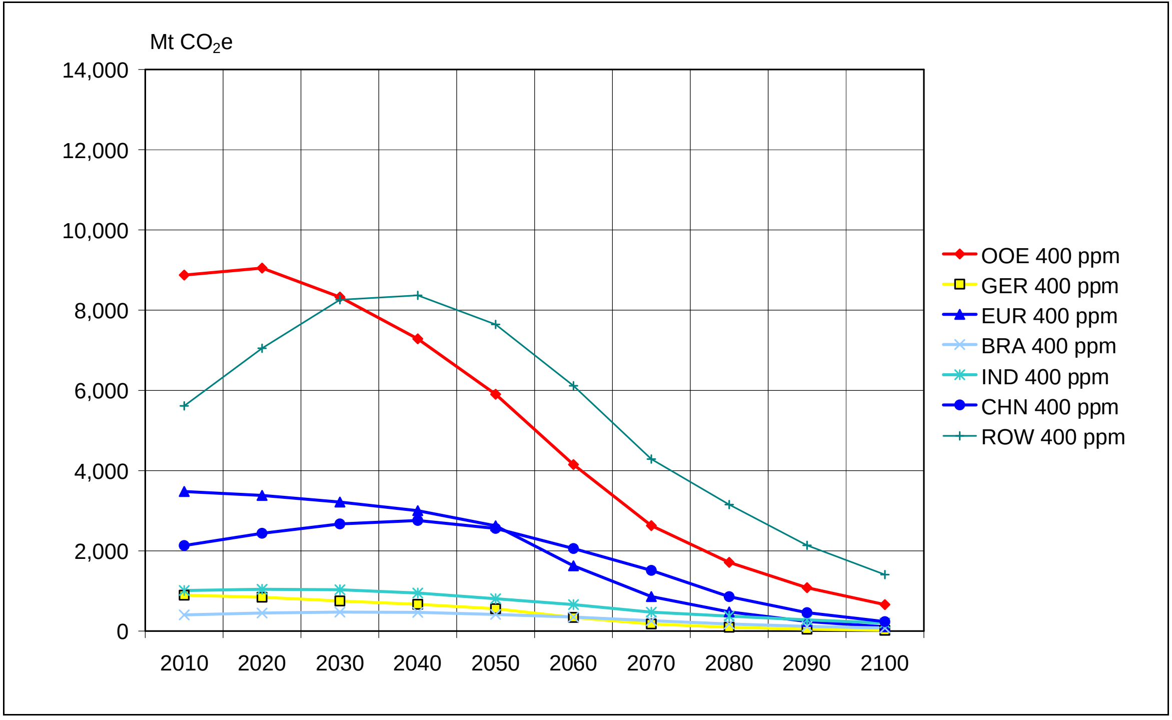
The resulting regional emission allowances from 2010 to 2100, which are required so that the respective stabilisation targets are reached, are shown as regional emission paths in Figure 11 and Figure 12. Note that the intertemporally optimal nature of CO_2 emission paths on the global level induces relative strong reduction requirements versus business-as-usual on the regional level – even as early as 2010.

Figure 11: CO_2 emission paths required to reach the 450 ppm CO_2 stabilisation target



Source: Ecofys, calculations by ZEW

Figure 12: CO_2 emission paths required to reach the 400 ppm CO_2 stabilisation target



Source: Ecofys, calculations by ZEW

3.5.4 *Step 3*: CO_2 reduction requirements on the regional level

The following tables show regional CO_2 emission reduction requirements versus business-as-usual emission levels from 2010 to 2100, based on the emission paths by Ecofys for the respective stabilisation targets (compare Table 10 for details of the model regions). As a logical consequence of our three-step procedure, these regional reduction requirements represent intertemporally *optimal* emission reduction commitments in a staged setting.

Table 14: CO_2 emission reduction requirements versus BaU for 450 ppm stabilisation

	2010	2020	2030	2040	2050	2060	2070	2080	2090	2100
					- % -					
OOE	25.7	38.9	57.2	70.8	78.1	87.0	91.0	94.4	96.9	97.0
GER	22.6	28.6	42.8	56.8	64.2	74.5	77.9	83.3	88.9	87.9
EUR	23.6	31.1	48.6	63.3	71.2	79.8	82.9	87.2	85.3	81.0
BRA	0.0	0.0	0.0	0.0	0.0	20.7	53.2	70.5	84.4	89.2
IND	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.4	66.5
CHN	0.0	0.0	0.0	10.9	19.7	54.4	69.4	78.2	86.7	84.4
ROW	0.0	0.0	0.0	0.0	15.5	28.1	55.4	73.7	86.5	90.0

Source: Ecofys, calculations by ZEW

Table 15: CO_2 emission reduction requirements versus BaU for 400 ppm stabilisation

	2010	2020	2030	2040	2050	2060	2070	2080	2090	2100
					- % -					
OOE	49.4	59.1	62.2	71.9	77.7	85.5	92.7	96.8	98.1	99.0
GER	47.3	52.2	49.6	58.5	63.6	71.4	82.2	90.6	92.9	96.0
EUR	48.0	53.9	54.7	64.7	70.7	77.4	86.2	92.8	94.6	93.7
BRA	0.0	0.0	0.0	17.9	41.3	68.9	86.8	94.2	96.4	96.4
IND	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.1	55.1	83.7
CHN	0.0	22.0	35.8	42.8	56.5	72.8	86.9	93.5	95.4	94.8
ROW	0.0	0.0	24.8	38.6	56.3	75.2	88.9	95.4	96.7	96.7

Source: Ecofys, calculations by ZEW

3.5.5 Instrument choice: Participation in emissions trading or CDM

Within the instrument choice scenarios FLEXIBLE MECHANISMS 400 and 450, countries may participate in international emissions trading (ET) or host Clean Development Mechanism (CDM) projects. Participation in ET or CDM is derived by the emission reduction requirements of the respective region. It is assumed that all regions participate in ET, unless they have not committed to binding CO_2 emission reduction requirements versus business-as-usual. In this case, these countries will only host CDM projects (countries participating in ET at the same time represent CDM investor countries). The following tables show the regional participation in international emissions trading (ET) or the hosting of Clean Development Mechanism (CDM) projects for the respective stabilisation targets. The tables show that the periods of CDM participation by developing countries generally decrease as the stabilisation target becomes stricter, since developing countries also have to commit to stricter emission reduction targets.

Table 16: Regional participation in emissions trading or CDM at 450 ppm stabilisation

	2010	2020	2030	2040	2050	2060	2070	2080	2090	2100
OOE	ET	ET	ET	ET	ET	ET	ET	ET	ET	ET
GER	ET	ET	ET	ET	ET	ET	ET	ET	ET	ET
EUR	ET	ET	ET	ET	ET	ET	ET	ET	ET	ET
BRA	CDM	CDM	CDM	CDM	CDM	ET	ET	ET	ET	ET
IND	CDM	CDM	CDM	CDM	CDM	CDM	CDM	CDM	ET	ET
CHN	CDM	CDM	CDM	ET	ET	ET	ET	ET	ET	ET
ROW	CDM	CDM	CDM	CDM	ET	ET	ET	ET	ET	ET

Source: ZEW

Table 17: Regional participation in emissions trading or CDM at 400 ppm stabilisation

	2010	2020	2030	2040	2050	2060	2070	2080	2090	2100
OOE	ET	ET	ET	ET	ET	ET	ET	ET	ET	ET
GER	ET	ET	ET	ET	ET	ET	ET	ET	ET	ET
EUR	ET	ET	ET	ET	ET	ET	ET	ET	ET	ET
BRA	CDM	CDM	CDM	ET	ET	ET	ET	ET	ET	ET
IND	CDM	CDM	CDM	CDM	CDM	CDM	CDM	ET	ET	ET
CHN	CDM	ET	ET	ET	ET	ET	ET	ET	ET	ET
ROW	CDM	CDM	ET	ET	ET	ET	ET	ET	ET	ET

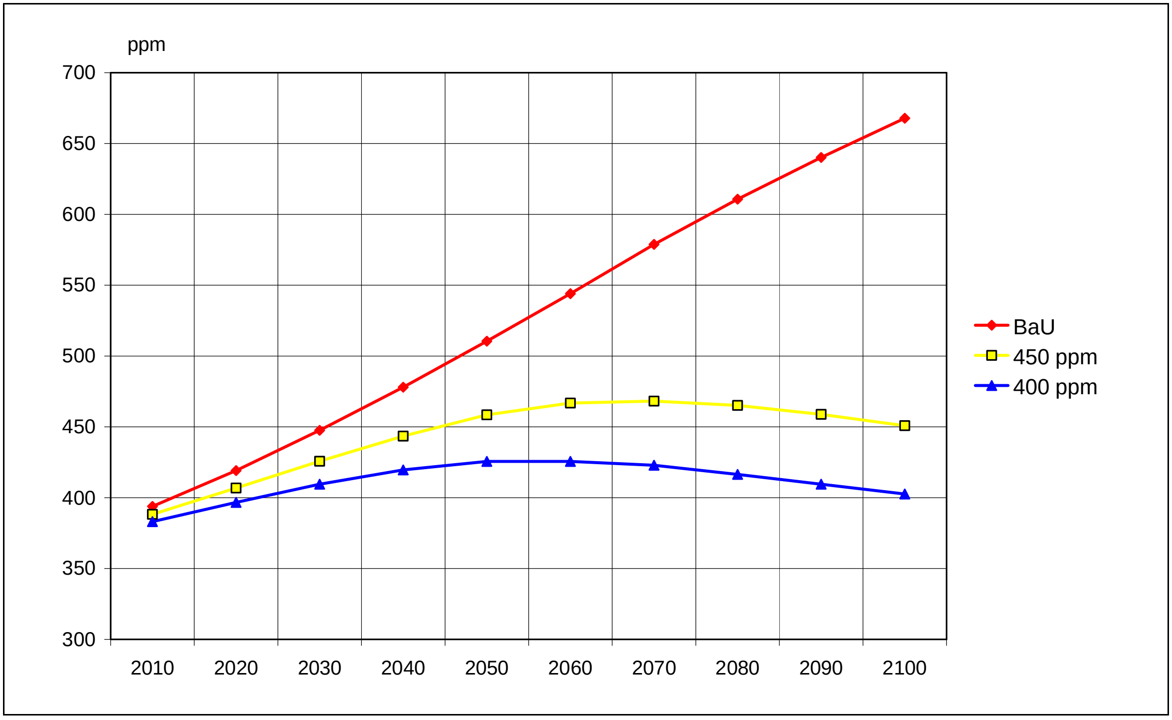
Source: ZEW

3.6 Simulation results

The CO_2 emission paths required in order to reach the respective stabilisation targets were implemented as carbon emission restrictions on the various economies in the model PACE-IAM. The following figures illustrate the central simulation results.

Within the climate sub-module of the model, the respective CO_2 emission paths imply CO_2 concentrations of 450 and 400 ppm in 2100. Figure 13 shows the resulting CO_2 concentration paths from 2010 to 2100 for 450 and 400 ppm stabilisation as compared to the business-as-usual path.

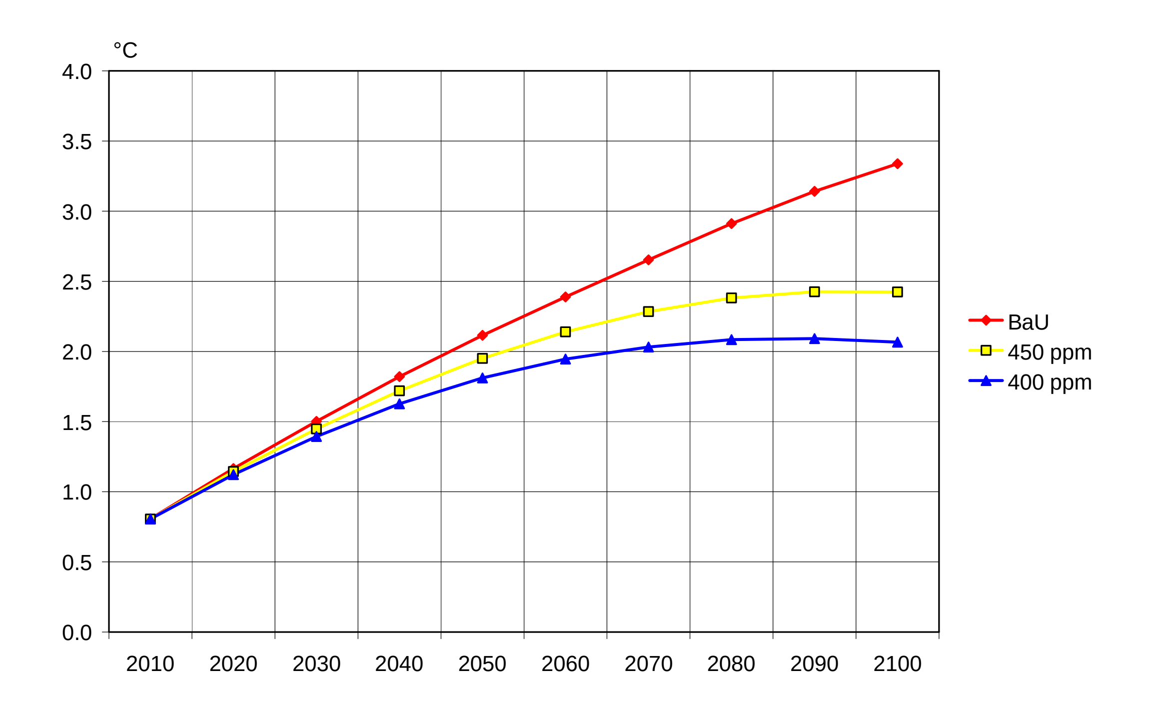
Figure 13: Stabilisation scenarios: CO_2 concentration paths



Source: ZEW

As the next step in the reaction chain within the climate sub-module, CO_2 concentration paths determine global temperature impacts. Figure 14 presents the mean temperature rise resulting from the two stabilisation scenarios.

Figure 14: Global mean temperature rise versus pre-industrial level



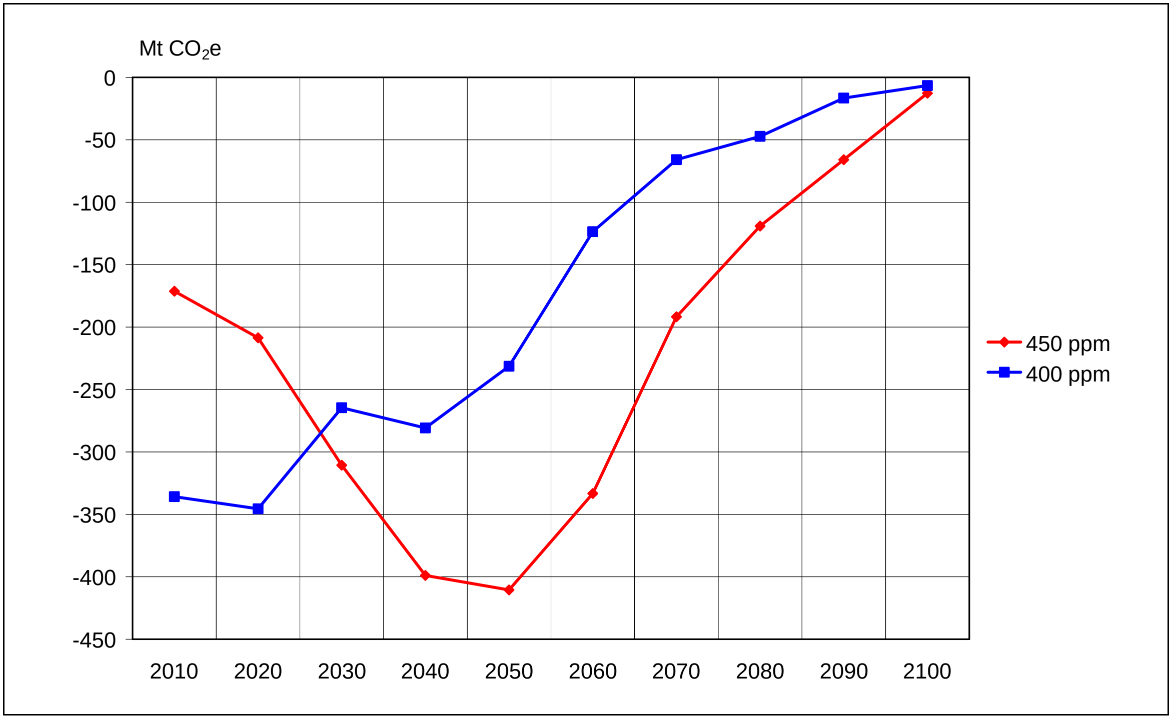
Source: ZEW

This figure shows that for a 450 ppm stabilisation, global mean temperature increases by 2.5 degrees, whereas the temperature rise under 400 ppm amounts to 2.1 degrees as compared to a 3.3 degree increase under the business-as-usual scenario.

3.6.1 Emission market impacts of stabilization scenarios

We begin our economic impact analysis by focusing on the emissions market, where carbon permits are traded internationally – both among Annex B countries (as “Assigned Amount Units”, AAUs) or between industrialised and developing countries by means of the CDM (as “Certified Emission Reductions”, CERs). Figure 15 shows net carbon permit exports (i.e. exports minus imports) of Germany from participating in the flexible mechanisms under the two stabilisation scenarios.

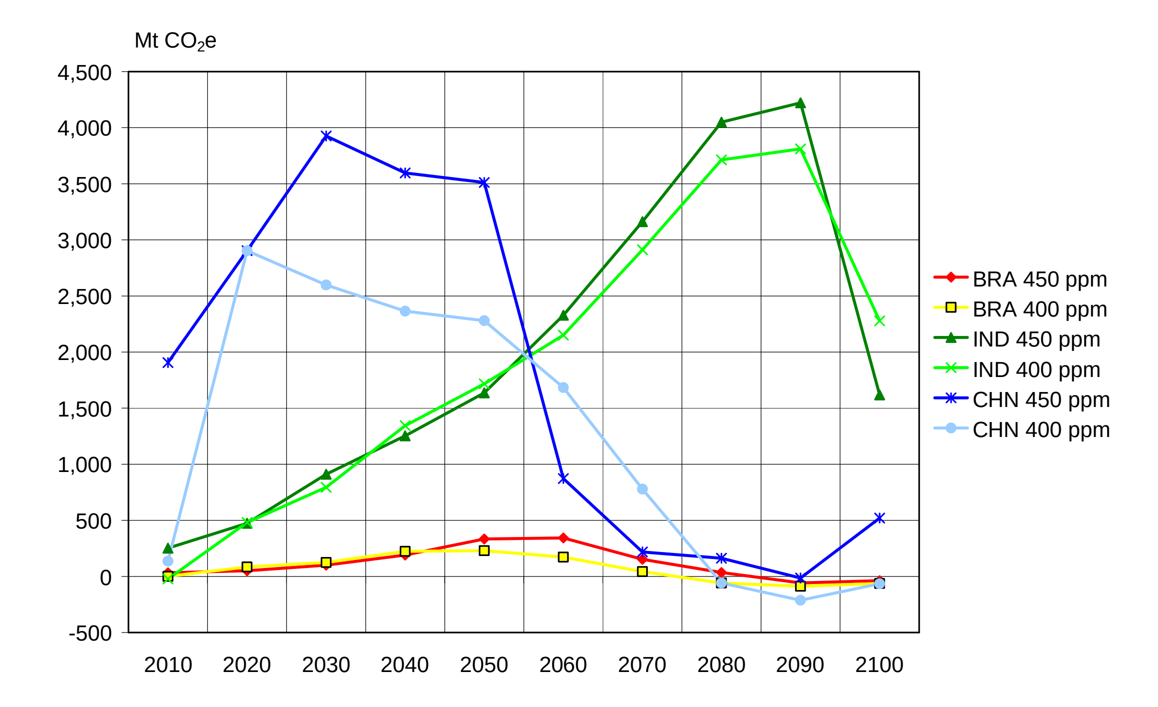
Figure 15: Germany – Net carbon permit exports



Source: ZEW

Germany clearly represents an importer on the international permit market, using emissions trading and CDM projects as an alternative to domestic abatement measures. However – despite of an increase of imports until 2050 under 450 ppm – imports are decreasing in the long run and are lower for 400 ppm than under the 450 ppm stabilisation scenario. These effects are due to the stricter emission control targets of Germany and all other world regions both for a 400 ppm stabilization and over time, as presented in the previous section: stricter targets cause the permit price to rise considerably, so that the attractiveness of the Flexible Mechanisms decreases compared to domestic abatement measures. In 2100, German permit imports shrink to almost zero. Figure 16 illustrates net carbon permit exports for selected developing regions (we focus on Brazil, India and China as the central CDM host countries).

Figure 16: Developing countries – Net carbon permit exports



Source: ZEW

The emissions market for key developing countries imparts a heterogeneous picture. With regard to overall emission permit export levels, China clearly represents the dominant CDM host country in the first half of the century, while India assumes this role in the second half of the century. Compared to these two regions, Brazil represents a rather small permit exporter. Moreover, the three permit exporters pursue very distinct export paths over time. Brazil follows a flat, but nevertheless inversely u-shaped path, India a rising path until 2090, and China a falling path from 2030 onwards. These temporal export patterns are due to the individual emission control targets (Section 3.5.4): while all reduction commitments are getting stricter over time, they are strongest for China, lower for Brazil and lowest of all for India. Since other world regions also face stricter targets over time, this implies a trade-off for permit exporters between an (advantageous) rising permit price and a (disadvantageous) lower domestic availability of exportable permits. In the long run, this trade-off is most beneficial for India, while it is least beneficial for China.

Moreover, we observe that the three developing countries generally export a larger amount of allowances under 450 ppm than under 400 ppm, although this pattern may be reversed over time. Again we have a trade-off for these regions between a higher overall permit demand under 400 ppm due to stricter targets for all world regions and a lower domestic availability of exportable permits due to stricter individual targets of developing countries.

3.6.2 Macroeconomic impacts of stabilisation scenarios

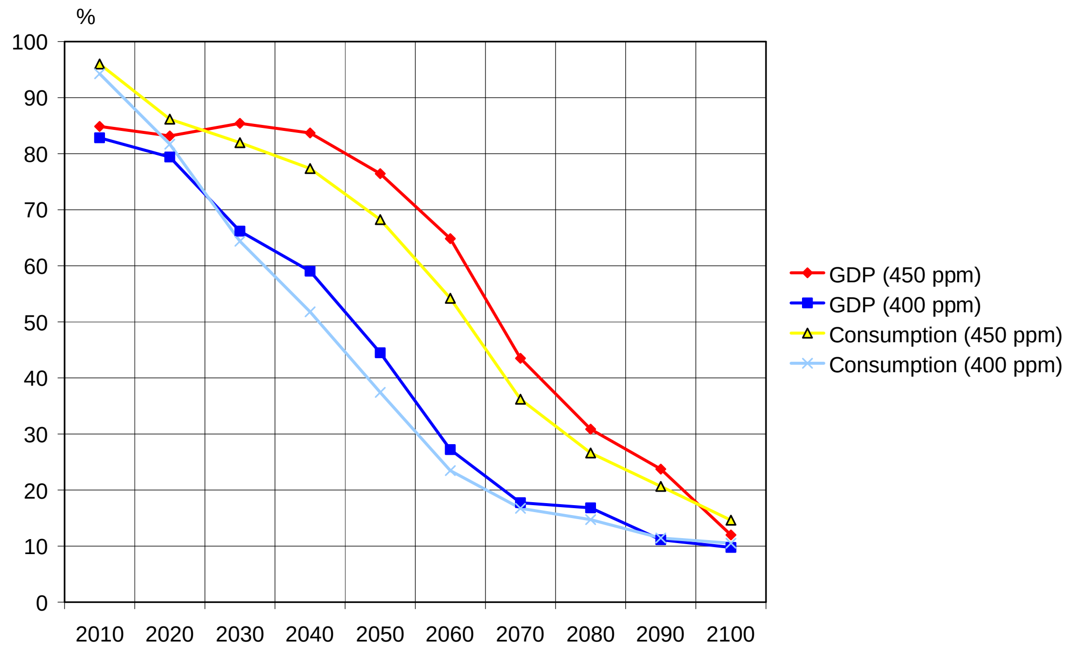
From a general equilibrium perspective, the economic effects of climate change policies surpass the emissions market and cause so-called *market spillovers*. First, the domestic emissions market and the goods market (i.e. production and consumption levels) are interlinked. For potential emission permit importers, carbon abatement policies may decrease production levels by the associated decreased energy use due to increased domestic abatement, or a policy-induced increased permit price. For emission permit exporters, supplying permits may on the one hand reduce production due to the implied emission reductions, but on the other hand increase production due to a redistribution of export revenues to the economy, which may in turn increase consumption and thereby production.

Secondly, carbon abatement policies in large open economies not only cause adjustment of domestic production and consumption patterns but also influence international prices via changes in exports and imports. Changes in international prices (*terms-of-trade* impacts) imply a secondary benefit or burden which can significantly alter the economic implications of the primary domestic policy. Some countries may shift part of their domestic abatement costs to trading partners ("beggar-thy-neighbor" policies), while other abating countries face welfare losses from a deterioration of their terms of trade. In the policy debate of climate change, international spillovers from sub-global abatement policies play an important role. A major determinant for the differences in sign and magnitude of spillovers is the trade position of countries on international crude oil and coal markets. The cutback in global demand for these fossil fuels implies a significant drop in their prices, providing economic gains to fossil fuel importers and losses to fossil fuel exporters. These effects are especially relevant for impacts on developing countries.

Thirdly, regional spillovers may be caused by international trade in goods: carbon abatement policies that decrease economic activity (such as production and consumption) in abating regions may also have negative impacts on economic activity in other regions – if they are trading partners – via decreased import demand or export supply of abating regions.

In order to analyse these general equilibrium (i.e. multi-market) impacts from climate policy in greater detail, we will focus in the following on macroeconomic indicators, such as GDP and macroeconomic consumption. Here, we generally illustrate economic impacts for various world regions caused by a use of the flexible mechanisms by Germany. We start with the associated impacts for Germany, which are illustrated in Figure 17.

Figure 17: Germany – Avoided GDP and macroeconomic consumption loss by means of the use of flexible mechanisms

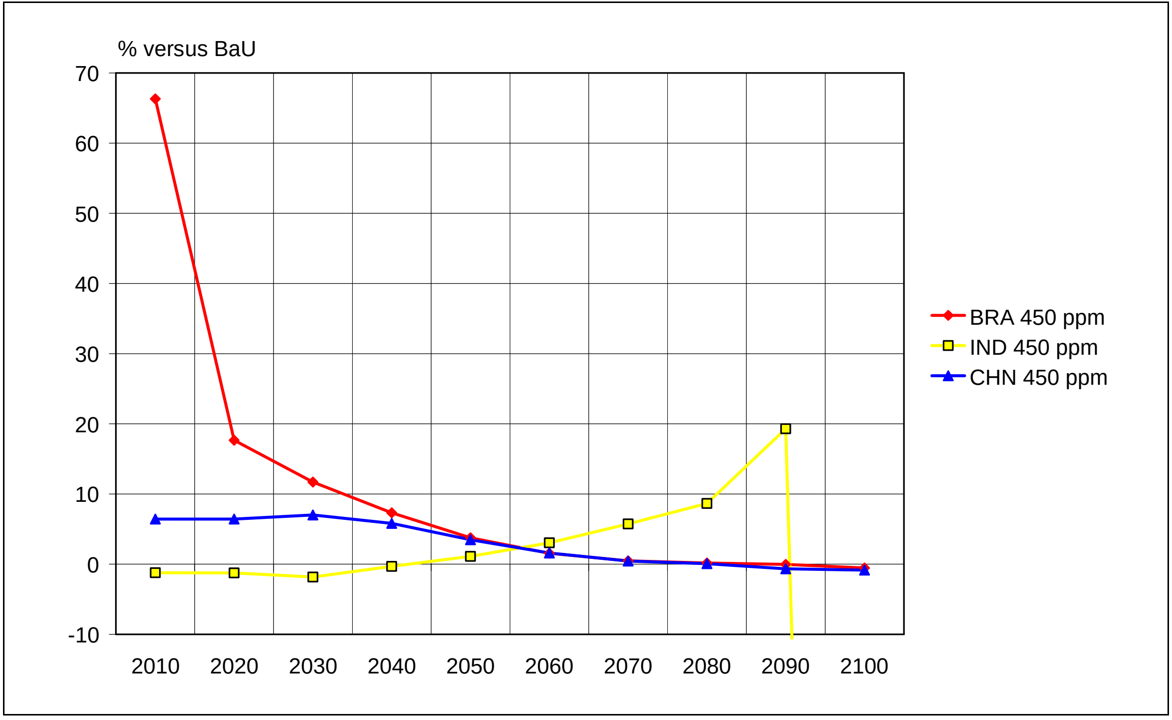


Source: ZEW

This figure demonstrates that by using the flexible mechanisms of the Kyoto Protocol, Germany is able to reduce the GDP and consumption losses caused by emission control policies to a considerable degree.[14] However, the avoided losses are higher for a 450 ppm stabilisation and decrease over time. These effects are due to stricter world-wide emission control targets under 400 ppm stabilisation as well as over time, which cause the permit price to increase substantially and the relative macroeconomic benefits from using the flexible mechanisms to decrease. Figure 18 presents the associated GDP effects for developing countries under a 450 ppm stabilisation policy.

[14] Note that GDP effects presented here reflect our cost-effectiveness approach and do not, therefore, take into account the benefits of climate policies, such as avoided damages from climate change.

Figure 18: Developing countries – Avoided GDP loss through the use of flexible mechanisms by Germany, 450 ppm stabilisation



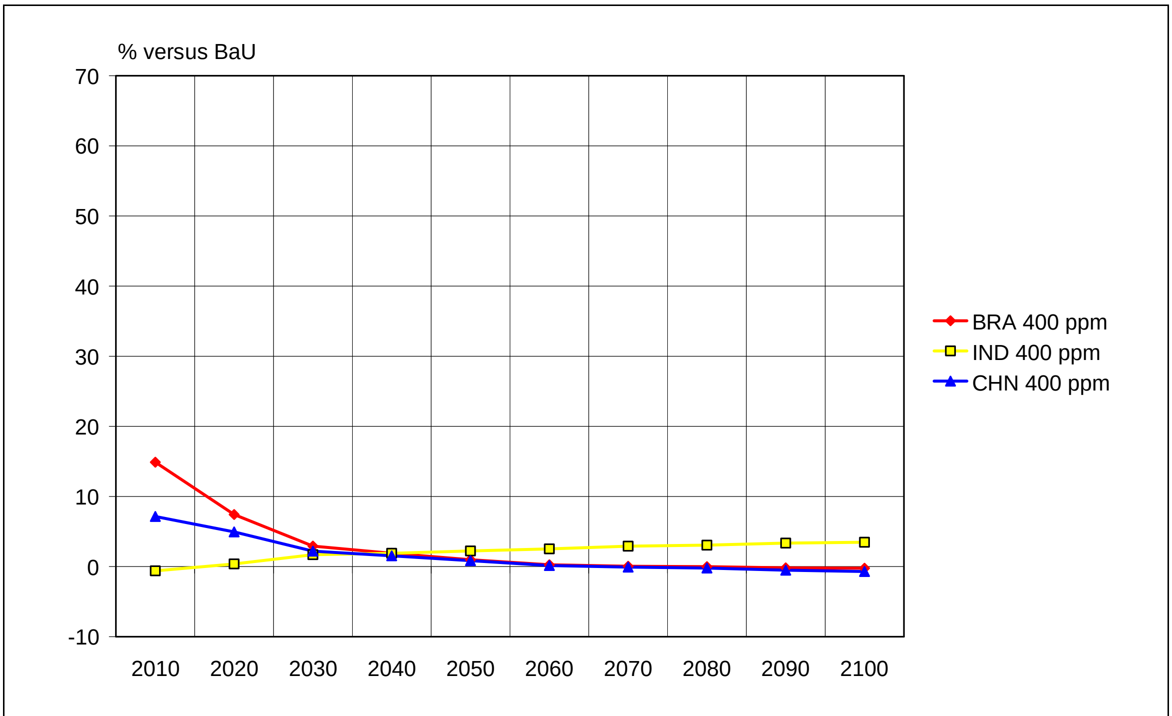
Source: ZEW

Generally, the GDP of developing regions may be ambiguously affected by global carbon abatement strategies: whereas India is benefiting on a large scale versus business-as-usual GDP levels, Brazil and China are affected negatively (absolute effects are not illustrated here). Production levels of these two regions decrease due to their own emission control constraints and associated abatement, but also due to abatement by other regions via the international goods trade channel: lower goods imports and exports from industrialised regions affect production in these regions negatively. These effects cannot be compensated by their status of energy importers (who benefit from falling international fuel prices due to global carbon emission restrictions). This compensation is, however, holding for India, which assumes a relatively low emission control target and features increasing GDP gains over time.

Figure 18 shows that permit-exporting developing countries are generally benefiting by Germany using the flexible mechanisms of the Kyoto Protocol. This beneficial effect is on the one hand due to the additional German permit demand and a higher permit price, on the other hand caused by international trade in goods, which decreases to a lesser extent if the trading partner Germany faces lower GDP losses. Moreover, we observe that the (large) avoided GDP losses of Brazil and China as well, are decreasing over time, whereas increasing avoidance over time is shown for India (except for a fall in 2100). These temporal paths reflect the decreasing permit exports of China and the increasing exports of India up to the close of the century (Figure 16).

Similar results are obtained under a 400 ppm stabilisation – however, greater GDP losses are generally avoided under the 450 ppm stabilisation scenario, as was demonstrated in Germany's case (Figure 19).

Figure 19: Developing countries – Avoided GDP loss arising as a result of Germany using flexible mechanisms, 400 ppm stabilisation

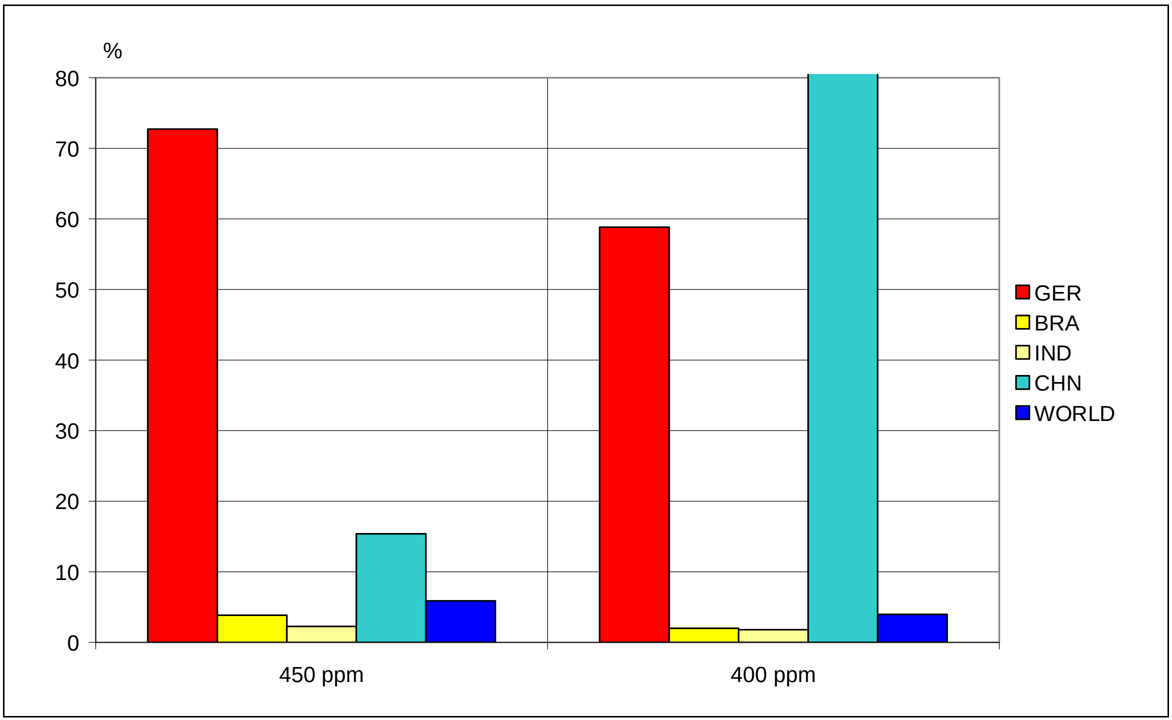


Source: ZEW

In order to quantify the overall economic impacts resulting from climate change policies, we deploy social welfare as the overarching economic indicator, i.e. aggregate utility. Welfare changes are conveyed by the *Hicksian Equivalent Variation* (HEV), which measures the income change that is equivalent to the induced change in utility, i.e. expresses welfare change in terms of income change. The welfare indicator thereby summarises both the presented economic impacts on the emissions market and macroeconomic impacts. The indicator represents cumulated welfare from 2000 to 2100, which is discounted using a rate of 5%.

Welfare effects presented here reflect our cost-effectiveness approach and do not, therefore, take into account the benefits of climate policies, such as avoided damages from climate change. Figure 20 illustrates the avoided welfare loss (induced by economic reactions to emission constraints) that was achieved by virtue of Germany's use of flexible mechanisms, for central developing countries as well as the world under the two stabilisation scenarios. In our scenarios in Table 12, we compare the welfare effects of scenario FLEXIBLE MECHANISMS 450 with NO TRADE GERMANY 450 and FLEXIBLE MECHANISMS 400 with NO TRADE GERMANY 400 for various world regions.

Figure 20: Germany and other world regions – Avoided welfare loss achieved by use of flexible mechanisms versus BaU



Source: ZEW

Figure 20 shows that all regions economically benefit from the inclusion of Germany in the flexible mechanisms of the Kyoto Protocol. By participating in international emissions trading and the CDM, Germany itself is significantly avoiding potential welfare losses compared to domestic action of over 70 %under a 450 ppm stabilisation – decreasing welfare loss from 1.10 %to 0.30 %– and over 50 %under a 450 ppm stabilisation scenario. While Germany clearly benefits from enhanced economic flexibility by trading emissions internationally, CDM host countries Brazil, India and China also reap beneficial welfare changes. In this context, China receives the highest relative welfare gains, although on a small absolute scale: a 400 ppm stabilisation, a welfare loss of 0.01 % under NO TRADE GERMANY turns into a welfare *gain* of 0.06 % under FLEXIBLE MECHANISMS (illustrated by an unlimited bar in Figure 20). Additionally, we note that world-wide relative welfare gains arise from Germany's inclusion in the panoply of flexible mechanisms.

Although developing regions like Brazil may face absolute welfare losses from global stabilisation policies, we note that absolute welfare gains arise for China in the 450 ppm scenario, and even larger benefits for India regardless of the stabilisation goal (not illustrated in Figure 20). Although the *relative* gains of India from Germany's use of the flexible mechanisms are comparably small, these amount to gains of 2.26 %(even 7.38 %) in the case of 450 ppm (400 ppm).

3.7 Conclusions

Our simulations using an integrated-assessment model of the global economy based on intertemporal optimisation show that Germany is benefiting substantially from using the flexible mechanisms of the Kyoto Protocol, as compared to domestic abatement measures. In general, central driving forces of the simulated economic impacts include the strictness of global emission reduction targets and individual targets, interactions between emissions and goods market, as well as international spillovers arising from international trade in goods and fossil fuels.

Germany comprises a large importer of emission permits and CDM credits. Moreover, our simulations indicate that also for other industrialised world regions the project-based mechanisms contribute indefatigably to global stabilisation targets being achieved. In the first half of the century, China clearly is the dominant CDM host country (i.e. CER exporter), while India takes over this role in the second half of the century. Compared to these two regions, Brazil comprises a rather small CER exporter.

In the context of macroeconomic impacts of the underlying stabilisation scenarios, we find that by using the flexible mechanisms of the Kyoto Protocol, Germany is able to considerably reduce GDP and consumption losses caused by emission control policies. What is more, also permit-exporting developing countries generally harvest macroeconomic cost savings by dint of Germany's participation in the flexible mechanisms (with India receiving even absolute GDP gains). These beneficial effects are on the one hand due to the additional German permit demand and an associated higher permit price, and are on the other hand caused by international trade in goods, which decreases to a lesser degree if Germany, the trading partner, faces lower GDP losses.

In addition, all world regions economically benefit in terms of overall welfare when Germany makes use of the flexible Kyoto mechanisms. By participating in international emissions trading and the CDM, Germany itself is able to substantially avoid potential welfare losses in comparison to domestic action of up to 70%. Moreover, we behold absolute welfare gains for China and even larger benefits for India – despite of their own stage-orientated emission control commitments.

Several caveats of the present analysis are to be mentioned. First, the purpose of our cost-effectiveness approach is to spotlight climate policy strategies that minimise the economic costs of stabilising CO_2 concentrations. To this end, we deliberately ignore the benefits from avoided climate change (e.g. associated damages for developing countries), which could outweigh positive cost impacts and might even affect the assumed regional economic business-as-usual paths. Furthermore, as we only concentrate on CO_2 abatement strategies, we sidestep potentially cheaper abatement strategies related to other gases such as CH_4, thereby potentially overstating economic adjustment costs (Böhringer et al. 2005). Finally, the underlying assumption of an unrestricted use of the CDM might be relaxed by the introduction of supplementarity considerations by climate policy makers. Such considerations could especially restrict CER imports by industrialised countries in order to assure that the use of project-based mechanisms remains merely supplementary to domestic action, thereby limiting the simulated cost savings for industrialised countries and beneficial impacts for developing regions substantially.

4 Long-term prospects of CDM and JI – Results of the Delphi survey

Long-term forecasts with a time horizon of 40 to 50 years generally face substantial uncertainties. Therefore, a systematic approach for dealing with these uncertainties is required, which should be able to cope with expectations that diverge substantially. A method which has proven quite effective for such questions is the so-called Delphi survey.

This method was developed by Olaf Helmer, Nicholas Rescher, Norman Dalkey and other researchers within the so-called Research and Development project (RAND), when they tried to forecast the military potential of future technology (Helmer and Rescher 1959). They found out that "experts, particularly when they agree, are more likely than non-experts to be correct about questions in their field. However, they found that bringing experts together in a conference room introduces factors that may have little to do with the issue at hand. For example, the loudest voice rather than the soundest argument may carry the day; or, a person may be reluctant to abandon a previously stated opinion in front of his peers." (Gordon 1994, p. 1).

To overcome such flaws as these at conferences, workshops or focus groups, the Delphi method was designed to stimulate true debate, independent of personalities. Selected experts who are familiar with the issue in question are provided with a number of theses or questions. After a first round of answers, the experts are then given the results of the first round and prompted to reassess their views in a second round and to change their opinion – or not, as the case may be. None of the experts knows who else is participating; anonymity is hereby secured and no one must fear losing face if he or she changes his or her mind.[15]

These two aspects – anonymity and feedback – represent the basic cornerstones of the Delphi method. The objective of most Delphi applications is the reliable and creative exploration of ideas, or the production of suitable information as a basis for decision-making. The Delphi method represents a useful communication device among a group of experts and thus facilitates the formation of a group judgment. The Delphi method is, therefore, a suitable approach for identifying the long-term prospects of project-based Kyoto mechanisms.

As part of this research project, a Delphi survey on the future perspectives of the project-based mechanisms was undertaken. A first draft of a Delphi questionnaire was developed by the Öko-Institut. This draft was discussed with Kyoto mechanism experts from the German Ministry for the Environment and from Germany's Federal Environmental Agency (UBA) and revised thereafter. It was then sent out to five selected external pre-testers, whose comments were taken onboard before all other experts were invited to answer the questionnaire online. The Delphi survey was conducted in two rounds. In

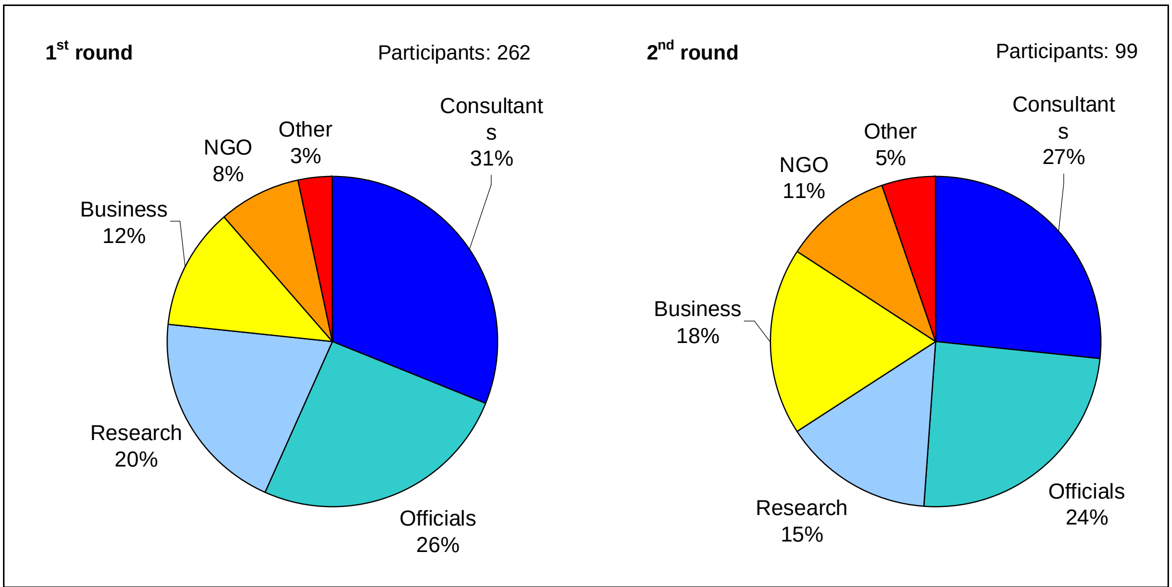
[15] A comprehensive overview of the history, objectives and options of the Delphi method can be found in Linstone, Turoff, Helmer (2002).

both rounds, experts had more than four weeks in which to answer the questionnaire. To improve participation, three reminders were sent out for each round to those experts who had not yet replied to the questionnaire.

4.1 Participants and answers

More than 800 experts worldwide were invited to participate in the first round. More than 250 experts (30 %) participated in the first round, more than 230 of which provided at least one answer. Those experts who participated were provided with the results of the first round and were requested to participate again in the second round. More than two fifths (43 %) of the experts who had participated in the first round also participated in the second round, by reviewing their answers given in the first round.

Figure 21: Background of participants



Source: Öko-Institut

The distribution of experts across different professional backgrounds is in general rather balanced (Figure 21).[16] However, consultants participated in an especially active fashion, while NGOs were somewhat underrepresented, although their fraction improved slightly between the first and the second rounds.

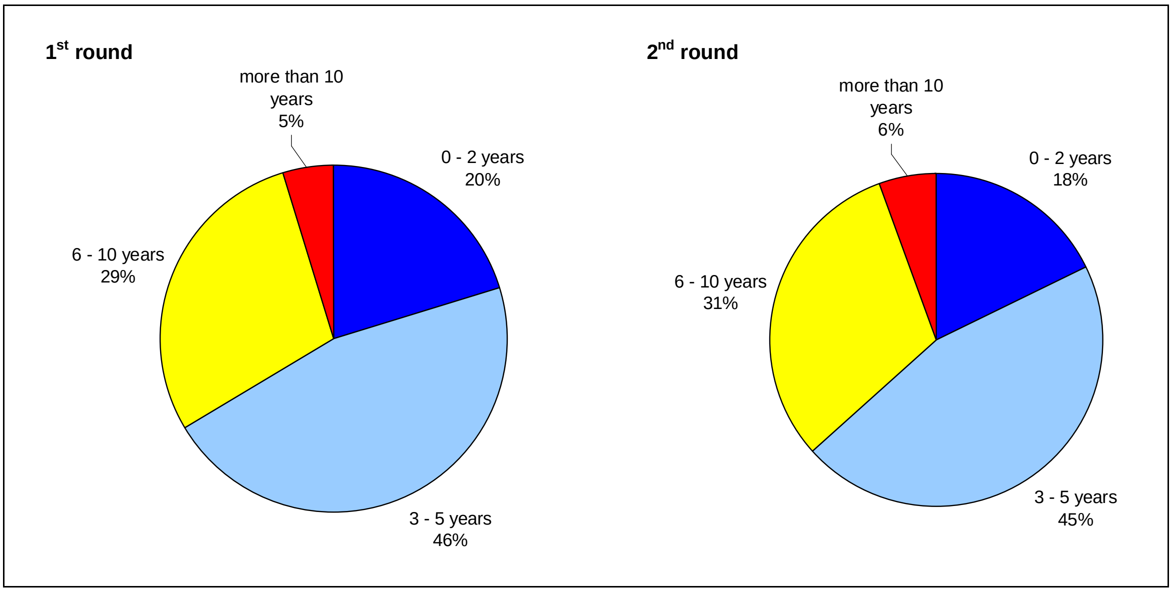
More than one third of the experts who participated had more than five years of experience in the field of project-based Kyoto mechanisms, and another 45 % had at least three years of experience in this field (Figure 22).[17] Only 20 % of the participants are compara-

[16] Question 1a: What is your background in project-based mechanisms?

[17] Question 1b: How many years of experience do you have in the field of project-based mechanisms?

tively new in this area, with less than two years of experience. From the first to the second round, the proportion of more experienced experts increased slightly.

Figure 22: Experience of participants



Source: Öko-Institut

In terms of the domicile of the experts, the Delphi survey is clearly dominated by experts from Europe, although the distribution evens itself out a little in the second round (Figure 23).[18] This is mainly due to the fact that more than half of the experts who were invited to participate come from a European country. The bias is, therefore, not the result of differences in the answering behaviour of experts, but rather the result of an imbalance in our expert database. These imbalances may be caused on the one hand by the fact that we are based in Europe and have, therefore, better access to European experts. On the other hand, it may be caused by the fact that European countries are more active in the field of flexible Kyoto mechanisms, which might originate in turn from a stronger demand for flexible Kyoto mechanisms pursuant to the launch of the European emissions trading scheme in early 2005. Even though this might explain the predominance of European experts, it remains a flaw of the Delphi survey, since only about one fifth of the experts originate from developing countries, where a major share of the mitigation projects are to be implemented in the future.

[18] Question 1c: Your citizenship:

Figure 23: Origin of participants

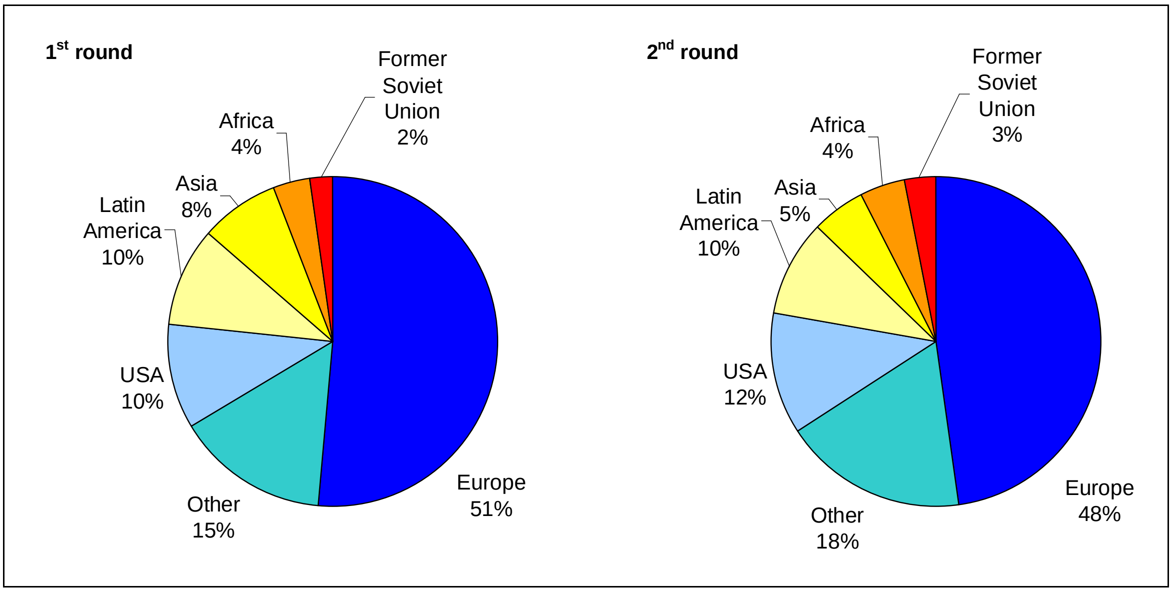


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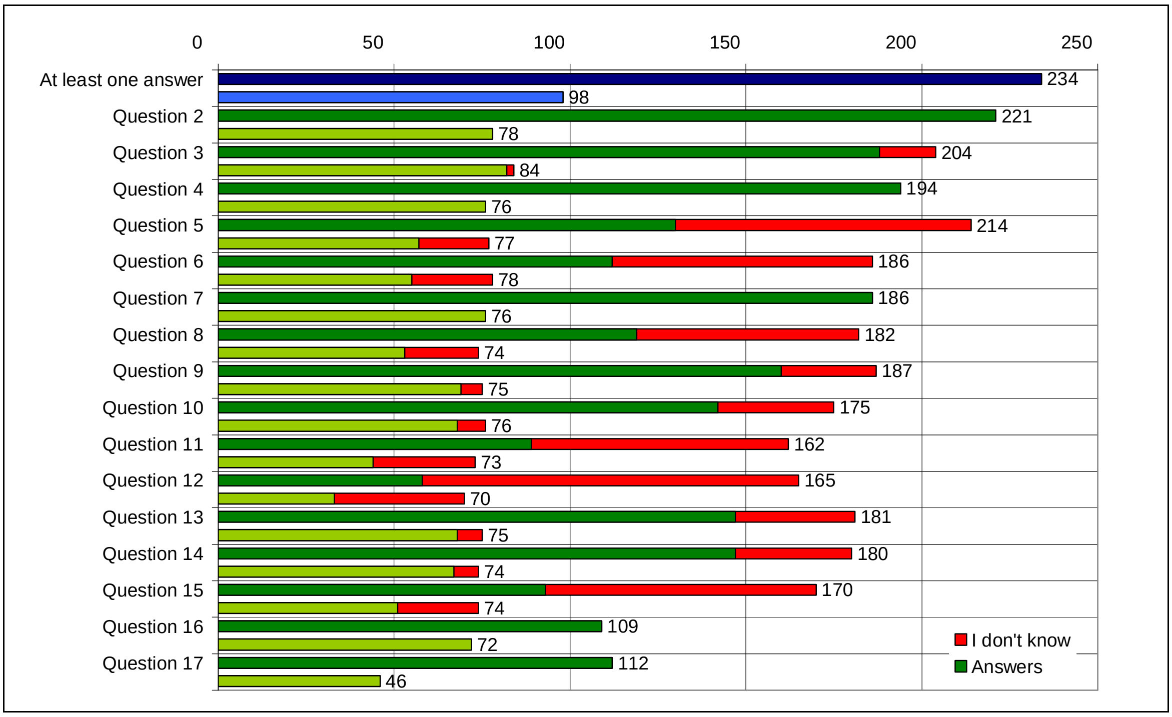
Figure 24: Number of responses by question



Source: Öko-Institut

Aside from the opening questions which addressed the background, experience and origin of the experts themselves, the questionnaire comprised 16 thematic questions, most of which had several sub-questions. The grand majority of questions were to be answered by a mouse-click. In addition, experts could freely provide textual comments under each question and general comments at the end of the questionnaire (Question 18).

In the first round, the number of answers given to the last questions was substantially lower than those for the first questions (Figure 24). This is not surprising, since the questions at the close of the questionnaire requested quantitative information, such as global market size or distribution of project categories across countries and regions, while the first questions had a more qualitative character. This discrepancy is not observable in the second round: each question except for the last one was answered by 70 to 80 experts.

In general, the second Delphi round corroborated the results of the first Delphi round in the case of most questions, and contributed to the consolidation of the results. Correspondingly, the results of the second round are often clearer and more distinct. In addition, the share of experts who answered "I don't know" decreased on average from almost one third in the first round (31%) to slightly more than one fifth in the second (22%). All in all, it can be concluded that the second round corroborated the results of the first round and that it improved the reliability of the results.

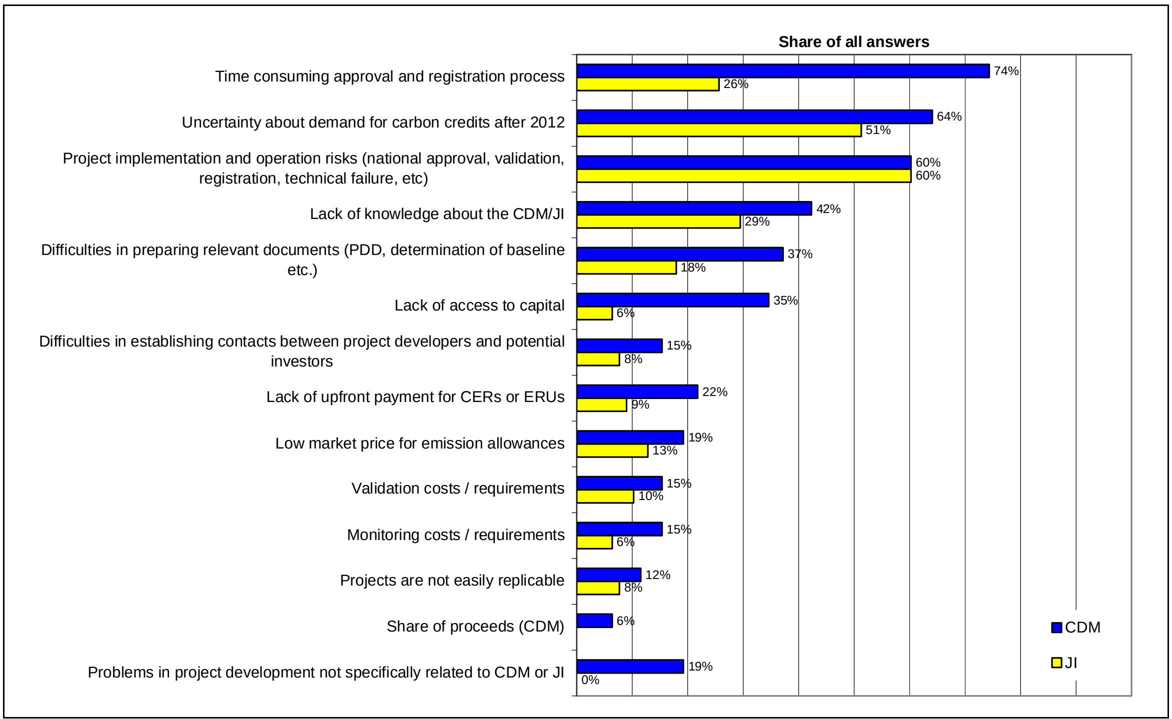
4.2 Results

4.2.1 Barriers to the implementation of CDM and JI projects

More than 60% of the experts identified the time-consuming approval and registration process, the uncertainty about demand for carbon credits after 2012 and the risks due uncertainties of national approval, validation, registration, technical failure, etc. as the most important barriers to the implementation of CDM projects (Figure 25).[19] The lack of knowledge about the CDM and the lack of access to capital are of less importance, although remain relevant. By contrast, the share of proceeds, which has been discussed as discriminating against the CDM and favouring JI, and the costs for monitoring and validation are not considered barriers to the implementation of CDM projects.

[19] Question 2: What are the most important barriers to the implementation of CDM and JI projects? (multiple choices possible).

Figure 25: Most important barriers to the implementation of CDM and JI projects



Source: Öko-Institut

The picture is relatively similar for JI: risks due to uncertainties of national approval, validation, registration, technical failure, etc. and the uncertainty about demand for carbon credits after 2012 are considered to be the most important barriers, whereas monitoring and validation costs are not considered to be barriers. Access to capital seems to be an even smaller problem for JI projects than for CDM projects.

These results are not systematically different to the results of the first Delphi round. However, in the first round, the results were less distinct. The most important barriers according to the results of the first round were selected in the second round by an even greater proportion of experts, whereas the potential barriers that were considered of less importance in the first round were selected by an even smaller proportion of experts in the second round. In other words, the results of the first round were endorsed and confirmed in the second round.

In general, the evaluation conducted by the different expert groups does not deviate substantially from the overall average. However, some smaller deviations should be highlighted. For the CDM, both business and NGO experts assess the risks arising from uncertainties of national approval, validation, registration, technical failure, etc. as more important than uncertainty about the demand for carbon credits after 2012 (Table 51, p. 206). Two thirds of the NGO experts also consider the lack of access to capital and problems in project development not specifically related to CDM as rather important barriers. In addition, a greater degree of experts from developing countries considers the lack of access to capital, difficulties in establishing contacts between project developers and potential investors and the costs for validation to constitute a substantial barrier to the implementation of CDM projects.

With regard to JI, the ranking of barriers by the different expert groups is almost identical to the overall average – at least for the three most important barriers (Table 51, p. 206). However, a greater proportion of business and NGO experts once again considers the risks due to uncertainties of national approval, validation, registration, technical failure, etc. to constitute an important barrier.

Uncertainty about demand for carbon credits after 2012 can only be addressed by an agreement on a future climate regime, or at least by a clear policy decision on the use of project-based mechanisms within emission trading schemes established by countries, such as the European Emissions Trading Scheme. Such a future international climate regime is, of course, urgently needed for the development and use of the potential of the flexible Kyoto mechanisms. However, negotiations on future commitment periods under the Kyoto Protocol will only start in 2006 and the process of reaching agreements will undoubtedly be time-consuming. Whereas this barrier can only be addressed in a cooperative fashion, the other barriers can be tackled by individual actors. The Executive Board of the CDM may streamline the time-consuming approval and registration process. Individual governments might reduce project implementation and operation risk through improved and streamlined national approval and registration processes and through capacity building.

4.2.2 Measures to overcome barriers

In this question[20] we provided several measures which could potentially help to overcome the barriers to the project-based mechanisms. Those who participated in the Delphi survey were requested to assess the importance of the measures. They identified the most important measures as: clarifying perspectives of CDM and JI after 2012, strengthening the CDM Methodological Panel, simplifying the CDM procedures, strengthening the CDM Executive Board and clarifying the CDM procedures (Figure 26). Surprisingly, the removal of the principle of "share of proceeds" – discussed as a tax that disadvantages CDM in comparison to JI – was regarded as the least important measure for overcoming the barriers to the project-based mechanisms. Other measures considered to be of minor importance are public procurement tenders, investor forums (such as the Carbon Expo), cooperation with chambers of commerce and national investment authorities and information campaigns about the CDM and JI, generally among companies in investor and host countries.

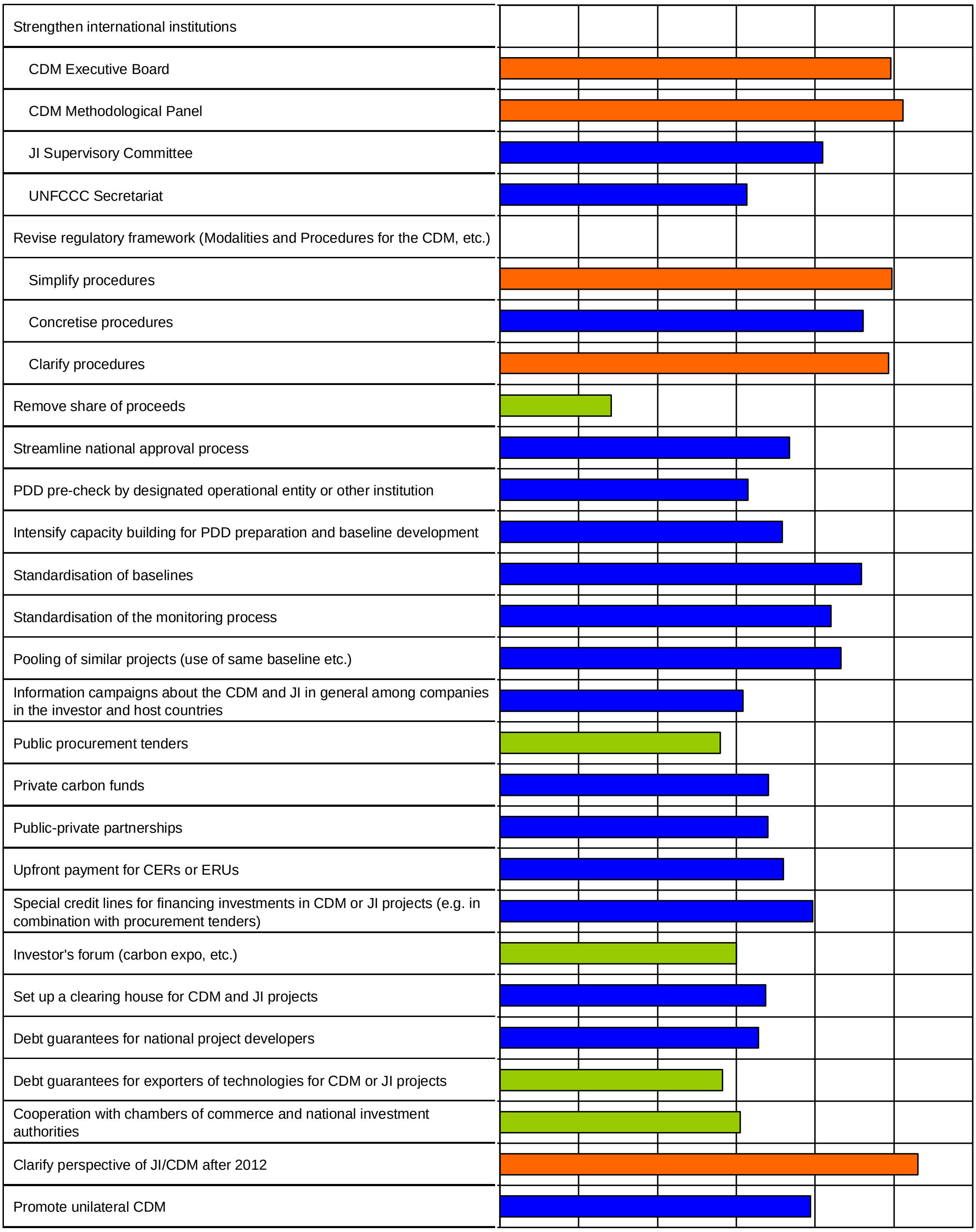
Evaluation of individual measures provided in the survey did not change substantially between the first and second Delphi round. However, the most important measure of the second round – clarification of the perspectives of JI and CDM after 2012 – was not provided in the first round. It was introduced in the second round since several experts had mentioned it in their comments to this question in the first round.

[20] Question 3: Which measures do you consider most important to overcome the barriers to the project-based mechanism? (Very important, Important, Less important, Not important).

Appraisals delivered by the different groups of experts on the importance of these measures do not deviate substantially from the overall average (Table 52, p. 207). Nevertheless, the appraisals made by US experts generally accord measures a somewhat lesser importance than they are accorded on average, whereas appraisals made by consultants and experts from developing countries grant measures a greater importance than the average. According to the experts from developing countries, more efforts should be made regarding information campaigns on the CDM and JI in general among companies in the investor and host countries. Consultants regard public procurement tenders, unsurprisingly, as significantly more important than all other expert groups do.

All in all, it can be concluded that the most important measures for improving conditions for project-based mechanisms are: a clearer picture of the time period after 2012 and a strengthening of the relevant international institutions, namely the CDM Executive Board and the CDM Methodological Panel. A removal of the share of proceeds, additional public procurement tenders and the organisation of additional investor forums will, by contrast, not contribute significantly to improving conditions for the project-based mechanisms.

Figure 26: Importance of measures to overcome barriers to the project-based mechanisms

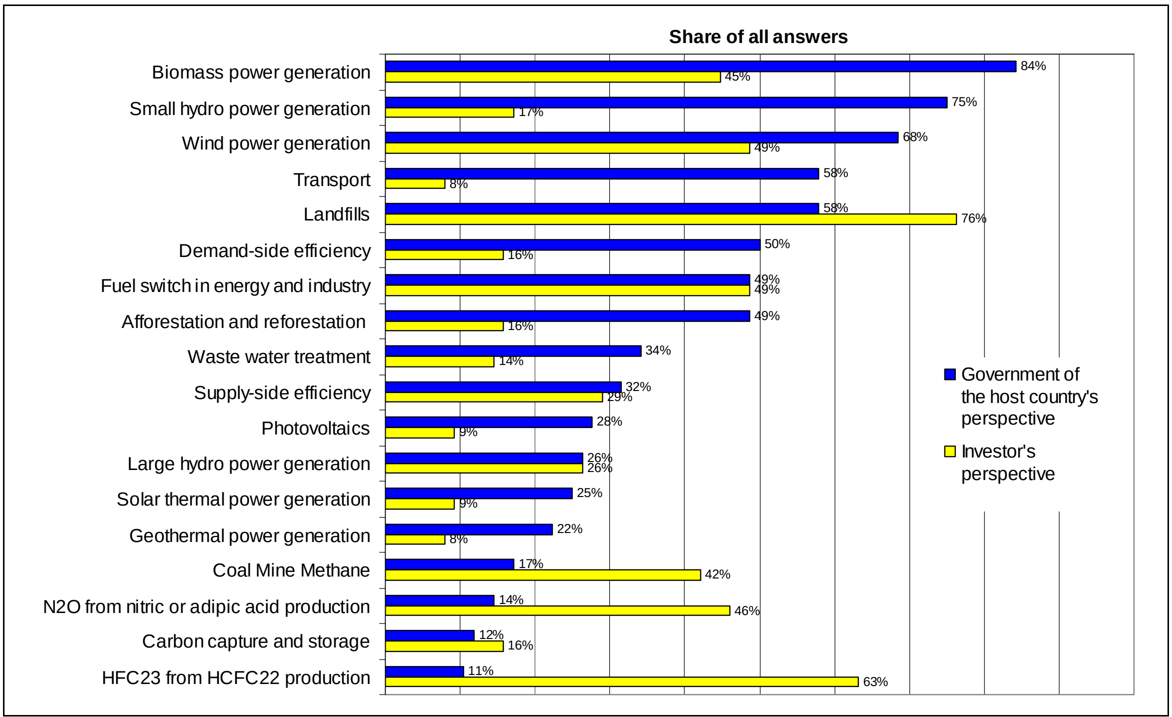


Source: Öko-Institut

4.2.3 Attractiveness of project types

The attractiveness of different project types has been intensively discussed in the past. For example, it was argued that afforestation and reforestation projects will be quite attractive due to their low GHG abatement costs. However, the abatement costs are only one factor out of many which influence the attractiveness of a project type. In particular, attractiveness is also a question of perspective: investors prefer different project types to host country governments.[21]

Figure 27: Attractiveness of project types



Source: Öko-Institut

According to the experts, host country governments view small-scale renewable projects (biomass, small hydro and wind power generation) as particularly attractive, whereas investors prefer project types with larger project sizes (HFC-23 from HCFC-22 production, N_2O from nitric or adipic acid production and coal mine methane) and lower GHG abatement costs (Figure 27). However, for some of the project types, attractiveness is considered to be independent of the difference in perspective: methane avoidance from landfills and fuel switch projects are seen as relatively attractive for both host country governments and investors, whereas carbon capture and storage (CCS), large hydro power generation and supply-side efficiency are deemed to not be attractive from both perspectives.

[21] Question 4: Which CDM or JI project types are particularly attractive from a) the investor's perspective and b) the government of the host country's perspective? (multiple choices possible).

Compared to the first round, the results are more distinct and clear in the second, i.e. the most attractive project types were selected by a greater proportion of experts, whereas a smaller number of experts selected the least attractive project types. This is true of both the host country government's and the investor's perspectives. Moreover, the attractiveness ranking does not change substantially between the first and the second round. The four most and least attractive project types are almost identical in both rounds.

In general, the same holds for the assessment of individual expert categories (Table 53, p. 214). The attractiveness ranking does not deviate significantly between the expert categories, although the numbers of experts who view a specific project type as attractive do deviate substantially. Nevertheless, US experts see photovoltaics and CCS projects as substantially more attractive, and HFC-23 from HCFC-22 production to be less attractive from the investor's perspective than is average. Experts from research institutes estimate the attractiveness of afforestation and reforestation projects to be much lower, but NGO experts view the attractiveness of waste water treatment as much greater than all the experts do on average.

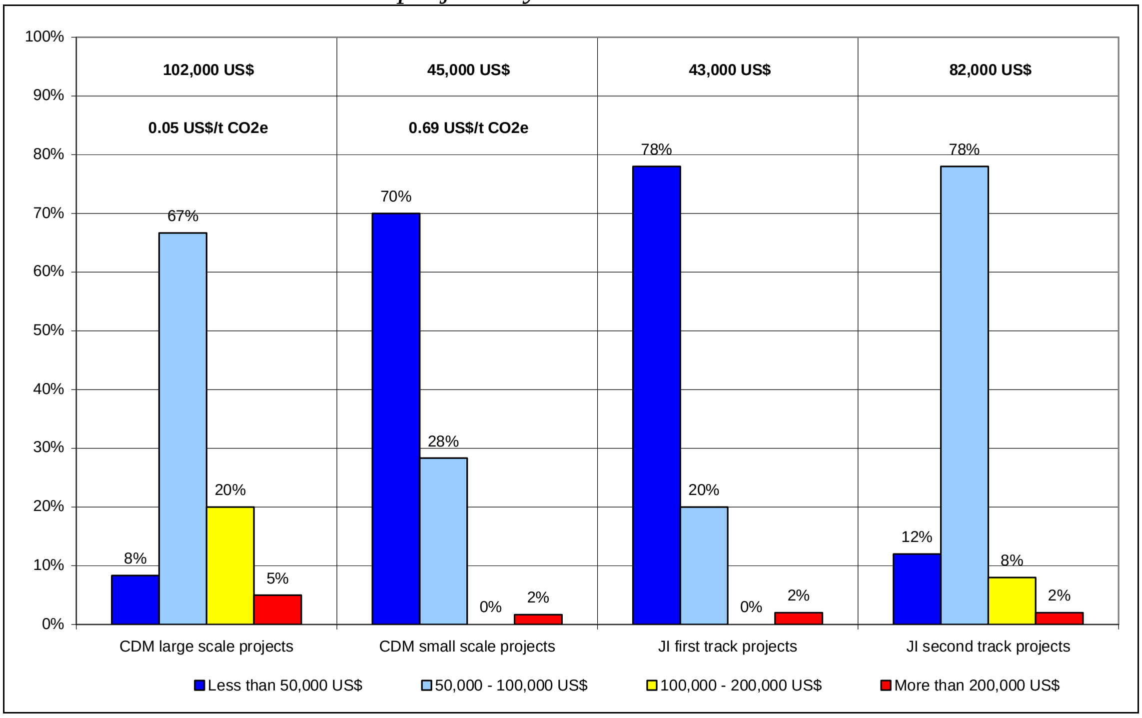
4.2.4 Transaction costs

For large-scale CDM and JI second track projects, most experts expect transaction costs for project development to amount to between US$ 50,000 and US$ 100,000. For small-scale CDM and JI first-track projects, most experts estimate transaction costs to be less than US$ 50,000 (Figure 28).[22]

The second Delphi round corroborated the results of the first Delphi round. However, a greater share of experts generally estimated the transaction costs to be one category higher in the first round. In the second round, some experts revised their views and generally estimated the transaction costs to be one category lower. Correspondingly, the second round resulted in slightly lower transaction costs and a more distinct picture, which helps in turn the consolidation of expectations of transaction costs for the development of CDM and JI projects.

[22] Question 5: What do you expect will be the typical transaction costs for the development of CDM and JI projects by 2010? (Less than 50,000, 50,000-100,000, 100,000-200,000, More than 200,000 US$ per project)
Note: Transaction costs include, for example, costs for PDD development and baseline determination, approval from the relevant designated national authorities (DNAs), validation by a designated operational entity (DOE), registration at the CDM Executive Board and negotiation of emission reductions purchase agreements (ERPAs). Costs for monitoring and verification are addressed in the following questions and should not be taken into account here. Moreover, transaction costs not directly related to the CDM or JI (such as technical design and planning, financing, etc.) should not be considered.

Figure 28: Expectations on the typical transaction costs for the development of CDM and JI projects by 2010



Source: Öko-Institut

This pattern can also be observed for individual expert groups: in most groups the great majority of the experts expect transaction costs to be between US$ 50,000 and US$ 100,000 for CDM large-scale and JI second-track projects, and transaction costs lower than US$ 50,000 for CDM small-scale and JI first-track projects (Table 54, p. 215). Only business and US experts tend to estimate higher transaction costs, ranging between US$ 50,000 and US$ 100,000 for small-scale projects. The picture for NGO experts is also somewhat different. This can be explained, however, by the rather small number of respondents, a large proportion of which answered "I don't know" to this question.

Assuming specific average values for each cost category allows for the approximate average transaction costs for the different project categories to be estimated. We assume transaction costs to amount to US$ 25,000 on average for the category below US$ 50,000, US$ 75,000 for the category spanning US$ 50,000 to 100,000, US$ 150,000 for the category US$ 100,000 - 200,000, and US$ 400,000 for the category above US$ 200,000. This results in average transaction costs of about US$ 102,000 for a large-scale CDM project, around US$ 45,000 for a small-scale CDM project, approximately US$ 43,000 for a first-track JI project, and about US$ 82,000 for a JI second-track project.[23]

[23] In the first round, these estimates resulted in substantially higher values: US$ 153,000 and US$ 109,000 for large-scale CDM and second-track JI projects and US$ 61,000 and US$ 69,000 for small-scale CDM and first-track JI projects.

Taking into account average project sizes, it is possible to get an approximate magnitude of the specific transaction costs per carbon credit generated. For the CDM, the CDM pipeline overview as of 14th November 2005[24] provided by the UNEP RISØ Centre lists 456 CDM projects, 351 of which are large-scale and 105 small-scale projects. Assuming a project duration of 7 or 10 years, the large-scale projects will generate 1.9 million carbon credits on average per project during the crediting period. The small-scale projects generate 66,000 carbon credits on average per project during the crediting period.

As a result, the level of specific transaction costs is approximately US$ 0.05 per carbon credit generated for large-scale CDM projects and about US$ 0.70 per carbon credit for small-scale CDM projects. Taking into account the share of small and large scale projects the overall specific transaction costs for the CDM project development would be in the range of between US$ 0.07 and US$ 0.20 per carbon credit, depending on whether the number of projects or the average project size is used to weight the specific averages of small- and large-scale projects. However, it should be noted that these values only provide cost ranges of a rather indicative nature and may differ significantly among projects and project types.

Due to a lack of corresponding data, this estimation cannot be carried out for transaction costs of JI projects. However, transaction costs of JI projects should be slightly smaller than those of CDM projects, since the administrative requirements (validation, registration, etc.) are expected to be simpler.

In summary, average transaction costs for the development of small-scale CDM and first-track JI projects are estimated to be in the range of US$ 40,000 to US$ 45,000 per project. They are estimated to be roughly double as high for large-scale CDM and second-track JI projects. However, in relation to carbon credits generated, the transaction costs of small-scale CDM and first-track JI projects are estimated to be considerably higher than those of large scale CDM and second track JI projects.

4.2.5 Costs of monitoring and verification

Apart from the validation and registration of CDM and JI projects, the monitoring, reporting and verification (MRV) of emission reductions that have been attained is a major source of transaction cost. Costs for monitoring and verification do, of course, deviate between project types, depending on the complexity of the baseline and monitoring requirements and the project as a whole.[25]

On average, experts estimate that CCS projects will face the highest annual costs for MRV (25,700 US$/a[26]) and renewable projects the lowest (9,000 US$/a) (Figure 29).

[24] http://www.cd4cdm.org/Publications/CDMpipeline.xls.

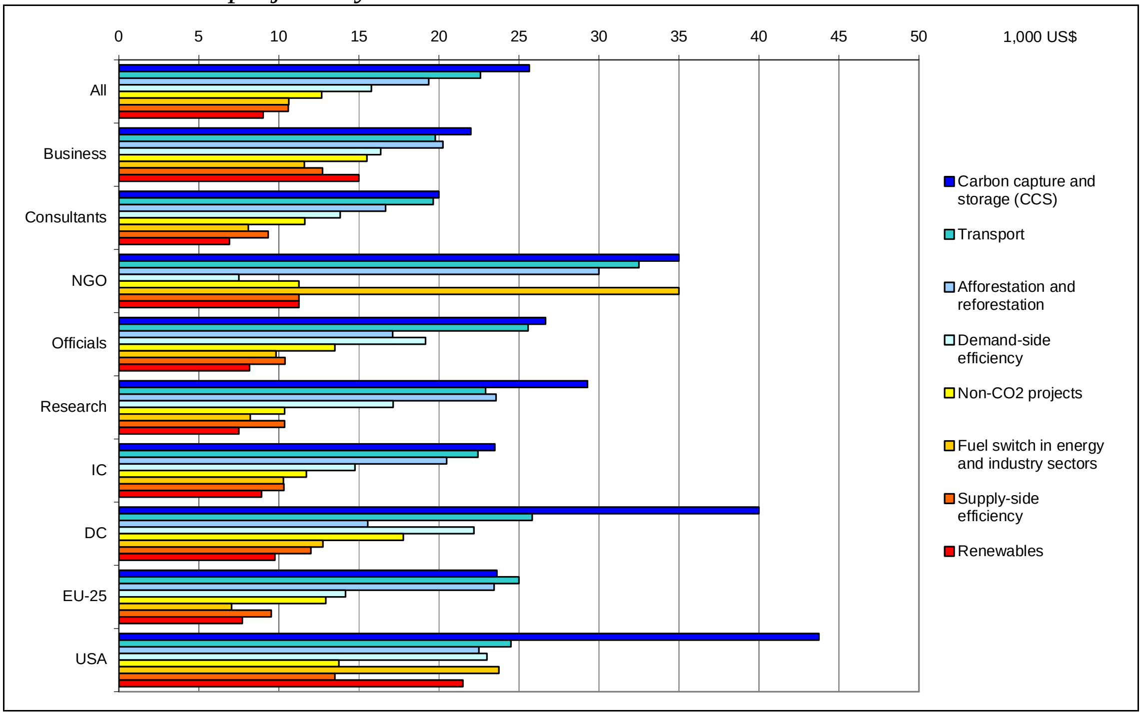
[25] Question 6: What do you expect will be the typical annual costs for the monitoring and verification of CDM or JI projects by 2010? (Less than 5,000, 5,000-10,000, 10,000-20,000, 20,000-50,000, More than 50,000 US$ per project and year).

[26] For this calculation of average MRV costs, the values of 2,500, 7,500, 15,000, 35,000 and 75,000 US$/a were assumed for the five answer categories.

Transport and afforestation and reforestation projects are also regarded as expensive in the context of MRV costs, while supply-side efficiency and fuel switch in industry are only slightly more expensive than renewable projects.

From the first to the second round, the number of experts who selected "I don't know" as their answer decreased substantially from 40% to less than 30%. Simultaneously, the average MRV costs for all project categories decreased by some 20% from 19,200 US$/a to 15,800 US$/a.

Figure 29: Typical annual costs for the monitoring and verification of CDM or JI projects by 2010



Source: Öko-Institut

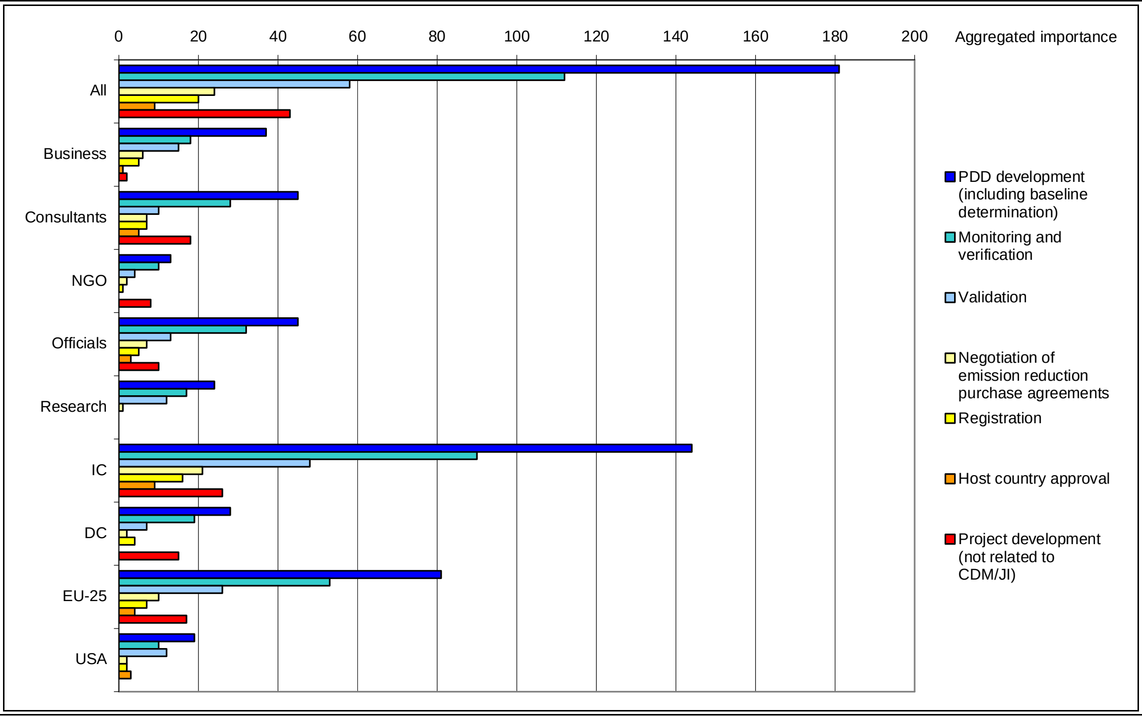
The ranking of the MRV costs is quite similar for all categories of experts although EU experts expect slightly higher MRV costs for transport than for CCS projects (Figure 29 and Table 55, p. 216). By contrast, US experts expect MRV costs to be lower for supply-side efficiency and non-CO_2 projects than for renewable projects. US, NGO[27] and developing country experts estimate annual MRV costs to be, on average, substantially higher; consultants estimate them, on the other hand, to be markedly lower than all the experts do.

[27] Only 6 NGO experts responded to this question and the majority of those who participated answered "I don't know". This increases the weight of the remaining respondents and explains the NGOs outlier for "fuel switch in energy and industry sectors". The results for NGO experts should, therefore, be interpreted with caution.

4.2.6 Drivers for transaction costs

Several aspects contribute to the total transaction costs of a project: PDD development, host country approval, registration, to name just some of the influencing factors.[28] According to assessment by experts, PDD development is by far the most important driver for transaction costs (Figure 30).

Figure 30: Most important drivers for transaction costs by 2010



Source: Öko-Institut

Host country approval and registration of projects are regarded, on the other hand, as the least important contributors to transaction costs. Obviously, it is in the interests of host countries that projects are approved and established; they tend, therefore, to keep the necessary procedures simple.

The ranking did not change between the first and the second Delphi round. The only notable difference is the "project development not related to CDM or JI" cost driver, which was only introduced in the second round after it had been flagged by several experts in the first round. According to the rankings given in the second round, the problems related to project development, which are not related to CDM or JI, were considered to be more important to the total transaction costs than host country approval, registration and negotiation of emission reduction purchase agreements (ERPA). On the other hand, it was not regarded as important as PDD development, MRV or the validation of projects.

[28] Question 7: What will be the three most important drivers for transaction costs by 2010?

In general, the ranking of drivers is quite similar to the overall average for all expert categories, even though US, business and research experts regard problems of project development which are not related to CDM or JI as less important to transaction costs than all experts do on average (Figure 30 and Table 56, p. 218).

4.2.7 Necessary project size

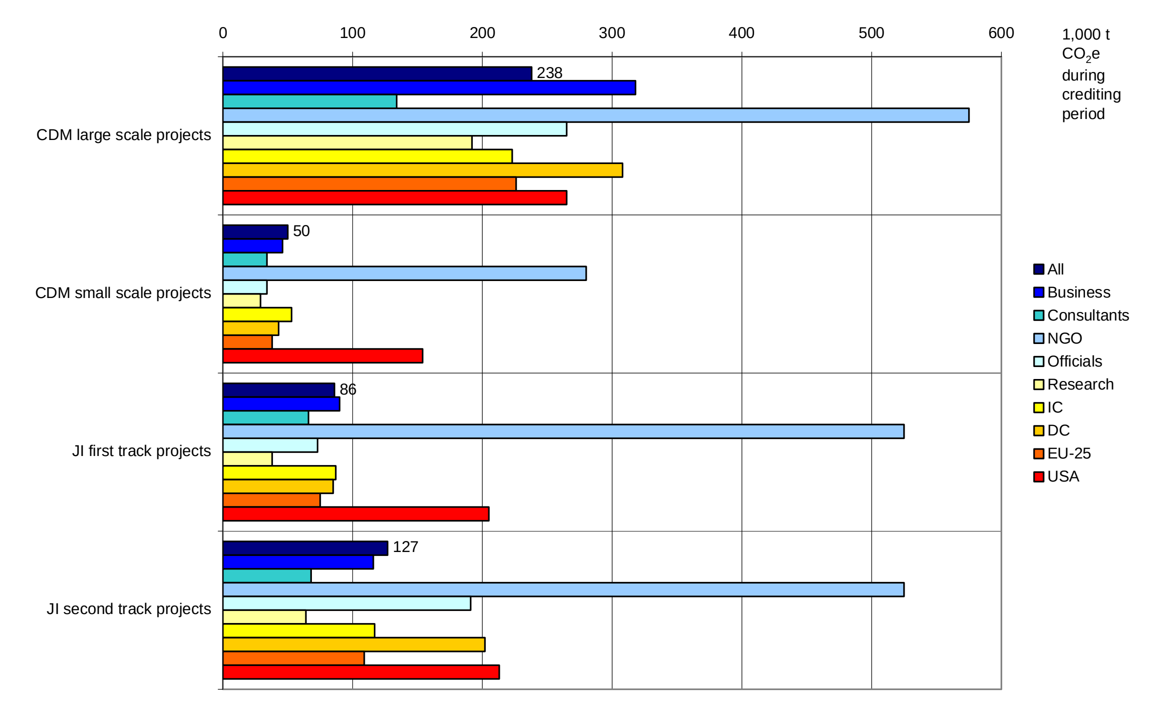
Due to a number of fixed transaction costs, such as validation, host country approval or registration, CDM or JI projects need to have a minimum project size to be economically feasible. This minimum size will be different for small or large scale CDM and for first- and second-track JI projects.[29]

Most experts deem the minimum project size of small-scale projects to be between 20,000 and 50,000 t CO_2e; for all other project categories, the size is seen to range between 50,000 and 100,000 t CO_2e. Determining an average value from the answers to the estimates, the following tenet emerges: a large-scale CDM project should have a size of about 238,000 t CO_2e[30] during the entire crediting period in order to be feasible (Figure 31). For second- and first-track JI projects and small-scale CDM projects, minimum project sizes of 127,000 t CO_2e, 86,000 t CO_2e and 50,000 t CO_2e can be calculated respectively. These figures illustrate that large-scale CDM projects need to be about five times larger than small-scale CDM projects, while second track JI projects need to be only about 50 % larger than first-track JI projects.

[29] Question 8: What project size is necessary to make a CDM or JI project feasible (taking into account transaction costs)? (Less than 10,000, 10,000-20,000, 20,000-50,000, 50,000-100,000, 100,000-250,000, 250,000-500,000, more than 500,000 t CO_2e emission reduction during the crediting period).

[30] For this calculation of the minimum project size, we assume 5,000, 15,000, 35,000, 75,000, 175,000, 375,000 and 875,000 t CO_2e during the crediting period as average values of the seven answer categories.

Figure 31: Necessary project size to make a CDM or JI project feasible



Source: Öko-Institut

Compared to the first Delphi round, the share of experts who answered "I don't know" was reduced from 35% to less than 30%. The answers in the second round deemed transaction costs significantly lower than in the first round: the average minimum project size sank from 206,000 t CO_2e to 125,000 t CO_2e (-39%).

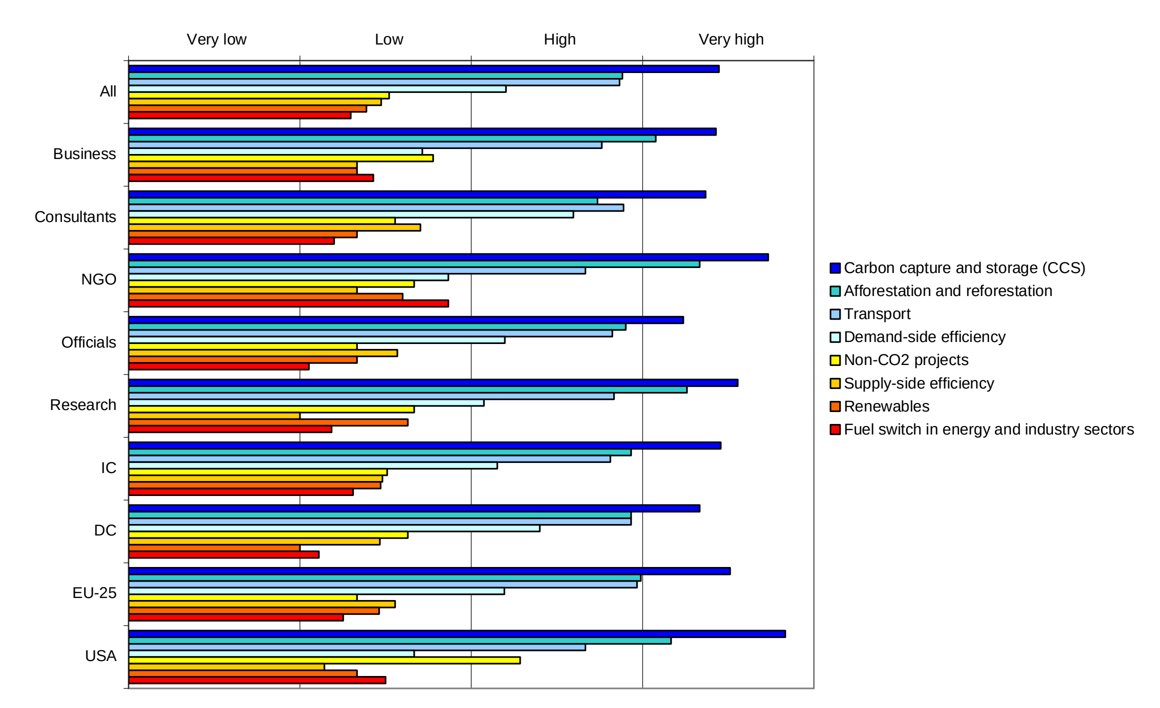
Differences in the order of the necessary project size are again relatively small between the expert categories (Figure 31 and Table 57, p. 220). Nevertheless, NGO and US experts estimate the necessary project size to be much greater than the average, and experts from research institutes and consultants regard the necessary project size to be, on average, somewhat lower than all experts do.

4.2.8 Overall risks of project types

The feasibility of projects depends, moreover, on the overall risk related to the project. The overall project implementation risk depends in turn on various factors, such as the risks of host country approval, the technology applied or the project category.[31]

[31] Question 9: What is the overall risk associated with the generation of CERs or ERUs? (Very low, Low, High, Very high)
Note: Consider all the relevant risks, including, for example, the risk of non-approval, non-validation or non-registration of the project (by the host country, the validator or the CDM Executive Board/JI Supervisory Committee) or the risk of non-delivery during project implementation and operation (e.g. due to technical failure, lower performance, non-permanence in the case of forestry projects, etc).

Figure 32: Overall risk associated with the generation of CERs or ERUs



Source: Öko-Institut

Experts considered CCS, afforestation and reforestation and transport projects to be, on average, very risky or risky, while the risks of fuel switch in energy and industry sectors, renewable and supply-side efficiency projects were seen as low (Figure 32).[32]

As with other questions, the second Delphi round resulted in a consolidation of the results, since the proportion of experts answering "I don't know" sank from 14% to just 7% and the difference between the most and the least risky project type widened.

A comparatively homogeneous picture also emerges from the assessment of the implementation risks of the different project types among the different categories of experts (Figure 31 and Table 58, p. 221). The ranking of project types is almost identical in all expert categories and the values do not differ substantially. In summary, the perception of implementation risks of different project types is evidently a matter of common sense and does not depend on the background or origin of the experts.

4.2.9 Characteristics of project types

Several characteristics of project types determine their attractiveness and feasibility as CDM and JI projects. On the one hand, formal requirements (such as validation and registration) lead to fix costs (transaction costs). In this respect, larger projects tend to reap

32 In our calculation of the overall risk, we assumed values from 0 to 3 for the "very low" to "very high" answer categories.

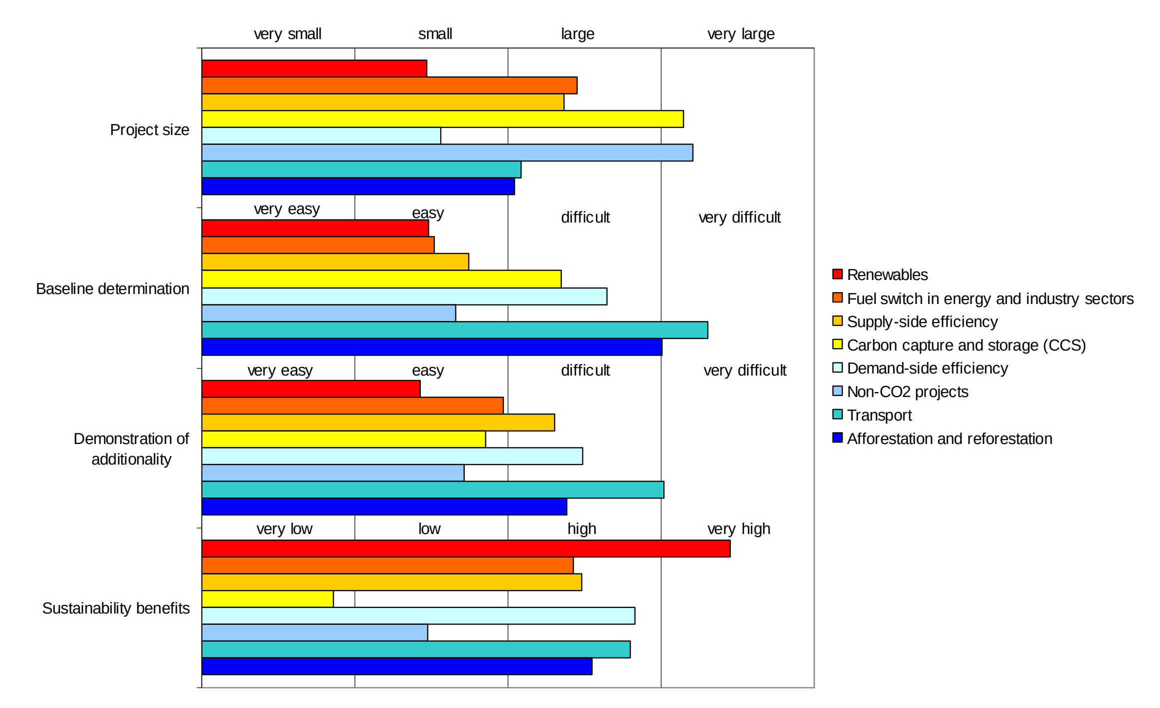
advantages over small projects, since these costs can be distributed over a higher amount of carbon credits generated.

For each project, documentation (such as the Project Design Document or monitoring reports) has to be drafted, including the calculation of emission reductions. The more complex the determination of the baseline and the demonstration of additionality, the more uncertain the recognition of the project is as a CDM or JI project, and the higher the transaction costs are for the preparation of documents as well as for validation and verification. Moreover, whether or not the baseline of a project can be determined easily and conservatively and whether the demonstration of additionality is straightforward, may also influence the attractiveness of projects for buyers of carbon credits. Finally, the attractiveness of CDM and JI projects for the host country as well as for buyers of carbon credits is also dependent on their contribution to sustainable development. For the CDM, for instance, the host country has to issue a letter of approval stating, amongst other things, that the project contributes to the sustainable development of the country. Some buyers of carbon credits (official/governmental as well as private) also have sustainability criteria which projects have to meet.[33]

Figure 33 shows how participants in the Delphi survey classify CDM and JI project types according to the above-mentioned criteria.

[33] Question 10: Please classify the project types according to their characteristics.
(Project size: Very small, Small, Large, Very large
Baseline determination: Very easy, Easy, Difficult, Very difficult
Demonstration of additionality: Very easy, Easy, Difficult, Very difficult
Sustainability benefits: Very high, High, Low, Very low)

Figure 33: Characteristics of project types



Source: Öko-Institut

With regard to project size, participants consider non-CO_2 projects as well as carbon capture and storage projects to have the largest size among all project types (Figure 33). Renewable and demand-side efficiency projects rank as the smallest. Fuel switch in energy and industry sectors, supply-side efficiency, transport as well as afforestation and reforestation projects lie between these extremes, but are still considered large projects. Apart from the fact that NGOs, in contrast to other participants, regard afforestation and reforestation projects as large or very large, there are no substantial differences between the results regarding the participants' profession or nationality as well as between the first and the second round of the Delphi survey (Table 59, p. 223).

As far as the determination of the baseline is concerned, half of the projects are considered to be difficult or very difficult (Figure 33). Transport projects as well as afforestation and reforestation projects are seen as the most difficult, whereas renewable and fuel switch projects are believed to be the easiest ones. There are no substantial differences between answers in the first and second round or between groups of participants (Table 60, p. 225).

In the case of the demonstration of additionality, half of all project categories are once again regarded as difficult or very difficult (Figure 33). Transport as well as demand-side efficiency projects are seen to be the most difficult, whereas renewable as well as non-CO_2 projects rank as the least difficult. One difference between groups of participants can be highlighted: among NGOs, afforestation and reforestation projects are considered the most difficult (Table 61, p. 227). For all other groups as well as between round one and two of the Delphi survey the results show no substantial differences.

With respect to sustainability benefits of different project categories, most categories are considered to have high or very high sustainability benefits. Only CCS projects and non-CO_2 projects rank low; their contribution to achieving sustainability is seen to be very small and small, respectively (Figure 33). The highest sustainability benefits are assigned to renewable, demand-side efficiency and transport projects. Two major differences between answers of groups of participants can be highlighted: NGOs assign afforestation and reforestation as well as non-CO_2 projects substantially lower sustainability benefits than respondents of other groups (Table 62, p. 229). It has to be noted, however, that the number of NGO respondents is rather small. There are no significant differences between the results of the first and the second round.

4.2.10 Mitigation costs

Expected mitigation costs in 2010 vary considerably between project categories, ranging from close to zero to almost 50 US$/t CO_{2e} (Figure 34 and Table 63, p. 231).[34]

All projects mitigating greenhouse gases other than CO_2 (HFC-23 from HCFC-22 production, N_2O from nitric or adipic acid production, landfills, coal mine methane, waste water treatment) are estimated on average as having mitigation costs lower than 10 US$/t CO_2e.[35] The lowest mitigation costs (0 to 5 US$/t CO_2e) arise for projects destroying HFC-23, N_2O or CH_4 (landfills). For other non-CO_2 projects (coal mine methane, waste water treatment), mitigation costs amount to between 5 and 10 US$/t CO_2e on average.

Mitigation costs for fuel switch and supply-side efficiency projects are typically estimated to be between 5 and 10 US$/t CO_2e.

The most inexpensive option for utilising renewable energy is deemed to be large hydro projects (5 to 10 US$/t CO_2e). Biomass and small hydro power generation projects are expected to have average mitigation costs of between 10 and 15 US$/t CO_2e. Other renewable power projects (wind, geothermal, solar thermal power) average between 15 and 20 US$/t CO_2e. The most costly renewable energy project type (> 40 US$/t CO_2e) are expected to be photovoltaics.

All other project types are expected on average to have mitigation costs of between 10 and 15 US$/t CO_2e (afforestation and reforestation, demand-size efficiency) or between 15 and 20 US$/t CO_2e (transport). Only CCS projects are considered nearly as costly as photovoltaics (> 40 US$/t CO_2e).

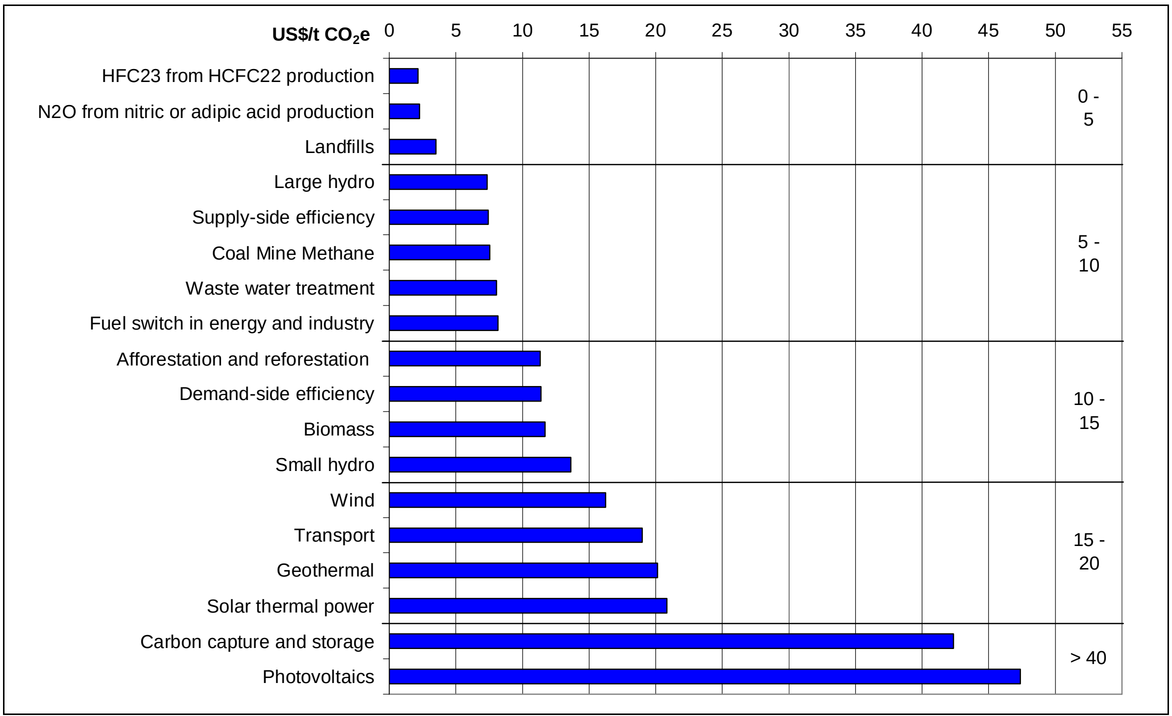
Results in the first and the second round do reveal differences in this context. On the one hand, the answers of participants were clearer and more distinct in the second round,

[34] Question 11: What will be the typical mitigation costs in 2010? (Less than 0, 0-5, 5-10, 10-25, 25-50, Higher than 50 US$/t CO_2e)
Note: Transaction costs (related to project development as well as monitoring) should not be taken into account.

[35] For the calculation of the average mitigation costs we assume -2.5, 2.5, 7.5, 17.5, 37.5 and 75.0 US$/t CO_2e as average values of the six answer categories.

whereas they were more evenly distributed in the first round. On the other hand, mitigation costs estimates decreased between the first and the second round in most cases, sometimes substantially (e.g. landfill gas projects: 8.0 US$/t CO_2e (1st round) to 3.5 US$/t CO_2e (2nd round)).

Figure 34: Expected mitigation costs by project type in 2010



Source: Öko-Institut

4.2.11 Relative market price of lCERs and tCERs

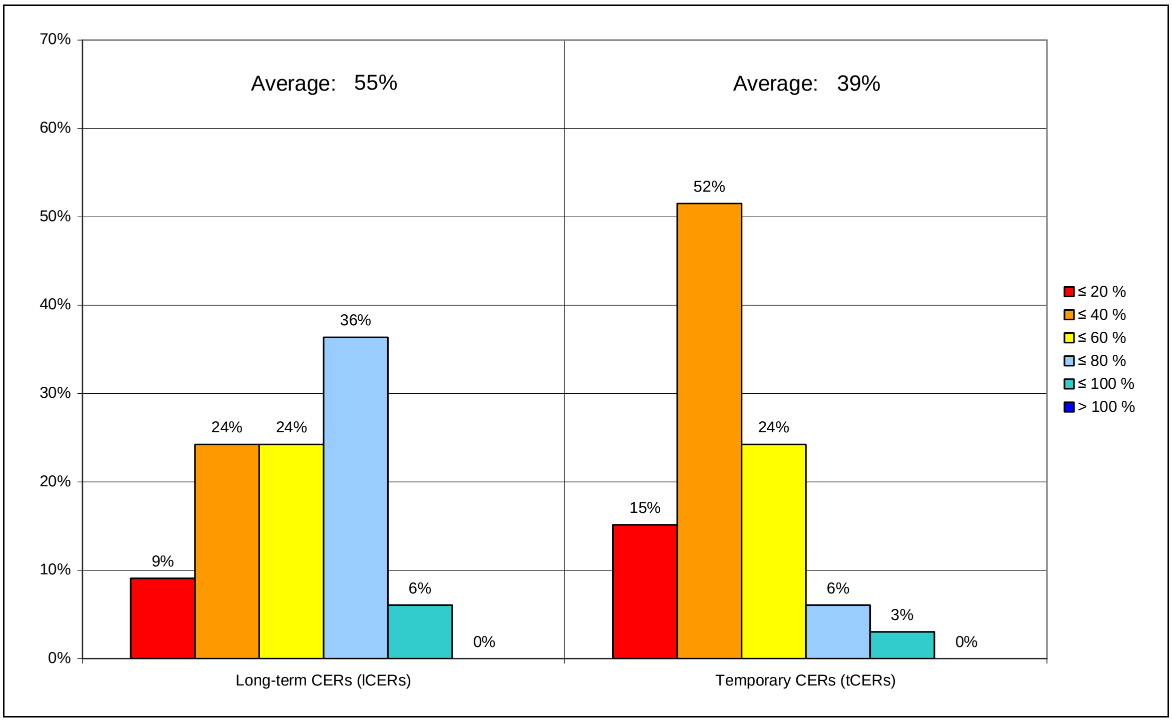
The temporary nature of carbon credits generated by afforestation and reforestation projects (lCERs, tCERs) is regarded as exercising significant impact on the market price of such credits (Figure 35).[36] According to the Delphi survey, the value of lCERs will only amount to about 55 % of the value of CERs from other projects. The value of tCERs is expected to be even lower (39 %).

The distribution of answers, however, is not very distinct. For lCERs a normal distribution emerges; distribution is lognormal in the case of tCERs. The results for tCERs are

[36] Question 12: What will be the market price of temporary and long-term CERs relative to CERs from other project types in 2010?
Note: CERs from afforestation and reforestation projects differ from CERs from other projects, since they have to be replaced after a certain time. For that reason, the market price between these two types of CERs might be different. For example, 50% means that the market price for a temporary or a long-term CER is only half of that for other project types.

more distinct than for lCERs. This indicates that a greater degree of uncertainty prevails for the latter with respect to future prices.

Figure 35: Relative market price of lCERs and tCERs in 2010, share of answers



Source: Öko-Institut

In general, respondents are very uncertain about this issue: more than half of all participants did not provide an answer to this question (Table 64, p. 235, “I don’t know”).

The average values do not change significantly between groups of participants (Table 64, p. 235). However, one difference between groups of participants can be highlighted: 29% of all officials believe that the relative market price of tCERs will be lower than 20%. Beyond this, there are no significant differences between the results of different groups of participants (Table 64, p. 235). Furthermore, there are no significant differences between the results of the first and the second round.

4.2.12 Future development of CDM and JI

The way CDM and JI will evolve in the future depends on many different aspects. On the one hand, the demand of carbon credits from project-based mechanisms is dependent on the extent to which national governments and private companies who have emission reduction commitments will use their own mitigation measures in order to meet their emission targets. On the other hand, the supply of carbon credits is dependent on several aspects, such as whether the barriers to project implementation will be removed, whether transaction costs can be further reduced, whether the necessary institutional framework (e.g. DNAs) will be established in all countries, whether forestry projects will find their place in the carbon market, etc. Other aspects, such as the issue of how additionality will be assessed, or whether sustainability benefits of projects will be taken seriously, may play a significant role as well.[37]

Concerning the **origin of demand** of carbon credits from project-based mechanisms (Figure 36), participants of the Delphi questionnaire believe that the flexible mechanisms will complement the implementation of domestic measures and the use of international emissions trading for national governments (54 % affirmative answers), but will not be used as the main means of mitigating greenhouse gas emissions (22 %). For companies, it is believed that internal abatement measures and emissions trading will prevail, rather than the use of project-based flexible mechanisms (78 % believe that most companies will not use project-based flexible mechanisms). Despite this perceived reluctance of companies to use project-based flexible mechanisms, participants believe that purchases from companies covered by emissions trading schemes will dominate the market rather than, governmental purchase programs (69 % compared to 35 %). No consensus emerges among the participants, however, with regard to the future market share of voluntary offset projects.

When different groups of participants are compared, it can be highlighted that NGOs are sceptical as to whether project-based flexible mechanisms will be used in a significant fashion by national governments (use of international emissions trading and project-based mechanisms: 25 %, domestic measures and international emissions trading, but not project-based flexible mechanisms: 40 %) (Table 65, p 236). Furthermore, the researchers numbering among the participants do not convey such a definite trend with respect to the prevalence of governmental tenders or private companies. About half of the researchers agree with each question. With regard to the market share of voluntary offset programs, the business sector is especially confident that the market share will be higher than 3 % (90 %), whereas researchers are particularly sceptical (13 %).

[37] Question 13: Do you agree with the following statements? (I agree, I don't agree).

Figure 36: Origin of demand of carbon credits

Question	Share of affirmative answers
Industrialized countries will mainly use project-based mechanisms to fulfill their Kyoto commitments.	22%
Industrialized countries will mainly implement domestic measures and use international emissions trading but not project-based mechanisms to fulfill their Kyoto commitments.	37%
Industrialized countries will mainly use international emissions trading and project-based mechanisms to fulfill their Kyoto commitments.	54%
Companies covered under emissions trading schemes will mainly use project-based mechanisms to fulfill their commitments.	21%
Companies covered under emissions trading schemes will mostly carry out internal abatement measures and/or use emissions trading but not project-based mechanisms to meet their commitments.	78%
By 2010, the demand for CERs and ERUs will be dominated by governmental procurement tenders.	35%
By 2010, the demand for CERs and ERUs will be dominated by companies covered under emissions trading schemes.	69%
Buyers using CERs or ERUs for voluntary compensation of greenhouse gas emissions will make up more than 3 % of the overall demand for CERs and ERUs.	51%

Source: Öko-Institut

Regarding the **origin of supply** of carbon credits, participants believe that if companies use flexible mechanisms they will mostly draw on carbon funds (85 %) and not invest directly in CDM or JI projects (8 %) (Figure 37). Moreover, large-scale projects are expected to prevail (76 %). However, larger countries (China, India) are not regarded as dominant in the supply of carbon credits (32 % and 19 %, respectively).

Figure 37: Origin of supply of CERs and ERUs

Question	Share of affirmative answers
Most companies covered under emissions trading schemes will use carbon funds to purchase CERs or ERUs.	85%
Most companies covered under emissions trading schemes will directly invest in CDM or JI projects.	8%
By 2010, 20 % of all projects will provide more than 80 % of all CERs and ERUs.	76%
By 2010, more than two thirds of the global CERs will come from China and India.	32%
Only large host countries will utilise the domestic JI or CDM mitigation potential.	19%

Source: Öko-Institut

With respect to **forestry projects** in the CDM, project participants deem the temporary character of lCERs and tCERs to be a major barrier to the implementation of such projects (84 %) (Figure 38). This is consistent with the perception that lCERs and tCERs will have a significantly lower market price in comparison to CERs from other projects (Section 4.2.11). A vast majority (84 %) believes that most forestry projects only aim at a temporary storage of carbon. The risk of *unintended* release of carbon by such projects is considered to be low, though. Officials and developing countries are especially confident in this respect (92 % and 91 %, respectively), whereas US experts and researchers betray more doubts (29 % and 44 %, respectively) (Table 65, p. 236). The participants of the Delphi survey are not quite sure about whether procurement tenders and carbon funds will buy carbon credits from forestry projects. The business sector and NGOs are in particular sceptical about this issue (only 25 % and 20 %, respectively, of affirmative answers).

Figure 38: Forestry projects in the CDM

Question	Share of affirmative answers
By 2010, most procurement tenders and carbon funds will also purchase tCERs and lCERs from afforestation and reforestation projects.	48%
The temporary character of lCERs and tCERs is in many cases prohibitive to the implementation of afforestation or reforestation projects under the CDM.	84%
Most afforestation and reforestation projects aim at a temporary storage of carbon (such as, for example, commercial plantations).	84%
On a global scale, less than 10 % of the carbon stored in afforestation and reforestation projects will be released unintentionally (e.g. as a result of fires, illegal logging, etc)	63%

Source: Öko-Institut

In the context of the **additionality** issue, participants of the Delphi survey believe that carbon credits are not decisive in investment decisions (86 %) and that many projects would be implemented without registration under the CDM (71 %) (Figure 39). Nevertheless, carbon revenues have a significant positive effect on the profitability of CDM and JI projects (57 %).

All participants (100 %) from NGOs, developing countries and the US believe that many projects would be implemented without the CDM (Table 65, p. 236).

Figure 39: Additionality

Question	Share of affirmative answers
Carbon revenues significantly increase the profitability of CDM and JI projects.	57%
In many cases, carbon revenues are the icing on the cake, but are not decisive for the investment decision.	86%
Many projects would also be implemented without registration under the CDM.	71%

Source: Öko-Institut

With respect to **sustainable development** (Figure 40), 79 % of participants believe that most CDM projects are beneficial and 63 % believe that the CDM leads to a transfer of technology. Experts from developing countries, though, do not believe that a transfer of technology actually takes place (27 %) (Table 65, p. 236). Participants are not clear about whether a high share of CDM electricity projects increases the consumption of electricity in the host country, and are, therefore, in a situation of suppressed demand. Experts from NGOs (100 %) in particular believe that many CDM projects are in an environment of suppressed demand, whereas developing countries doubt this (20 %).

Figure 40: Sustainable development benefits

Question	Share of affirmative answers
Many CDM electricity generation projects result in an increased consumption of electricity.	50%
Most CDM projects have sustainable development benefits (health, poverty alleviation, etc).	79%
Most CDM projects lead to a transfer of technology to developing countries.	63%

Source: Öko-Institut

Concerning the development of project documentation for flexible mechanisms, the vast majority of participants agree that the use of approved methodologies and the replication of projects significantly reduce transaction costs (Table 65, p. 236).

In general, the answers of respondents on all issues are clearer and more distinct in the second round rather than in the first.

4.2.13 Evolution of the climate mitigation regime

The current climate mitigation regime includes binding emission targets which apply up to the year 2012. The design of a potential subsequent regime is of great importance for the development of CDM and JI projects.[38] In 2006, the first talks on this issue will be held. Figure 41 shows participants' expectations with respect to the occurrence and timing of elements of a future climate regime.

More than four fifths of the experts believe that all major industrialised countries will have introduced emissions trading schemes by 2020 (Table 66, p. 237). More than half of participants expect that the role of JI will be negligible in comparison to international emissions trading in 2020; almost 30% believe that this will already be the case in 2010. More than two thirds assume, furthermore, that by 2020 a sectoral CDM will be introduced, and that emissions trading schemes in industrialised countries will cover all greenhouse gases and will have extended to most sectors of the economy.

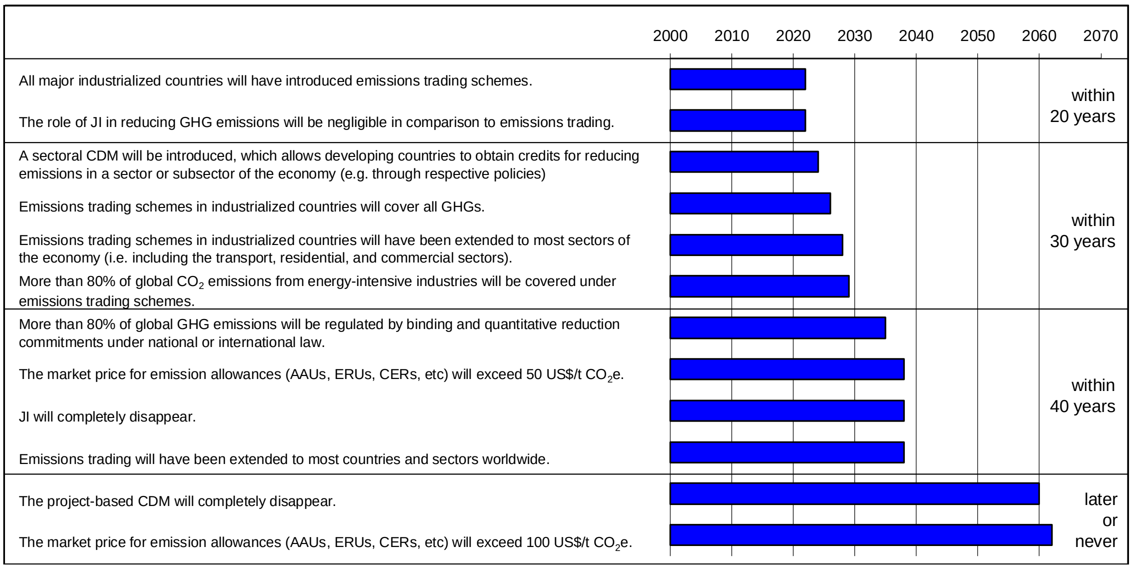
More than half of the participants also think that more than 80% of the global CO_2 emissions from energy-intensive industries will be covered by emissions trading schemes by 2020. However, 30% of the experts presume that this will first be the case in 2030. 45% of the participants suppose that by 2030 more than 80% of global GHG emissions will be regulated by binding and quantitative reduction commitments and that emissions trading will have been extended to most countries and sectors worldwide.

Almost one third (on both accounts) believes that JI will completely disappear by 2020 or 2030. Project-based CDM, in contrast, will disappear after 2050 or not at all according to the opinions of almost two thirds of the experts.

The picture is quite mixed with regard to the market price of emission allowances: two fifths (40%) of the participants assume that it will exceed 50 US$/t CO_2e by 2020, while another 28% believe that this price will be reached only after 2050 or even later. However, with regard to the price level of 100 US$/t CO_2e, more than two thirds of the experts agree that this will first be reached after 2050 or, indeed, never.

[38] Question 14: By when do you expect the following to happen? (2010, 2020, 2030, 2040, 2050, Later or never).

Figure 41: Evolution of the climate mitigation regime



Source: Öko-Institut

Figure 41 provides an overview of the weighted averages of the experts' estimates of when a certain situation will occur: within the next 20 years, the role of JI will be negligible and all major industrialised countries will have introduced emissions trading schemes. Moreover, experts assume that the project-based CDM will only disappear after 2050, or indeed never, and that the market price for allowances will not exceed 100 US$/t CO_2e before 2050, or even later.

4.2.14 Global market size of JI and CDM

More than 50% of the experts estimate a market size of 100 to 250 Mt CO_2e per year in 2010 and 250 to 500 Mt CO_2e in 2020 (Table 67, p. 240).[39] For 2050 the pictures is, unsurprisingly, less conclusive: 35% expect the market for project-based credits to range between 500 and 1,000 Mt CO_2e, while 24% and 14% deem the market size to be between 1,000 and 2,000, or between 2,000 and 5,000, respectively.

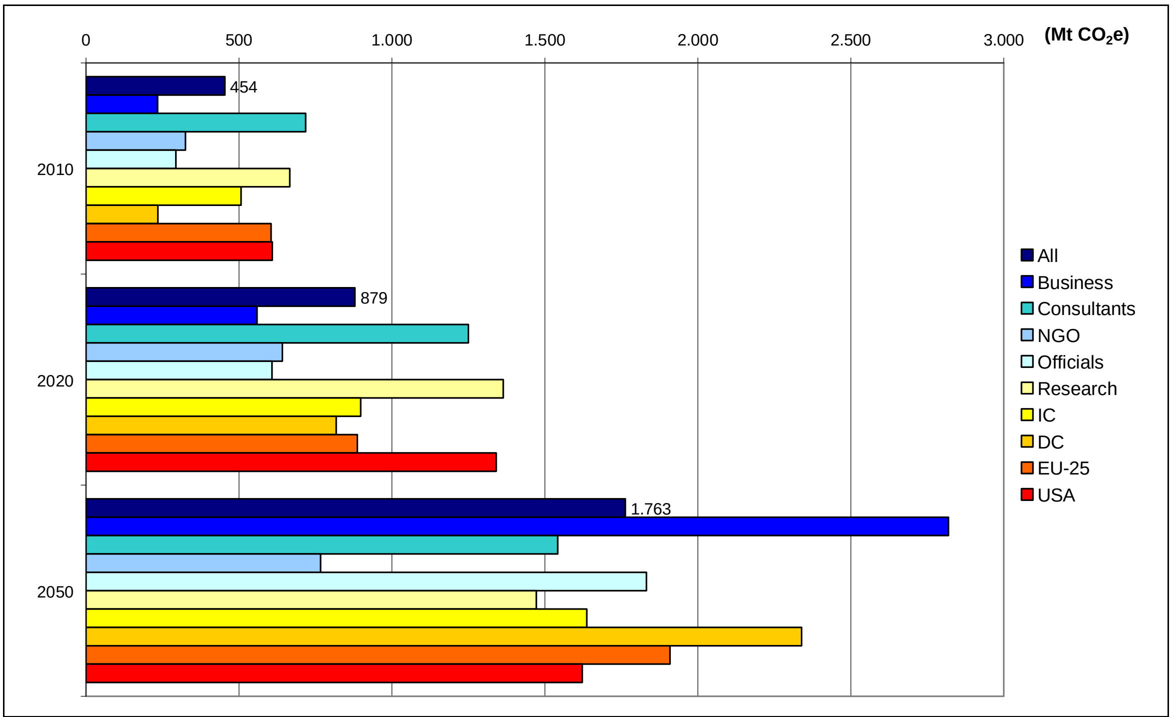
The aggregated weighted market size of project-based mechanisms will double twice from 2010 to 2050, reaching around 450 Mt CO_2e per year on average in 2010, 900 Mt CO_2e in 2020 and 1,800 Mt CO_2e in 2050 (Figure 42).[40] However, there is significant uncertainty among the respondents; about one third of all participants did not provide an answer ("I don't know"; Table 67). Moreover, there are significant differences between the answers of different groups of participants. For instance, the business

[39] Question 15: What will be the global annual market size of project-based mechanisms (JI and CDM) in 2010, 2020 and 2050? (Less than 100, 100-250, 250-500, 500-1,000, 1,000-2,000, 2,000-5,000, More than 5,000).

[40] For this calculation of the CDM and JI market size, we assume a market size of 50, 175, 375, 750, 1,500, 3,500 and 7,500 Mt CO_2e per year as average values for the seven answer categories.

sector is the most confident about the development of the market size up to 2050 (around 2,800 Mt CO_2e on average), whereas NGOs remain rather sceptical (averaging around 800 Mt CO_2e) (Figure 42).

Figure 42: Global market size of JI and CDM (aggregated weighted values)

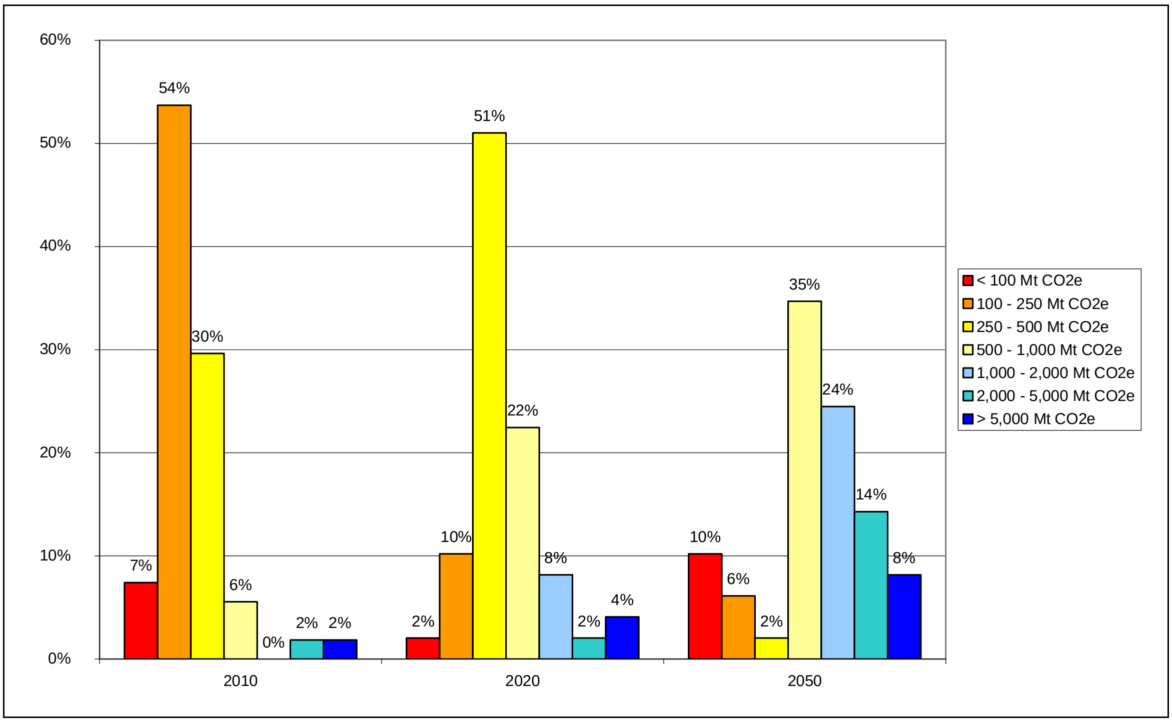


Source: Öko-Institut

In 2010, the results of all participants are quite unequivocal (54 % agree that the market size will range from 100 to 250 Mt CO_2e per year). However, uncertainty among participants intensifies when long-term effects are forecasted: answers of participants to the question of market size in 2050 diverge significantly (Figure 43).

There are significant differences between the results of the first and the second round. For all years under question, participants estimated the market size of project-based mechanisms in the second round to be between 30 % and 40 % smaller than was estimated in the first round.

Figure 43: Global market size of CDM and JI (share of answers for all participants)



Source: Öko-Institut

The experts' expectations with regard to the short- and long-term market size are up to an order of magnitude below the simulation results of various models (Sections 2.2.1 and 3.6.1). One potential explanation for this difference is that the experts envisage obstacles for the development of the market which are not adequately taken into account in the simulation models. However, perhaps the experts just underestime the cost advantages of CDM and JI projects.

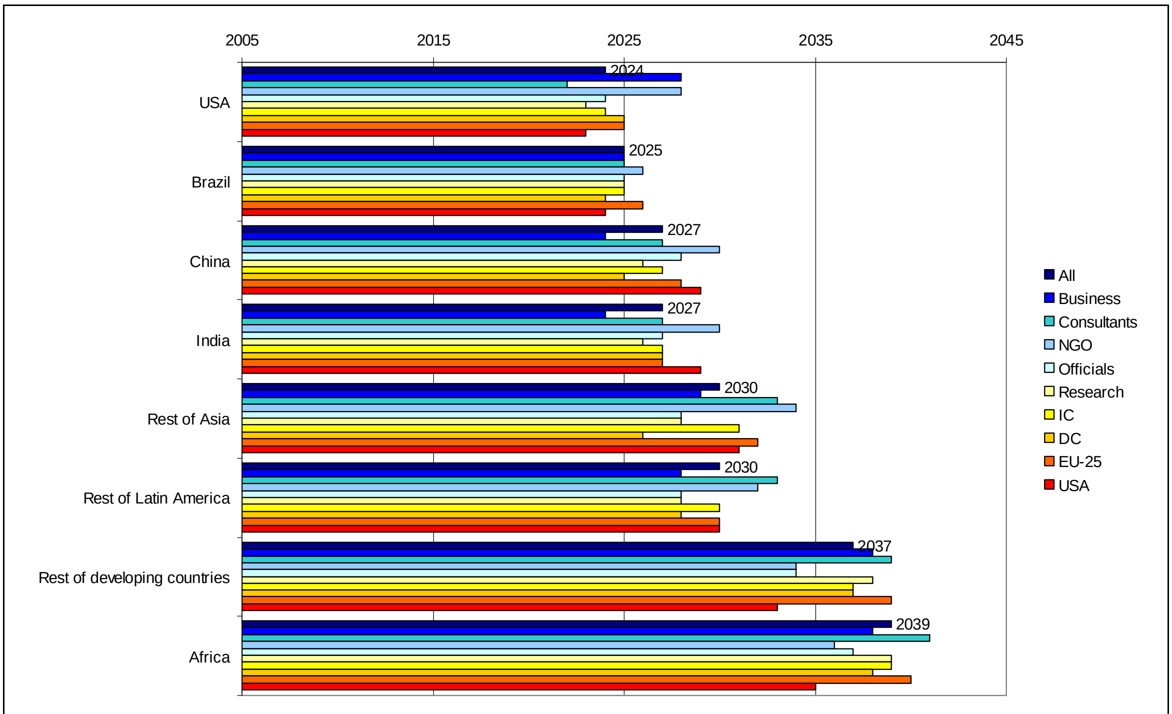
4.2.15 Expansion of the climate regime

More than three quarters of participants expect that the United States will adopt quantitative emission targets by 2020 (Table 68, p. 241).[41] The majority of experts also believe that large developing countries – Brazil, India and China – will also take on such targets by 2020 (67%, 59% and 60% respectively). However, about one fifth of experts assume that these countries will adopt quantitative targets in 2030 at the earliest.

[41] Question 16a: By when do you expect the following to happen? The country or region has adopted absolute or relative greenhouse gas emission targets. (2020, 2030, 2040, 2050)
Note: This question is new in the second Delphi round, since question 16 of the first round (What will be the geographic distribution of CDM and JI projects in 2020 and 2050?) was neither easy to answer, nor to evaluate and did not deliver the intended results.

In addition, the majority of participants assume that the remaining developing countries (apart from those in Africa) will assume quantitative targets by 2030. Nevertheless, the majority is not as unequivocal as it was in the case of the US, Brazil, India and China. A significant proportion of experts also believe that these developing countries might adopt quantitative targets in 2020 or in 2040. One quarter of participants assume in each case that the remaining developing countries will take on quantitative targets in 2040 or 2050. Africa is expected to be the last region to undertake quantitative targets. About one third of the experts believe on both accounts that Africa will adopt quantitative commitments by 2040 or 2050.

Figure 44: Expansion of the climate regime



Source: Öko-Institut

Figure 44 provides an overview of the weighted averages of the expected introduction year of quantitative targets for each region and expert category. The ranking of the countries or regions in the context of the introduction of quantitative targets is quite similar for all expert groups, although some differences in the average introduction years can be identified. Business, NGO and experts from developing countries believe that China and India (business) or Brazil (NGO and developing countries) will accept quantitative targets before the United States does.

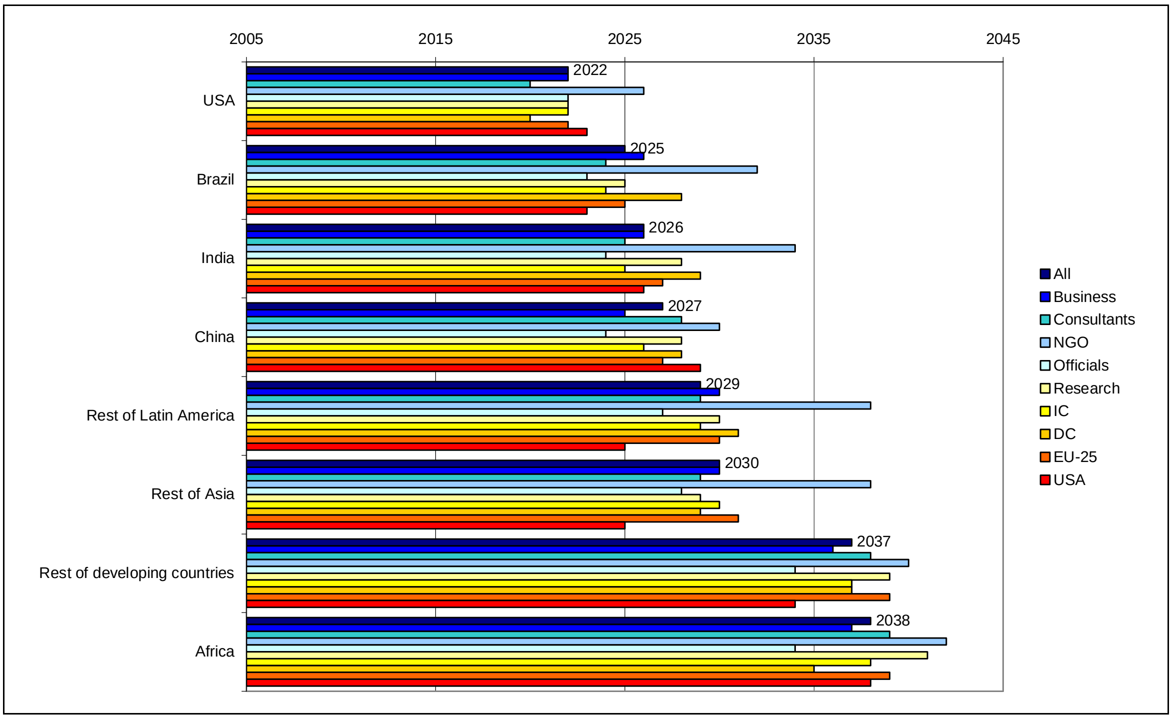
4.2.16 Introduction of emissions trading schemes for companies

The question regarding the introduction of emissions trading schemes for companies generated nearly the same results as that on the expansion of the climate regime.[42] Most of the experts evidently believe that the introduction of emission trading schemes goes hand in hand with the expansion of the climate regime.

Figure 45 displays the weighted average introduction year of emissions trading schemes for companies, differentiated by region and expert category. As for the previous question, the results of the Delphi survey are quite conclusive for many regions, especially for the United States (Table 69, p. 243). However, there is considerable uncertainty among participants as to when the remaining Latin American states, Africa and other developing countries will introduce trading schemes.

The results are similar for the different groups of participants. However, NGOs are more sceptical about the timing of the introduction of trading schemes. On average, they believe that such systems will be introduced six years later than expected on average by all participants.

Figure 45: Introduction of emissions trading schemes for companies



Source: Öko-Institut

[42] Question 16b: By when do you expect the following to happen? The country or region has established trading scheme for companies. (2020, 2030, 2040, 2050)
Note: This question is new in the second Delphi round, since question 16 of the first round (What will be the geographic distribution of CDM and JI projects in 2020 and 2050?) was neither easy to answer, nor to evaluate and did not deliver the intended results.

4.2.17 Share of the global CDM and JI market by project type

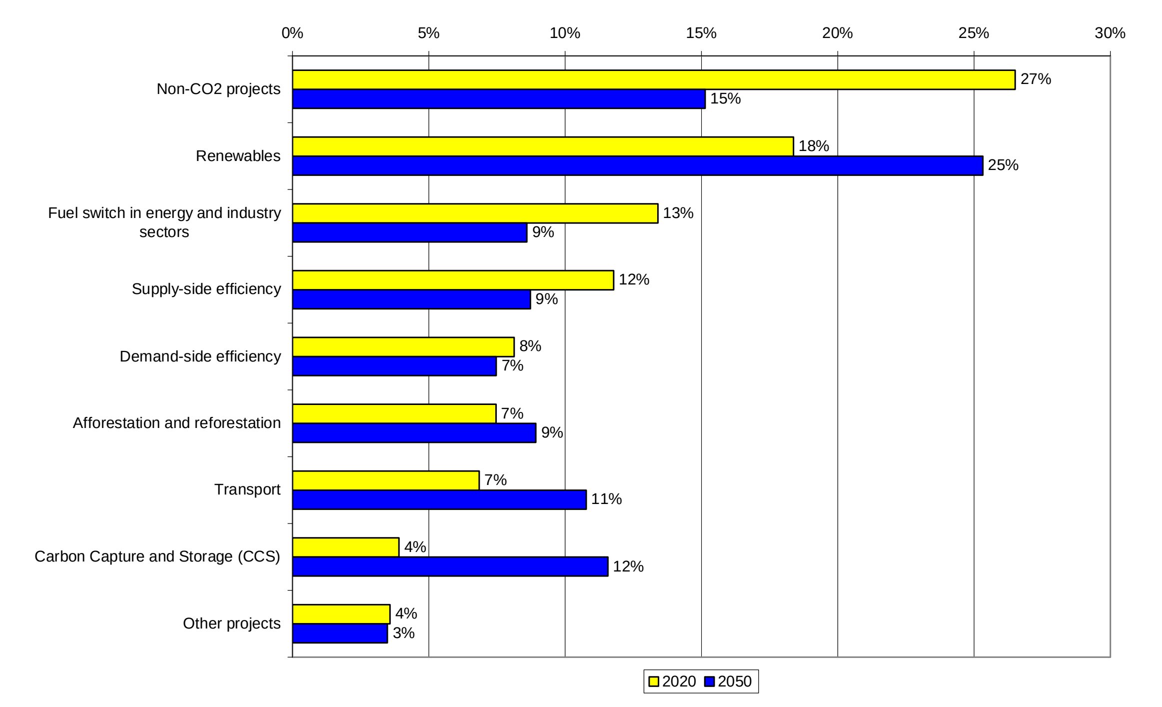
In the medium term (2020), the CDM and JI market is expected to be dominated by non-CO_2 projects (27 %), followed by those on renewables (18 %), fuel switch (13 %), and supply-side efficiency (12 %) (Figure 46).[43] All other project categories are believed to have a market share lower than 10 %. For most project types, results do not differ significantly between groups of participants. However, NGOs believe that non-CO_2 projects will have an even more dominant position in terms of market share in 2020 (36 %) (Table 70, p. 245).

In the long run (2050), non-CO_2 projects are expected to suffer a significant decrease in market share (15 %), whereas renewable energy projects are expected to increase considerably (25 %). Additionally, carbon capture and storage (12 %) and transport (11 %) projects will experience significant increases in their market shares, whereas the market for fuel switch and supply-side efficiency projects will decrease (9 % on both accounts). Forestry and demand-side efficiency projects in addition to other projects will not develop further beyond 2020 in any significant way, remaining at a level below 10 %. Results are similar between groups of participants for most project types. Concerning renewable energy projects, however, there is a significant spread between answers: the United States expects a market share of 31 %, whereas researchers anticipate 21 %. The differences for CCS projects are significant, too: NGOs anticipate a market share of 16 %, whereas developing countries believe that it will amount to only 5 % (Table 70, p. 245).

There are no significant differences between the results of the first and second round of the Delphi survey in this case.

43 Question 17: What will be the distribution of CDM and JI projects across mitigation options in 2020 and 2050?

Figure 46: Share of the global CDM and JI market by project type



Source: Öko-Institut

4.3 Conclusions

In general, the Delphi survey served to corroborate the views expressed by stakeholders in various forums on CDM and JI. Most of the results were not unexpected. However, several answers substantiate the general, and somewhat diffuse, perception of the future of CDM and JI and allow for expectations on future transaction costs, market sizes and shares, mitigation costs, etc to be approximately quantified. The most important lessons learned from the Delphi survey are summarised below:

- The time-consuming approval and registration process, coupled with uncertainty about the demand for CDM and JI credits after 2012 constitute the most important barriers to the development of the project-based mechanisms. Correspondingly, the most important measures to overcome these barriers are: strengthening the international institutions, namely the CDM Executive Board and the CDM Methodological Panel, and acquiring a clearer picture of the time period after 2012. Several decisions made in the first COP/MOP in Montreal in December 2005 have already contributed to overcoming these barriers in the interim: the decision to start negotiations on future commitment periods under the Kyoto Protocol[44] will extend and deepen the confidence of project developers in the demand for CDM and JI credits continuing after

[44] Decision -/CMP.1 (Consideration of commitments for subsequent periods for Parties included in Annex I to the Convention under Article 3, paragraph 9, of the Kyoto Protocol).

2012. Other decisions have also buttressed the CDM and JI, namely the establishment of the JI Supervisory Committee[45] and the reinforcement of the CDM institutions[46], including the provision of additional financial resources for the CDM Executive Board. These decisions are going in the right direction, but will not eliminate the barriers entirely. Accordingly, efforts undertaken to reduce these barriers should not be weakened in the future.

- PDD development is, at the time being, deemed the most important driver for transaction costs. However, the vast majority of experts believe that this part of the transaction costs can be substantially reduced, once project developers can draw on approved methodologies and projects of the same type. Since the CDM began, methodologies have been approved for most sectors and many projects have been registered. Consequently, this barrier is, in fact, being alleviated in the main. Host country approval and registration of projects is, by contrast, regarded as the least important contributor to transaction cost. For large-scale CDM and JI second-track projects, most experts expect transaction costs for project development to be between US$ 50,000 and US$ 100,000. For small-scale CDM projects and JI first-track projects most experts estimate transaction costs to amount to less than US$ 50,000. On average, transaction costs for CDM projects can be estimated as ranging between US$ 0.05 per CER for large-scale CDM projects and US$ 0.70 per CER for small-scale CDM projects. Transaction costs for monitoring and reporting range between US$ 10,000 and US$ 25,000 on average per year. CCS, transport and afforestation and reforestation projects will entail rather high monitoring and verification costs, while monitoring and verification costs of renewables, supply-side efficiency and fuel switch in industry are assumed to be at the lower end of the range.
- The expected mitigation costs per t CO_2e vary substantially between project types, ranging from about US$ 0 per t CO_2e to almost US$ 50 per t CO_2e. They can be sub-divided into 5 categories: 1) HFC, N_2O and landfill projects beget mitigation costs of between 0 and 5 US$/t CO_2e; 2) large hydro, supply-side efficiency, etc. entail average mitigation costs of between 5 and 10 US$/t CO_2e; 3) afforestation/reforestation, demand side efficiency, biomass etc. have average mitigation costs ranging from between 10 and 15 US$/t CO_2e; 4) transport and some renewable projects entail average mitigation costs of between 15 and 20 US$/t CO_2e; 5) CCS and PV projects generate mitigation costs exceeding 40 US$/t CO_2e. Unsurprisingly, current project pipelines are dominated by projects falling under the first category (Figure 1, p. 18).
- The aggregated weighted market size of project-based mechanisms is expected to double twice from 2010 until 2050 and will reach around 450 Mt CO_2e in 2010, 900 Mt CO_2e in 2020 and 1800 Mt CO_2e in 2050. However, a significant uncertainty was evident among the respondents; about one third of all participants did not provide an answer. Moreover, there are significant differences between the answers of different groups of participants. For instance, the business sector is the most confi-

[45] Decision -/CMP.1 (Implementation of Article 6 of the Kyoto Protocol).

[46] Decision -/CMP.1 (Further guidance relating to the Clean Development Mechanism).

dent about the development of the market size up to 2050 (around 2,800 Mt CO_2e on average), whereas NGOs remain rather sceptical (around 800 Mt CO_2e on average).

- In the medium term (2020), non-CO_2 projects (27%) and renewable projects (18%) are expected to dominate the CDM and JI market. All other project categories are believed to have substantially smaller market shares. In the long run (2050), non-CO_2 projects are expected to decrease significantly in terms of market share (15%), whereas renewable energy projects are expected to increase considerably (25%). Carbon capture and storage (12%) and transport (11%) projects will also have increased significantly their market shares, whereas the market for fuel switch and supply-side efficiency projects will decrease (9% on both accounts). Forestry and demand-side efficiency projects and other projects will not evolve significantly beyond 2020, remaining at a level below 10%.
- With regard to the origin of demand for and supply of carbon credits from project-based mechanisms, most experts anticipate that the governments of industrialised countries will not principally use CDM and JI to fulfil their commitments, but rather will use these instruments to complement domestic measures and the purchase of credits under international emissions trading. The same holds true for companies: they are expected to adopt internal abatement measures or use emissions trading, but not CDM or JI, in the main. Nevertheless, experts believe that the demand for CDM and JI credits will be dominated by companies. However, it is anticipated that they will mostly draw on carbon funds, instead of directly investing in CDM or JI projects. Moreover, large-scale projects are expected to dominate the supply market. What is more, experts believe that not only large countries will make use of their CDM or JI potential and that the credit market may not, therefore, be dominated by China and India, even though they are expected to be the biggest suppliers.
- With regard to the development of the future climate change regime, most experts (88%) anticipate that all industrialised countries will have introduced emissions trading schemes by 2020. Moreover, these systems are expected to cover all greenhouse gases and most sectors of industrialised countries, at the latest by 2030. At a later stage, trading schemes will cover most energy-intensive industries worldwide (2030). Most experts also assume that all countries and sectors will be covered by emissions trading schemes by then. However, one fifth of the experts believe that this will never be the case. JI is expected to become negligible in comparison to emissions trading by the time the latter systems will have been introduced in most industrialised countries. At a later stage it may even disappear (about 2040). The disappearance of the project-based CDM seems to be rather improbable. On the contrary, it is expected that a sectoral CDM will complement the existing project-based one by 2020 or 2030.
- Participants of the Delphi survey believe that the United States and large developing countries – Brazil, China and India – will adopt emission targets in the medium term (2020). Africa, along with the remaining developing countries is only expected to take on such targets in the long run. The introduction of emissions trading schemes for companies goes hand in hand with the expansion of the climate regime.

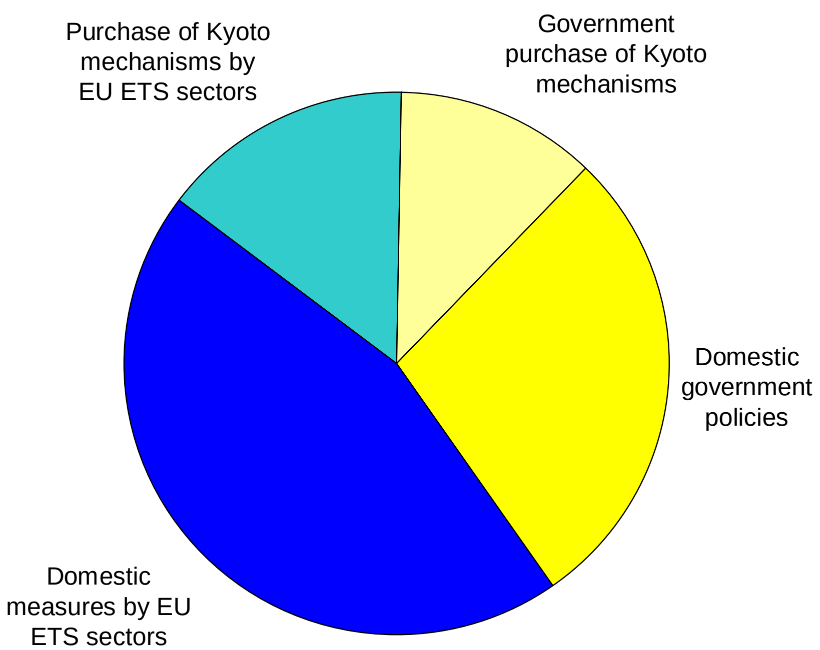
All in all, it can be concluded that the future perspectives for the projects-based Kyoto mechanisms are manifold, and do indeed differ for CDM and for JI. While JI may be repressed or replaced by emissions trading in the medium term, and may disappear altogether in the long term, CDM might be reformed and expanded from being a project-based mechanism to encompassing broader concepts, such as a sectoral CDM. Nevertheless, extending binding, quantitative targets to developing countries in the medium term might also diminish the market size of the CDM, although it is not expected to disappear completely, even in the long run. In the short term, it is comparatively important that the international institutions of the flexible mechanisms be strengthened and that an agreement to succeed the Kyoto protocol be found.

5 Framework conditions and instruments for the promotion of CDM and JI in Germany

The analysis undertaken in Chapter 2 identified the considerable potential of CDM and JI projects in contributing to greenhouse gas mitigation. Moreover, Chapter 2 revealed that for Germany – from an economic perspective – the use of these instruments is an efficient track to take. According to the model results, Germany should import between 200 and 350 Mt CO_2e of Kyoto units in the medium term (2020), depending on the global CO_2 concentration target path (Figure 15). It is not possible, however, to determine the extent to which project-based mechanisms or AAU should be purchased.

In any case, the main aims of this research project are to answer the question as to whether Germany should make use of the project-based Kyoto mechanisms, and if so, to what extent. This is not solely an economic question; rather, other aspects need to be incorporated as well. In tackling this question, public purchase of project-based mechanisms and purchase by private entities as part of their commitments under the EU ETS should be differentiated. Figure 47 can serve as an illustration for why this is important.

Figure 47: Domestic policies and measures and purchase of Kyoto mechanisms



Source: Öko-Institut

The German economy can basically be sub-divided into sectors covered by the EU ETS (blue) and those which are not (yet) covered by the EU ETS (yellow). Currently, the EU ETS covers the energy-intensive industries (electricity generation, refineries, steel, cement, glass, ceramics and paper). All other sectors, such as private households, services and transport are not covered. The sectors encompassed by the system all have to comply with the overall reduction target, which is set by the number of allowances that have been allocated. Each operator has to decide, therefore, whether to apply mitigation measures, or to purchase additional emission allowances (make-or-buy decision). If all German operators collectively intend to emit more CO_2 emissions than the quantity for which they have been allocated allowances, they then have to purchase allowances from abroad or can – as a result of the Linking Directive (2004/101/EC) – also purchase project-based Kyoto mechanism units (CERs or ERUs) from developing countries or countries in transition. This decision is taken by each operator individually on the basis of microeconomic efficiency calculations, taking into account other factors such as risks and transaction costs. As soon as the legal framework for emissions trading and the use of project-based mechanisms is set, the operators decide on their own the extent to which they will purchase project-based mechanisms in order to comply with the reduction targets. The size of the light blue section in Figure 47 is thus determined by the decentralised purchase decision of each operator covered under the EU ETS.[47] In other words, the decision of EU ETS operators to purchase project-based Kyoto units is internalised, and can be taken in a decentralised manner without any discretionary government intervention. The government might, nonetheless, facilitate such decisions by helping to eliminate hurdles and barriers which hamper the use of the projects-based mechanisms (Sections 5.2 and 5.4).

For those sectors not covered by the EU ETS, the picture is very different. Operators and private entities of these sectors do not have the power to decide whether reduction measures should be applied, or whether project-based mechanisms units should be bought. Rather, they have to comply with climate policies, such as eco taxes or building standards, or may accept government incentives for mitigation measures. Accordingly, the government has to take the make-or-buy decision for this sector. Domestic policies addressed to the not-covered sectors should – from an economic viewpoint – be implemented as long as the marginal abatement costs are lower than the expected market price of project-based Kyoto mechanisms. For the remaining share of reduction requirements, the government should purchase Kyoto mechanisms. The decision on how many Kyoto units are needed in order to fulfil the reduction requirement of the non-EU ETS sectors has to be taken by the government, since private entities simply do not have the legal right to take this decision. In other words, the make-or-buy decision is not internalised in the case of non-EU ETS sectors and has to be taken by the government.

Although the extent to which flexible mechanisms should be used seems to be quite clear from the point of view of economic theory, it is rather difficult to determine the appropriate amount in practice. A precondition for determining the appropriate amount of

[47] The size is, nevertheless, restricted due to Art. 1.8 (c) of the so-called Linking Directive (2004/101/EC, OJ, L 338, 30.11.2004, p. 18), which obliges each Member State – in order to be consistent with the supplementarity obligations under the Kyoto Protocol – to limit the scope which EU ETS operators have in the use of ERUs and CERs. In Germany, operators may use project-based Kyoto units totaling 12% of the amount of allowances allocated to each installation (BMU 2006, p. 38f).

Kyoto units in order for the national target to be met is that the target for the EU ETS sector must be set at an efficient level. If the EU ETS sectors received more allowances than is efficient, the non-EU ETS sectors would have to contribute more to climate mitigation than is efficient. If the EU ETS sectors received too few allowances, the non-EU ETS sectors would then contribute lesser mitigation efforts than is efficient in striving to achieve the national targets.

In discussing the consequences of over- or underestimating the governmental purchase of Kyoto mechanisms, we assume that an efficient amount of allowances will be allocated to the EU ETS sector. If the government purchases too few Kyoto units, the overall compliance cost for fulfilling the mitigation target would increase, because comparatively more expensive domestic measures would need to be implemented than would be efficient. Purchasing too many Kyoto units would also result in higher overall costs, since several comparatively cheap mitigation measures in the non-EU ETS sectors would not be implemented. Despite the fact that the optimal level of government purchase is difficult to determine, there might be other reasons why the government may decide to deviate from the economic optimum (Section 5.3.4).

It could also be argued that the government should purchase additional Kyoto units, whilst increasing the amount of allowances allocated to trading sectors. This would alleviate the situation for those sectors and would improve their competitiveness. However, such a strategy would certainly be subject to scrutiny under Articles 87 and 88 of the EU Treaty on Government Aid and might be rejected by the Commission. Moreover, if the purchase of Kyoto units were financed by the governmental budget, this strategy would constitute a considerable violation of the *polluter-pays principle* and would place the burden on the commons. From an environmental economics perspective, such a strategy can therefore not be recommended.

In summary: the 'make-or-buy' decision was internalized, as regards the use of flexible Kyoto mechanisms for the trading sectors, thanks to the introduction of the EU ETS. After deciding on the total amounts of allowances to be allocated to the trading sector, the government should refrain from interfering in this decision. However, tackling some of the obstacles and barriers impeding the use of these mechanisms by the trading sector might indeed prove constructive. To this end, we discuss the hurdles and difficulties below and assess measures which are designed to overcome these barriers.

The government has to decide the extent to which domestic mitigation measures should be combined with the purchase of flexible Kyoto mechanisms for the non-trading sector. Although this decision might be predominantly an economic one, it cannot be decided on economic criteria alone. As a result, we assess other criteria below that should be incorporated in decisions on the amount of Kyoto units to be purchased by the government.

Before tackling these issues, we will begin by examining how other governments address this question. We will also provide an overview of the public and private programs for the purchase of project-based Kyoto mechanisms in other countries.

5.1 Overview of existing international programmes

Programmes for promoting CDM and JI mainly include funds for CER or ERU purchases. These funds fuse various CDM or JI projects together, pooling the associated CER and ERU credits. The main purpose of these funds is to offer direct access to the purchase of CERs or ERUs for public or private entities, without the purchasing entity having to conduct the project which generates the corresponding emission reductions. Consequently, by facilitating the purchase of project-based permits, the promoting authorities foster the development of CDM and JI projects at the same time.

An overview of existing programmes for promoting the use of the project-based mechanisms of the Kyoto Protocol is presented in the following. In Table 18 we distinguish the various funds by the addressed investors (i.e. purchasers): public investor programs, private investor funds or mixed funds. In the table, the following criteria for classifying promotion programs are presented: the key focus of the funds (CDM or JI projects), the designated investment region and the corresponding managing authority. Further criteria include the potential secondary objectives of the programs (besides promoting CDM and JI investments), investors who were specifically addressed and the financial volume of the respective funds.

Table 18: Public and private funds for the purchase of CERs and ERUs

Fund	Focus	Main Region	Management	Secondary objective	Investors	Volume - M€ -
Governmental Funds						**1.173**
Spanish Carbon Fund	CDM- and JI projects	Projects from many regions, including Latin America, North Africa, East Asia, South Asia, Eastern Europe and the Russian Federation	World Bank	To promote renewable energy and energy efficiency projects in developing countries and countries with economies in transition	Spanish public and private entities	170
Iniciativa Iberoamericana de Carbono	CDM projects					47
IFC Netherlands Carbon Facility (INCaF)	CDM projects	In developing countries, excluding Central and Eastern European proposals	World Bank's group agency International Finance Corporation (IFC)			44
Netherlands European Carbon Facility (NECaF)	JI projects	In developing countries, excluding Central and Eastern European proposals	World Bank's group agency International Finance Corporation (IFC)			92
Netherlands CDM Facility	CDM projects	Developing countries	World Bank			150
Austrian JI/CDM Program	CDM- and JI projects		Kommunalkredit Public Consulting (KPC)		Austrian government	288
Danishcarbon.dk	CDM- and JI projects, ERU, AAU, CER	Central and Eastern Europe	Danish Ministry of the Environment	Supports Danish Industry and the Governments of Central and Eastern Europe in their efforts to build capacity for the trading of Carbon Credits		47
Canada Climate Change Development Fund (CCCDF)	CDM- and JI projects	Developing countries	CIDA (Canadian International Development Agency)	Contributing to sustainable development and poverty reduction	Canada	83
Belgium Federal JI/CDM Tender	CDM- and JI projects		Belgium's Federal Government		Belgian federal government	9
Flemish Government JI/CDM Tender	CDM- and JI projects	Central-Eastern Europe (proposals from Poland, Russia, Hungary), Asia (India) and South America (Chile)	The regional Flemish Government in Belgium			70
ERUPT	JI projects		Senter (governmental agency)		Mostly larger private companies (e.g. the Dutch electric power company Nuon)	50 [1)]
CERUPT	CDM projects		Senter (governmental agency)		Mostly larger private companies (e.g. the Dutch electric power company Nuon)	33 [1)]
Finnish CDM & JI program JIQ	CDM- and JI projects	Africa, Latina America and India				20 [2)]
Swedish International Climate Investment Programme SICLIP	CDM- and JI projects	Kyoto signatories in Africa, Asia, Latin America and Central & Eastern Europe	Swedish Energy Agency			15

Table 18: Public and private funds for the purchase of CERs and ERU – continued

Fund	Focus	Main Region	Management	Secondary objective	Investors	Volume - M€ -
EcoSecurities Standard Bank Carbon Facility	CDM- and JI projects	Central & Eastern Europe, inc. Countries of Former Soviet Union	EcoSecurities and Standard Bank London Limited (SBL), the investment banking arm of South Africa's Standard Bank Group		Danish Ministry of the Environment	10
Rabobank-Dutch government CDM Facility	CDM projects	All CDM countries, but preferably those countries with a local presence (Argentina, Brazil, Chile, China, India, Indonesia, Mexico and Thailand)				45
Private-sector Funds						**1.437**
Japan Carbon Finance, Ltd	CDM- and JI projects	Asia, Central and South America, Eastern Europe	Japan Carbon Finance (JCF)		JBIC, DBJ, Japanese industry	118
ICECAP	CDM- and JI projects		UK energy trading company Cumbria Energy		Seeking investors	200 [3)]
GG-CAP Greenhouse Gas Credit Aggregation Pool	CDM- and JI projects	Africa; Central Asia; Eastern Europe; Latin America; Southeast Asia/Oceania	Natsource Asset Management		26 companies (energy production)	455
European Carbon Fund	CDM- and JI projects		IXIS Environnement & Infrastructures		11 private-sector financial investors; generally open to all investors	105
Trading emissions	CDM, JI, EUAs		Carbon Capital Markets		Financial institutions	258
Climate Change Capital	CDM, JI, EUAs				Not disclosed	80
RNK Capital	CDM projects		RNK Captial LLC		RNK Capital	21
UBS Alternative Climate	CDM- and JI projects		UBS		Companies, institutional investors	9
Dexia-FondElec Energy Efficiency and Emission Reduction Fund	Fund projects that will utilize clean, renewable energy, and/or energy efficient emission reduction technologies to improve industrial processes, and thereby, reduce the need for fossil fuel and mitigate climate change	Central and Eastern Europe	FondElec Group	Generating plant retrofits and fuel conversions, heat recovery systems, electric transmission grids, gas and district heating system improvements, illumination, and industrial energy efficiency enhancements		108
D&B Capital´s Clean Energy Fund			Investment Company (CEMCO)		Large emitting corporations, financial institutions	83
Mixed Funds (Public/Private)						**1.377**
Carbon Fund	CDM- and JI projects		World Bank		6 governments, 17 companies, 3 banks	150

Table 18: Public and private funds for the purchase of CERs and ERUs – continued

Fund	Focus	Main Region	Management	Secondary objective	Investors	Volume - M€ -
Community Development Carbon Fund (CDCF)	CDM projects		World Bank in cooperation with the International Emissions Trading Association (IETA) and the United Nations Framework Convention on Climate Change	Verbesserung des Lebensunterhaltes von lokalen Gemeinschaften	9 governments, 15 companies	107
Bio Carbon Fund (BCF)	Provide finance to demonstrate projects that sequester or remove greenhouse gases in forest and agro-ecosystems		World Bank	Deliver cost-effective emission reductions, while promoting biodiversity conservation and sustainable development	Governments, companies	44 [4)]
Italian Carbon Fund	CDM- and JI projects	China, Mediterranean region, Middle East, Central America (Balkans for JI)	World Bank		Italian government	13
Danish Carbon Fund	Purchases JI credits	Central and Eastern Europe	World Bank		Danish government (Ministry of Foreign Affairs of Denmark and the Ministry of the Environment of Denmark) and Danish companies, each 50%	58
KfW-Klimaschutzfonds/ KfW Carbon Fund	CDM- and JI projects		KfW banking group for the German government		KfW, German government, 20 European companies	50 [5)]
Nordic Environment Finance Cooperation Testing Ground Facility (NEFCO)/Baltic Sea Region TGF	JI projects	Central and Eastern Europe	Nordic Environment Finance Corporation (Nefco)		6 governments, 17 companies, 3 banks	30
EBRD Multilateral Carbon Fund	CDM, JI, EUAs	Central Europe, South East Europe & Caucasus and Russia & Central Asia	European Bank for Reconstruction and Development (EBRD), and possibly the European Investment Bank		Fund currently being structured	100 [6)]
European Partnership Carbon Fund	CDM- and JI projects		World Bank and the European Investment Bank		Fund currently being structured; likely to be targeted at European governments and companies	50
Umbrella Carbon Facility	CDM projects		World Bank	Established by the World Bank recently with the aim to invest in very large projects	Chinese companies	775

[1)] Approximately; [2)] 10 million bilateral/10 million in PCF and TGF (Testing Ground Facility); [3)] at price of 10 €/t CO_2e;
[4)] target size: € 83 million; [5)] target size: € 50 million, therefrom € 10 million of KfW; [6)] between € 50 million € 150 million.

Source: Compilation by ZEW

From the list of over 30 existing project funds with a total volume of virtually € 4 billion, it becomes clear that almost all programs focus on both CDM and JI projects simultaneously – exceptions are the NECaf, ERUPT or NEFCO funds, which explicitly cover JI projects. Moreover, instead of focusing on specific countries, there is typically a broad scope of potential project regions, such as Central and Eastern Europe, or even developing countries as an aggregate world region.

The World Bank is clearly the most prominent fund-managing entity of CDM and JI project funds. However, authorities from various countries, such as those in the Netherlands, Canada or Japan, are offering promotion programs for purchasing project-based credits. In Germany, the key authority is the KfW banking group, which manages funding activities for private investors (Section 5.4.1). Up to now, public authorities have managed CDM and JI funding programs in the main – an exception is Natsource Asset Management, a private corporation in the UK.

Secondary objectives of the project funds mainly comprise of renewable energy developments, energy efficiency promotion or contributions to sustainable development. With regard to the investor groups, the majority of the funds addresses public or mixed public and private CER and ERU purchases, less promotion programs exclusively focus on private investors. However, the latter offer the highest total financial volume (almost € 1.5 billion). In general, the project fund volume levels show dramatic differences: whereas low-volume programs range from around € 10 to 50 million, large funds offer financial volumes of up to € 775 million (such as the World Bank's Umbrella Carbon Facility).

In conclusion, there is certainly a great variety of programs promoting CDM and JI investments. The funds are flexible in terms of the region of investments and are aimed at both at public and private investors. In the near future, the number of project funds for CER and ERU purchases are expected to rise, as are the financial volumes of the funds. By further promoting investments in the project-based mechanisms of the Kyoto Protocol, the role of CDM and JI – also beyond the Kyoto compliance period – can be significantly strengthened.

5.2 Barriers to the use of project-based mechanisms by private entities

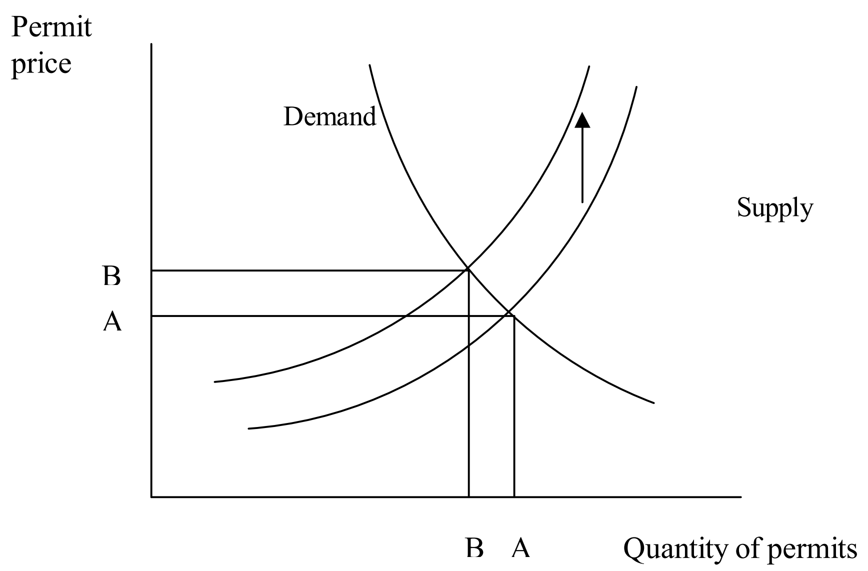
5.2.1 Transaction Costs

Transaction costs are those costs incurred by initiating and completing transactions, such as finding partners, holding negotiations, obtaining advice from lawyers or other experts, monitoring agreements, etc. Thus, they occur to some degree in every market transaction, simply by being the costs that arise from the transfer of any property right.

5.2.1.1 General Assessment

Regarding their impact on the market for emission permits, transaction costs generally alter the equilibrium permit price. In Figure 48, the rising curve represents world permit supply, whereas the falling one represents permit demand, derived from emission reduction requirements in net permit-buying countries and the associated cost schedules of domestic abatement. Consideration of transaction costs implies an upward shift of the supply curve, leading to a reduction of quantities traded and a rise in the equilibrium price. In Figure 48, point A represents the market equilibrium without transaction costs, and point B includes transaction costs. The lower trading volume indicates that countries will consequently abate more domestically, compared to the situation without transaction costs.

Figure 48: Impact of transaction costs on the permit market



Source: Michaelowa and Jotzo (2005)

Table 19 presents definitions of disaggregated cost components, which further sub-divide transaction costs into categories that parallel – in the case of JI and CDM projects – the project cycle.

Table 19: Definition of project related transaction cost components

Transaction Cost Components	Description
	Project-based (JI, CDM): Pre-implementation
Search costs	Costs incurred by investors and hosts as they seek out partners for mutually advantageous projects
Negotiation costs	Includes those costs incurred in the preparation of the project design document (i.e. baseline determination and monitoring rules) that also documents assignment and scheduling of benefits over the project time period. It also includes public consultation with key stakeholders.
Validation costs	Review and revision of project design document by operational entity
Approval costs	Registration and approval by UNFCCC Board and authorisation from host country
	Project-based (JI, CDM): Implementation
Monitoring costs	Costs needed to ensure that participants are fulfilling their obligations
Verification costs	Annual verification by the UNFCCC Executive Board/ Supervisory Committee
Certification costs	Including issue of Certified Emission Reductions (CERs for CDM) and issue of Emission Reduction Units (ERUs for JI) by UNFCCC Executive Board
Enforcement costs	Includes costs of administrative and legal measures incurred in the event of departure from the agreed transaction
	International Emissions Trading (IET)
Search costs	Same as project-based; to include annual verification
Negotiating costs	To include legal and insurance fees associated with participation in the market
Monitoring costs	Same as project-based; to include annual verification
Certification costs	Certification and issue of Assigned Amount Units (AAUs) by UNFCCC Executive Board
Enforcement costs	Includes costs of administrative and legal measures incurred in the event of departure from the agreed transaction

Source: Eckermann et al. (2003)

Transaction costs inevitably increase the costs for the participants of the transaction, thereby lowering the trading volume or even discouraging some transactions from occurring in the first place. The efficiency of market-based policy instruments is thus limited.

In Table 20 typical project types for the different project sizes are presented.

Table 20: Correlation of projects and project size

Type	Typical projects
Very large	Large hydro, gas power plants, large CHP, geothermal, landfill/pipeline methane capture, cement plant efficiency, large-scale afforestation
Large	Wind power, solar thermal, energy efficiency in large industry
Medium – upper	Boiler conversion, DSM, small hydro
Medium – lower	Energy efficiency in housing and SME, mini hydro
Small	PV

Source: Eckermann et al. (2003)

The data is most usefully expressed in terms of transaction costs per CO2e. Clearly, if the costs per t CO_2e are too high, this will prohibit an otherwise profitable carbon exchange.

The costs of the operation of the CDM Executive Board (EB) are to be carried by project developers in the form of a share of proceeds. The first Conference of the Parties – which served as a meeting of the Parties to the Kyoto Protocol (COP/MOP1) – decided in December 2005 that project developers have to pay a fee of 0.10 US$ per CER for the first 15,000 CERs issued in a year and 0.20 US$ per CER for all subsequent CERs. Hence, this fee structure favours small projects. This regulation replaces the earlier registration fee by the EB: registration fees paid so far are considered upfront payments of the share of proceeds.

As can be seen in Table 21, there is a strong correlation between the size of projects in terms of CO_2 reductions, and transaction costs per t CO_2e. The tables present a categorisation that roughly fits with the different data sources for JI and CDM projects.

Table 21: Project sizes for CDM projects and associated transaction costs

Type	Reduction (t CO_2e/a)	Low (€/t CO_2e)	Central (€/t CO_2e)	High (€/t CO_2e)
CDM				
Very large	> 14,000	0.02	0.05	0.27
Large	1,400 - 14,000	0.07	0.14	0,55
Medium – upper	140 - 1,400	1.36	2.73	4,09
Medium – lower	14 - 140	18	27	82
Small	< 14	183	273	545
JI				
Very large	> 14,000	0.01	0.03	0.05
Large	1,400 - 14,000	0.14	0.27	0.55
Medium – upper	140 - 1,400	0.82	2.73	4.09
Medium – lower	14 - 140	10	27	82
Small	< 14	109	136	164

Source: Eckermann et al. (2003)

Whereas the data for JI and CDM projects are presented separately, significant cost differences between the two instruments cannot be identified from the ranges that Eckermann et al. (2003) adopted to account for project specification, location etc. It can be expected that costs for both instruments will fall considerably over time, as learning effects, coupled with increased competition in these markets, bring cost reductions in both project phases, the pre-implementation and implementation. A 20 % cost reduction in the implementation phase – as assumed by PriceWaterhouseCoopers (2000) – may therefore be seen as a minimum reduction.

Transaction costs will be substantial and will lead to a lower than expected utilisation ratio of the mechanisms. Table 22 shows that, while the CDM and Second Track JI have to bear all categories of transaction costs, IET is less impacted.

Registration costs are defined as the costs which the project developer has to pay to the EB for registration of the project so long the COP has not yet decided on an administration fee for CDM projects. The EB charges the registration fee based on the anticipated emission reduction, as stipulated in the Project Design Document. The fee will be deducted in the form of CERs upon issuance (see Section 5.2.1.1 for details). Thus, the registration costs rise and fall with the anticipated emission reduction.

Table 22: Transaction cost types accruing under the different mechanisms

Transaction Cost Components	**Relation to project size**	**CDM**	**JI Track 1**	**JI Track 2**	**IET**
Search costs	Fixed	X	X	X	
Negotiation costs	Degressive	X	X	X	X
Baseline determination costs	Fixed	X	X	X	
Approval costs	Fixed	X	X	X	
Validation costs	Fixed	X		X	
Registration costs	Fixed	X			
Monitoring costs	Fixed	X	X	X	
Verification costs	Degressive	X		X	
Certification costs	Degressive	X			
Enforcement costs	Proportional				
Transfer costs	Proportional				X
Registry costs	Proportional	X	X	X	X
Minimum fixed cost (k€)		150	80	140	NA

Source: Michaelowa and Stronzik (2002), ZEW

In Table 23 an initial notion of the magnitude of absolute transaction costs of potential non-small-scale CDM projects is given. As can be observed, the cost estimates for some components vary significantly. When adding up the lowest (highest) absolute search and negotiation costs, the min./max. MTACs (market transaction costs) displayed is obtained. The min./max. PITCs (pre-implementation transaction costs) and ITCs (implementation transaction costs) are obtained when the lowest (highest) figures for the

PITCs and ITCs cost components which do not depend on the projects' emission reduction are added together. The resulting min./max. TACs I (transaction costs) range from US$ 160,000 to US$ 715,000.

In order to highlight the effects of a project's total emission reduction on the specific transaction costs, Michaelowa and Stronzik (2002) applied absolute cost estimates to different project types and their generic range of emission reductions over a crediting period of ten years (Michaelowa and Stronzik 2002, p. 25). These emission reduction ranges were used in Krey's study in order to calculate the min. specific transaction costs on the basis of the min. transaction costs quantified in Table 23. The results are displayed in Table 24. They have been calculated as follows.

The min. MTACs, PITCs and ITCs I are taken from Table 23. It is assumed that they are applied to all project types in the same magnitude. For calculating the total min. PITCs and ITCs, the registration costs and the costs arising from the adaptation fee – a 2% tax on revenues from CER sales as proposed under the Marrakech Accords (UNFCCC, 2002) – were added. As these depend on the total emission reduction, they were calculated separately, for each project type and its generic emission reduction.

Costs arising from the adaptation fee were calculated by multiplying the total amount of emission reduction with the adaptation fee of 2%. The resulting value is the amount of CERs that will be deducted up to the end of the crediting period. The value was then multiplied with an assumed CER price of US$ 3.78 (Jotzo and Michaelowa 2002, p. 185). The resulting sum represents the total loss in CER revenue due to the adaptation fee. Specific transaction costs have been calculated by dividing the absolute cost figures by the anticipated total emission reduction.

Table 23: Estimates for absolute transaction costs of potential non-small-scale CDM projects by cost component

TACs		**US$**	
MTACs	Search Costs	18,000	3-15%pf CERs
	Negotiation Costs	29,000 - 471,000	
PITCs	Baseline Costs	20,000 - 25,000	
	Monitoring Plan Costs	8,000 - 18,000	
	Approval Costs	47,000	
	Validation Costs	6,000 - 34,000	
	Registration Costs	*5,000 - 30,000*	
ITCs	Monitoring Costs	12,000	
	V+C Costs	4,000 - 18,000 per turn	
	Adaptation Costs	*2%of CERs*	
Min./Max. MTACs		47,000	489,000
Min./Max. PITCs + ITCs I		113,000	226,000
Min./Max. TACs I		**160,000**	**715,000**

Source: Krey (2004)

On the basis of this preliminary estimation of specific transaction costs, Table 24 shows that min. specific transaction costs range from 0.12 US$/t CO_2 for "very large" projects to 212 US$/t CO_2 for "micro" projects. Transaction costs for "very large" and "large" projects are largely in line with the estimates based on the results of the Delphi survey (Section 4.2.4). However, Krey's bottom-up analysis of transactions costs reveals that the transaction costs for very small projects might be substantially higher than those calculated from the replies to the Delphi survey.

Table 24: Dependence of specific transaction costs of CDM projects on the total emission reduction

TACs	Total Emission Reduction over Crediting Period of 10 Years (Typical Project Type)									
	5,000,000 t CO_2e ("very large") (e.g. large hydro power, landfill methane capture, etc)		1,000,000 t CO_2e ("large") (e.g. wind power park, large industrial energy-efficiency projects, etc)		100,000 t CO_2e ("small") (e.g. small hydro, small industrial boiler conversion, etc)		10,000 t CO_2e ("mini") (e.g. energy efficiency in households or SMEs, mini hydro, etc)		1,000 t CO_2e ("micro") (e.g. PV)	
	US$	US$/t CO_2	US$	US$/t CO_2	US$	US$/t CO_2	US$	US$/t CO_2	US$	US$/t CO_2
Min. MTACs	47,000	0.009	47,000	0.047	47,000	0.47	47,000	4.70	47,000	47.0
Min. PITCs + ITCs	568,000	0.114	250,600	0.251	172,560	1.73	165,756	16.58	165,076	165.1
Min. PITCs + ITCs I	160,000	0.032	160,000	0.160	160,000	1.60	160,000	16.00	160,000	160.0
Registration Costs	30,000	0.006	15,000	0.015	5,000	0.05	5,000	0.50	5,000	5.0
Adaptation Fee	378,000	0.076	75,600	0.076	7,560	0.08	756	0.08	75.6	0.1
Min. TACs	615,000	0.123	297,600	0.298	219,560	2.20	212,756	21.28	212,076	212.1

Source: Krey (2004)

5.2.1.2 Case Study for India

In Table 25, the costs already quantified in the survey and the costs estimated by Krey following the procedure described above are presented. The underlying data of these cost estimates are based on a group of CDM projects. Costs are given in absolute terms and as a % of the total TACs for the lowest and the highest value, as found in empirical studies and estimated by survey participants.

As can be seen from Table 25, the lowest absolute costs quantified in the survey account for around 76 % of the lowest total transaction costs, according to the assumptions made. The highest costs quantified account for around 88 %. Therefore, it can be concluded that the major share of the total transaction costs accumulated by the selected projects was quantified in the survey.

Table 25: Shares of Transaction Costs Quantified in Total Transaction Costs of Selected CDM Projects in India

TACs (Data Availability)	**Lowest Cost Figures**		**Highest Cost Figures**	
	US$	**Share in Total TACs (%)**	**US$**	**Share in Total TACs (%)**
Search Costs	19,000	25.4	29,000	5.3
Negotiation Costs	10,500	14.0	10,500	1.9
PDD Costs	6,500	8.7	120,000	21.9
Validation Costs	6,000	8.0	80,000	14.6
Registration Costs	5,000	6.7	30,000	5.5
Adaptation Fee	10,193	13.6	212,349	38.7
TACs Survey	***57,193***	***76.4***	***481,849***	***87.8***
Approval Costs	1,000	1.3	10,000	1.8
Monitoring Costs	6,550	8.8	6,550	1.2
V+C Costs	10,112	13.5	50,559	9.2
TACs Estimates	***17,662***	***23.6***	***67,110***	***12.3***
Total TACs	**74,885**	**100.0**	**548,959**	**100.0**

Source: Krey (2004)

In Table 25, it can be observed that the share of each cost component in the total transaction costs varies from the lowest to highest value. This is especially evident in the case of the following components. The shares of search costs and negotiation costs in the lowest transaction costs (25.4 % and 14.0 % respectively) are much higher than is the case in the highest transaction costs (5.3 % and 1.9 % respectively).

In contrast, the PDD costs and costs arising from the adaptation fee are significantly higher in the highest transaction costs (21.9 % and 38.7 % respectively) than in the case of the lowest transaction costs (8.0 % and 13.6 % respectively).

An explanation for the prevailing status of costs stemming from the adaptation fee in the highest transaction costs could be that this is the only cost component that is mainly influenced by the projects total emission reduction. It could be asserted that the project with the highest emission reduction incurs the highest costs as a result of the adaptation fee and that the project with the lowest emission reduction incurs the lowest costs.

The significantly lower shares of search costs and negotiation costs in the highest transaction costs might indicate that there is a "ceiling" for these costs, as they were incurred by a number of projects in the same magnitude. By contrast, discrepancy in PDD costs is much more significant and consequently the share of PDD costs rises commensurately, from the lowest to highest transaction costs. Table 26 below displays the lowest and highest specific cost values for each cost component for which data was obtained as well as the sum of each.

Table 26: Shares of Cost Components in Specific Transaction Costs Quantified for CDM Projects in India

TACs (Data Availability)	Lowest Cost Figure		Highest Cost Figure	
	US$/t CO_2	Share in SUM (%)	US$/t CO_2	Share in SUM (%)
Search Costs	0.005	8.1	0.091	19.4
Negotiation Costs	0.002	3.2	0.044	9.4
PDD Costs	0.004	6.5	0.125	26.6
Validation Costs	0.003	4.8	0.080	17.0
Registration Costs	0.006	9.7	0.042	8.9
Adoption Fee	0.042	67.7	0.088	18.7
SUM TACs Survey	**0.062**	**100**	**0.470**	**100**

Source: Krey (2004)

As can be seen, costs from the adaptation fee have by far the highest share in the lowest specific transaction costs quantified (almost 68 %). It can be assumed that this is because it makes up the only cost component where economies of scale do not occur. In comparison with the costs arising from the adaptation fee, the share of the other cost components – each lying in the range of 3.2 % to 9.7 % – can be considered as minor.

Costs for the adaptation fee with a share of 18.7 % are considerably less prevalent in the highest specific transaction costs.

When considering the other cost components, it can be clearly seen that the share of PDD costs (26.6 %), search costs (19.4 %) and validation costs (17.0 %) is much higher than the share of negotiation costs and registration costs (9.4 % and 8.9 % respectively). It can be concluded that PDD costs, validation costs and the adaptation fee constitute the key share in the sum of specific transaction costs quantified for projects with relatively low emission reductions. Hence, it can be assumed that those cost components affect the viability of CDM projects to a large extent.

Comparing the above findings for India to the general assessment of Section 5.2.1.1, it becomes clear that the case study estimates are generally in line with, but slightly lower than, the common assessment, with regard to the total transaction costs. In general, there is a tendency to lower maximum estimates in the case of India. On the cost component basis, we also record consistent results with the general estimates – this is in particular true of registration fee estimates. Approval, monitoring and negotiation costs are, however, estimated to be lower in the Indian case study, whereas validation costs are evaluated as higher.

5.2.2 Risk in CDM Projects

CDM projects are subject to numerous risks. Beside the conventional project risks, additional risks arise from participating in the nascent carbon market. The risks can be categorised as follows (Jahn et al. 2004, PointCarbon 2005):

- **Conventional project risks:** Conventional project risks cover all the risks that are linked to the design and implementation of a traditional project activity. These risks relate to the construction, performance, financial engineering of a project, conclusion of enforceable contracts, credit worthiness of counterparties, environmental and social impacts and force majeure.
- **Kyoto risk:** The Kyoto risk principally relates to the perspectives of a post-Kyoto agreement and whether currently non-ratifying countries who would potentially participate in a CDM project will ratify and comply with its obligations. If the Protocol is not to prevail in the long run, it is questionable whether generated emission reductions achieved via the CDM can be applied in non-Kyoto emission trading regimes.
- **CER price risk:** The CER price risk relates to the uncertain market price for CERs. The market price is driven by the aggregate supply and demand for the amount of emission reduction credits (AAUs, ERUs, CERs). The demand side depends primarily on the number of countries making use of the Kyoto mechanisms. Kyoto ratification by the United States, for example, would raise the demand significantly. The supply of emission reduction credits will strongly be influenced by the amount of surplus AAUs coming from the countries with economies in transition, also known as "hot air". Thus, it is very difficult to forecast future prices for CERs.
- **CER quantity risk:** CER quantity risk means that the amount of CERs generated in a project cannot be precisely determined ex ante. The amount of CERs is derived from the difference between actual emissions and baseline emissions. The quantity of expected CERs may vary for the following reasons. The baseline has to be adjusted during the crediting period in step with technological innovation, new host country energy or environmental policy (baseline risk).. Actual project emissions alter unexpectedly, due to changes in the activity level of the project. A shift in the activity level could result from a change in demand for the project output, business interruption etc. (baseline emission risk). Imagine the baseline of a power plant being determined by an emission factor of 1 kg of CO_2/kWh. The actual emission factor is 0.8 kg of CO_2/kWh, so that the emission reduction accounted for is 0.2 kg of CO_2/kWh of generated power. If the power plant is shut down due to an unexpected interruption, the operator does not only lose the conventional power output, but also the associated emission reductions.
- **Country risk:** CDM projects are accomplished in DCs, where the economic, political, and financial situation is generally unstable in comparison to industrialised coun-

tries. Country risk includes the risk of dispossession, breach of contracts for political reasons and the risk that emission reductions might not be transferred to an Annex B country.

- **Registration risk:** It is possible that a project has not been registered as a CDM project in the UNFCCC database. This issue is called Registration risk. There is a backlog, but as soon as more projects are registered, this registration risk will decrease.

A survey of the most important risks for the JI and CDM flexible mechanisms, country risk, project risk and price risk are presented in Table 27.

Table 27: Risks for different flexible mechanisms

	Emissions trading		**JI**	**CDM**
	Internal abatement	**Purchase of emission permits**		
Country Risk	No	No	Country specific	Country specific
Project Risk	Low	No	High	High
Price Risk	Low	High	Medium	Medium

Source: Betz et al. (2005), ZEW

Assuming that CDM and JI projects are to be located in developing countries and economies in transition, differential risk premia may have to be considered in project analysis.

One method is to calculate risk premia for different countries using equity returns and risk of default compared to a base country. A methodological framework from which the risk premia for equities in different countries can be estimated is presented by Damadoran (undated). Damadoran (1999) calculates this for the USA, relative to a number of other countries in the world, using average default spreads for different credit rankings. Table 29 presents some of the results of this analysis. The estimates can be used as rough indicators of the country risk element to be applied to projects in the different countries, since they relate the risk of failure to the countries' own rating.

In Table 28, the average risk premia attributed to countries of different credit ratings are listed. Naturally, the level of risk rises as the credit rating falls.

These average risk premia in different countries provide the basis for preliminary estimations of the country risk premia, to which projects under JI and CDM are exposed (shown in Table 29).

Table 28: Average Risk Premia by Credit Ranking

Credit Ranking	Average risk premium
AAA	0.00%
AA1	0.60%
AA2	0.65%
AA3	0.70%
A2	0.90%
A3	0.95%
BAA1	1.20%
BAA2	1.30%
BAA3	1.45%
BA1	2.50%
BA2	3.00%
BA3	4.00%
B1	4.50%
B2	5.50%
B3	6.50%
CAA	7.50%

Source: Eckermann et al. (2003) based on Damodaran (1999)

As can be seen in Table 29, the Country Risk Premium in the Eurozone, Germany and the USA have the lowest (0.00%), whereas the premium is highest in Argentina (5.50%), Russia (5.50%) and the Ukraine (7.50%). Interestingly, the table shows that potential JI host countries, such as Bulgaria and the Ukraine, are classified as having a higher risk premium than potential CDM host countries, such as Brazil, India or Mexico.

Table 29: Estimates of Country Risk Premia for Equities

Country	**Long-Term Rating**	**Country Risk Premium**
Argentina	B2	5.50%
Australia	AA2	0.65%
Brazil	B1	4.50%
Bulgaria	B2	5.50%
China	A3	0.95%
Eurozone	AAA	0.00%
Germany	AAA	0.00%
India	BA2	3.00%
Japan	AA1	0.60%
Mexico	BAA3	1.45%
Russia	B2	5.50%
Saudi Arabia	BAA3	1.45%
Turkey	B1	4.50%
Ukraine	CAA1	7.50%
USA	AAA	0.00%

Source: Eckermann et al. (2003)

5.2.3 Conclusions

Transaction costs of CDM or JI projects consist of numerous components, such as search or registration costs and constitute a significant cost element for the use of the flexible mechanisms of the Kyoto Protocol. Economically, the consideration of transaction costs implies an upward shift of the supply curve, leading to a reduction of quantities traded and an increase in the equilibrium price. The efficiency of CDM or JI as market-based climate policy instruments is thereby compromised.

The literature survey that we conducted illustrates that the absolute level of transaction costs is more or less similar across all project types. Therefore, the size of a project is an important determinant in the costs per ton of carbon that is reduced: the spread between unit transaction costs for “micro” and very large projects appears to be dramatic. While the effect of transaction costs on large projects is almost negligible, they can be prohibitive for small projects. This may prevent projects from being undertaken that are otherwise cost-effective, and may even lead to some countries refraining from participating in CDM projects. However, concerning instrument choice within the project-based mechanisms, the available data for JI and CDM projects does not allow identifying significant transaction cost differences between the two instruments.

Due to their significant impact on the costs of using the project-based mechanisms, the following measures may be proposed to reduce transaction costs (Eckermann et al. 2003):

- Simplified modalities for small-scale projects,
- Rules that enhance transparency (especially in order to reduce search costs),
- Bundling of projects in order to jointly undertake each step of the project cycle,
- Verification and certification undertaken at long intervals,
- Exemption of selected projects from one or more steps of the project cycle,
- Streamlining of information that is needed for each step of the project cycle.

Besides transaction costs, CDM and JI projects are subject to numerous investment risks. Despite the conventional project risks, additional risks arise from participating in the nascent carbon market, such as country risk or CER price risk. This finding is in particular true of projects in developing countries and economies in transition. Unlike transaction costs, investment risk may differ between JI and CDM projects. This is mainly due to country risk, which (according to the observed data) is generally higher in Eastern European economies than in central CDM host countries.

5.3 Advantages and disadvantages of governmental purchase of CERs and ERUs

Germany has announced at both national and international level that it aims at meeting its Kyoto target without using the flexible mechanisms, apart from trading within the European Emissions Trading Scheme (EU ETS). Nevertheless, the purchase of CERs and ERUs by the government could be considered. The purchase of CERs or ERUs could have different scopes:

- CERs or ERUs could be used to reduce the costs of meeting the Kyoto target.
- A strategic reserve of CERs or ERUs for use in future commitment periods could be built up.
- A reserve of CERs or ERUs may help to address the uncertainty in meeting the Kyoto target. Since the actual emissions from 2008 to 2012 will depend on a number of uncertain factors, such as GDP growth, fuel prices and natural climatic variations, a small reserve of CERs or ERUs could be used in case the target is not met due to unexpected variations of these factors (e.g. systematically lower fuel prices than expected today).
- A public tender to purchase CERs or ERUs may be used to push particular technologies or project types.
- Germany could gain experience with using project-based mechanisms by initiating a public tender to purchase CERs or ERUs.

A public purchase of CERs or ERUs may have a single objective or different objectives. The advantages and disadvantages of a public purchase of CERs or ERUs differ with the scope of the purchase and are discussed in the following. The discussion is structured according to economic, environmental, legal and strategic issues. We do not consider the public purchase of AAUs – apart from the transactions within the ETS –, since the purchase of excess AAUs (hot air) would not result in any emission reductions and would, consequently, be very difficult to communicate, taking into account Germany's former positions and role in international climate negotiations.

5.3.1 Economic aspects

The public purchase of CERs or ERUs could potentially reduce the costs for compliance with the Kyoto Protocol. From the perspective of economic theory, the use of CERs or ERUs is efficient if the prices for CERs or ERUs are lower than the abatement costs of further domestic policies and measures. Thus, the benefits from purchasing CERs or ERUs crucially depend on the level of marginal abatement costs of a country. Both the marginal mitigation costs of domestic policies and measures and future prices for CERs and ERUs are uncertain. The existing assessments of mitigation costs and future prices of allowances use different methodological approaches and make different underlying assumptions. Respectively, the results differ significantly and should be assessed with care when discussing the potential cost reductions from the use of the flexible mechanisms.

Domestic abatement costs

Some studies have identified mitigation measures with relatively low or even negative mitigation costs. They include mitigation measures in part that are difficult to represent in top-down models, for example, since the power sector is only represented by a single production function in many models.

For example, Markewitz and Ziesing (2004) estimate that a 40% reduction by 2030 of the 1990 GHG emissions could be achieved with average mitigation costs of about 5 €/t CO_2e. Mitigation measures would mainly occur in the electricity sector by reducing electricity demand by energy efficiency measures, by substituting coal by natural gas in electricity generation and by increasing the use of wind power. A further reduction to 50% of the 1990 GHG emissions by 2030 would increase mitigation costs considerably (to about 35 €/t CO_2e), since more cost-intensive measures would have to be implemented.

Many mitigation measures have low or even negative mitigation costs, but their implementation is often prohibited by barriers, including several non-economic barriers (Section 5.2). These measures are often difficult to identify without detailed data for specific sectors, as used, for example, by Markewitz and Ziesing (2004). In this regard, the results from macro-economic models regarding the economic benefits of using the project-based mechanisms should be assessed carefully.

The economic consequences for industrialised countries of using the CDM are complex. From a cost-efficiency perspective, an extensive use of the CDM at present exploits relatively cheap abatement options in developing countries (which have not assumed binding reduction targets). Thereby, domestic abatement options of industrialised countries with relatively low marginal abatement costs are not exploited today and can be saved for future reductions. However, as soon as the availability of low-cost abatement options of developing (and other industrialised) countries decreases – e.g. due to their own emission reduction commitments – domestic options will have to play a more dominant role in the abatement portfolio of industrialised countries. From a structural economic perspective, covering a large part of emission reduction requirements by importing CERs leads to less domestic energy-efficient investments; what is more, shifts to less carbon-intensive fuels will not be undertaken. Consequently, domestic emissions will be higher in the long run and a – necessary – structural change towards an energy-efficient economy will occur more slowly. In this case, large domestic emission reductions required in the short term may cause high abatement costs. Reciprocally, achieving a large part of emission reduction requirements by domestic investments leads to lower future domestic emissions and fosters a structural change towards an energy-efficient economy.

Windows of opportunity and stranded investments

Alongside the economic efficiency and cost reductions that could be achieved, some other economic aspects should also be taken into account in assessing the use of the flexible mechanisms. Potential stranded investments (i.e. capital investments in technologies that turn out to not be economic at a later stage) related to investment cycles and uncertainties about the future climate policies constitute an important aspect in this context.

In many sectors that are particularly important for the long-term mitigation of GHG emissions, today's investment decisions will determine GHG emissions and mitigation costs in the long term. Often, there is only a limited timeframe, also referred to as 'window of opportunity', for long-term structural changes in the economy, since the costs for such structural changes could increase in the future. Furthermore, there is great uncertainty about the future international framework for the mitigation of climate change. Different expectations on such a future framework may result in stranded investments.

In the power sector, about 30 % to 45 % of the installed capacity needs to be replaced in Germany up to 2025 (Enquete-Kommission 2002, p. 235f). Future GHG emissions up to and beyond 2050 in Germany will depend considerably on what technologies will be used for new power plants planned over the next ten years. In this context, it is particularly important whether new lignite and coal power plants or natural gas fired power plants will dominate the capacity replacements. Most long-term mitigation scenarios identify natural gas-fired combined cycle power plants and the use of combined heat and power (CHP) as mitigation measures that have relatively low mitigation costs and considerable potential. A decision to invest in large new lignite (and coal) power plants could exacerbate future efforts to significantly mitigate GHGs, given that these plants could continue to operate well beyond 2050. With long-term GHG reduction requirements of 60 % to 80 %, the construction of new lignite power plants could result in a stranded investment, given that the current allocation rules and price expectation for allowances do not yet reflect these future reduction requirements. In this case, such plants may need to shut down before reaching their technical lifetime which would be associated with significant costs. The main cause of potential stranded investments in the case of the power sector is the large uncertainty related to future prices of allowances in the ETS.

The power sector is covered by the ETS and public purchase of CERs or ERUs does not directly affect decision-making by investors in the private sector. However, if the public purchase of CERs or ERUs is used to increase the amount of allowances in national allocation plans, it could result in price signals within the ETS that are not consistent with the long-term reduction requirements that have been envisaged and which therefore may lead to stranded investments.

Similar considerations apply to a number of other sectors in the economy. In the residential and commercial sector, new buildings are used for many decades. While the costs of measures to enhance the energy efficiency of buildings are low when undertaken during construction, costs become much higher for retrofits of existing buildings. Similar to the power sector, there is a window of opportunity for cost-efficient mitigation at a certain point of time – this being, the construction of new buildings – which is often not reflected in economic models. Consequently, it may appear more cost-efficient from a short-term perspective to purchase CERs and ERUs instead of establishing or continuing a program setting financial incentives for more efficient buildings. However, the purchase of CERs and ERUs may, from a longer-term perspective, result in stranded investments (i.e. inefficient buildings) with higher associated future costs (renovation, construction of new buildings) – which may exceed the cost savings achieved today, due to the use of CERs and ERUs.

Vehicles have a lower lifetime than power plants or buildings. Nevertheless, the efficiency of new vehicles today will determine GHG emissions for approximately two subsequent decades, since the efficiency of the existing vehicle stock can hardly be improved.

The long-term implications outlined here of the use of CERs and ERUs should be taken into account when assessing the public purchase of CERs and ERUs. In the light of the necessary long-term global emission reductions, it should be ensured that long-term structural changes that enable a significant reduction of GHG emissions in the future are not abandoned in favour of purchasing CERs and ERUs.

On the other hand, the CDM may, from a longer term perspective, induce technological innovation and structural changes in developing countries, which enable these countries to embark on less carbon-intensive emission paths, avoiding the lock-in in inefficient and carbon-intensive technologies. This is particularly relevant for countries which are already undergoing significant transformations.

However, the CDM project portfolio is currently still dominated by non-CO_2 mitigation options, which do not result in significant structural changes or technological innovations in developing countries (Chapter 2). Once these low-hanging fruits have been harvested, these effects might become reality in the longer run.

In order to provide incentives for structural changes and technological innovation in developing countries, a public purchase tender for CERs might prioritise the purchase of CERs from respective project types, such as renewable energies or energy efficiency technologies.

5.3.2 Environmental aspects

The Kyoto Protocol and the Marrakech Accords require that emission reductions from CDM and JI project activities should be additional, i.e. emissions should be reduced below the levels in the absence of the CDM or JI project activity. In other words: project activities also taking place in the absence of the CDM or JI should not be registered. If a project activity is additional, the registration and the subsequent use of CERs or ERUs to fulfil commitments are neutral with respect to global GHG emissions.

If a CDM project activity is also implemented in the absence of the CDM, the registration and subsequent use of CERs results in a global increase of emissions, since the CERs did not result in a decrease of emissions, but rather allow Annex I countries to increase their emissions. This is different for JI, since the ERUs are issued from assigned amount units (AAUs), which, in the absence of JI, would likely be used for compliance purposes in the first commitment period or be banked for a subsequent commitment period.

In practice, the demonstration of additionality is difficult to verify, since it is counterfactual. Most stakeholders agree that many CDM project activities are not additional in practice and would also be implemented in the absence of the CDM. In the Delphi survey, 86 % of the participants agreed with the statement that "*In many cases, carbon revenues are the icing on the cake, but are not decisive for the investment decision*" and 71 % agreed with the statement that "*Many projects would also be implemented without registration under the CDM*" (Section 4.2.12). Hence, if the CDM is used to fulfil commitments, it should be made clear that alongside the positive effects – contributions to a more sustainable development path in developing countries, mainstreaming mitigation of GHG emissions in the public and private sector, building capacities on climate change mitigation, etc – the use of the CDM will likely result in increased global GHG emissions in the short term.

In response to the well-known environmental concerns about the CDM, a possible consequence could be that a public purchase programme focuses on JI projects or CDM projects that may have positive spill-over effects in terms of GHG emission reductions in the long term, such as innovative technologies or practices, for example. Innovative technologies, implemented under CDM or JI, may help to run down learning curves and diffuse such technologies, thereby indirectly involving further GHG emission reductions in the future.

5.3.3 Legal aspects arising from decisions adopted under the Kyoto Protocol

The guidelines under the Kyoto Protocol include several legal aspects with respect to the use of CERs and ERUs to fulfil commitments.

Supplementarity: The Marrakech Accords under the Kyoto Protocol established that "*the use of the mechanisms shall be supplemental to domestic action and that domestic action shall thus constitute a significant element of the effort made by each Party included in Annex I to meet its quantified emission limitation and reduction commitments* *under Article 3.1*".[48] This provision has little legal relevance, since the language is relatively vague and since the use of Kyoto units from the flexible mechanisms has not been limited in the specifications of the International Transaction Log (ITL), i.e. the trade of Kyoto units has not been limited technically and the compliance committee under the Kyoto Protocol would have a rather weak legal basis if they were to criticise countries that use the flexible mechanisms extensively. However, it should be noted that the EU aimed at limiting the use of the flexible mechanisms to 50% of the reduction commitments as part of the negotiations for Marrakech. A more extensive use of the flexible mechanisms by the EU could be difficult to communicate publicly. In the case of Germany, a 50% cap on the use of the flexible mechanisms would correspond to 10.5% of its 1990 emissions, and in turn to about 653 million CERs and ERUs for the first commitment period. Even if the CERs and ERUs are extensively used in the ETS, Germany would not need to use the mechanisms to such an extent in order to meet its Kyoto commitment. In conclusion, the supplementarity provisions under the Kyoto Protocol have no practical relevance for Germany.

Carry-over of CERs and ERUs: If CERs or ERUs are intended to be used in future commitments, units valid for the first commitment period would need to be carried over to subsequent commitment periods. According to the modalities for the accounting of assigned amounts under Article 7.4 of the Kyoto Protocol (Decision 19/CP.7), the carry-over of CERs and ERUs to subsequent commitment periods is limited to 2.5% of the assigned amount[49] for both CERs and ERUs. lCERs and tCERs from afforestation and reforestation activities are not permitted to be carried over in any form to subsequent commitment periods.[50] According to Germany's most recent national GHG inventory submitted in 2005, the 2.5% cap for CERs and ERUs would correspond to a maximum carry-over of about 120 million CERs and 120 million ERUs to the second commitment period.[51] The amount would become correspondingly smaller with lower assigned amounts in any future commitment periods. In practical terms, this provision could be circumvented easily: a country could retire the purchased CERs and ERUs and carry over a respective quantity of AAUs, since the carry-over of AAUs is not restricted. Hence, Germany could even purchase and indirectly carry over larger amounts than the cap indicated above. However, an indirect carry-over through retirement of CERs and ERUs and carry-over of AAUs would imply that Germany would formally make use of the flexible mechanisms already in the very first commitment period – which may produce a communication problem (Section 5.3.4). The cap for carry-over could also become relevant if the private sector within the ETS is to carry over significant amounts of CERs and ERUs. Since borrowing of allowances from future commitment periods is not

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[48] Paragraph 1 of Decision -/CMP.1 (Principles, nature and scope of the mechanisms pursuant to Articles 6, 12 and 17 of the Kyoto Protocol), FCCC/CP/2001/13/Add.2, p. 3.

[49] Paragraph 15 of Decision -/CMP.1 (Modalities for the accounting of assigned amount), FCCC/CP/2001/13/Add.2, p. 59.

[50] Paragraphs 41 and 45 of Decision -/CMP.1 (Modalities and procedures for afforestation and reforestation project activities under the clean development mechanism in the first commitment period of the Kyoto Protocol), FCCC/CP/2003/6/Add.2, pp. 24-25.

[51] 1,243,692 Mt CO_2e (in 1990) * (1-21%) * 5 * 2.5%.

possible under the Kyoto Protocol and the ETS, companies under the ETS could use a reserve of CERs and ERUs which provides them with flexibility in fulfilling their commitments and which may be carried over to subsequent commitment periods.

In summary, restrictions on carry-over under Article 7.4 are also expected to have little *legal* relevance for Germany.

Cap on use of tCERs and lCERs: The Marrakech Accords established, furthermore, a cap of one percent of the base year emissions, multiplied by five for the use of tCERs and lCERs in the first commitment period.[52] This corresponds to a maximum use of 62 million tCERs or lCERs for the first commitment period in Germany. Given the expected limited availability of tCERs and lCERs for the first commitment period, it is not anticipated that this threshold will be very relevant.

In conclusion, since Germany has not planned to use the flexible mechanisms up to now in meeting its Kyoto target, the legal restrictions under Kyoto Protocol are very unlikely to have practical relevance for Germany. However, restrictions related to the carry-over of CERs and ERUs need to be taken into account if Germany is to start building up a reserve of CERs and ERUs for use in future commitment periods.

5.3.4 Strategic issues

Germany has so far communicated on a national and international level that it will meet its Kyoto target by implementing domestic policies and measures. The public purchase of CERs or ERUs would be a change in the general strategy, which would need to be communicated carefully.

The net GHG emissions of Germany were 18.2 % below its 1990 emissions in 2003 (EEA 2005). Although the Kyoto target of 21 % has almost been reached, the emission trends in recent years, indicate – in addition to projections – that the adoption of further policies and measures is necessary for the Kyoto target to be met. The annual report by the EEA (2005) on GHG emission trends and projections in Europe estimates that with existing policies and measures, Germany's GHG emissions will be 1.2 percentage points higher than the Kyoto target (without LULUCF) in 2010, based on several official sources.

Given that Germany is not far from reaching its Kyoto target, a public purchase program for the use of CERs or ERUs in the first commitment period would be difficult to communicate publicly in a consistent manner with the previously communicated image of a "leadership country" with respect to climate mitigation. This is because a national purchase program for the first commitment period would imply that Germany would not necessarily need to implement any further domestic policies and measures to meet the Kyoto target. Other objectives for the public purchase of CERs or ERUs, such as the build-up of a strategic reserve of CERs or ERUs for use in future commitment periods, or a focused program to promote certain technologies or particularly sustainable projects, could be easier to communicate publicly.

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[52] Paragraph 7 (b) of Decision 17/CP.7, FCCC/CP/2001/13/Add.2, p. 22.

In times of tight public budgets being consolidated, an important aspect is whether the public purchase of CERs and ERUs burdens or unburdens public budgets. The public purchase of CERs or ERUs would require additional financial resources being made available for this purpose. Given the ongoing consolidation of public budgets, it may be difficult to make such resources available. This applies particularly to the option of building up a strategic reserve of CERs and ERUs for use in future commitment periods. In a situation where future targets have not been negotiated, and CERs and ERUs were purchased for long-term strategic uses, it might be difficult to make significant financial resources available.

If CERs or ERUs are purchased for use in the first commitment period, it could be argued that the public purchase of CERs or ERUs could be financially more favourable than the provision of financial resources required to implement additional measures in sectors not covered in the ETS. However, this depends on the assumptions on costs for domestic measures and future prices for CERs or ERUs. Furthermore, a number of additional policies and measures that are envisaged – such as the use of renewables for heat generation – do not burden the public budget, but rather put the financial burden on consumers or the private sector. It seems unlikely, therefore, that the public purchase of CERs and ERUs will unburden public budgets.

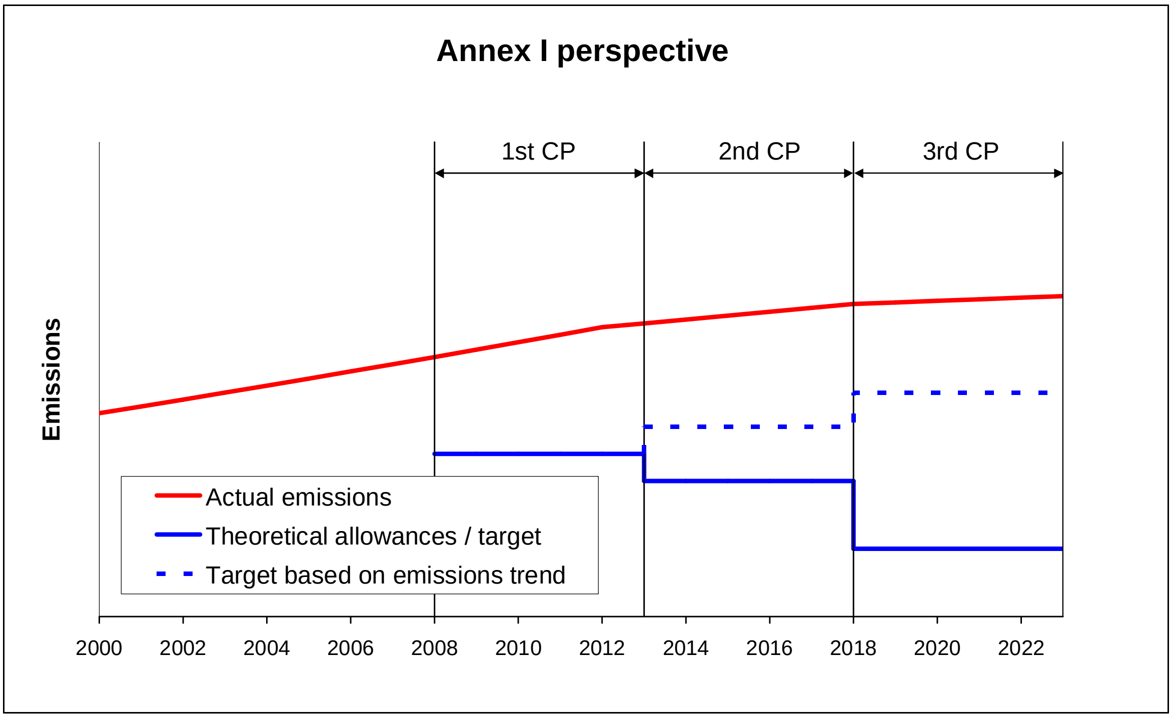
A more strategic, long-term environmental problem in using the flexible mechanisms is related to the implications of the negotiations of future commitments. As yet, it is unclear what the basis for future emission reductions targets will be. In principle, absolute or relative targets could be based on:

- historical emissions data preceding the adoption of the Kyoto Protocol (e.g. 1990),
- the assigned amount allocated for the first commitment period, or
- recent emissions data (e.g. emissions during the first commitment period).

An extensive use of the flexible mechanisms may have implications on future targets of both industrialised countries and developing countries.

In industrialised countries that are heavily reliant on flexible mechanisms, the actual emissions are significantly higher than the assigned amount allocated to country. In theory, any future targets should not depend on whether a country has used flexible mechanisms in the past. However, in practice, an extensive use of the mechanisms could influence negotiations on future targets, since an ambiguous future target would become even more difficult to meet. This is because the difference between a more ambiguous target and the actual emissions is greater for countries who have strongly relied on flexible mechanisms, than for countries who have primarily undertaken domestic measures. This is schematically illustrated in Figure 49 below. As a result, future targets for countries who have strongly relied on flexible mechanisms might become looser in practice, than those for countries who have primarily undertaken domestic action.

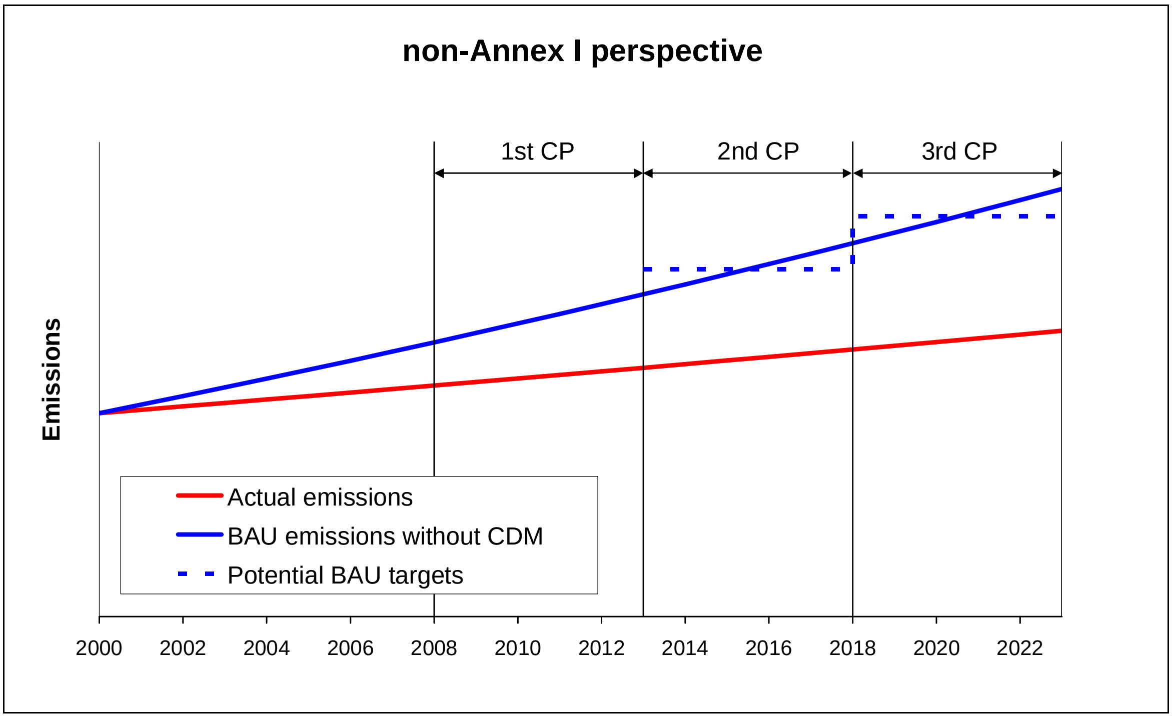
Figure 49: Effects of purchase of Kyoto units on negotiations for future targets in industrialised countries



Source: Öko-Institut

If GHG emissions are significantly reduced in a developing country by dint of CDM project activities in the first commitment period, the respective quantity of CERs also needs to be issued during the subsequent commitment periods, until the crediting period comes to an end (up to 21 years). This may cause difficulties when this country takes over a national or sectoral target in the second or third commitment period. Previously initiated projects under the CDM would need to receive CERs from a sector or country who may have an emissions cap. In this case, the CDM would become a similar mechanism to JI, where ERUs are converted from the assigned amount. As a consequence, CERs would need to be converted from assigned amount units allocated to the country or sector. In this case, in negotiations on their targets, developing countries would request that the CERs that need to be issued from their cap are included and reflected in their national or sectoral target, since they would otherwise have difficulties issuing the respective quantities of CERs. As a consequence, it is likely that future emission reduction targets (of any sort) for developing countries will not be based on their actual emissions, but rather on the higher emission level that would have occurred without the CDM. This is schematically indicated in Figure 50 below.

Figure 50: Effects of purchase of Kyoto units on negotiations for future targets in developing countries



Source: Öko-Institut

This strategic problem becomes particularly problematic if some CDM projects are not additional. In this case, global GHG emissions would not only increase in the short term due to the non-additional CDM projects, but could additionally result in looser mitigation targets of developing countries.

In summary, an extensive global use of CDM could potentially result in difficulties during negotiations of future commitments for both industrialised and developing countries, potentially resulting in less ambitious climate mitigation targets. However, this effect can hardly be influenced by Germany, but depends rather on future climate negotiations and the extent to which CDM is being used on a global level.

5.3.5 Conclusions

In considering the governmental purchase of CERs or ERUs, there are a number of aspects that should be taken into account. While the legal provisions under the Kyoto Protocol do not provide relevant limitations for Germany's purchase of CERs and ERUs, there are a number of aspects that suggest that any purchase should be considered carefully. Firstly, the purchase of CERs is likely to result in higher global levels of GHG emissions, mainly because most CDM projects are not considered to be additional, but also due to possible negative implications for structural changes in the direction of less GHG-intensive emission paths in Germany. This would make it more difficult for ambitious climate mitigation targets to be achieved in the future. Secondly, there still appears to be a significant potential for GHG abatement in Germany at a reasonable cost.

5.4 Instruments for promoting the use of CERs and ERUs in Germany

The Delphi survey has also revealed the need for the institutional framework of the project-based mechanisms to be strengthened (Section 4.2.2), by improving the financial endowments of the CDM and JI institutions, for example. The additional resources would certainly increase the supply of CERs by enabling the Methodological Panels (MP) and the CDM Executive Board (EB) to approve more new baseline methods and register more CDM projects. This measure would, therefore, improve the framework conditions for the flexible mechanisms in general and would also indirectly promote the use of those instruments in Germany.

However, since the parties to the Kyoto Protocol pledged, in their first meeting in December 2005 in Montreal, to contribute more than US$ 9.4 million for the CDM Executive Board, the Methodological Panels and the management of the JI, some of these demands seem to have already been satisfied. Germany contributed US$ 1 million of this budget (PointCarbon 2005). Thus, we do not see any further need for additional contributions by Germany in the short term.

According to the experts, PDD development is by far the most important driver of transaction costs (Figure 30). However, they also believe that the use of approved baseline methodologies will significantly reduce the transaction costs (Section 4.2.6). Therefore, supporting the development of baseline methodologies would additionally improve the framework conditions of flexible Kyoto mechanisms. Such support is particularly needed for project categories which are less attractive from the investor's perspective, and rather more attractive from the host government's perspective, such as small hydro, transport, demand-side efficiency, etc. (Section 4.2.3). Germany might focus its support on methodologies for technologies where it has a proven track record, for example renewable energies or demand-side energy efficiency. Methodological support might increase the market share of these project categories, thereby indirectly increasing the demand for German technologies.[53]

Measures such as those described above will improve the framework conditions for the project-based Kyoto mechanisms in general and, correspondingly, promote the use of these instruments in Germany in an indirect fashion only. We do not, therefore, elaborate on this kind of measures, but rather focus on measures which directly promote the use of CERs and ERUs in Germany. Some of these chiefly address the purchase of these instruments by private entities, whereas others focus predominantly on government purchase.

[53] However, these effects will be rather small, if indeed noticeable at all. For more details, see Section 5.4.4 below.

Instruments for promoting the use of project-based mechanisms should help to overcome existing barriers. Some of the key barriers are high transaction costs, significant risks and lack of information on the use of these instruments.

5.4.1 Funds

Operators of installations covered under the EU ETS might intend to use project-based Kyoto mechanisms. However, they might refrain from doing so since they flinch from the efforts which this decision would induce: they would have to identify an appropriate country and adequate projects. Moreover, they must either develop a project idea by themselves or co-operate with a project developer abroad. All these decisions include several uncertainties and risks and consume time and money.

The appropriate instrument for addressing these hurdles is a fund for project-based mechanisms. Such a fund might gather the demand of several operators for project-based flexible mechanisms and then identify the appropriate projects to fulfil this demand. In this way, the managers of the fund can reduce the transaction costs by making use of economies of scale and reduce simultaneously the risks through the compilation of adequate project portfolios with opposing risk structures.

Unsurprisingly, several such public and private funds do already exist. Section 5.1 provides an overview of the size, aims and alignment of these funds. Some of these funds are national funds to provide the governmental demand, others are national or international funds which intend to fulfil the demand for reduction credits from companies. Germany has also established a fund for the use of project-based mechanisms: the KfW-*Klimaschutzfonds* (Climate Protection Fund) was initiated in 2004 by the KfW, a public bank partly owned by the Federal Government (80%) and the Federal States (20%). At the outset, this fund was endowed with € 10 million and aimed to attract an additional € 40 million from private companies. By the end of 2005, the *KfW-Klimaschutzfonds* had already attracted € 70 million from more than 20 companies, predominantly from Germany, but also from Austria, Luxembourg and France.[54]

This instrument is evidently quite successful and has evolved into to a "fast-selling item". Table 18 also illustrates that this is not only the case in Germany, but that such funds have emerged in several countries, several of them completely private or at least semi-private. The private sector has intrinsic interests in establishing such funds, even without governmental initiative or support. Thus, we do not see any need for governmental support of this instrument to be continued in Germany. This is in line with the views expressed in the Delphi survey: more than half of the experts agree that public procurement tenders, for instance, are less important, or are not important at all in overcoming the barriers to the project-based mechanisms (Table 52). Nevertheless, the development of the *KfW-Klimaschutzfonds* should be carefully observed and evaluated on a regular basis in order to avoid undesirable trends of such an important instrument.

[54] KfW, 7. November 2005, KfW-Klimaschutzfonds hat 80 Mio. EUR erworben (KfW acquired € 80 million), http://www.kfw.de.

5.4.2 Insurance

Companies who plan to purchase CERs or ERUs face the risk that these credits will never be delivered, because the project was never realised, cannot provide the planned amount of credits, or has completely collapsed. Usually such purchase contracts are therefore designed as so-called 'futures', which will only be paid on delivery of the emission reduction credits. Such types of contracts help to avoid investors losing their money. However, if the certificates are not delivered at the agreed date, the potential buyers still might have a compliance problem because they lack reduction credits which are needed in order to comply with their commitments. If the certificate market is liquid enough, they will be able to use their capital to purchase credits or allowances from other suppliers. However, the price of Kyoto units might have increased in the meantime, so that they are still worse off, although they did not have to write off the capital reserved to pay for the CER or ERU futures.

However, not all project developers can accept payment on delivery. Some projects – particularly small-scale projects – need at least a certain share of upfront payments to get the project going, since the financing conditions are unfavourable and do not allow for the projects to be initiated without any upfront contribution by the investor. In the case of upfront payments, the investors additionally face the risk of losing their money if the projects do not develop as planned.

Both risks are conventional business risks which are associated with other business transactions and particularly international transactions as well. They can be hedged by private insurance policies, which demand a premium on the certificate or allowance price for their service and compensate for the losses in the case of the pre-defined irregularities. Currently, several insurance organisations – such as Austrian Garant Insurance, French Global Sustainable Development Project and Swiss Re Greenhouse Gas Risk – have launched the first carbon delivery guarantee insurance. In the case of non-delivery, the insurance will pay a pre-determined price for the certificates which are not delivered (Brown Rudnick Berlack Israels LLP 2006, p. 20). In another initiative, several players of the project-based mechanisms market are involved in the formation of a carbon delivery guarantee insurance to be called *Parhelion*. They will hedge the upfront payments for a project and intend to charge between 6 and 10% of the upfront payments as a risk premium to cover the costs of their service.[55]

At the time being, these insurance products do not really hedge the non-delivery risk, since they do not provide replacement certificates, and compensate only for the economic losses brought about thereby. However, it is not unlikely that full carbon delivery guarantees (which provide replacement certificates) will emerge in the medium term. As the examples illustrate, there does not seem to be any need for government intervention in this market. Hedging is an intrinsic interest of all business activities and where such interests are strong enough, an appropriate insurance product will emerge. Government intervention might, in contrast, lead to a crowding-out of private initiatives. We recommend, therefore, that such activities should not be undertaken.

55 Personal communication by Mr. Lafeld, 3C, on 25th January 2006.

Despite the fact that the experts in the Delphi survey did not regard debt guarantees for national project developers or exporters of technologies for CDM or JI projects as particularly important in surmounting barriers to project-based instruments (Section 4.2.2), such an instrument might still be included in a strategy for promoting project-based flexible mechanisms in Germany. It might hedge CDM or JI projects against several non-economic risks, such as nationalisation, war, revolutionary conflicts or the breaching of legally-binding promises. In this way, they would certainly reduce some of the typical risks associated with CDM and JI projects and simultaneously contribute to the promotion of JI and CDM projects. However, such governmental guarantees for foreign direct investments already exist in Germany; they are commonly known as *Hermesbürgschaften* (*Hermes guarantees*, Germany's export credit insurance agency) and cover both export risks and foreign direct investment risks, the latter through an instrument called *Investitionsgarantien*[56], (*investment guarantees*). In the framework of CDM and JI projects, the latter guarantees are of special interest. They are managed by PriceWaterhouseCoopers (PWC) and have already been used for several renewable and energy efficiency projects. However, a specific program for promoting the use of these investment guarantees for CDM and JI projects does not exist and does not seem to be necessary, since the instrument can by used for this purpose alone.[57] Nevertheless it might be helpful to promote the presence of these investment guarantees to a greater degree within the group of companies covered by the EU ETS and potential project developers.

5.4.3 Information

Improving knowledge of the options for using the project-based Kyoto mechanism in Germany might also help to promote and extend the use of these mechanisms. Such a strategy might include information campaigns designed to spread the options of using these instruments in Germany within the relevant focus groups (mainly companies covered by the EU ETS) on the one hand, and advice and guidance which help to apply these rather complex instruments if a company has already decided to use them, on the other hand.

However, the participants of the Delphi survey did not consider this instrument very important in overcoming barriers to the CDM. The majority of the experts deem this strategy to have a low importance; more than a half of the experts think that is has a low importance, or indeed none at all (Table 52, pp. 207-213). One reason for this view is certainly that the experts regard several other measures and strategies as more important in overcoming the hurdles to the project-based mechanism (Section 4.2.2). However, information on these instruments is already available in abundance. The possibilities of these mechanisms are well known among the companies; therefore, experts do not deem additional effort (in terms of information campaigns on the project-based Kyoto mechanisms) to be necessary.

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[56] Investitionsgarantien der Bundesrepublik Deutschland, AuslandsGeschäftsAbsicherung (AGA), http://www.agaportal.de.

[57] Personal communication by Mr. Pfitzner, PWC AG Wirtschaftsprüfungsgesellschaft, on 25th January 2006.

This is true not only of information campaigns, but also of guidance on the implementation of these instruments by German companies. The first comprehensive guidance document on the flexible mechanisms was published as early as 2001 by the Ministry for the Environment of the State of Baden-Württemberg (Betz et al., 2001). Since then, the document has been updated twice. The most recent edition was published in 2005 and includes all aspects relevant for making use of the flexible mechanisms in Germany on over 700 pages (Betz et al., 2005). Since the level and quality of available information on project-based mechanisms is already quite good, we recommend that additional efforts should not be made with regard to this instrument.

It would, nevertheless, be helpful to establish regular stakeholder meetings between the governmental administrations of the flexible mechanisms in Germany and a selection of stakeholders from business associations, NGOs, the research community, and project developers, etc. Such meetings should be used in order to identify new barriers which always emerge in the practical implementation of such instruments. It could also – as is the case in the UK (PointCarbon 2006a) – address issues related to the implementation of the so-called Project Mechanisms Act (ProMechG), which is the German transposition of the Linking Directive (2004/101/EC). The German emissions trading working group (*Arbeitsgruppe Emissionshandel*; AGE for short), which was set up in 2000 (Schafhausen 2004) shortly after the European Commission presented its Green Book on Emissions Trading (COM(2000) 87 final), serves as such a stakeholder meeting, by dint of its several sub-working groups. It should be continued on a regular basis – even if the structures of emissions trading are already well established – in order to address upcoming problems related to the use of flexible Kyoto mechanisms in Germany.

5.4.4 Governmental purchase

Whilst we discussed instruments which might help in surmounting barriers to the extended use of project-based mechanisms by private entities or companies covered by the EU ETS in previous sections, we will focus in this section on the question as to whether the German government should complement its domestic policies for reducing emissions of greenhouse gases with strategies for using project-based Kyoto mechanisms.

For this purpose, it would be fruitful if the potential goals of governmental purchase presented in Section 5.2 were reiterated:

1. Reduction of costs;
2. Strategic reserve for future commitment periods;
3. Reserve to cover business cycle or temperature uncertainties;
4. Promotion of certain technologies or project categories;
5. Gaining experience via learning-by-doing.

These goals of government purchase are not necessarily alternatives. Some of them might be pursued simultaneously, whereas others can be considered as options to be selected alternately:

1. *Reduction of costs*. Cost reduction can be one goal of investing in flexible Kyoto mechanism. However, the economic attractiveness should not be the only criterion, particularly since most experts expect that many projects are not really additional (Figure 39). As the extensive use of flexible Kyoto mechanisms in Germany would also prevent necessary structural changes towards a low carbon economy (Section 5.2), the economic advantages of purchasing flexible mechanisms should not constitute the sole and main argument. Nevertheless, if flexible Kyoto units are purchased to achieve other targets, they will rather likely contribute simultaneously to a reduction of the compliance costs in Germany (Section 3.7).
2. *Strategic reserve for future commitment periods*. The expectation that carbon prices will be substantially increased in the future forms the rationale for founding a strategic reserve. Taking into account the broadly accepted need to reduce greenhouse gas emissions to a considerable degree, the assumption does not seem to be brazen. However, if the parties to the Kyoto Protocol fail to agree upon a continuation of the Kyoto or a similar regime, carbon prices might collapse. Investing in a strategic reserve of flexible Kyoto mechanisms would, therefore, also serve as a firm commitment to continuing with Kyoto or a similar regime. Nevertheless, a reserve can only be considered strategic if it covers a substantial amount of future reduction targets. Germany has committed to reducing its GHG emissions by more than 30 % compared to 1990 levels in 2020, if the EU as a whole agrees upon a 30 % reduction (CDU/CSU/SPD 2005, p. 54). In this case, Germany has to reduce its GHG emissions compared to 1990 by at least 370 Mt CO_2e during the period from 2017 to 2022. Assuming that a strategic reserve would cover 20 % of that reduction target and assuming a price of € 10 per flexible mechanism unit, more than € 3.7 billion would be necessary to purchase these units today. The economic advantages of a strategic reserve might be substantial: given that the real carbon price will increase to 40 €/CO_2e by 2020 and assuming a real discount rate of 6 %, the costs incurred in achieving that goal might be almost halved by early investment in flexible Kyoto mechanisms alone.

   However, taking into account that Germany has been breaching the EU's Maastricht criteria for several years, investing in a strategic Kyoto reserve appears virtually impossible.
3. *Reserve to cover business cycle or temperature uncertainties*. The Kyoto targets are absolute targets. In order to comply, the countries have to achieve the target, or undershoot it. However, an unexpected boom or a series of rather cold years may result in emissions that are higher than expected. The temperature effect alone may increase the total CO_2 emissions in a 5 year period by up to 0.8 %, or 37 Mt CO_2e.[58] If uncertainties resulting from business cycles are also incorporated, a reserve of 1 or 2 % of the reduction target seems to be justified. Assuming a medium-term reduction target of -40 %, this would correspond to a reserve of some 25 to 50 million Kyoto units to cover the uncertainties of a five year period. To acquire these units, some € 500 mil-

[58] Estimated against the background of average deviation of the temperature adjusted and actual CO_2 emissions (Ziesing 2006, estimatations by author).

lion would be needed from the federal budget. However, since the reserve can be built up over several years, it is not necessary for these financial resources to be provided in one fiscal year. One risk remains with such a reserve: it might be considered to be a regular contribution to achieving the GHG reduction target. However, in this case the reserve would not serve as a reserve any more. It would, in addition, mean abandoning the goal of achieving the mitigation targets by course to domestic measures alone.

4. *Promotion of certain technologies or project categories.* Government purchase of project-based Kyoto units might exclude certain project types or categories, and foster others. In this way, the German government might hinder the expansion of project categories which are regarded as not additional or not sustainable, or promote the expansion of other project categories which would not be developed by market forces alone (transport, end-use energy efficiency, etc.). This, however, would definitely result in comparatively higher mitigation costs, which is not in itself a bad thing, but should nevertheless be kept in mind. This strategy might also be adopted in order to promote project types in which German companies have a proven track record so as to foster Germany's technology export. This, again, might – as a double dividend – increase employment in Germany. However, it could be questioned whether these effects would be noticeable at all. Due to European competition regulations, tenders for projects or Kyoto units cannot be restricted to German companies, but have to be open to all companies. Correspondingly, it cannot be guaranteed that German companies will be the main profiteers from these acquisitions. An early analysis of the Dutch Emissions Reduction Procurement Tender (EruPT) has revealed that Dutch companies profited the most from the first tender round, mainly due to their better knowledge of the background and political structures in the Netherlands. However, the participation of foreign companies was much stronger in the second round (Cames et al. 2004, p. 148f). Looijenstein (2002) assumes, nevertheless, that Dutch companies benefited from these tenders (at least indirectly) by dint of an increased demand for Dutch mitigation technologies.

5. *Gaining experience via learning-by-doing.* Several parties to the Kyoto protocol have already established acquisition programs for project-based flexible Kyoto units (Table 18). In doing so, they are able to gain experiences in this area, can identify the strengths and weaknesses of these instruments and contribute to the improvement of their design and management. Germany can, on the other hand, only contribute on a theoretical level to these debates. Additionally, Germany will have to develop the foundation for an acquisition program from scratch, if the German government is to abandon its policy of achieving the agreed mitigation target by means of domestic measures alone.

Taking into account the pros and cons of the different motives for the government purchasing project-based Kyoto units, the strategic reserve can certainly be excluded from further consideration, at least in the medium term. Rather, it is assumed here that the German government is standing by its commitment to achieving its Kyoto and burden sharing target by means of domestic measures alone.[59] However, a smaller reserve to cover temperature or business cycle uncertainties seems to be feasible and compatible with Germany's commitment to achieve all necessary GHG reductions by recourse to domestic measures. A reserve of some 25 to 50 Mt CO_2e should be adequate in covering the uncertainties encompassed by a five-year commitment period. Taking the price of 10 € per CER or ERU as a basis, building up this reserve between 2008 and 2017 would require financial resources of some € 25 to 50 million annually. This amount is, of course, not exactly "peanuts", but it should be possible to finance it from the federal budget, even if resources are rather scarce. At the same time, this uncertainty reserve might be used to promote certain project technologies and categories. Moreover, it would definitely increase knowledge about flexible Kyoto mechanisms in Germany and would help buttress the structure which is necessary for the use of these instruments in Germany.

5.5 Conclusion and Recommendations

Instruments for promoting the use of project-based Kyoto mechanisms in Germany can be differentiated according to those instruments which facilitate the use of these mechanisms by private entities, particularly companies which are covered under the EU ETS, and those instruments which result in the use of such mechanisms by the German government.

Since the introduction of the EU ETS has already created a strong demand for project-based Kyoto units in the private sector, the first category aims for the main part at removing barriers which impede the use of these mechanisms. Transaction costs and risks are identified as the key barriers to using these mechanisms. Funds which gather the demand of several investors may reduce transaction costs by dint of specialisation and economies of scale and – by producing project portfolios in a clever manner – the risks as well. The remaining risks can be further reduced (although never completely eliminated) with the help of insurances.

Section 5 provides an overview of more than 30 funds, some of them purely public or private, some of them run in public-private partnership. Germany has also established a fund for the use of project-based mechanisms: the KfW-*Klimaschutzfonds* (Climate Protection Fund) was initiated in 2004 by the KfW (Germany's governmental credit agency for reconstruction). The fund has been quite successful so far and has attracted substantially more private investments than was envisaged, not only from German companies, but also from Austrian, Luxembourgian and France ones, too.

Insurances which hedge the non-delivery risks of upfront payments or the non-compliance risk of futures paid on delivery are not yet fully operational, but are under preparation. Currently, several insurance organisations, such as Austrian Garant Insur-

[59] The German Climate Protection Program (BMU 2000) does not explicitly exclude the use of flexible Kyoto mechanisms. However, it does enumerate only domestic measures for achieving the target (BMU 2000, pp. 9-12).

ance, French Global Sustainable Development Project and Swiss Re Greenhouse Gas Risk, have launched the first carbon delivery guarantee insurance. In the case of non-delivery, the insurance will pay a pre-determined price for the certificates which are not delivered. In another initiative, several players of the project-based mechanisms market are involved in forming a carbon delivery guarantee insurance called *Parhelion* which will hedge the upfront payments for a project.

Debt guarantees for national project developers or exporters of technologies for CDM or JI projects might hedge CDM or JI projects against several non-economic risks, such as nationalisation, war, revolutionary conflicts or the breaching of legally-binding promises. However, such governmental guarantees for foreign direct investments called *Investitionsgarantien* (*investments guarantees*) already exist in Germany and could be used for CDM and JI projects. Nevertheless, it might be helpful if it were more actively and widely disseminated among the group of companies covered by the EU ETS and potential project developers that these investment guarantees can be used for CDM and JI projects.

Reducing transaction costs and risks are intrinsic aims of the economy. Unsurprisingly, our analysis has shown that insurances are already being extensively applied by private companies. Therefore, we do not envisage that these instruments should continue to be financially supported by the German government for the time being.

Improving knowledge about options for using project-based Kyoto mechanisms in Germany might also help to promote and extend the use of these mechanisms by private investors. However, the participants of the Delphi survey did not consider information campaigns that important in surmounting the barriers to the CDM. The majority of the experts regard this strategy as being of lesser importance. Generally, the project-based mechanisms are well-known among the companies. In Germany, the first comprehensive guidance document on the flexible mechanisms was published in 2001 (Betz et al., 2001). Since this time, the document has been updated twice. The most recent edition was published in 2005 and includes all aspects relevant for making use of the flexible mechanisms in Germany across more than 700 pages (Betz et al., 2005). Since the level and quality of available information on project-based mechanisms is already rather good, we recommend that additional effort should not be invested in increasing the amount of information on the CDM and JI.

However, problems – or the need for additional information – might emerge when the project-based Kyoto mechanisms are actually used in Germany. Thus, we recommend that stakeholder consultation be continued on a regular basis within the framework of the so-called *Arbeitsgruppe Emissionshandel* (Emissions Trading Working Group). These consultations should include experts from companies which apply these mechanisms, as well as experts from industry associations, NGOs, political parties, research organisations and the government. The consultations should address upcoming questions related to the use of flexible Kyoto mechanisms in Germany.

As regards the extended use of project-based Kyoto mechanisms by the government, we have discussed whether the German government should purchase Kyoto units and, if so, in what sort of quantity. In the first place, it should be highlighted that the government should not purchase project-based Kyoto units in order to alleviate the burden of the companies covered by the EU ETS. This is because such a step would violate the *polluter-pays principle* and would burden the general public, instead of individual companies. However, only half of the emitters of greenhouse gases in Germany are covered by the trading scheme. The German government is responsible for those sectors not covered by the EU ETS delivering their contribution to meeting the national target, either by introducing policies and measures, or by acquiring Kyoto units. Whereas the companies in the trading sector decide individually the extent to which they use the project-based Kyoto mechanisms, the German Government has to decide for the emissions of the non-trading sectors whether to make the reductions domestically by recourse to policies and measures, or to buy reductions from abroad.

From a purely economic point of view, the German government should acquire Kyoto units until the marginal abatement costs of domestic policies and measures in the non-trading sector are equivalent to the price of the Kyoto units. In this way, the purchasing of CERs or ERUs would reduce the overall compliance costs in Germany for achieving the national target.

However, this is mainly true in the short-term perspective. In the longer term, an extensive use of the mechanisms may also entail disadvantages. Firstly, most stakeholders believe that many CDM projects are not additional, i.e. that they would be implemented in any case. With the current design of the CDM as a project-based mechanism, the use of the CDM is, therefore, likely to result in a global increase in GHG emissions. Secondly, assessments of GHG abatement options in Germany suggest that a considerable potential still exits at a reasonable cost level. Thirdly, structural effects have to be taken into account as well: shifting from domestic policies and measures to the purchasing of project-based Kyoto units would result in reduced structural change towards a low carbon economy in Germany, which in turn would result in a *lock-in* in more carbon intensive technologies or practices. This could make achieving ambitious mitigation targets in the future more difficult and more costly. On the other hand, the use of the project-based mechanisms may accelerate structural change in developing countries or countries with economies in transition and thus have positive effects in the host countries. However, the CDM and JI project pipeline is currently dominated by projects which do not result in a systematic structural change of the energy system (HFC-23 destruction, N_2O avoidance, landfill gas capture, etc.). Obviously, it could be asked whether investment in project-based Kyoto mechanisms genuinely results in structural changes in developing countries and countries in transition at present (it does clearly reduce the need for structural changes in Germany). Short-term economic advantages should, therefore, not be the only motive for purchasing project-based Kyoto units and should not be used in isolation in order to determine the extent to which these units should be acquired by the German government.

For the first compliance period from 2008 to 2012, we assume that Germany will stand by its commitment (which it has reiterated on several occasions) to achieving its reduction target by domestic policies and measures alone. Nevertheless, building up a reserve to cover business cycle and temperature uncertainties, promoting certain technologies or project categories, and gaining experience via learning-by-doing could constitute other motives (aside from reduced compliance costs) for the government purchasing CERs or ERUs at a later stage. Estimates show that the uncertainties arising from variations in the average temperature are equivalent to almost 1% of the German reduction target. If uncertainties due to business cycle variations were also covered, a reserve of 1 to 2% of the medium-term reduction target of -40%, or 25 to 50 million Kyoto units, seems to be adequate to cover these risks. It could be built up over a period of 10 years and would, assuming a price of € 10 per unit, require financial resources of € 25 to € 50 million a year.

This uncertainty reserve could also be used to promote project categories which require technologies in which Germany has a proven track record (renewables, energy efficiency, etc.). In this way, acquisition may stimulate demand for German technologies, although such effects are expected to be rather slight. Finally, such an uncertainty reserve would doubtlessly enhance the experience with these project-based flexible Kyoto mechanisms in Germany and establish structures which can be used if this instrument were to be used to a greater degree at a later stage.

More indirectly, Germany can promote the use of project-based flexible Kyoto mechanisms by helping to strengthen CDM and JI institutions. However, since Germany has recently started to make substantial contributions to the budget, we do not see any further need for additional contributions by Germany in the short term.

Finally, Germany could encourage the use of this instrument indirectly by developing new baseline and monitoring methodologies. PDD development is the most important driver for transaction costs. However, these costs will be reduced significantly once approved baseline methodologies are available. Such support is particularly needed for project categories which are less attractive from the investor's perspective, and more attractive from the host government's perspective, such as transport, demand-side efficiency, etc. In this vein, methodological support might increase the market share of these project categories, thereby increasing the demand for German technologies in a marginal fashion as well.

6 Summary

This section forms a summary of this report, “Long-term prospects of CDM and JI”. The report is based on a research project carried out by the Öko-Institut and ZEW for the Federal Environmental Agency in Germany. The project’s aim is the evaluation of the medium- and long-term potential of the Clean Development Mechanism (CDM) and Joint Implementation (JI). Furthermore, cost reduction effects brought about by the use of flexible mechanisms, associated barriers and risks as well as framework conditions and instruments to foster the use of flexible mechanisms are analysed.

Against the background of the Kyoto Protocol, which took effect in 2005, and emerging discussions about a future climate regime, it is necessary that future mitigation options for Germany’s emissions commitments be evaluated. Besides domestic measures, the so-called flexible mechanisms under the Kyoto Protocol, namely international emissions trading (ET), JI and CDM, can be applied. Commitments can be hereby partly fulfilled by recourse to acquiring emission certificates (ET), or by initiating climate mitigation projects in developed (JI) or developing countries (CDM). In this way, cost benefits could be tapped which would not be tapped when using domestic measures alone.

Germany has always advocated strict commitments and a climate system that has ecological integrity. Moreover, German companies are already using or planning to use flexible mechanisms for compliance under the European Emissions Trading Scheme (EU ETS). The role of flexible mechanisms should, therefore, be discussed in the light of further ambitious climate mitigation targets, as well as in terms of strategic aspects.

Future potential of CDM and JI

The future potential of CDM and JI was analysed by means of a literature review as well as by conducting our own projections, encompassing both the medium-term potential up to the close of the first commitment period, as well as the long-term potential beyond this. Both projects mitigating CO_2 and non-CO_2 projects are incorporated in the analysis.

The future CDM market potential will depend in particular on future mitigation efforts and the way in which the CDM will be developed further in a future climate regime. Based on an analysis of the potential and actual market developments, it can be expected that up to 2012 about 2,000 to 3,000 CERs will be generated, corresponding to a volume in the range of 300 – 500 Mt CO_2e in 2010. This volume is considerably smaller than the theoretical potential of several Gt CO_2e, but still considerable compared with the Kyoto commitments and taking into account transaction costs and the delayed start of the CDM.

In a longer term perspective, developing countries could deliver considerable amounts of permits with the help of the CDM or similar market mechanisms. The theoretical global potential for mitigation of CO_2 emissions is estimated in a number of different studies and models at several Gt CO_2 a year. With more ambitious mitigation paths, the volume decreases in the second half of the century as a result of the assumption that more developing countries will take on commitments.

Calculations of the abatement potential for CH_4 from landfills, N_2O from adipic acid production and HFC-23 from production of HCFC-22 show that the mitigation of non-CO_2 gases will continue to remain an important source of CERs.

Economic benefits from the use of flexible mechanisms

Model simulations were carried out in order to determine potential cost reduction effects brought about by the use of flexible mechanisms. The scenarios encompass several emission paths, implying different greenhouse gas stabilisation levels and regional distribution of emission reductions. The contribution of flexible mechanisms to reaching these targets was assessed. Several economic and environmental indicators were used to evaluate the obtained results. In addition, the climate impacts of alternative stabilisation scenarios were determined.

Using an integrated assessment model for the global economy based on intertemporal optimisation, the simulations reveal that Germany benefits substantially from using flexible mechanisms, as compared to domestic abatement measures. Central driving forces of the simulated economic impacts include the strictness of global emission reduction targets and individual targets, interactions between emissions and goods market, and international spillovers through international trade in goods and fossil fuels.

Germany represents a large importer of emission permits and CDM credits. For other industrialised world regions, the simulation runs also indicate a considerable contribution of the project-based mechanisms to reaching global stabilisation targets. In the first half of the century, China will clearly be the dominant CDM host country, whilst India will take over this role in the second half of the century. In contrast, Brazil represents a rather small CER exporter.

Regarding the macroeconomic impacts of the underlying stabilisation scenarios, it was shown that by using the flexible mechanisms Germany is able to considerably reduce GDP losses and consumption losses caused by emission control policies. What is more, permit-exporting developing countries generally harvest macroeconomic cost savings when Germany participates in flexible mechanisms (with India even receiving absolute GDP gains). These beneficial effects are on the one hand due to the additional German permit demand and an associated higher permit price, and are, on the other hand, caused by international trade in goods, which decreases to a lesser degree if Germany, the trading partner, faces lower GDP losses.

In terms of overall welfare, all world regions will also benefit economically from Germany's use of flexible mechanisms. By participating in international emissions trading and the CDM, Germany itself is able to substantially reduce potential welfare losses of up to 70%, as compared to domestic action alone. Moreover, absolute welfare gains can also be observed for China and even larger benefits for India – despite their own staggered emission control commitments.

However, caveats involved in the simulation analysis have to be taken into account. First, the applied cost-effectiveness approach aims to spotlight climate policy strategies which minimise the economic costs of stabilising CO_2 concentrations. Benefits from avoided climate change are deliberately neglected which could outweigh positive cost impacts and might even affect the assumed regional economic business-as-usual paths. Furthermore, since only CO_2 abatement strategies are considered, potentially cheaper abatement strategies related to non-CO_2 gases are neglected, thereby potentially overstating economic adjustment costs. Finally, the underlying assumption of an unrestricted use of the CDM might be relaxed by introducing supplementarity considerations by climate policy makers, thereby limiting the simulated cost savings for industrialised countries and beneficial impacts for developing regions.

Delphi survey

A Delphi survey among international experts in the field of flexible mechanisms was carried out. The issues raised in the questionnaire include topics such as barriers to the implementation of CDM and JI projects, costs, risks as well as forecasts about the future climate regime and the role of CDM and JI.

In general, the Delphi survey corroborated the views expressed by stakeholders in various forums on CDM and JI. Most of the results are not unexpected. However, several answers substantiate the general, and somewhat diffuse, perception of the future of CDM and JI and allow for an approximate quantification of expectations on future transaction costs, market sizes and shares, mitigation costs, etc. The most important lessons learned from the Delphi survey are summarised below:

- The time-consuming approval and registration process and uncertainty about the demand for CDM and JI credits after 2012 constitute the most important barriers to the development of the project-based mechanisms. Strengthening the international institutions, namely the CDM Executive Board and the CDM Methodological Panel and a clearer picture of the time period after 2012 are, correspondingly, the most important measures for overcoming these barriers. Several decisions such as starting talks about future commitment periods, the establishment of the JI Supervisory Committee or the provision of additional financial resources to the CDM Executive Board have already contributed in the meantime to overcoming these barriers. However, additional efforts are considered necessary.
- PDD development is, at the time being, deemed the most important driver for transaction costs. However, transaction costs can be substantially reduced once approved methodologies are available and similar projects have been implemented. Since the start of the CDM, numerous methodologies have been approved and many projects have been registered. Consequently, this barrier is being alleviated. Host country approval and registration of projects is, in contrast, considered the least important contributor to transaction costs. For large-scale CDM and JI second-track projects, transaction costs for project development are expected to lie between US$ 50,000 and US$ 100,000. For small-scale CDM projects and JI first-track projects transaction costs are considered to be less than US$ 50,000. On average, transaction costs for CDM projects can be estimated at around US$ 0.05 per CER for large-scale CDM projects and US$ 0.70 per CER for small-scale CDM projects. Transaction costs for monitoring and reporting range, on average, from US$ 10,000 to US$ 25,000 a year. CCS, transport and afforestation and reforestation projects will induce rather high monitoring and verification costs, the project categories renewables, supply-side efficiency and fuel switch in industry are assumed to be at the lower end of the range.

- The expected mitigation costs per t CO_2e vary substantially between project types and range from about US$ 0 per t CO_2e to almost US$ 50 per t CO_2e. They can be sub-divided into five categories: 1) HFC, N_2O and landfill projects with mitigation costs between 0 and 5 US$/t CO_2e; 2) large hydro, supply-side efficiency projects, etc. with average mitigation costs of between 5 and 10 US$/t CO_2e; 3) afforestation/reforestation, demand side efficiency, biomass projects, etc. with average mitigation costs of between 10 and 15 US$/t CO_2e; 4) transport and some renewables projects with average mitigation costs of between 15 and 20 US$/t CO_2e; 5) CCS and PV projects with mitigation costs of more than 40 US$/t CO_2e. Unsurprisingly, current project pipelines are dominated by projects from the first category.
- The aggregated weighted market size of project-based mechanisms is expected to double twice from 2010 until 2050 and will reach around 450 Mt CO_2e in 2010, 900 Mt CO_2e in 2020 and 1800 Mt CO_2e in 2050. However, there is significant uncertainty among the respondents with regard to this issue. Moreover, significant differences arose between the answers of different groups of participants.
- In the medium term (2020), non-CO_2 projects (27 %) and renewable (18 %) projects are expected to dominate the CDM and JI market. All other project categories are believed to make up substantially smaller market shares. In the long run (2050), non-CO_2 projects are expected to experience a significant decrease in market share (15 %), whereas renewable energy projects are expected to increase considerably (25 %). Carbon capture and storage (12 %) and transport (11 %) projects will also markedly increase their market shares, whereas the market for fuel switch and supply-side efficiency projects will decrease (both at 9 %). Forestry and demand-side efficiency projects and other projects will not develop in a significant fashion beyond 2020, remaining at a level under 10 %.
- Concerning the origin of the demand for and supply of carbon credits from project-based mechanisms, it is expected that the governments of industrialised countries will not use CDM and JI in the main to fulfil their commitments, but will rather use these instruments to *complement* domestic measures and the purchase of credits under international emissions trading. The same holds true for companies: they are expected to chiefly carry out internal abatement measures or use emissions trading, but not CDM or JI. Nevertheless, experts believe that the demand for CDM and JI credits will be dominated by companies; they will, however, mostly draw on carbon funds instead of directly investing in CDM or JI projects. Large-scale projects are expected to dominate the supply market. Furthermore, experts believe that not only large countries will make use of their CDM or JI potential; the credit market might not, therefore, be dominated by China and India, even though they are expected to be the biggest suppliers.
- With regard to the development of the future climate change regime, most experts anticipate that all industrialised countries will have introduced emissions trading schemes by 2020. Moreover, these systems are expected to cover all greenhouse gases and most sectors of industrialised countries, at least until 2030. At a later stage, trading schemes will cover most energy-intensive industries worldwide (2030). Most experts also assume that all countries and sectors will be covered by emissions

trading schemes by then. However, one fifth of the experts believe that this will never be the case. JI is expected to become negligible in comparison to emissions trading by the time that the systems for the latter have been introduced in most industrialised countries. They may even disappear at a later stage (about 2040). The disappearance of the project-based CDM seems to be rather improbable. It is anticipated instead that a sectoral CDM will complement the existing project-based one by 2020 or 2030.

- Participants of the Delphi survey believe that the United States and the large developing countries – Brazil, China and India – will take on emission targets in the medium term (2020). Africa and the remaining developing countries are only expected to adopt such targets in the long run. The introduction of emissions trading schemes for companies goes hand in hand with the expansion of the climate regime.

All in all, the future outlook of project-based Kyoto mechanisms is multifarious and differs for the CDM and JI. While JI may be repressed or replaced by emissions trading in the medium term and may disappear altogether in the long term, the CDM might be reformed and expanded from a project-based mechanism to encompassing broader concepts, such as a sectoral CDM. Nevertheless, extending binding, quantitative targets to developing countries in the medium term might also diminish the market size of the CDM, although it is not expected to disappear completely, even in the long run. It is comparatively important in the short term that the international institutions of the flexible mechanisms be strengthened and that an agreement to succeed the Kyoto protocol be found.

Framework conditions and instruments

Finally, framework conditions and instruments for fostering the use of CDM and JI in Germany were analysed. This analysis addresses, on the one hand, instruments which remove barriers to the use of CDM and JI and promote their utilisation by industry, particularly industry covered by the EU ETS. On the other hand, governmental programs could be set up by the German government to purchase credits from CDM and JI projects in the medium term.

Since the introduction of the EU ETS has already created a considerable demand for project-based Kyoto credits in the private sector, the first category aims mainly at removing barriers which impede the use of these mechanisms. Transaction costs and risks are identified as key barriers to the use of these mechanisms. Funds which gather the demand of several investors may reduce the transaction costs by means of specialisation and economies of scale and – by compiling project portfolios in a deft manner – the risks as well. The remaining risks can be further reduced – although never completely eliminated – with the help of insurances.

An overview of more than 30 funds is provided in our report, some of them purely public or private, some of them run in public-private partnership. Germany has also established a fund for the use of project-based mechanisms: the KfW-*Klimaschutzfonds* ("Climate Protection Fund"). This fund has been quite successful so far and has attracted substantially more private investments than was envisaged, even from neighbouring countries.

Insurances which hedge the non-delivery risks of upfront payments or the non-compliance risk of futures paid on delivery are being drawn up. Several insurance organisations have launched the first carbon delivery guarantee insurance. In the case of non-delivery, the insurance will pay a pre-determined price for the certificates which are not delivered. In another initiative, several players of the project-based mechanisms market are involved in forming a carbon delivery guarantee insurance called *Parhelion* which will hedge the upfront payments for a project.

Debt guarantees for national project developers or exporters of technologies for CDM or JI projects might hedge CDM or JI projects against several non-economic risks such as nationalisation, war, revolutionary conflicts or the breaching of legally-binding promises. Such governmental guarantees for foreign direct investments do, however, already exist in Germany – *Hermesbürgschaften* (*Hermes guarantees*, Germany's export credit insurance agency) and *Investitionsgarantien,* (*investment guarantees*) – and could be used for CDM and JI projects. Nevertheless, it might be helpful if it were more actively and widely disseminated among the group of companies covered by the EU ETS and potential project developers that these investment guarantees can be used for CDM and JI projects.

The analysis has shown that both instruments are already being extensively applied by private companies. There is therefore no additional need at the time being for the German government to financially support these instruments.

Improving knowledge of project-based mechanisms might also help to promote and extend their use by private investors. However, in the Delphi survey, information campaigns were not regarded as important in surmounting the barriers to the CDM. The majority of the experts regard this strategy as being of lesser importance. Generally, the project-based mechanisms are well-known among the companies. A comprehensive guidance document on the use of flexible mechanisms in Germany is available. Therefore, no additional effort is recommended in this case.

However, problems – or the need for additional information – might emerge when the project-based Kyoto mechanisms are actually used in Germany. It is therefore recommended that stakeholder consultation be continued on a regular basis within the framework of the so-called *Arbeitsgruppe Emissionshandel* ("Emissions Trading Working Group"). These consultations should include experts from companies who apply these mechanisms, from industry associations, NGOs, parties, research organisations and the government. They should address upcoming questions related to the use of flexible Kyoto mechanisms in Germany.

Several issues are discussed which relate to the potential acquisition of carbon credits by the German government. Project-based credits should not be purchased by the government in order to alleviate the burden of companies covered by the EU ETS. Such a step would violate the 'polluter-pays' principle and would burden the general public instead of individual companies. However, only half of the emitters of greenhouse gases in Germany are covered by the trading scheme. The German government is responsible for the other sectors delivering their contribution to meeting the national target as well, either by introducing policies and measures, or by acquiring Kyoto credits. Whereas the companies in the trading sector decide on an individual basis to which extent they use the project-based Kyoto mechanisms, the government has to decide on behalf of the non-trading sectors whether to carry out the reductions domestically with the help of policies and measures, or to buy reductions from abroad.

From a purely economic point of view, the German government should acquire Kyoto units as long as the marginal abatement costs of domestic policies and measures in the non-trading sector are greater or equal to the price of the Kyoto credits. In this way, purchasing CERs or ERUs would reduce the overall compliance costs which are accrued in Germany in order to meet the national target.

However, this is chiefly true from a short-term perspective. From a longer-term perspective, an extensive use of the mechanisms may also entail disadvantages. Firstly, most stakeholders believe that many CDM projects are not additional, i.e. that they would be implemented in any case. With the current design of the CDM as a project-based mechanism, the use of the CDM is therefore likely to result in a global increase of GHG emissions. Secondly, assessments of GHG abatement options in Germany suggest that a considerable potential still exits at a reasonable cost. Thirdly, structural effects have to be taken into account as well: shifting from domestic policies and measures to the purchasing of project-based Kyoto units would result in reduced structural change towards a low carbon economy in Germany, resulting in a 'lock-in' in more carbon-intensive technologies or practices. This could in turn make it more difficult and more costly for ambitious mitigation targets to be achieved in the future. On the other hand, the use of the project-based mechanisms may accelerate structural change in developing countries or countries with economies in transition and would therefore give rise to positive effects in the host countries. However, the CDM and JI project pipeline is currently dominated by projects which do not result in systematic structural change of the energy system (HFC-23 destruction, N_2O avoidance, landfill gas capture, etc.). Evidently, it could be called into question whether investment in project-based Kyoto mechanisms genuinely results at present in structural changes in developing countries and countries in transition (by contrast, it does clearly reduce the need for structural changes in Germany). Short-term economic advantages should therefore not constitute the only motive for purchasing project-based Kyoto units and should not be used in isolation in order to determine the extent to which these units should be acquired by the German government.

For the first commitment period from 2008 to 2012, it is assumed that Germany will stand by its commitment to achieving its reduction target by means of domestic policies and measures alone. Nevertheless, building up a reserve to cover business cycle and temperature uncertainties, promoting certain technologies or project categories and gaining experience via learning-by-doing could constitute other motives (in addition to reduced compliance costs) for governmental purchase of CERs or ERUs. Uncertainties arising from variations in the average temperature are equivalent to almost 1 % of the German reduction target. If uncertainties which arise because of business-cycle variations were also to be incorporated, a reserve of 1 to 2 % of the reduction target, or 25 to 50 million Kyoto units, seems to be adequate to cover these risks. It could be built up over a period of 10 years and would, assuming a price of € 10 per credit, require financial resources of € 25 to € 50 million a year.

This uncertainty reserve could also be used to promote project categories which make use of technologies in which Germany has a proven track record (renewables, energy efficiency, etc.). In this vein, acquisition may stimulate demand for German technologies, although such effects are expected to be rather slight. Lastly, such an uncertainty reserve would add to experiences with project-based mechanisms and would establish structures that could be used, if these instruments were to be used to a greater degree at a later stage.

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8 Annexes

8.1 Results of the Delphi survey

Table 30: Background, experience and origin of experts (Question 1)

	1st round	2nd round
Background	231	94
Consultant	52	14
Research organisation	46	14
Government representative	41	15
NGO	18	10
Project developer	14	7
Enterprise buying CERs and/or ERUs	10	6
Development cooperation agency	9	5
Multilateral organisation	9	3
Public buyer of CERs and/or ERUs	8	4
Other	8	5
Broker	7	6
Designated Operational Entity	6	4
Business association	2	1
Bank	1	
Background group	231	94
Consultants	72	25
Officials	59	23
Research	46	14
Business	28	17
NGO	18	10
Other	8	5
Experience	212	90
0 - 2 years	43	16
3 - 5 years	98	41
6 - 10 years	61	28
more than 10 years	10	5
Country	226	94
EU-15	107	44
Rest of industrialized countries	34	17
USA	23	11
Rest of Latin America	16	8
EU-10	9	1
Rest of Asia	9	1
Africa	8	4
India	8	4
Brazil	6	1
Former Soviet Union	5	3
China	1	
Region	226	94
Europe	116	45
Other	34	17
USA	23	11
Latin America	22	9
Asia	18	5
Africa	8	4
Former Soviet Union	5	3
Industrialised or developing country	226	94
Industrialized countries	178	76
Developing countries	48	18

Source: Öko-Institut

Table 31: Number of answers to each question

	Round	Answers	I don't know	total
At least one answer	1st	234		234
	2nd	98		98
Question 2	1st	221		221
	2nd	78		78
Question 3	1st	188	16	204
	2nd	82	2	84
Question 4	1st	194		194
	2nd	76		76
Question 5	1st	130	84	214
	2nd	57	20	77
Question 6	1st	112	74	186
	2nd	55	23	78
Question 7	1st	186		186
	2nd	76		76
Question 8	1st	119	63	182
	2nd	53	21	74
Question 9	1st	160	27	187
	2nd	69	6	75
Question 10	1st	142	33	175
	2nd	68	8	76
Question 11	1st	89	73	162
	2nd	44	29	73
Question 12	1st	58	107	165
	2nd	33	37	70
Question 13	1st	147	34	181
	2nd	68	7	75
Question 14	1st	147	33	180
	2nd	67	7	74
Question 15	1st	93	77	170
	2nd	51	23	74
Question 16	1st	109		109
	2nd	72		72
Question 17	1st	112		112
	2nd	46		46

Source: Öko-Institut

8.1.1 First round

Table 32: What are the most important barriers to the implementation of CDM projects? (Question 2)

	All	Busi-ness	Consul-tants	NGO	Offi-cials	Re-search	IC	DC	EU-25	USA
n	221	26	68	17	54	40	163	48	107	19
CDM	- share of all answers -									
Time consuming approval and registration process	67%	92%	69%	59%	59%	63%	70%	60%	75%	79%
Uncertainty about demand for carbon credits after 2012	63%	65%	63%	65%	57%	65%	64%	56%	64%	63%
Project implementation and operation risks (national approval, validation, registration, technical failure, etc)	63%	62%	60%	59%	69%	60%	63%	60%	64%	74%
Lack of knowledge about the CDM/JI	50%	46%	46%	59%	61%	45%	46%	60%	49%	47%
Difficulties in preparing relevant documents (PDD, determination of baseline etc.)	43%	27%	44%	53%	43%	43%	42%	46%	44%	47%
Lack of access to capital	38%	35%	44%	35%	37%	30%	32%	56%	30%	21%
Difficulties in establishing contacts between project developers and potential investors	31%	15%	31%	47%	35%	25%	25%	48%	21%	26%
Lack of upfront payment for CERs or ERUs	31%	15%	40%	41%	24%	25%	27%	38%	28%	21%
Low market price for emission allowances	26%	8%	26%	47%	17%	33%	21%	35%	14%	32%
Validation costs / requirements	26%	8%	31%	24%	17%	43%	23%	38%	23%	21%
Monitoring costs / requirements	19%	12%	22%	18%	9%	35%	17%	25%	19%	21%
Projects are not easily replicable	13%	12%	10%	12%	17%	13%	12%	17%	11%	21%
Share of proceeds (CDM)	8%		9%	18%	9%	10%	6%	19%	7%	11%
Problems in project development not specifically related to CDM or JI										
JI	- share of all answers -									
Project implementation and operation risks (national approval, validation, registration, technical failure, etc)	40%	58%	35%	35%	48%	35%	49%	10%	53%	58%
Uncertainty about demand for carbon credits after 2012	39%	42%	35%	35%	37%	40%	47%	6%	49%	53%
Lack of knowledge about the CDM/JI	35%	42%	29%	41%	50%	23%	41%	15%	43%	42%
Time consuming approval and registration process	34%	54%	24%	12%	41%	40%	43%	8%	50%	42%
Difficulties in preparing relevant documents (PDD, determination of baseline etc.)	23%	15%	18%	24%	35%	18%	27%	8%	31%	32%
Difficulties in establishing contacts between project developers and potential investors	18%	12%	16%	35%	20%	13%	20%	10%	15%	21%
Low market price for emission allowances	15%	12%	15%	12%	9%	23%	17%	6%	13%	32%
Lack of upfront payment for CERs or ERUs	14%	4%	16%	18%	17%	13%	16%	6%	18%	16%
Validation costs / requirements	14%	4%	13%	12%	15%	20%	17%	6%	17%	21%
Lack of access to capital	12%	12%	12%	12%	17%	3%	14%	4%	10%	16%
Monitoring costs / requirements	10%	8%	7%	12%	11%	18%	12%	6%	14%	16%
Projects are not easily replicable	8%	12%	6%	6%	9%	10%	10%		10%	16%
Problems in project development not specifically related to CDM or JI										

Source: Öko-Institut

Table 33: Which measures do you consider most important to overcome the barriers to the project-based mechanism? (Question 3)

	n	Very important	Important	Less important	Not important	I don't know
		- share of all answers -				
Strengthen international institutions						
CDM Executive Board						
All	204	59%	31%	6%	4%	4%
Business	25	86%	9%	5%		
Consultants	64	65%	23%	8%	3%	3%
NGO	15	29%	64%	7%		
Officials	48	60%	30%	5%	5%	4%
Research	38	46%	40%	6%	9%	5%
IC	149	58%	31%	6%	4%	4%
DC	46	59%	32%	7%	2%	
EU-25	93	62%	31%	2%	5%	2%
USA	19	56%	25%	13%	6%	16%
CDM Methodological Panel						
All	204	63%	29%	6%	2%	3%
Business	25	96%	4%			
Consultants	64	60%	33%	7%		2%
NGO	15	43%	43%	14%		
Officials	48	68%	23%	7%	2%	4%
Research	38	49%	37%	9%	6%	5%
IC	149	61%	30%	8%	1%	3%
DC	46	67%	28%	2%	2%	
EU-25	93	63%	29%	7%	1%	2%
USA	19	53%	41%		6%	11%
JI Supervisory Committee						
All	204	34%	40%	22%	4%	20%
Business	25	65%	25%	10%		9%
Consultants	64	27%	37%	34%	2%	24%
NGO	15	29%	43%	29%		46%
Officials	48	31%	51%	14%	3%	17%
Research	38	24%	41%	24%	10%	12%
IC	149	33%	40%	23%	4%	16%
DC	46	29%	48%	19%	5%	36%
EU-25	93	36%	40%	20%	4%	12%
USA	19	18%	45%	27%	9%	39%
UNFCCC Secretariat						
All	204	21%	37%	31%	11%	8%
Business	25	29%	33%	29%	10%	9%
Consultants	64	19%	36%	42%	4%	9%
NGO	15	23%	31%	31%	15%	13%
Officials	48	32%	34%	20%	15%	5%
Research	38	9%	44%	32%	15%	6%
IC	149	16%	40%	33%	11%	9%
DC	46	33%	30%	28%	10%	5%
EU-25	93	13%	44%	38%	5%	8%
USA	19	18%	12%	35%	35%	11%

Source: Öko-Institut

Table 33: Which measures do you consider most important to overcome the barriers to the project-based mechanism?(Question 3) – continued

	n	Very important	Important	Less important	Not important	I don't know
		- share of all answers -				
Strengthen international institutions						
Simplify procedures						
All	204	58%	25%	12%	5%	1%
Business	25	75%	21%	4%		
Consultants	64	56%	30%	10%	5%	
NGO	15	21%	29%	29%	21%	7%
Officials	48	62%	18%	16%	4%	2%
Research	38	57%	30%	8%	5%	
IC	149	55%	27%	13%	6%	1%
DC	46	70%	16%	9%	5%	
EU-25	93	60%	24%	10%	7%	1%
USA	19	47%	26%	16%	11%	
Concretise procedures						
All	204	40%	44%	13%	2%	3%
Business	25	59%	23%	18%		
Consultants	64	33%	44%	21%	2%	2%
NGO	15	38%	38%	23%		7%
Officials	48	49%	42%	7%	2%	4%
Research	38	26%	69%	3%	3%	3%
IC	149	38%	48%	12%	2%	4%
DC	46	50%	30%	20%		
EU-25	93	41%	49%	8%	1%	1%
USA	19	33%	44%	17%	6%	5%
Clarify procedures						
All	204	48%	39%	12%	1%	1%
Business	25	54%	29%	17%		
Consultants	64	51%	39%	10%		
NGO	15	33%	33%	33%		
Officials	48	49%	44%	2%	5%	2%
Research	38	39%	50%	11%		
IC	149	45%	42%	12%	1%	1%
DC	46	57%	31%	12%		
EU-25	93	42%	47%	9%	2%	
USA	19	50%	28%	22%		
Remove share of proceeds						
All	204	5%	10%	47%	38%	22%
Business	25	5%	11%	53%	32%	14%
Consultants	64	2%	7%	50%	41%	19%
NGO	15	11%	11%	33%	44%	36%
Officials	48	6%	15%	36%	42%	18%
Research	38	8%	8%	52%	32%	29%
IC	149	4%	10%	49%	38%	23%
DC	46	9%	13%	44%	34%	16%
EU-25	93	6%	10%	45%	39%	18%
USA	19		11%	67%	22%	53%
Streamline national approval process						
All	204	26%	47%	21%	7%	6%
Business	25	38%	38%	19%	5%	9%
Consultants	64	25%	47%	20%	7%	2%
NGO	15	25%	33%	33%	8%	20%
Officials	48	26%	38%	29%	7%	5%
Research	38	18%	67%	6%	9%	8%
IC	149	23%	53%	17%	7%	8%
DC	46	34%	27%	32%	7%	
EU-25	93	22%	56%	18%	5%	8%
USA	19	31%	38%	6%	25%	16%

Source: Öko-Institut

Table 33: Which measures do you consider most important to overcome the barriers to the project-based mechanism?(Question 3) – continued

	n	Very important	Important	Less important	Not important	I don't know
		- share of all answers -				
PDD pre-check by designated operational entity or other institution						
All	204	9%	45%	33%	13%	7%
Business	25	19%	38%	24%	19%	5%
Consultants	64	9%	36%	39%	16%	5%
NGO	15	21%	43%	36%		
Officials	48	8%	68%	19%	5%	10%
Research	38		41%	41%	19%	9%
IC	149	9%	47%	31%	13%	6%
DC	46	11%	42%	36%	11%	5%
EU-25	93	5%	51%	31%	13%	7%
USA	19	12%	29%	41%	18%	6%
Intensify capacity building for PDD preparation and baseline development						
All	204	24%	40%	27%	9%	2%
Business	25	10%	43%	33%	14%	5%
Consultants	64	18%	39%	30%	13%	2%
NGO	15	27%	33%	27%	13%	
Officials	48	37%	41%	20%	2%	2%
Research	38	29%	40%	26%	6%	
IC	149	16%	45%	30%	9%	2%
DC	46	49%	26%	16%	9%	
EU-25	93	16%	43%	32%	9%	2%
USA	19	6%	39%	28%	28%	5%
Standardisation of baselines						
All	204	40%	47%	9%	4%	3%
Business	25	33%	48%	14%	5%	13%
Consultants	64	35%	47%	11%	6%	
NGO	15	14%	71%	7%	7%	
Officials	48	51%	40%	9%		4%
Research	38	53%	39%	6%	3%	3%
IC	149	36%	51%	10%	4%	4%
DC	46	57%	30%	9%	5%	
EU-25	93	41%	51%	8%		6%
USA	19	32%	42%	11%	16%	
Standardisation of the monitoring process						
All	204	34%	42%	19%	4%	4%
Business	25	24%	33%	33%	10%	5%
Consultants	64	21%	48%	28%	3%	2%
NGO	15	15%	62%	15%	8%	7%
Officials	48	50%	34%	11%	5%	6%
Research	38	53%	42%	6%		3%
IC	149	29%	46%	21%	4%	5%
DC	46	52%	31%	12%	5%	
EU-25	93	34%	42%	20%	4%	4%
USA	19	33%	39%	17%	11%	5%
Pooling of similar projects (use of same baseline etc.)						
All	204	34%	47%	15%	4%	3%
Business	25	22%	48%	26%	4%	
Consultants	64	30%	50%	15%	5%	3%
NGO	15	29%	57%	7%	7%	
Officials	48	33%	44%	20%	2%	2%
Research	38	54%	31%	9%	6%	5%
IC	149	30%	48%	18%	4%	4%
DC	46	48%	41%	9%	2%	
EU-25	93	32%	46%	18%	4%	5%
USA	19	37%	42%	11%	11%	

Source: Öko-Institut

Table 33: Which measures do you consider most important to overcome the barriers to the project-based mechanism?(Question 3) – continued

	n	Very important	Important	Less important	Not important	I don't know
		- share of all answers -				
Information campaigns about the CDM and JI in general among companies in the investor and host countries						
All	204	20%	37%	29%	14%	1%
Business	25	10%	19%	52%	19%	
Consultants	64	10%	43%	37%	10%	2%
NGO	15	21%	21%	36%	21%	
Officials	48	33%	38%	20%	9%	
Research	38	27%	42%	12%	18%	3%
IC	149	16%	36%	32%	15%	1%
DC	46	29%	44%	17%	10%	
EU-25	93	12%	39%	31%	18%	
USA	19	18%	18%	35%	29%	11%
Public procurement tenders						
All	204	14%	36%	36%	14%	8%
Business	25	15%	25%	40%	20%	5%
Consultants	64	9%	31%	46%	13%	8%
NGO	15	21%	57%	7%	14%	
Officials	48	13%	37%	34%	16%	14%
Research	38	19%	34%	34%	13%	9%
IC	149	10%	36%	38%	16%	8%
DC	46	27%	35%	30%	8%	10%
EU-25	93	6%	29%	45%	19%	7%
USA	19	17%	50%	11%	22%	5%
Private carbon funds						
All	204	21%	43%	25%	11%	5%
Business	25	29%	42%	21%	8%	
Consultants	64	31%	31%	28%	10%	3%
NGO	15		71%	14%	14%	
Officials	48	15%	50%	25%	10%	9%
Research	38	13%	42%	32%	13%	9%
IC	149	17%	43%	28%	12%	6%
DC	46	34%	41%	17%	7%	2%
EU-25	93	18%	36%	30%	16%	3%
USA	19	18%	53%	12%	18%	11%
Public-private partnerships						
All	204	19%	48%	22%	12%	6%
Business	25	14%	48%	19%	19%	
Consultants	64	22%	38%	27%	13%	7%
NGO	15	13%	53%	13%	20%	
Officials	48	18%	54%	23%	5%	5%
Research	38	17%	48%	24%	10%	12%
IC	149	16%	44%	27%	13%	7%
DC	46	23%	60%	8%	10%	2%
EU-25	93	16%	43%	28%	14%	4%
USA	19	18%	35%	24%	24%	11%
Upfront payment for CERs or ERUs						
All	204	24%	44%	24%	8%	5%
Business	25	14%	48%	29%	10%	5%
Consultants	64	29%	43%	16%	12%	2%
NGO	15	8%	42%	33%	17%	14%
Officials	48	27%	41%	27%	5%	5%
Research	38	18%	50%	32%		13%
IC	149	17%	48%	26%	10%	7%
DC	46	45%	30%	23%	3%	2%
EU-25	93	16%	47%	30%	8%	4%
USA	19	13%	47%	13%	27%	21%

Source: Öko-Institut

Table 33: Which measures do you consider most important to overcome the barriers to the project-based mechanism? (Question 3) – continued

	n	Very important	Important	Less important	Not important	I don't know
		- share of all answers -				
Special credit lines for financing investments in CDM or JI projects (e.g. in combination with procurement tenders)						
All	204	29%	46%	20%	5%	10%
Business	25	32%	42%	21%	5%	10%
Consultants	64	30%	51%	18%	2%	5%
NGO	15	17%	25%	33%	25%	14%
Officials	48	22%	46%	30%	3%	12%
Research	38	27%	57%	7%	10%	12%
IC	149	22%	50%	21%	7%	11%
DC	46	45%	39%	16%		5%
EU-25	93	22%	49%	22%	7%	13%
USA	19	27%	27%	20%	27%	17%
Investor's forum (carbon expo, etc.)						
All	204	12%	40%	38%	10%	3%
Business	25	9%	41%	36%	14%	
Consultants	64	20%	37%	36%	7%	3%
NGO	15		31%	54%	15%	7%
Officials	48	17%	46%	29%	7%	5%
Research	38		34%	47%	19%	3%
IC	149	11%	37%	41%	11%	4%
DC	46	15%	50%	28%	8%	
EU-25	93	13%	30%	43%	14%	5%
USA	19		24%	59%	18%	11%
Set up a clearing house for CDM and JI projects						
All	204	19%	37%	34%	11%	11%
Business	25	11%	21%	47%	21%	10%
Consultants	64	27%	29%	31%	14%	17%
NGO	15	14%	21%	50%	14%	7%
Officials	48	10%	63%	20%	8%	11%
Research	38	21%	36%	36%	6%	6%
IC	149	14%	36%	39%	11%	11%
DC	46	32%	41%	19%	8%	12%
EU-25	93	10%	37%	41%	12%	13%
USA	19	17%	22%	39%	22%	5%
Debt guarantees for national project developers						
All	204	14%	43%	35%	8%	17%
Business	25	6%	39%	50%	6%	14%
Consultants	64	20%	47%	29%	4%	20%
NGO	15	10%	30%	50%	10%	23%
Officials	48	6%	48%	36%	9%	15%
Research	38	7%	48%	28%	17%	15%
IC	149	9%	41%	39%	11%	19%
DC	46	19%	56%	25%		10%
EU-25	93	10%	37%	42%	10%	17%
USA	19	7%	21%	36%	36%	26%
Debt guarantees for exporters of technologies for CDM or JI projects						
All	204	15%	35%	40%	10%	19%
Business	25	12%	41%	35%	12%	19%
Consultants	64	23%	38%	30%	9%	20%
NGO	15	10%	10%	60%	20%	23%
Officials	48	3%	41%	47%	9%	16%
Research	38	11%	36%	39%	14%	15%
IC	149	14%	33%	40%	14%	21%
DC	46	14%	40%	43%	3%	10%
EU-25	93	16%	34%	39%	10%	16%
USA	19	18%	9%	36%	36%	42%

Source: Öko-Institut

Table 33: Which measures do you consider most important to overcome the barriers to the project-based mechanism? (Question 3) – continued

	n	Very important	Important	Less important	Not important	I don't know
		- share of all answers -				
Cooperation with chambers of commerce and national investment authorities						
All	204	14%	36%	38%	13%	10%
Business	25	6%	18%	53%	24%	15%
Consultants	64	14%	42%	40%	4%	14%
NGO	15	23%	15%	38%	23%	7%
Officials	48	17%	42%	28%	14%	8%
Research	38	6%	45%	30%	18%	3%
IC	149	9%	33%	41%	17%	10%
DC	46	23%	49%	29%		8%
EU-25	93	9%	32%	39%	19%	9%
USA	19	6%	19%	50%	25%	16%

Source: Öko-Institut

Table 34: Which CDM or JI project types are particularly attractive from …? (Question 4)

	All	Busi-ness	Consul-tants	NGO	Offi-cials	Re-search	IC	DC	EU-25	USA
n	194	23	61	15	44	36	138	46	87	16
a) the investor's perspective					- share of all answers -					
Landfills	70%	78%	77%	47%	68%	64%	72%	61%	69%	75%
HFC23 from HCFC22 production	64%	52%	77%	60%	57%	58%	62%	65%	66%	63%
Wind power generation	58%	70%	62%	60%	52%	53%	56%	63%	48%	56%
Fuel switch in energy and industry	57%	78%	59%	40%	57%	47%	55%	63%	55%	63%
N_2O from nitric or adipic acid production	51%	52%	64%	27%	48%	44%	51%	50%	51%	50%
Biomass power generation	47%	74%	46%	53%	41%	42%	48%	46%	46%	56%
Coal Mine Methane	53%	61%	72%	33%	41%	36%	56%	43%	59%	44%
Supply-side efficiency	39%	48%	36%	33%	36%	47%	38%	41%	38%	50%
Large hydro power generation	48%	43%	51%	53%	50%	50%	47%	52%	51%	31%
Small hydro power generation	27%	26%	33%	7%	34%	19%	24%	37%	15%	44%
Demand-side efficiency	24%	35%	26%	20%	20%	28%	26%	22%	23%	38%
Afforestation and reforestation	22%	17%	15%	20%	27%	39%	22%	22%	24%	25%
Carbon capture and storage	33%	30%	30%	33%	39%	36%	33%	37%	30%	31%
Waste water treatment	33%	39%	46%	20%	23%	25%	36%	28%	34%	38%
Solar thermal power generation	18%	26%	15%	20%	18%	19%	18%	17%	21%	31%
Photovoltaics	16%	22%	15%	20%	14%	22%	16%	17%	20%	19%
Geothermal power generation	29%	35%	30%	33%	30%	25%	32%	20%	33%	13%
Transport	16%	13%	20%	13%	16%	19%	17%	15%	17%	19%
b) the government of the host country's perspective										
Biomass power generation	73%	48%	74%	87%	73%	75%	65%	89%	67%	63%
Small hydro power generation	65%	39%	79%	53%	66%	64%	59%	80%	52%	69%
Wind power generation	65%	52%	70%	73%	73%	53%	61%	72%	63%	56%
Transport	64%	43%	70%	60%	66%	61%	58%	76%	57%	50%
Landfills	62%	48%	66%	40%	75%	56%	57%	78%	54%	63%
Demand-side efficiency	56%	48%	62%	60%	48%	61%	54%	61%	52%	50%
Fuel switch in energy and industry	61%	43%	59%	67%	75%	58%	61%	61%	66%	56%
Afforestation and reforestation	56%	35%	61%	67%	61%	50%	50%	76%	46%	63%
Waste water treatment	49%	39%	57%	33%	55%	44%	44%	65%	43%	50%
Supply-side efficiency	52%	39%	52%	80%	48%	50%	49%	57%	48%	38%
Photovoltaics	48%	30%	52%	60%	41%	56%	44%	59%	46%	44%
Large hydro power generation	38%	22%	43%	27%	55%	25%	35%	48%	36%	31%
Solar thermal power generation	48%	30%	51%	47%	48%	50%	43%	57%	44%	50%
Geothermal power generation	52%	35%	52%	47%	66%	44%	51%	50%	53%	44%
Coal Mine Methane	33%	22%	41%	20%	34%	28%	32%	37%	28%	50%
N_2O from nitric or adipic acid production	18%	26%	13%	13%	23%	17%	19%	15%	21%	6%
Carbon capture and storage	22%	22%	25%	13%	27%	17%	18%	33%	21%	31%
HFC23 from HCFC22 production	20%	22%	15%	20%	25%	17%	21%	17%	22%	19%

Source: Öko-Institut

Table 35: What do you expect will be the typical transaction costs for the development of CDM and JI projects by 2010? (Question 5)

	n	Less than 50,000 US$	50,000 - 100,000 US$	100,000 - 200,000 US$	More than 200,000 US$	I don't know
		- share of all answers -				
CDM large scale projects	**194**	**9%**	**38%**	**36%**	**17%**	**20%**
Business	23	11%	33%	44%	11%	22%
Consultants	63	7%	30%	41%	21%	22%
NGO	14	10%	50%	20%	20%	29%
Officials	45	10%	40%	37%	13%	29%
Research	36	15%	41%	30%	15%	25%
IC	141	11%	33%	41%	14%	23%
DC	45	2%	46%	27%	24%	9%
EU-25	87	13%	35%	44%	8%	28%
USA	17		33%	27%	40%	12%
CDM small scale projects	**194**	**51%**	**39%**	**9%**	**1%**	**19%**
Business	23	33%	56%	11%		22%
Consultants	63	48%	43%	7%	2%	22%
NGO	14	55%	27%	9%	9%	21%
Officials	45	48%	42%	10%		26%
Research	36	70%	26%	4%		25%
IC	141	49%	42%	7%	2%	21%
DC	45	58%	30%	13%		9%
EU-25	87	47%	44%	8%	2%	26%
USA	17	47%	33%	13%	7%	12%
JI first track projects	**194**	**52%**	**31%**	**14%**	**3%**	**46%**
Business	23	44%	38%	19%		27%
Consultants	63	47%	29%	18%	6%	27%
NGO	14		50%	50%		83%
Officials	45	65%	20%	10%	5%	52%
Research	36	60%	33%	7%		53%
IC	141	54%	30%	12%	4%	40%
DC	45	25%	38%	38%		76%
EU-25	87	49%	35%	13%	4%	35%
USA	17	63%	13%	25%		53%
JI second track projects	**194**	**25%**	**40%**	**26%**	**8%**	**46%**
Business	23	33%	33%	27%	7%	29%
Consultants	63	20%	34%	37%	9%	29%
NGO	14			100%		83%
Officials	45	26%	47%	11%	16%	55%
Research	36	40%	47%	7%	7%	53%
IC	141	26%	39%	27%	9%	40%
DC	45	14%	43%	29%	14%	79%
EU-25	87	26%	37%	31%	6%	35%
USA	17	13%	50%	13%	25%	53%

Source: Öko-Institut

Table 36: What do you expect will be the typical annual costs for the monitoring and verification of CDM or JI projects by 2010? (Question 6)

	n	Less than 5,000 US$	5,000 - 10,000 US$	10,000 - 20,000 US$	20,000 - 50,000 US$	More than 50,000 US$	I don't know
		- share of all answers -					
Renewables	**186**	**23%**	**38%**	**29%**	**7%**	**3%**	**28%**
Business	22	27%	33%	33%	7%		29%
Consultants	61	27%	35%	29%	8%		16%
NGO	13	13%	63%			25%	38%
Officials	43	23%	33%	30%	10%	3%	30%
Research	34	15%	45%	30%	5%	5%	41%
IC	137	22%	40%	31%	4%	2%	31%
DC	41	27%	30%	21%	15%	6%	20%
EU-25	84	21%	46%	26%	4%	4%	31%
USA	17	17%	42%	42%			29%
Fuel switch in energy and industry sectors	**186**	**19%**	**37%**	**31%**	**7%**	**7%**	**33%**
Business	22	13%	27%	47%	13%		29%
Consultants	61	27%	31%	29%	10%	2%	19%
NGO	13		20%	20%		60%	62%
Officials	43	15%	48%	22%	7%	7%	37%
Research	34	16%	32%	42%		11%	44%
IC	137	20%	41%	31%	4%	5%	38%
DC	41	15%	21%	33%	18%	12%	18%
EU-25	84	21%	49%	23%	2%	6%	36%
USA	17		40%	50%		10%	41%
Supply-side efficiency	**186**	**15%**	**34%**	**38%**	**10%**	**4%**	**39%**
Business	22	17%	17%	58%	8%		40%
Consultants	61	21%	26%	33%	19%		28%
NGO	13		50%	17%	17%	17%	54%
Officials	43	4%	52%	35%	4%	4%	47%
Research	34	16%	37%	37%		11%	44%
IC	137	16%	35%	40%	6%	3%	43%
DC	41	11%	29%	32%	21%	7%	30%
EU-25	84	15%	42%	38%	4%	2%	41%
USA	17		25%	38%	25%	13%	53%
Carbon capture and storage (CCS)	**186**	**8%**	**23%**	**27%**	**24%**	**19%**	**46%**
Business	22	17%	17%	33%	25%	8%	37%
Consultants	61	12%	26%	26%	24%	12%	42%
NGO	13		50%		17%	33%	54%
Officials	43	5%	19%	29%	33%	14%	49%
Research	34	6%	13%	25%	19%	38%	53%
IC	137	7%	21%	28%	23%	21%	47%
DC	41	14%	27%	18%	27%	14%	44%
EU-25	84	4%	24%	31%	24%	16%	45%
USA	17				33%	67%	47%

Source: Öko-Institut

Table 36: What do you expect will be the typical annual costs for the monitoring and verification of CDM or JI projects by 2010? (Question 6) – continued

	n	Less than 5,000 US$	5,000 - 10,000 US$	10,000 - 20,000 US$	20,000 - 50,000 US$	More than 50,000 US$	I don't know
		- share of all answers -					
Demand-side efficiency	**186**	**8%**	**28%**	**31%**	**26%**	**7%**	**37%**
Business	22	8%	31%	38%	23%		38%
Consultants	61	14%	20%	30%	32%	5%	25%
NGO	13		57%			43%	42%
Officials	43	4%	32%	28%	32%	4%	40%
Research	34	6%	29%	35%	18%	12%	50%
IC	137	9%	29%	33%	25%	5%	41%
DC	41	7%	28%	28%	24%	14%	26%
EU-25	84	8%	30%	36%	22%	4%	40%
USA	17		33%	11%	33%	22%	47%
Non-CO2 projects	**186**	**17%**	**33%**	**43%**	**7%**	**1%**	**44%**
Business	22	25%	17%	58%			45%
Consultants	61	21%	33%	36%	10%		31%
NGO	13		40%	60%			62%
Officials	43	12%	35%	46%	4%	4%	40%
Research	34	9%	36%	36%	18%		67%
IC	137	17%	31%	49%	4%		47%
DC	41	16%	36%	28%	16%	4%	38%
EU-25	84	15%	33%	50%	2%		43%
USA	17		17%	67%	17%		65%
Transport	**186**	**5%**	**22%**	**32%**	**28%**	**13%**	**46%**
Business	22		25%	33%	42%		37%
Consultants	61	8%	19%	31%	28%	14%	39%
NGO	13		33%	33%		33%	54%
Officials	43	4%	12%	36%	32%	16%	42%
Research	34	8%	38%	23%	15%	15%	62%
IC	137	4%	26%	28%	31%	10%	49%
DC	41	8%	12%	38%	19%	23%	35%
EU-25	84	2%	29%	33%	33%	2%	48%
USA	17		22%	22%	22%	33%	47%
Afforestation and reforestation	**186**	**13%**	**27%**	**28%**	**20%**	**12%**	**44%**
Business	22		22%	56%	22%		50%
Consultants	61	23%	23%	23%	21%	10%	33%
NGO	13	20%	40%			40%	62%
Officials	43	5%	32%	32%	23%	9%	46%
Research	34	13%	27%	20%	27%	13%	55%
IC	137	11%	29%	25%	22%	14%	50%
DC	41	21%	21%	32%	21%	4%	30%
EU-25	84	8%	35%	23%	25%	10%	49%
USA	17			33%	22%	44%	47%

Source: Öko-Institut

Table 37: What will be the three most important drivers for transaction costs by 2010? (Question 7)

	n	Most important	Second most important	Third most important	Impor-tance
		- share of all answers -			
PDD development (including baseline determination)	**186**	**46%**	**22%**	**19%**	**370**
Business	21	38%	29%	19%	40
Consultants	60	53%	20%	18%	131
NGO	13	38%	8%	31%	21
Officials	44	45%	20%	20%	87
Research	33	36%	24%	21%	59
IC	133	43%	21%	22%	256
DC	44	50%	23%	11%	91
EU-25	81	42%	20%	21%	151
USA	16	25%	19%	38%	24
Monitoring and verification	**186**	**16%**	**25%**	**21%**	**220**
Business	21	10%	19%	19%	18
Consultants	60	15%	22%	27%	69
NGO	13	15%	31%	8%	15
Officials	44	18%	25%	23%	56
Research	33	21%	30%	18%	47
IC	133	17%	27%	20%	164
DC	44	14%	18%	25%	45
EU-25	81	17%	28%	19%	103
USA	16	19%	38%	13%	23
Validation	**186**	**13%**	**24%**	**19%**	**197**
Business	21	14%	19%	24%	22
Consultants	60	8%	23%	22%	56
NGO	13	23%	23%	23%	18
Officials	44	11%	32%	14%	49
Research	33	24%	21%	15%	43
IC	133	16%	20%	23%	145
DC	44	7%	34%	11%	44
EU-25	81	15%	22%	23%	91
USA	16	38%	13%	19%	25
Negotiation of emission reduction purchase agreements	**186**	**11%**	**9%**	**14%**	**120**
Business	21	24%	14%	10%	23
Consultants	60	10%	15%	8%	41
NGO	13		8%	15%	4
Officials	44	9%	7%	18%	26
Research	33	6%	3%	18%	14
IC	133	10%	12%	14%	89
DC	44	14%	2%	11%	25
EU-25	81	9%	11%	11%	48
USA	16	6%	6%	25%	9

Source: Öko-Institut

Table 37: What will be the three most important drivers for transaction costs by 2010? (Question 7) – continued

	n	Most important	Second most important	Third most important	Impor-tance
			- share of all answers -		
Registration	**186**	**9%**	**4%**	**11%**	**86**
Business	21	14%		14%	12
Consultants	60	5%	7%	12%	24
NGO	13	15%	15%	8%	11
Officials	44	16%		9%	25
Research	33	3%	3%	9%	8
IC	133	9%	4%	9%	58
DC	44	11%	5%	18%	27
EU-25	81	11%	4%	7%	39
USA	16	6%	6%	6%	6
Host country approval	**186**	**4%**	**11%**	**9%**	**79**
Business	21		19%	14%	11
Consultants	60	3%	10%	8%	23
NGO	13	8%	8%	8%	6
Officials	44		11%	7%	13
Research	33	9%	12%	9%	20
IC	133	4%	13%	8%	59
DC	44	2%	9%	11%	16
EU-25	81	4%	10%	11%	34
USA	16	6%	19%		9

Source: Öko-Institut

Table 38: What project size is necessary to make a CDM or JI projects feasible (taking into account transaction costs)? (Question 8)

	n	Less than 10,000	10,000 - 20,000	20,000 - 50,000	50,000 - 100,000	100,000 - 250,000	250,000 - 500,000	More than 500,000	I don't know
		emission reductions during crediting period (t CO_2e)							
		- share of all answers -							
CDM large scale projects	**182**	**1%**	**3%**	**11%**	**21%**	**19%**	**22%**	**22%**	**22%**
Business	21		6%		35%	12%	24%	24%	19%
Consultants	59	2%	2%	15%	21%	15%	27%	17%	10%
NGO	12		13%		25%	13%		50%	33%
Officials	43		3%	3%	25%	16%	28%	25%	24%
Research	33			18%	9%	32%	14%	27%	33%
IC	130	1%	4%	9%	23%	18%	25%	21%	24%
DC	43			11%	22%	22%	19%	27%	14%
EU-25	79	2%	3%	7%	22%	22%	19%	24%	27%
USA	15			7%	21%	7%	36%	29%	7%
CDM small scale projects	**182**	**4%**	**27%**	**23%**	**21%**	**14%**	**7%**	**4%**	**21%**
Business	21		24%	24%	24%	24%		6%	19%
Consultants	59	4%	25%	31%	17%	15%	6%	2%	10%
NGO	12		33%	22%	11%	22%		11%	25%
Officials	43		28%	13%	28%	13%	13%	6%	24%
Research	33	10%	25%	20%	25%	5%	15%		35%
IC	130	5%	28%	22%	21%	13%	7%	4%	24%
DC	43		22%	28%	25%	14%	8%	3%	12%
EU-25	79	3%	24%	22%	21%	16%	9%	5%	27%
USA	15	14%	7%	21%	21%	14%	14%	7%	7%
JI first track projects	**182**	**6%**	**15%**	**17%**	**25%**	**16%**	**15%**	**6%**	**48%**
Business	21	6%	12%	18%	24%	12%	12%	18%	19%
Consultants	59	10%	10%	29%	19%	16%	16%		42%
NGO	12					100%			91%
Officials	43		16%	5%	32%	26%	11%	11%	51%
Research	33	8%	17%	8%	25%	8%	33%		60%
IC	130	7%	14%	17%	25%	16%	16%	5%	40%
DC	43			14%	29%	29%	14%	14%	79%
EU-25	79	2%	12%	22%	27%	16%	14%	8%	35%
USA	15	13%		13%	38%	13%	25%		47%
JI second track projects	**182**	**1%**	**10%**	**22%**	**22%**	**19%**	**14%**	**13%**	**48%**
Business	21		12%	18%	18%	12%	18%	24%	19%
Consultants	59	3%	13%	25%	19%	28%	3%	9%	41%
NGO	12							100%	91%
Officials	43			22%	33%	11%	28%	6%	54%
Research	33		15%	31%	15%	8%	15%	15%	57%
IC	130	1%	9%	23%	21%	18%	16%	12%	39%
DC	43			14%	29%	29%		29%	79%
EU-25	79	2%	8%	22%	20%	22%	16%	12%	35%
USA	15			13%	38%	13%	13%	25%	47%

Source: Öko-Institut

Table 39: What is the overall risk associated with the generation of CERs or ERUs? (Question 9)

	n	Very low	Low	High	Very high	I don't know
		- share of all answers -				
Renewables	187	14%	54%	27%	5%	5%
Business	22	23%	55%	18%	5%	
Consultants	60	14%	45%	36%	5%	3%
NGO	14	8%	54%	31%	8%	7%
Officials	43	13%	61%	21%	5%	10%
Research	34	19%	56%	22%	3%	6%
IC	135	12%	55%	31%	2%	5%
DC	43	22%	49%	17%	12%	5%
EU-25	83	11%	53%	34%	3%	8%
USA	17	18%	53%	29%		
Fuel switch in energy and industry sectors	187	16%	61%	18%	5%	8%
Business	22	27%	50%	23%		
Consultants	60	9%	64%	20%	7%	7%
NGO	14	9%	82%		9%	15%
Officials	43	19%	61%	17%	3%	16%
Research	34	28%	50%	19%	3%	6%
IC	135	15%	63%	18%	5%	9%
DC	43	23%	59%	15%	3%	7%
EU-25	83	13%	64%	17%	5%	10%
USA	17	18%	53%	18%	12%	
Supply-side efficiency	187	10%	56%	31%	3%	15%
Business	22	10%	50%	30%	10%	5%
Consultants	60	6%	54%	36%	4%	15%
NGO	14		70%	30%		23%
Officials	43	13%	48%	39%		28%
Research	34	21%	59%	21%		9%
IC	135	10%	55%	33%	2%	16%
DC	43	12%	55%	27%	6%	18%
EU-25	83	9%	53%	35%	3%	16%
USA	17	13%	47%	40%		12%
Carbon capture and storage (CCS)	187	4%	11%	41%	44%	24%
Business	22		19%	33%	48%	5%
Consultants	60	2%	2%	59%	37%	31%
NGO	14		9%	27%	64%	21%
Officials	43	4%	14%	32%	50%	33%
Research	34	7%	18%	43%	32%	18%
IC	135	5%	9%	42%	43%	21%
DC	43	4%	18%	36%	43%	33%
EU-25	83	2%	10%	35%	54%	23%
USA	17	13%	7%	40%	40%	12%

Source: Öko-Institut

Table 39: What is the overall risk associated with the generation of CERs or ERUs? (Question 9) – continued

	n	Very low	Low	High	Very high	I don't know
		- share of all answers -				
Demand-side efficiency	187	6%	28%	51%	15%	14%
Business	22	10%	24%	48%	19%	5%
Consultants	60	6%	26%	48%	20%	17%
NGO	14		45%	27%	27%	15%
Officials	43		35%	53%	12%	21%
Research	34	10%	27%	57%	7%	9%
IC	135	6%	30%	50%	15%	13%
DC	43	3%	29%	50%	18%	19%
EU-25	83	4%	27%	56%	13%	13%
USA	17	20%	33%	20%	27%	12%
Non-CO2 projects	187	20%	49%	30%	1%	21%
Business	22		68%	26%	5%	14%
Consultants	60	24%	49%	24%	2%	18%
NGO	14	10%	40%	50%		23%
Officials	43	27%	39%	33%		21%
Research	34	19%	52%	29%		36%
IC	135	21%	47%	31%	1%	21%
DC	43	16%	48%	32%	3%	23%
EU-25	83	20%	47%	31%	2%	23%
USA	17	17%	58%	25%		29%
Transport	187	3%	15%	49%	33%	13%
Business	22		5%	60%	35%	5%
Consultants	60	2%	13%	46%	40%	19%
NGO	14		25%	58%	17%	8%
Officials	43	3%	19%	44%	33%	16%
Research	34	10%	17%	50%	23%	12%
IC	135	3%	14%	52%	31%	13%
DC	43	3%	23%	40%	34%	15%
EU-25	83	3%	11%	52%	35%	20%
USA	17	13%	13%	44%	31%	6%
Afforestation and reforestation	187	6%	13%	44%	37%	14%
Business	22		5%	30%	65%	5%
Consultants	60	4%	9%	40%	47%	12%
NGO	14		10%	40%	50%	23%
Officials	43	6%	23%	49%	23%	19%
Research	34	17%	13%	53%	17%	12%
IC	135	4%	12%	44%	39%	14%
DC	43	11%	19%	43%	27%	12%
EU-25	83	3%	14%	42%	41%	13%
USA	17	7%	13%	40%	40%	12%

Source: Öko-Institut

Table 40: Characteristics of project types: Project size (Question 10)

	n	Very small	Small	Large	Very large	I don't know
		- share of all answers -				
Renewables	175	6%	68%	23%	3%	10%
Business	20	5%	63%	26%	5%	10%
Consultants	57	9%	62%	29%		10%
NGO	13		92%	8%		8%
Officials	37	3%	74%	23%		16%
Research	33	7%	60%	20%	13%	9%
IC	123	5%	71%	21%	3%	9%
DC	42	11%	54%	29%	6%	13%
EU-25	72		69%	26%	5%	10%
USA	16	8%	85%	8%		13%
Fuel switch in energy and industry sectors	175	1%	20%	66%	13%	9%
Business	20		5%	68%	26%	9%
Consultants	57		30%	61%	9%	10%
NGO	13		18%	73%	9%	15%
Officials	37		25%	63%	13%	14%
Research	33		13%	80%	7%	6%
IC	123		15%	72%	12%	9%
DC	42		36%	50%	14%	10%
EU-25	72		13%	72%	15%	9%
USA	16		15%	77%	8%	13%
Supply-side efficiency	175		28%	64%	8%	17%
Business	20		18%	76%	6%	17%
Consultants	57		28%	60%	13%	17%
NGO	13		17%	83%		8%
Officials	37		46%	50%	4%	30%
Research	33		24%	72%	3%	9%
IC	123		26%	64%	9%	17%
DC	42		32%	62%	6%	15%
EU-25	72		23%	65%	12%	15%
USA	16		20%	80%		33%
Carbon capture and storage (CCS)	175	1%	15%	43%	41%	31%
Business	20		15%	54%	31%	31%
Consultants	57		21%	41%	38%	40%
NGO	13		10%	50%	40%	23%
Officials	37	5%	18%	41%	36%	41%
Research	33		4%	46%	50%	16%
IC	123	1%	13%	45%	40%	28%
DC	42		27%	41%	32%	42%
EU-25	72	2%	8%	49%	41%	24%
USA	16		11%	33%	56%	40%

Source: Öko-Institut

Table 40: Characteristics of project types: Project size (Question 10) – continued

	n	Very small	Small	Large	Very large	I don't know
		- share of all answers -				
Demand-side efficiency	175	10%	57%	29%	5%	19%
Business	20	13%	50%	31%	6%	19%
Consultants	57	14%	59%	22%	5%	23%
NGO	13		73%	27%		8%
Officials	37	12%	50%	38%		26%
Research	33	4%	56%	30%	11%	16%
IC	123	11%	60%	25%	3%	19%
DC	42	6%	45%	39%	10%	18%
EU-25	72	10%	62%	25%	4%	20%
USA	16	9%	45%	36%	9%	27%
Non-CO2 projects	175	2%	14%	35%	49%	17%
Business	20	7%	13%	27%	53%	17%
Consultants	57		7%	36%	57%	12%
NGO	13	11%	11%	33%	44%	25%
Officials	37		18%	32%	50%	22%
Research	33		22%	35%	43%	26%
IC	123	1%	17%	33%	49%	17%
DC	42	3%	7%	33%	57%	21%
EU-25	72	2%	13%	35%	51%	17%
USA	16		36%	18%	45%	27%
Transport	175	4%	33%	52%	11%	24%
Business	20	15%	38%	38%	8%	24%
Consultants	57	3%	30%	55%	12%	30%
NGO	13		22%	67%	11%	31%
Officials	37	7%	26%	63%	4%	27%
Research	33		30%	52%	19%	16%
IC	123	6%	39%	50%	5%	27%
DC	42		15%	61%	24%	18%
EU-25	72	6%	43%	47%	4%	29%
USA	16		30%	70%		33%
Afforestation and reforestation	175	5%	33%	46%	17%	25%
Business	20	8%	17%	67%	8%	25%
Consultants	57	5%	35%	46%	14%	21%
NGO	13		25%	50%	25%	38%
Officials	37		61%	32%	7%	24%
Research	33	8%	17%	42%	33%	25%
IC	123	7%	35%	45%	13%	25%
DC	42		31%	45%	24%	24%
EU-25	72	4%	39%	45%	12%	26%
USA	16		20%	60%	20%	33%

Source: Öko-Institut

Table 41: Characteristics of project types: Determination of the baseline (Question 10)

	n	Very easy	Easy	Difficult	Very difficult	I don't know
		- share of all answers -				
Renewables	175	13%	60%	24%	2%	6%
Business	20	16%	63%	21%		6%
Consultants	57	15%	57%	25%	4%	7%
NGO	13		70%	20%	10%	23%
Officials	37	20%	54%	26%		5%
Research	33	9%	66%	22%	3%	3%
IC	123	11%	61%	26%	2%	7%
DC	42	20%	55%	20%	5%	5%
EU-25	72	11%	62%	26%	2%	10%
USA	16	7%	53%	33%	7%	6%
Fuel switch in energy and industry sectors	175	12%	60%	27%	1%	9%
Business	20	16%	58%	26%		9%
Consultants	57	16%	49%	35%		11%
NGO	13		80%	10%	10%	23%
Officials	37	16%	59%	25%		11%
Research	33	10%	67%	23%		3%
IC	123	10%	61%	27%	1%	11%
DC	42	18%	55%	28%		5%
EU-25	72	15%	54%	31%		10%
USA	16	7%	67%	20%	7%	6%
Supply-side efficiency	175	4%	51%	41%	4%	13%
Business	20	6%	56%	39%		13%
Consultants	57	7%	41%	48%	4%	16%
NGO	13		50%	30%	20%	17%
Officials	37	3%	50%	40%	7%	17%
Research	33	3%	59%	38%		6%
IC	123	4%	57%	35%	4%	13%
DC	42	6%	27%	61%	6%	13%
EU-25	72	5%	51%	41%	3%	10%
USA	16		69%	23%	8%	19%
Carbon capture and storage (CCS)	175	10%	32%	35%	23%	29%
Business	20	7%	13%	53%	27%	29%
Consultants	57	12%	32%	32%	24%	37%
NGO	13	22%	33%	22%	22%	31%
Officials	37		36%	45%	18%	41%
Research	33	11%	33%	30%	26%	10%
IC	123	11%	32%	38%	20%	30%
DC	42	7%	29%	36%	29%	28%
EU-25	72	12%	24%	40%	24%	29%
USA	16		42%	42%	17%	25%

Source: Öko-Institut

Table 41: Characteristics of project types: Determination of the baseline (Question 10) – continued

	n	Very easy	Easy	Difficult	Very difficult	I don't know
		- share of all answers -				
Demand-side efficiency	175	2%	16%	59%	23%	16%
Business	20	6%	29%	47%	18%	16%
Consultants	57	5%	7%	64%	25%	19%
NGO	13		20%	60%	20%	23%
Officials	37		21%	54%	25%	24%
Research	33		10%	72%	17%	6%
IC	123	3%	15%	55%	27%	18%
DC	42		18%	74%	9%	15%
EU-25	72	2%	12%	51%	36%	16%
USA	16	8%	15%	62%	15%	19%
Non-CO2 projects	175	12%	52%	30%	6%	21%
Business	20		75%	25%		21%
Consultants	57	9%	58%	28%	5%	22%
NGO	13	17%	33%	33%	17%	45%
Officials	37	17%	40%	33%	10%	19%
Research	33	14%	43%	33%	10%	28%
IC	123	11%	58%	26%	4%	24%
DC	42	10%	37%	40%	13%	17%
EU-25	72	15%	53%	28%	4%	23%
USA	16		64%	18%	18%	31%
Transport	175	1%	8%	38%	54%	14%
Business	20			50%	50%	14%
Consultants	57	2%	4%	30%	64%	15%
NGO	13		20%	50%	30%	23%
Officials	37		3%	41%	56%	14%
Research	33		17%	34%	48%	9%
IC	123	1%	6%	43%	50%	17%
DC	42		14%	27%	59%	8%
EU-25	72	2%	7%	35%	56%	17%
USA	16		8%	46%	46%	19%
Afforestation and reforestation	175	3%	8%	44%	45%	20%
Business	20			25%	75%	20%
Consultants	57	2%	9%	54%	35%	16%
NGO	13	13%		25%	63%	38%
Officials	37	4%	11%	50%	36%	24%
Research	33	4%	7%	43%	46%	13%
IC	123	2%	8%	44%	45%	21%
DC	42	6%	6%	47%	42%	12%
EU-25	72	4%	7%	44%	46%	19%
USA	16		8%	17%	75%	25%

Source: Öko-Institut

Table 42: Characteristics of project types: Demonstration of additionality (Question 10)

	n	Very easy	Easy	Difficult	Very difficult	I don't know
			- share of all answers -			
Renewables	175	17%	47%	28%	7%	9%
Business	20	11%	56%	28%	6%	9%
Consultants	57	24%	38%	30%	8%	7%
NGO	13	27%	18%	45%	9%	15%
Officials	37	18%	53%	24%	6%	8%
Research	33	14%	57%	21%	7%	13%
IC	123	16%	48%	29%	7%	11%
DC	42	27%	49%	19%	5%	3%
EU-25	72	10%	51%	30%	10%	13%
USA	16		40%	47%	13%	6%
Fuel switch in energy and industry sectors	175	5%	45%	40%	10%	11%
Business	20	6%	39%	50%	6%	11%
Consultants	57	4%	43%	43%	11%	11%
NGO	13		27%	55%	18%	15%
Officials	37	6%	56%	28%	9%	14%
Research	33	7%	52%	33%	7%	13%
IC	123	5%	42%	42%	11%	14%
DC	42	6%	61%	31%	3%	5%
EU-25	72	7%	32%	45%	17%	14%
USA	16		53%	40%	7%	6%
Supply-side efficiency	175	3%	32%	53%	12%	15%
Business	20		24%	71%	6%	15%
Consultants	57	5%	27%	55%	14%	17%
NGO	13		42%	33%	25%	8%
Officials	37	3%	35%	45%	16%	16%
Research	33		36%	64%		19%
IC	123	3%	32%	53%	12%	17%
DC	42	3%	33%	58%	6%	13%
EU-25	72	3%	25%	54%	17%	16%
USA	16		38%	54%	8%	19%
Carbon capture and storage (CCS)	175	19%	41%	28%	12%	29%
Business	20	21%	36%	14%	29%	29%
Consultants	57	20%	49%	23%	9%	34%
NGO	13	10%	30%	30%	30%	23%
Officials	37	29%	29%	33%	8%	33%
Research	33	17%	46%	33%	4%	23%
IC	123	20%	39%	31%	10%	27%
DC	42	13%	46%	25%	17%	35%
EU-25	72	26%	26%	36%	12%	29%
USA	16	8%	58%	25%	8%	25%

Source: Öko-Institut

Table 42: Characteristics of project types: Demonstration of additionality (Question 10) – continued

	n	Very easy	Easy	Difficult	Very difficult	I don't know
		- share of all answers -				
Demand-side efficiency	175	1%	22%	58%	18%	16%
Business	20		29%	47%	24%	16%
Consultants	57	5%	12%	63%	21%	19%
NGO	13		30%	60%	10%	17%
Officials	37		23%	58%	19%	16%
Research	33		27%	69%	4%	16%
IC	123	2%	22%	57%	19%	17%
DC	42		23%	71%	6%	16%
EU-25	72	2%	17%	59%	22%	16%
USA	16		15%	69%	15%	19%
Non-CO2 projects	175	14%	48%	29%	8%	21%
Business	20	7%	53%	33%	7%	21%
Consultants	57	23%	50%	20%	7%	15%
NGO	13	13%	38%	38%	13%	33%
Officials	37	7%	53%	30%	10%	19%
Research	33	5%	47%	32%	16%	37%
IC	123	13%	52%	26%	9%	23%
DC	42	10%	45%	34%	10%	19%
EU-25	72	16%	49%	24%	12%	25%
USA	16		50%	33%	17%	25%
Transport	175	1%	16%	47%	36%	17%
Business	20		23%	46%	31%	17%
Consultants	57	2%	13%	42%	42%	15%
NGO	13		40%	50%	10%	23%
Officials	37		6%	55%	39%	16%
Research	33	4%	24%	36%	36%	19%
IC	123	1%	14%	48%	37%	21%
DC	42	3%	26%	41%	29%	11%
EU-25	72	2%	11%	45%	42%	23%
USA	16		23%	46%	31%	19%
Afforestation and reforestation	175	6%	24%	46%	24%	23%
Business	20		29%	29%	43%	23%
Consultants	57	7%	26%	49%	19%	17%
NGO	13	14%	14%	57%	14%	42%
Officials	37	7%	17%	48%	28%	22%
Research	33	9%	22%	43%	26%	26%
IC	123	3%	25%	48%	24%	25%
DC	42	16%	23%	42%	19%	16%
EU-25	72	4%	21%	48%	27%	26%
USA	16		23%	46%	31%	19%

Source: Öko-Institut

Table 43: Characteristics of project types: Sustainability benefits (Question 10)

	n	Very high	High	Low	Very low	I don't know
		- share of all answers -				
Renewables	175	55%	41%	4%	1%	2%
Business	20	50%	50%			2%
Consultants	57	61%	39%			2%
NGO	13	62%	31%	8%		
Officials	37	54%	43%	3%		5%
Research	33	55%	36%	9%		
IC	123	53%	44%	3%		2%
DC	42	63%	33%	5%		2%
EU-25	72	55%	41%	4%		1%
USA	16	47%	47%	7%		
Fuel switch in energy and industry sectors	175	13%	54%	26%	7%	3%
Business	20	20%	50%	25%	5%	3%
Consultants	57	8%	48%	33%	12%	4%
NGO	13	17%	33%	42%	8%	8%
Officials	37	21%	68%	12%		6%
Research	33	9%	59%	22%	9%	
IC	123	13%	55%	26%	6%	3%
DC	42	13%	55%	25%	8%	2%
EU-25	72	18%	56%	22%	4%	1%
USA	16	7%	33%	40%	20%	
Supply-side efficiency	175	11%	59%	25%	4%	7%
Business	20	11%	63%	21%	5%	7%
Consultants	57	8%	59%	27%	6%	8%
NGO	13	23%	23%	46%	8%	
Officials	37	23%	55%	23%		14%
Research	33	3%	74%	19%	3%	3%
IC	123	12%	60%	23%	5%	7%
DC	42	14%	54%	30%	3%	8%
EU-25	72	17%	56%	24%	3%	4%
USA	16		46%	38%	15%	13%
Carbon capture and storage (CCS)	175	4%	21%	38%	37%	16%
Business	20		12%	47%	41%	16%
Consultants	57		17%	39%	44%	23%
NGO	13	18%	9%	18%	55%	15%
Officials	37	3%	34%	45%	17%	19%
Research	33	3%	21%	41%	34%	6%
IC	123	2%	21%	45%	33%	15%
DC	42	3%	26%	26%	45%	21%
EU-25	72	3%	27%	42%	28%	13%
USA	16		15%	54%	31%	13%

Source: Öko-Institut

Table 43: Characteristics of project types: Sustainability benefits (Question 10) – continued

	n	Very high	High	Low	Very low	I don't know
		- share of all answers -				
Demand-side efficiency	175	25%	59%	14%	1%	7%
Business	20	32%	47%	21%		7%
Consultants	57	31%	57%	12%		8%
NGO	13	23%	46%	31%		
Officials	37	32%	61%	6%		14%
Research	33	10%	71%	16%	3%	3%
IC	123	30%	58%	12%	1%	7%
DC	42	11%	65%	24%		8%
EU-25	72	27%	55%	17%	2%	4%
USA	16	31%	62%	8%		13%
Non-CO2 projects	175	9%	27%	43%	21%	17%
Business	20	13%	31%	44%	13%	17%
Consultants	57	10%	21%	44%	25%	11%
NGO	13	10%	10%	50%	30%	17%
Officials	37	13%	33%	37%	17%	19%
Research	33		33%	48%	19%	34%
IC	123	8%	28%	46%	18%	18%
DC	42	9%	27%	33%	30%	18%
EU-25	72	14%	34%	38%	14%	19%
USA	16		20%	70%	10%	33%
Transport	175	35%	54%	10%	2%	9%
Business	20	25%	56%	19%		9%
Consultants	57	44%	48%	8%		9%
NGO	13	23%	69%	8%		
Officials	37	34%	47%	16%	3%	11%
Research	33	38%	55%	3%	3%	9%
IC	123	34%	53%	12%	1%	10%
DC	42	38%	54%	5%	3%	8%
EU-25	72	36%	52%	10%	2%	10%
USA	16	31%	46%	23%		13%
Afforestation and reforestation	175	28%	44%	23%	5%	12%
Business	20	18%	41%	29%	12%	12%
Consultants	57	42%	35%	19%	4%	11%
NGO	13	40%	30%	20%	10%	23%
Officials	37	19%	58%	23%		16%
Research	33	16%	52%	26%	6%	6%
IC	123	24%	46%	25%	5%	14%
DC	42	37%	45%	13%	5%	7%
EU-25	72	20%	43%	33%	5%	13%
USA	16	8%	69%	15%	8%	13%

Source: Öko-Institut

Table 44: What will be the typical mitigation costs in 2010? (Question 11)

	n	Less than 0 US$/t CO_2e	0 - 5 US$/t CO_2e	5 - 10 US$/t CO_2e	10 - 25 US$/t CO_2e	25 - 50 US$/t CO_2e	Higher than 50 US$/t CO_2e	I don't know
		- share of all answers -						
Large hydro	**162**	**6%**	**40%**	**28%**	**17%**	**6%**	**3%**	**44%**
Business	20	14%	43%	14%	21%	7%		30%
Consultants	52	7%	37%	30%	15%	4%	7%	46%
NGO	9		20%	40%	20%	20%		44%
Officials	36		44%	22%	22%	6%	6%	49%
Research	31		47%	29%	18%	6%		43%
IC	117	6%	38%	28%	20%	3%	5%	44%
DC	36		45%	30%	10%	15%		43%
EU-25	69	3%	47%	22%	22%		6%	46%
USA	15		17%	17%	33%	17%	17%	60%
Small hydro	**162**	**2%**	**19%**	**34%**	**29%**	**13%**	**3%**	**39%**
Business	20	7%	29%	29%	21%	7%	7%	30%
Consultants	52		18%	36%	25%	18%	4%	43%
NGO	9		17%	33%	17%	17%	17%	33%
Officials	36		14%	38%	33%	14%		42%
Research	31		26%	32%	37%	5%		34%
IC	117	1%	19%	35%	29%	13%	3%	39%
DC	36		23%	27%	32%	14%	5%	39%
EU-25	69	3%	16%	30%	32%	14%	5%	43%
USA	15		29%	43%	14%	14%		53%
Biomass	**162**	**4%**	**23%**	**36%**	**32%**	**5%**	**1%**	**36%**
Business	20	7%	13%	40%	33%	7%		25%
Consultants	52	3%	23%	29%	39%	3%	3%	37%
NGO	9		33%	17%	50%			33%
Officials	36		20%	55%	20%	5%		44%
Research	31	5%	24%	33%	38%			30%
IC	117	4%	18%	36%	35%	5%	1%	35%
DC	36		32%	36%	27%	5%		39%
EU-25	69	7%	16%	40%	28%	7%	2%	35%
USA	15				100%			60%
Wind	**162**	**1%**	**12%**	**32%**	**38%**	**13%**	**4%**	**38%**
Business	20	7%	13%	20%	40%	13%	7%	25%
Consultants	52		13%	43%	23%	17%	3%	40%
NGO	9			50%	50%			33%
Officials	36		5%	21%	53%	16%	5%	46%
Research	31		10%	30%	45%	10%	5%	31%
IC	117	1%	10%	32%	37%	15%	5%	36%
DC	36		5%	40%	45%	10%		43%
EU-25	69	2%	7%	31%	36%	17%	7%	36%
USA	15			17%	50%	33%		60%
Solar thermal power	**162**	**3%**	**10%**	**26%**	**26%**	**23%**	**11%**	**43%**
Business	20	7%	14%	7%	36%	21%	14%	30%
Consultants	52	4%	8%	25%	21%	29%	13%	51%
NGO	9	17%		50%		33%		33%
Officials	36		11%	39%	28%	11%	11%	49%
Research	31		11%	22%	28%	28%	11%	36%
IC	117	3%	11%	26%	21%	26%	14%	42%
DC	36	6%	6%	29%	35%	18%	6%	50%
EU-25	69	3%	13%	24%	13%	26%	21%	42%
USA	15		20%		20%	60%		67%

Source: Öko-Institut

Table 44: What will be the typical mitigation costs in 2010? (Question 11) – continued

	n	Less than 0 US$/t CO_2e	0 - 5 US$/t CO_2e	5 - 10 US$/t CO_2e	10 - 25 US$/t CO_2e	25 - 50 US$/t CO_2e	Higher than 50 US$/t CO_2e	I don't know
		- share of all answers -						
Photovoltaics	**162**		**3%**	**13%**	**24%**	**29%**	**31%**	**41%**
Business	20		7%	14%	14%	29%	36%	30%
Consultants	52		4%	21%	7%	25%	43%	43%
NGO	9		17%		50%	17%	17%	33%
Officials	36			12%	47%	29%	12%	51%
Research	31			11%	28%	22%	39%	36%
IC	117		3%	9%	25%	26%	38%	39%
DC	36		6%	29%	18%	35%	12%	50%
EU-25	69		3%	8%	23%	20%	48%	38%
USA	15			17%		33%	50%	60%
Geothermal	**162**	**1%**	**14%**	**25%**	**35%**	**16%**	**8%**	**49%**
Business	20		21%	14%	43%	21%		30%
Consultants	52	4%	13%	30%	26%	17%	9%	53%
NGO	9			20%	60%	20%		38%
Officials	36		7%	33%	40%	7%	13%	57%
Research	31		19%	19%	31%	25%	6%	43%
IC	117	2%	14%	24%	35%	19%	6%	44%
DC	36		8%	25%	42%	8%	17%	64%
EU-25	69		14%	22%	39%	14%	11%	45%
USA	15		20%		60%	20%		67%
Landfills	**162**	**6%**	**48%**	**30%**	**9%**	**5%**	**1%**	**38%**
Business	20	7%	36%	43%	7%	7%		26%
Consultants	52	10%	48%	32%	3%	3%	3%	38%
NGO	9		25%	25%	50%			50%
Officials	36		57%	29%	10%	5%		42%
Research	31	6%	44%	31%	13%	6%		43%
IC	117	6%	48%	32%	8%	4%	1%	37%
DC	36	6%	39%	28%	17%	11%		45%
EU-25	69	5%	46%	33%	10%	3%	3%	39%
USA	15		57%	29%		14%		53%
HFC23 from HCFC22 production	**162**	**13%**	**60%**	**12%**	**11%**	**2%**	**1%**	**46%**
Business	20	20%	30%	30%	10%	10%		47%
Consultants	52	15%	70%	7%	4%		4%	45%
NGO	9		67%	33%				63%
Officials	36	16%	58%	16%	11%			47%
Research	31		62%	8%	23%	8%		54%
IC	117	14%	56%	15%	12%	2%	2%	47%
DC	36	13%	63%	6%	13%	6%		52%
EU-25	69	15%	47%	21%	15%		3%	46%
USA	15	20%	60%		20%			67%
N2O from nitric or adipic acid production	**162**	**10%**	**62%**	**14%**	**10%**	**1%**	**1%**	**55%**
Business	20	11%	33%	33%	22%			53%
Consultants	52	13%	61%	17%	4%		4%	54%
NGO	9		67%	33%				63%
Officials	36	13%	75%	6%	6%			54%
Research	31		67%	8%	17%	8%		57%
IC	117	10%	58%	18%	12%		2%	55%
DC	36	7%	71%	7%	7%	7%		56%
EU-25	69	10%	50%	23%	13%		3%	52%
USA	15		100%					93%

Source: Öko-Institut

Table 44: What will be the typical mitigation costs in 2010? (Question 11) – continued

	n	Less than 0 US$/t CO_2e	0 - 5 US$/t CO_2e	5 - 10 US$/t CO_2e	10 - 25 US$/t CO_2e	25 - 50 US$/t CO_2e	Higher than 50 US$/t CO_2e	I don't know
		- share of all answers -						
Waste water treatment	**162**	**1%**	**36%**	**35%**	**21%**	**5%**	**1%**	**50%**
Business	20	11%	22%	33%	33%			53%
Consultants	52		41%	37%	19%		4%	46%
NGO	9			60%	20%	20%		44%
Officials	36		38%	46%	15%			63%
Research	31		44%	19%	31%	6%		43%
IC	117	2%	34%	36%	22%	3%	2%	48%
DC	36		36%	36%	21%	7%		58%
EU-25	69	3%	38%	38%	19%		3%	50%
USA	15		20%	20%	60%			67%
Coal Mine Methane	**162**	**4%**	**43%**	**27%**	**18%**	**6%**	**3%**	**49%**
Business	20		33%	25%	17%	17%	8%	37%
Consultants	52	4%	52%	33%	7%		4%	46%
NGO	9		25%	50%	25%			56%
Officials	36	6%	38%	19%	38%			56%
Research	31		50%	17%	17%	17%		57%
IC	117	2%	47%	24%	17%	7%	3%	48%
DC	36	7%	33%	33%	20%	7%		56%
EU-25	69	3%	41%	21%	24%	6%	6%	47%
USA	15		40%	20%	40%			67%
Fuel switch in energy and industry	**162**	**6%**	**29%**	**34%**	**26%**	**3%**	**2%**	**41%**
Business	20	7%	29%	36%	21%	7%		26%
Consultants	52	3%	24%	45%	24%		3%	40%
NGO	9		33%	67%				63%
Officials	36	6%	24%	35%	24%	12%		53%
Research	31		41%	18%	35%		6%	37%
IC	117	5%	29%	35%	25%	3%	3%	41%
DC	36	5%	21%	37%	32%	5%		42%
EU-25	69	3%	35%	30%	22%	5%	5%	41%
USA	15	14%	29%	57%				53%
Supply-side efficiency	**162**	**8%**	**31%**	**36%**	**18%**	**4%**	**2%**	**46%**
Business	20	8%	42%	25%	17%	8%		37%
Consultants	52	12%	31%	38%	15%		4%	47%
NGO	9		67%	33%				63%
Officials	36	7%	20%	40%	20%	13%		57%
Research	31	6%	22%	39%	28%		6%	36%
IC	117	7%	27%	40%	20%	3%	3%	46%
DC	36	6%	38%	31%	19%	6%		50%
EU-25	69	9%	29%	31%	20%	6%	6%	46%
USA	15		20%	40%	40%			64%
Carbon capture and storage	**162**		**14%**	**9%**	**29%**	**25%**	**23%**	**55%**
Business	20		17%	17%	17%	17%	33%	40%
Consultants	52		16%	11%	42%	16%	16%	60%
NGO	9		25%	25%	25%		25%	56%
Officials	36		20%	10%	30%	20%	20%	72%
Research	31		13%		27%	27%	33%	48%
IC	117		13%	7%	28%	24%	28%	53%
DC	36		30%	20%	30%	10%	10%	70%
EU-25	69		9%	6%	25%	31%	28%	52%
USA	15				40%	20%	40%	67%

Source: Öko-Institut

Table 44: What will be the typical mitigation costs in 2010? (Question 11) – continued

	n	Less than 0 US$/t CO_2e	0 - 5 US$/t CO_2e	5 - 10 US$/t CO_2e	10 - 25 US$/t CO_2e	25 - 50 US$/t CO_2e	Higher than 50 US$/t CO_2e	I don't know
		- share of all answers -						
Demand-side efficiency	**162**	**12%**	**22%**	**35%**	**26%**	**4%**	**1%**	**45%**
Business	20	8%	33%	25%	25%	8%		37%
Consultants	52	9%	17%	52%	17%		4%	50%
NGO	9		25%	50%	25%			50%
Officials	36	6%	24%	41%	24%	6%		51%
Research	31	24%	24%	18%	35%			39%
IC	117	11%	23%	35%	26%	3%	2%	44%
DC	36	13%	20%	33%	27%	7%		53%
EU-25	69	12%	21%	35%	24%	6%	3%	45%
USA	15	29%	14%	29%	29%			53%
Transport	**162**		**9%**	**28%**	**32%**	**19%**	**11%**	**51%**
Business	20		11%	33%	33%		22%	53%
Consultants	52		9%	35%	35%	13%	9%	50%
NGO	9			50%	25%	25%		56%
Officials	36			31%	38%	13%	19%	56%
Research	31		27%	7%	33%	33%		48%
IC	117		8%	25%	33%	21%	13%	53%
DC	36		18%	35%	35%	12%		50%
EU-25	69		11%	21%	25%	21%	21%	55%
USA	15			20%	40%	20%	20%	67%
Afforestation and reforestation	**162**	**4%**	**35%**	**37%**	**16%**	**6%**	**2%**	**47%**
Business	20	9%	36%	36%	18%			42%
Consultants	52	4%	32%	44%	12%	4%	4%	49%
NGO	9		25%	25%	50%			56%
Officials	36	6%	29%	53%	12%			53%
Research	31		28%	28%	17%	22%	6%	38%
IC	117	3%	33%	38%	16%	7%	3%	46%
DC	36	6%	38%	38%	13%	6%		53%
EU-25	69	3%	33%	39%	14%	8%	3%	45%
USA	15	14%	14%	14%	43%	14%		53%

Source: Öko-Institut

Table 45: What will be the market price of temporary and long-term CERs relative to CERs from other project types in 2010? (Question 12)

	n	≤ 20 %	≤ 40 %	≤ 60 %	≤ 80 %	≤ 100 %	> 100 %	Average	I don't know
		- share of all answers -							
Long-term CERs (lCERs)	**164**	**7%**	**11%**	**36%**	**32%**	**11%**	**4%**	**63%**	**65%**
Business	20	33%		33%	33%			47%	85%
Consultants	53	4%	13%	35%	22%	22%	4%	66%	53%
NGO	11				100%			75%	91%
Officials	38	11%	11%	44%	33%			54%	76%
Research	30	7%	7%	36%	43%	7%		62%	53%
IC	119	3%	12%	38%	26%	18%	3%	66%	71%
DC	38	12%	12%	35%	41%			55%	53%
EU-25	71	4%	13%	43%	30%	4%	4%	62%	66%
USA	15			33%	33%	33%		75%	80%
Temporary CERs (tCERs)	**164**	**25%**	**25%**	**33%**	**14%**	**4%**		**42%**	**65%**
Business	20	50%		50%				28%	90%
Consultants	53	21%	21%	38%	17%	4%		46%	55%
NGO	11			100%				60%	91%
Officials	38	33%	22%	11%	22%	11%		43%	76%
Research	30	33%	40%	27%				31%	50%
IC	119	29%	23%	34%	11%	3%		40%	71%
DC	38	18%	35%	35%	12%			41%	55%
EU-25	71	35%	22%	26%	13%	4%		39%	68%
USA	15		67%	33%				40%	80%

Source: Öko-Institut

Table 46: Future development of CDM and JI (Do you agree with the following statements?) (Question 13)

	All	Busi-ness	Consul-tants	NGO	Offi-cials	Re-search	IC	DC	EU-25	USA
n	181	21	58	13	41	32	129	41	78	15
Question	- share of affirmative answers ("I agree") -									
Industrialized countries will mainly use project-based mechanisms to fulfill their Kyoto commitments.	33%	39%	35%	54%	20%	29%	28%	44%	28%	33%
Industrialized countries will mainly implement domestic measures and use international emissions trading but not project-based mechanisms to fulfill their Kyoto commitments.	45%	44%	46%	40%	47%	50%	46%	44%	42%	54%
Industrialized countries will mainly use international emissions trading and project-based mechanisms to fulfill their Kyoto commitments.	54%	63%	48%	50%	47%	66%	52%	61%	53%	42%
Companies covered under emissions trading schemes will mainly use project-based mechanisms to fulfill their commitments.	29%	41%	37%	42%	19%	21%	23%	56%	20%	29%
Companies covered under emissions trading schemes will mostly carry out internal abatement measures and/or use emissions trading but not project-based mechanisms to meet their commitments.	68%	67%	65%	60%	70%	80%	73%	53%	75%	64%
By 2010, the demand for CERs and ERUs will be dominated by governmental procurement tenders.	46%	25%	34%	78%	50%	58%	46%	42%	43%	50%
By 2010, the demand for CERs and ERUs will be dominated by companies covered under emissions trading schemes.	54%	70%	60%	56%	53%	37%	46%	76%	49%	22%
Buyers using CERs or ERUs for voluntary compensation of greenhouse gas emissions will make up more than 3 % of the overall demand for CERs and ERUs.	49%	50%	51%	86%	38%	36%	47%	69%	46%	60%
Most companies covered under emissions trading schemes will use carbon funds to purchase CERs or ERUs.	75%	83%	67%	89%	70%	77%	76%	68%	76%	67%
Most companies covered under emissions trading schemes will directly invest in CDM or JI projects.	17%	15%	18%	20%	23%	12%	14%	32%	13%	33%
By 2010, 20 % of all projects will provide more than 80 % of all CERs and ERUs.	68%	79%	64%	67%	81%	52%	68%	68%	64%	80%
By 2010, more than two thirds of the global CERs will come from China and India.	45%	33%	39%	36%	76%	39%	45%	50%	50%	30%
Only large host countries will utilise the domestic JI or CDM mitigation potential.	38%	36%	33%	55%	48%	35%	36%	44%	34%	27%
By 2010, most procurement tenders and carbon funds will also purchase tCERs and lCERs from afforestation and reforestation projects.	44%	44%	37%	40%	52%	50%	42%	52%	41%	67%
The temporary character of lCERs and tCERs is in many cases prohibitive to the implementation of afforestation or reforestation projects under the CDM.	75%	69%	74%	71%	70%	86%	76%	72%	69%	100%
Most afforestation and reforestation projects aim at a temporary storage of carbon (such as, for example, commercial plantations).	77%	69%	67%	91%	80%	95%	79%	72%	81%	73%
On a global scale, less than 10 % of the carbon stored in afforestation and reforestation projects will be released unintentionally (e.g. as a result of fires, illegal logging, etc)	63%	70%	61%	33%	73%	53%	58%	74%	57%	56%
Carbon revenues significantly increase the profitability of CDM and JI projects.	57%	58%	60%	45%	58%	57%	59%	50%	68%	40%
In many cases, carbon revenues are the icing on the cake, but are not decisive for the investment decision.	74%	60%	73%	64%	83%	85%	70%	84%	72%	60%
Many projects would also be implemented without registration under the CDM.	56%	35%	59%	60%	48%	71%	51%	67%	49%	69%
Many CDM electricity generation projects result in an increased consumption of electricity.	51%	40%	42%	67%	50%	73%	60%	31%	56%	60%
Most CDM projects have sustainable development benefits (health, poverty alleviation, etc).	70%	82%	75%	58%	74%	62%	75%	68%	70%	80%
Most CDM projects lead to a transfer of technology to developing countries.	61%	83%	56%	42%	61%	57%	71%	35%	71%	71%
Transaction costs are significantly reduced once project developers can draw on approved methodologies and projects of the same type.	91%	95%	90%	92%	94%	87%	91%	90%	92%	100%

Source: Öko-Institut

Table 47: Evolution of the climate mitigation regime (By when do you expect the following to happen?) (Question 14)

	n	2010	2020	2030	2040	2050	Later or never	I don't know
		- share of all answers -						
More than 80 % of global GHG emissions will be regulated by binding and quantitative reduction commitments under national or international law.	**180**	**1%**	**33%**	**32%**	**8%**	**8%**	**18%**	**11%**
Business	21	5%	42%	32%		11%	11%	10%
Consultants	59		35%	29%	9%	9%	18%	5%
NGO	13		55%	36%			9%	15%
Officials	40		29%	39%	10%	6%	16%	23%
Research	32	3%	21%	28%	17%	7%	24%	9%
IC	129	1%	34%	32%	7%	7%	19%	9%
DC	41	3%	34%	28%	13%	9%	13%	22%
EU-25	77	1%	29%	35%	8%	6%	21%	6%
USA	16		54%	31%			15%	13%
All major industrialized countries will have introduced emissions trading schemes.	**180**	**23%**	**57%**	**9%**	**3%**	**2%**	**6%**	**6%**
Business	21	32%	37%	11%		11%	11%	10%
Consultants	59	29%	60%	7%	2%		2%	2%
NGO	13	17%	50%	33%				8%
Officials	40	26%	60%		6%		9%	13%
Research	32	10%	62%	10%	7%	3%	7%	6%
IC	129	19%	61%	10%	2%	2%	5%	5%
DC	41	41%	41%	8%	5%		5%	10%
EU-25	77	21%	53%	11%	4%	4%	7%	4%
USA	16	21%	57%	14%			7%	13%
Emissions trading schemes in industrialized countries will have been extended to most sectors of the economy (i.e. including the transport, residential, and commercial sectors).	**180**	**8%**	**53%**	**21%**	**4%**	**3%**	**12%**	**10%**
Business	21	11%	53%	37%				10%
Consultants	59	6%	49%	25%	4%		17%	9%
NGO	13	17%	50%	17%		8%	8%	8%
Officials	40	9%	59%	15%	3%	6%	9%	15%
Research	32	4%	61%	14%	7%	4%	11%	7%
IC	129	4%	54%	23%	4%	1%	14%	10%
DC	41	20%	46%	20%	3%	9%	3%	13%
EU-25	77	4%	48%	22%	4%	1%	20%	9%
USA	16	7%	57%	21%			14%	13%
Emissions trading schemes in industrialized countries will cover all GHGs.	**180**	**10%**	**49%**	**16%**	**5%**	**1%**	**20%**	**12%**
Business	21	5%	53%	11%	11%	5%	16%	10%
Consultants	59	13%	44%	20%	4%		19%	7%
NGO	13		42%	17%			42%	8%
Officials	40	10%	68%	3%	3%		16%	23%
Research	32	4%	43%	18%	11%		25%	7%
IC	129	6%	53%	14%	4%	1%	22%	10%
DC	41	18%	36%	21%	9%		15%	18%
EU-25	77	6%	49%	14%	4%		27%	7%
USA	16	8%	42%	17%	8%		25%	25%

Source: Öko-Institut

Table 47: Evolution of the climate mitigation regime (By when do you expect the following to happen?) (Question 14) – continued

	n	2010	2020	2030	2040	2050	Later or never	I don't know
		- share of all answers -						
Emissions trading will have been extended to most countries and sectors worldwide.	**180**	**1%**	**24%**	**32%**	**18%**	**7%**	**19%**	**13%**
Business	21		31%	19%	13%	13%	25%	24%
Consultants	59		27%	24%	24%	5%	20%	4%
NGO	13		36%	27%	18%		18%	15%
Officials	40		20%	57%	10%	3%	10%	23%
Research	32	3%	10%	28%	17%	14%	28%	3%
IC	129		21%	34%	20%	7%	18%	13%
DC	41	3%	32%	24%	12%	6%	24%	13%
EU-25	77		16%	33%	22%	7%	21%	11%
USA	16		38%	23%	23%	8%	8%	19%
More than 80 % of global CO2 emissions from energy-intensive industries will be covered under emissions trading schemes.	**180**	**4%**	**39%**	**29%**	**9%**	**8%**	**11%**	**10%**
Business	21	6%	44%	11%		17%	22%	14%
Consultants	59		42%	33%	10%	8%	8%	4%
NGO	13	8%	50%	8%	25%	8%		8%
Officials	40	6%	48%	35%	3%	3%	3%	23%
Research	32	7%	21%	24%	17%	10%	21%	3%
IC	129	3%	39%	31%	11%	8%	8%	9%
DC	41	13%	41%	16%	3%	9%	19%	16%
EU-25	77	3%	37%	28%	14%	11%	7%	5%
USA	16		50%	29%			21%	13%
The market price for emission allowances (AAUs, ERUs, CERs, etc) will exceed 50 US$/t CO2e.	**180**	**12%**	**29%**	**20%**	**7%**	**9%**	**23%**	**22%**
Business	21	25%	13%	25%		13%	25%	24%
Consultants	59	14%	27%	16%	14%	7%	23%	21%
NGO	13	11%	67%	11%		11%		31%
Officials	40	7%	36%	29%		4%	25%	26%
Research	32	9%	22%	22%	4%	17%	26%	23%
IC	129	13%	26%	21%	9%	8%	22%	22%
DC	41	11%	43%	14%		14%	18%	26%
EU-25	77	18%	21%	20%	8%	7%	26%	19%
USA	16		33%	11%	11%	11%	33%	40%
The market price for emission allowances (AAUs, ERUs, CERs, etc) will exceed 100 US$/t CO2e.	**180**	**2%**	**13%**	**15%**	**8%**	**9%**	**53%**	**25%**
Business	21		19%	13%	6%	13%	50%	20%
Consultants	59		20%	11%	2%	5%	61%	21%
NGO	13		25%	25%	13%		38%	38%
Officials	40	3%	7%	20%	17%	10%	43%	25%
Research	32	5%		10%	5%	20%	60%	33%
IC	129		13%	16%	6%	12%	54%	25%
DC	41	7%	17%	14%	14%	3%	45%	24%
EU-25	77		13%	11%	8%	11%	56%	20%
USA	16			13%	13%	25%	50%	47%

Source: Öko-Institut

Table 47: Evolution of the climate mitigation regime (By when do you expect the following to happen?)(Question 14) – continued

	n	2010	2020	2030	2040	2050	Later or never	I don't know
		- share of all answers -						
A sectoral CDM will be introduced, which allows developing countries to obtain credits for reducing emissions in a sector or subsector of the economy (e.g. through respective policies)	**180**	**19%**	**56%**	**12%**	**2%**	**1%**	**11%**	**18%**
Business	21	13%	40%	27%			20%	25%
Consultants	59	13%	65%	9%	2%		11%	16%
NGO	13	50%	30%	10%			10%	23%
Officials	40	15%	56%	18%	3%	3%	6%	15%
Research	32	25%	50%	4%	4%		17%	20%
IC	129	16%	61%	11%	1%		10%	23%
DC	41	22%	42%	14%	6%	3%	14%	5%
EU-25	77	15%	56%	15%	2%		13%	17%
USA	16	10%	70%	10%			10%	33%
The project-based CDM will completely disappear.	**180**	**2%**	**17%**	**14%**	**11%**	**3%**	**52%**	**27%**
Business	21		13%	13%	7%		67%	25%
Consultants	59		9%	20%	9%	4%	58%	20%
NGO	13	11%	44%				44%	31%
Officials	40		18%	14%	27%		41%	44%
Research	32	9%	9%	13%	13%	9%	48%	21%
IC	129	2%	15%	16%	12%	4%	49%	27%
DC	41	4%	12%	4%	12%		68%	34%
EU-25	77		15%	18%	15%	5%	47%	25%
USA	16	15%	31%	23%			31%	19%
The role of JI in reducing GHG emissions will be negligible in comparison to emissions trading.	**180**	**32%**	**39%**	**11%**	**2%**		**15%**	**32%**
Business	21	33%	20%	7%			40%	25%
Consultants	59	21%	53%	8%	3%		16%	31%
NGO	13	50%	50%					54%
Officials	40	36%	28%	20%	4%		12%	38%
Research	32	38%	48%	10%			5%	30%
IC	129	35%	35%	10%	1%		18%	30%
DC	41	20%	50%	15%	5%		10%	46%
EU-25	77	35%	33%	12%	2%		18%	20%
USA	16	50%	50%					60%
JI will completely disappear.	**180**	**5%**	**36%**	**20%**	**13%**	**2%**	**25%**	**35%**
Business	21	8%	46%	8%			38%	35%
Consultants	59	3%	32%	26%	13%	3%	24%	31%
NGO	13	25%	25%	25%			25%	38%
Officials	40	4%	35%	9%	26%		26%	43%
Research	32	5%	30%	35%	10%	5%	15%	33%
IC	129	6%	31%	20%	13%	1%	28%	34%
DC	41	5%	35%	25%	10%	5%	20%	47%
EU-25	77	2%	36%	23%	11%	2%	26%	29%
USA	16	17%	50%	17%	17%			60%

Source: Öko-Institut

Table 48: What will be the global annual market size of project-based mechanisms (JI and CDM) in 2010, 2020 and 2050? (Question 15)

	n	< 100 Mt CO_2e	100 - 250 Mt CO_2e	250 - 500 Mt CO_2e	500 - 1,000 Mt CO_2e	1,000 - 2,000 Mt CO_2e	2,000 - 5,000 Mt CO_2e	> 5,000 Mt CO_2e	I don't know
		- share of all answers -							
2010	**170**	**14%**	**31%**	**25%**	**14%**	**11%**	**5%**	**1%**	**36%**
Business	19	7%	29%	21%	7%	29%	7%		26%
Consultants	53	9%	28%	22%	16%	16%	6%	3%	40%
NGO	13	14%	29%	43%	14%				46%
Officials	38	17%	26%	30%	17%		9%		39%
Research	32	24%	24%	29%	14%	10%			32%
IC	120	16%	33%	20%	13%	12%	4%	1%	38%
DC	40	8%	16%	44%	16%	12%	4%		36%
EU-25	72	23%	33%	16%	9%	9%	7%	2%	40%
USA	15	25%	38%	25%	13%				47%
2020	**170**	**6%**	**10%**	**30%**	**18%**	**15%**	**17%**	**4%**	**47%**
Business	19	8%	15%	15%	15%	8%	31%	8%	32%
Consultants	53	7%		29%	29%	7%	21%	7%	46%
NGO	13	17%		33%	17%	17%	17%		54%
Officials	38	5%	21%	32%	5%	26%	5%	5%	50%
Research	32		12%	35%	18%	24%	12%		43%
IC	120	6%	10%	40%	11%	15%	13%	5%	48%
DC	40	4%	9%	4%	35%	17%	30%		39%
EU-25	72	5%	11%	43%	11%	8%	16%	5%	49%
USA	15	17%	17%	50%		17%			60%
2050	**170**	**10%**	**6%**	**9%**	**16%**	**19%**	**16%**	**23%**	**54%**
Business	19	8%		8%	8%	31%	15%	31%	32%
Consultants	53	4%	4%	12%	20%	20%	16%	24%	52%
NGO	13	20%			20%	60%			58%
Officials	38	19%	13%	19%	6%		25%	19%	57%
Research	32		15%		15%	23%	15%	31%	58%
IC	120	10%	10%	10%	14%	22%	16%	20%	57%
DC	40	5%		9%	18%	18%	18%	32%	44%
EU-25	72	7%	14%	10%	7%	24%	17%	21%	59%
USA	15	25%	25%		25%	25%			73%

Source: Öko-Institut

Table 49: What will be the geographic distribution of CDM and JI projects in 2020 and 2050? (Question 16)

	All	Business	Consultants	NGO	Officials	Research	IC	DC	EU-25	USA
n	109	10	34	5	25	23	72	30	42	8
2020					- average share -					
Non-Annex I countries										
China	22%	30%	21%	16%	21%	22%	22%	23%	22%	21%
India	17%	20%	16%	12%	18%	16%	17%	17%	17%	15%
Rest of Asia	8%	8%	8%	8%	8%	7%	8%	7%	8%	7%
Brazil	9%	7%	9%	6%	11%	9%	9%	8%	10%	6%
Rest of Latin America	7%	7%	8%	8%	7%	6%	7%	8%	7%	5%
Africa	4%	6%	4%	6%	4%	6%	4%	5%	5%	4%
Rest of developing countries	4%	2%	4%	5%	4%	3%	4%	4%	3%	4%
Annex I countries										
EU-15	10%	6%	12%	21%	10%	9%	9%	14%	7%	21%
EU-10										
USA	4%	2%	5%	7%	4%	4%	5%	3%	5%	5%
Former Soviet Union	8%	9%	8%	4%	9%	9%	9%	6%	11%	6%
Rest of industrialized countries	6%	2%	7%	6%	5%	8%	6%	6%	7%	6%
2050					- average share -					
Non-Annex I countries										
China	19%	26%	17%	16%	17%	20%	18%	21%	19%	18%
India	15%	16%	13%	14%	17%	16%	15%	15%	17%	14%
Rest of Asia	9%	11%	8%	11%	8%	7%	9%	7%	9%	7%
Brazil	7%	10%	7%	5%	7%	9%	8%	7%	8%	7%
Rest of Latin America	7%	7%	8%	9%	7%	5%	7%	7%	6%	6%
Africa	7%	7%	6%	12%	5%	7%	6%	6%	6%	7%
Rest of developing countries	4%	3%	5%	9%	4%	4%	5%	4%	4%	1%
Annex I countries										
EU-15	8%	5%	8%	5%	10%	8%	7%	11%	5%	12%
EU-10	5%	3%	6%	5%	6%	6%	6%	5%	5%	6%
USA	6%	1%	7%	5%	7%	6%	6%	6%	5%	10%
Former Soviet Union	8%	9%	7%	6%	7%	8%	9%	6%	10%	7%
Rest of industrialized countries	5%	2%	6%	5%	5%	5%	5%	5%	5%	4%

Source: Öko-Institut

Table 50: Share of the global CDM and JI market by mitigation options (What will be the distribution of CDM and JI projects across mitigation options in 2020 and 2050?) (Question 17)

	All	Business	Consultants	NGO	Officials	Research	IC	DC	EU-25	USA
	- weighted average -									
2020										
Non-CO2 projects	25%	19%	29%	20%	29%	20%	27%	18%	26%	19%
Renewables	18%	16%	20%	20%	17%	19%	17%	22%	16%	18%
Fuel switch in energy and industry sectors	13%	13%	12%	14%	13%	15%	14%	12%	15%	17%
Supply-side efficiency	12%	15%	10%	8%	12%	14%	12%	10%	15%	10%
Demand-side efficiency	8%	12%	6%	10%	6%	8%	8%	7%	7%	14%
Afforestation and reforestation	8%	8%	8%	10%	6%	8%	7%	9%	8%	6%
Transport	7%	11%	6%	8%	7%	8%	6%	10%	6%	7%
Carbon Capture and Storage (CCS)	5%	3%	6%	5%	5%	5%	5%	6%	5%	4%
Other projects	4%	2%	4%	4%	5%	4%	4%	5%	3%	5%
2050										
Non-CO2 projects	13%	8%	12%	17%	17%	12%	13%	13%	13%	9%
Renewables	23%	19%	22%	19%	24%	27%	22%	26%	24%	22%
Fuel switch in energy and industry sectors	10%	12%	10%	11%	10%	7%	9%	11%	10%	10%
Supply-side efficiency	10%	9%	10%	7%	9%	10%	10%	8%	11%	10%
Demand-side efficiency	9%	14%	9%	10%	7%	9%	10%	5%	8%	17%
Afforestation and reforestation	9%	11%	9%	12%	8%	8%	9%	9%	9%	11%
Transport	10%	10%	12%	9%	11%	9%	11%	10%	10%	9%
Carbon Capture and Storage (CCS)	11%	10%	12%	10%	9%	14%	11%	11%	10%	10%
Other projects	5%	7%	6%	3%	5%	4%	5%	6%	5%	2%

Source: Öko-Institut

8.1.2 Second round

Table 51: What are the most important barriers to the implementation of CDM projects? (Question 2)

	All	Business	Consultants	NGO	Officials	Research	IC	DC	EU-25	USA
n	78	11	18	6	19	12	59	14	34	8
CDM	- share of all answers -									
Time consuming approval and registration process	74%	91%	89%	83%	63%	58%	76%	71%	79%	50%
Uncertainty about demand for carbon credits after 2012	64%	45%	67%	50%	68%	67%	63%	64%	68%	38%
Project implementation and operation risks (national approval, validation, registration, technical failure, etc)	60%	91%	50%	83%	47%	58%	64%	50%	68%	50%
Lack of knowledge about the CDM/JI	42%	27%	44%	33%	53%	50%	37%	57%	44%	38%
Difficulties in preparing relevant documents (PDD, determination of baseline etc.)	37%	18%	50%	33%	26%	33%	32%	50%	29%	50%
Lack of access to capital	35%	9%	56%	67%	37%	25%	32%	50%	26%	50%
Difficulties in establishing contacts between project developers and potential investors	15%		28%	17%	16%	8%	12%	29%	9%	25%
Lack of upfront payment for CERs or ERUs	22%		28%	33%	5%	42%	19%	29%	12%	50%
Low market price for emission allowances	19%	9%	17%	50%	11%	25%	20%	14%	12%	38%
Validation costs / requirements	15%	9%	6%	33%	11%	33%	12%	29%	15%	25%
Monitoring costs / requirements	15%	9%	17%	33%	11%	17%	14%	21%	12%	25%
Projects are not easily replicable	12%	9%	6%	33%	16%	17%	12%	14%	15%	25%
Share of proceeds (CDM)	6%			33%	11%	8%	8%		9%	25%
Problems in project development not specifically related to CDM or JI	19%		33%	67%	11%	8%	19%	21%	12%	50%
JI	- share of all answers -									
Project implementation and operation risks (national approval, validation, registration, technical failure, etc)	60%	91%	50%	83%	58%	50%	73%	14%	85%	38%
Uncertainty about demand for carbon credits after 2012	51%	73%	44%	50%	53%	50%	63%	14%	62%	63%
Lack of knowledge about the CDM/JI	29%	36%	22%	33%	32%	33%	36%	7%	35%	50%
Time consuming approval and registration process	26%	45%	17%	50%	21%	25%	31%	14%	44%	25%
Difficulties in preparing relevant documents (PDD, determination of baseline etc.)	18%	27%	22%	33%	5%	17%	20%		24%	50%
Difficulties in establishing contacts between project developers and potential investors	8%		6%	17%	5%	25%	10%		6%	25%
Low market price for emission allowances	13%	9%	6%	33%	11%	17%	15%	7%	9%	25%
Lack of upfront payment for CERs or ERUs	9%		6%	33%		25%	10%	7%	6%	38%
Validation costs / requirements	10%			33%	11%	25%	12%	7%	15%	25%
Lack of access to capital	6%	9%		17%	5%	17%	8%		9%	13%
Monitoring costs / requirements	6%			33%	5%	8%	7%	7%	6%	25%
Projects are not easily replicable	8%	9%	6%	33%	5%	8%	10%		12%	25%
Problems in project development not specifically related to CDM or JI										

Source: Öko-Institut

Table 52: Which measures do you consider most important to overcome the barriers to the project-based mechanism? (Question 3)

	n	Very important	Important	Less important	Not important	I don't know
		- share of all answers -				
Strengthen international institutions						
CDM Executive Board	84	58%	32%	8%	1%	1%
Business	12	67%	25%	8%		
Consultants	19	78%	22%			
NGO	8	33%	50%	17%		
Officials	20	56%	39%	6%		
Research	12	45%	45%		9%	8%
IC	65	55%	37%	7%	2%	2%
DC	14	75%	25%			
EU-25	37	57%	40%	3%		
USA	10	38%	25%	25%	13%	11%
CDM Methodological Panel	84	66%	26%	5%	3%	
Business	12	91%	9%			
Consultants	19	67%	28%	6%		
NGO	8	57%	43%			
Officials	20	67%	28%	6%		
Research	12	36%	36%	9%	18%	
IC	65	65%	27%	5%	3%	
DC	14	75%	25%			
EU-25	37	66%	29%	6%		
USA	10	56%	22%		22%	
JI Supervisory Committee	84	36%	36%	25%	3%	14%
Business	12	45%	55%			8%
Consultants	19	44%	31%	19%	6%	6%
NGO	8	80%		20%		29%
Officials	20	13%	40%	47%		17%
Research	12	20%	50%	20%	10%	9%
IC	65	37%	40%	21%	2%	15%
DC	14	22%	22%	44%	11%	10%
EU-25	37	38%	41%	22%		6%
USA	10	60%	20%		20%	44%
UNFCCC Secretariat	84	20%	30%	36%	14%	1%
Business	12	18%	55%	27%		
Consultants	19	19%	31%	44%	6%	6%
NGO	8	29%	29%	29%	14%	
Officials	20	26%	26%	47%		
Research	12		18%	27%	55%	
IC	65	19%	32%	37%	12%	2%
DC	14	25%	17%	42%	17%	
EU-25	37	18%	27%	48%	6%	
USA	10		22%	33%	44%	

Source: Öko-Institut

Table 52: Which measures do you consider most important to overcome the barriers to the project-based mechanism?(Question 3) – continued

	n	Very important	Important	Less important	Not important	I don't know
		- share of all answers -				
Revise regulatory framework (Modalities and Procedures for the CDM, etc.)						
Simplify procedures	84	64%	22%	11%	3%	
Business	12	83%	17%			
Consultants	19	72%	28%			
NGO	8	14%	57%	14%	14%	
Officials	20	61%	11%	28%		
Research	12	55%	27%	9%	9%	
IC	65	66%	21%	10%	3%	
DC	14	67%	25%	8%		
EU-25	37	63%	20%	17%		
USA	10	67%	11%		22%	
Concretise procedures	84	43%	46%	10%	1%	
Business	12	36%	55%	9%		
Consultants	19	50%	44%	6%		
NGO	8	43%	29%	29%		
Officials	20	44%	50%	6%		
Research	12	30%	50%	10%	10%	
IC	65	44%	46%	9%	2%	
DC	14	45%	45%	9%		
EU-25	37	36%	55%	9%		
USA	10	56%	22%	11%	11%	
Clarify procedures	84	59%	31%	7%	3%	
Business	12	64%	36%			
Consultants	19	50%	44%	6%		
NGO	8	57%	29%	14%		
Officials	20	71%	29%			
Research	12	50%	30%		20%	
IC	65	63%	30%	5%	2%	
DC	14	40%	50%		10%	
EU-25	37	61%	33%	6%		
USA	10	56%	33%		11%	
Remove share of proceeds	84	5%	8%	42%	46%	7%
Business	12		9%	64%	27%	
Consultants	19			44%	56%	
NGO	8		17%	50%	33%	14%
Officials	20	12%	6%	53%	29%	
Research	12	14%	14%		71%	30%
IC	65	4%	8%	42%	47%	7%
DC	14	10%	10%	50%	30%	
EU-25	37	3%	6%	48%	42%	3%
USA	10	17%		33%	50%	33%

Source: Öko-Institut

Table 52: Which measures do you consider most important to overcome the barriers to the project-based mechanism?(Question 3) – continued

	n	Very important	Important	Less important	Not important	I don't know
		- share of all answers -				
Streamline national approval process	84	21%	45%	32%	3%	1%
Business	12	9%	73%	18%		
Consultants	19	19%	50%	31%		
NGO	8	33%	33%	17%	17%	14%
Officials	20	26%	32%	42%		
Research	12	40%	40%	20%		
IC	65	22%	45%	31%	2%	2%
DC	14	18%	45%	36%		
EU-25	37	15%	55%	30%		3%
USA	10	44%	22%	22%	11%	
PDD pre-check by designated operational entity or other institution	84	10%	44%	38%	7%	3%
Business	12		44%	56%		
Consultants	19	18%	41%	35%	6%	
NGO	8		29%	57%	14%	
Officials	20	19%	50%	25%	6%	6%
Research	12		78%	11%	11%	10%
IC	65	11%	42%	40%	7%	4%
DC	14		70%	30%		
EU-25	37	10%	35%	48%	6%	3%
USA	10		63%	25%	13%	11%
Intensify capacity building for PDD preparation and baseline development	84	26%	33%	33%	7%	
Business	12	9%	45%	36%	9%	
Consultants	19	24%	35%	35%	6%	
NGO	8	43%	29%	14%	14%	
Officials	20	38%	38%	25%		
Research	12	20%	30%	30%	20%	
IC	65	18%	40%	35%	7%	
DC	14	55%	9%	27%	9%	
EU-25	37	19%	38%	41%	3%	
USA	10		56%	11%	33%	
Standardisation of baselines	84	44%	45%	7%	4%	
Business	12	27%	64%	9%		
Consultants	19	61%	28%	6%	6%	
NGO	8	43%	43%		14%	
Officials	20	50%	44%	6%		
Research	12	20%	70%		10%	
IC	65	44%	46%	7%	3%	
DC	14	50%	42%		8%	
EU-25	37	50%	47%	3%		
USA	10	11%	56%	11%	22%	

Source: Öko-Institut

Table 52: Which measures do you consider most important to overcome the barriers to the project-based mechanism? (Question 3) – continued

	n	Very important	Important	Less important	Not important	I don't know
		- share of all answers -				
Standardisation of the monitoring process	84	31%	52%	13%	4%	
Business	12	9%	82%	9%		
Consultants	19	47%	41%	6%	6%	
NGO	8	29%	57%		14%	
Officials	20	38%	44%	19%		
Research	12	20%	70%	10%		
IC	65	28%	54%	16%	2%	
DC	14	45%	45%		9%	
EU-25	37	30%	58%	12%		
USA	10	11%	67%	11%	11%	
Pooling of similar projects (use of same baseline etc.)	84	35%	49%	14%	3%	1%
Business	12	25%	67%	8%		
Consultants	19	35%	53%	12%		
NGO	8	43%	43%		14%	
Officials	20	35%	47%	18%		6%
Research	12	40%	50%	10%		
IC	65	32%	53%	14%	2%	2%
DC	14	55%	45%			
EU-25	37	30%	52%	18%		3%
USA	10	33%	56%		11%	
Information campaigns about the CDM and JI in general among companies in the investor and host countries	84	19%	29%	41%	11%	3%
Business	12	18%	36%	36%	9%	
Consultants	19	6%	44%	44%	6%	
NGO	8	33%	17%	33%	17%	
Officials	20	25%	19%	50%	6%	11%
Research	12	20%	20%	40%	20%	
IC	65	16%	23%	47%	14%	3%
DC	14	33%	56%	11%		
EU-25	37	13%	28%	47%	13%	6%
USA	10	22%	11%	33%	33%	
Public procurement tenders	84	8%	32%	52%	8%	5%
Business	12		20%	70%	10%	
Consultants	19	6%	50%	44%		
NGO	8	40%	40%	20%		17%
Officials	20		29%	57%	14%	7%
Research	12	11%	33%	44%	11%	10%
IC	65	6%	33%	53%	8%	6%
DC	14	11%	33%	56%		
EU-25	37	7%	22%	59%	11%	7%
USA	10	13%	38%	50%		11%

Source: Öko-Institut

Table 52: Which measures do you consider most important to overcome the barriers to the project-based mechanism? (Question 3) – continued

	n	Very important	Important	Less important	Not important	I don't know
		- share of all answers -				
Private carbon funds	84	11%	51%	35%	3%	
Business	12		50%	50%		
Consultants	19	12%	59%	29%		
NGO	8	29%	29%	29%	14%	
Officials	20	6%	56%	38%		
Research	12	20%	50%	30%		
IC	65	10%	53%	34%	2%	
DC	14	10%	40%	50%		
EU-25	37	9%	50%	41%		
USA	10	22%	44%	22%	11%	
Public-private partnerships	84	12%	52%	30%	6%	1%
Business	12		55%	27%	18%	
Consultants	19	18%	59%	24%		
NGO	8	17%	33%	33%	17%	
Officials	20	7%	60%	33%		6%
Research	12	22%	44%	33%		
IC	65	13%	51%	30%	6%	2%
DC	14		70%	30%		
EU-25	37	4%	54%	36%	7%	3%
USA	10	25%	38%	25%	13%	
Upfront payment for CERs or ERUs	84	27%	34%	31%	8%	4%
Business	12	20%	30%	30%	20%	
Consultants	19	35%	41%	18%	6%	
NGO	8	20%	20%	40%	20%	17%
Officials	20	7%	47%	40%	7%	6%
Research	12	33%	33%	33%		10%
IC	65	25%	31%	35%	10%	5%
DC	14	22%	56%	22%		
EU-25	37	25%	25%	39%	11%	7%
USA	10	38%	25%	13%	25%	11%
Special credit lines for financing investments in CDM or JI projects (e.g. in combination with procurement tenders)	84	33%	37%	25%	4%	3%
Business	12	20%	30%	40%	10%	
Consultants	19	44%	50%	6%		
NGO	8	50%	17%	17%	17%	14%
Officials	20	19%	38%	44%		6%
Research	12	30%	40%	30%		
IC	65	25%	40%	32%	4%	4%
DC	14	64%	36%			
EU-25	37	21%	45%	31%	3%	6%
USA	10	33%	33%	22%	11%	

Source: Öko-Institut

Table 52: Which measures do you consider most important to overcome the barriers to the project-based mechanism?(Question 3) – continued

	n	Very important	Important	Less important	Not important	I don't know
		- share of all answers -				
Investor's forum (carbon expo, etc.)	84	5%	45%	45%	5%	3%
Business	12		89%		11%	
Consultants	19	6%	50%	44%		
NGO	8	14%	29%	43%	14%	
Officials	20		15%	77%	8%	7%
Research	12		56%	44%		10%
IC	65	4%	44%	46%	6%	4%
DC	14		50%	50%		
EU-25	37	3%	48%	45%	3%	3%
USA	10	13%	25%	38%	25%	11%
Set up a clearing house for CDM and JI projects	84	17%	41%	34%	7%	3%
Business	12	18%	27%	36%	18%	
Consultants	19	18%	53%	24%	6%	
NGO	8	33%	17%	33%	17%	14%
Officials	20	19%	50%	31%		6%
Research	12	10%	50%	40%		
IC	65	18%	38%	38%	5%	4%
DC	14	9%	64%	18%	9%	
EU-25	37	21%	38%	38%	3%	6%
USA	10	11%	33%	33%	22%	
Debt guarantees for national project developers	84	11%	50%	31%	8%	3%
Business	12		60%	40%		
Consultants	19	6%	69%	19%	6%	
NGO	8	17%	33%	33%	17%	
Officials	20	14%	36%	50%		7%
Research	12	13%	38%	25%	25%	11%
IC	65	10%	45%	37%	8%	4%
DC	14	9%	82%	9%		
EU-25	37	15%	33%	48%	4%	4%
USA	10		71%		29%	13%
Cooperation with chambers of commerce and national investment authorities	84	11%	38%	43%	8%	4%
Business	12		40%	50%	10%	
Consultants	19	6%	56%	38%		
NGO	8	29%	29%	14%	29%	
Officials	20	15%	31%	54%		19%
Research	12		33%	67%		
IC	65	8%	35%	50%	8%	4%
DC	14	22%	67%	11%		10%
EU-25	37	10%	37%	53%		3%
USA	10		25%	25%	50%	

Source: Öko-Institut

Table 52: Which measures do you consider most important to overcome the barriers to the project-based mechanism?(Question 3) – continued

	n	Very important	Important	Less important	Not important	I don't know
		- share of all answers -				
Clarify perspective of JI/CDM after 2012	84	75%	20%	1%	4%	
Business	12	82%	18%			
Consultants	19	79%	21%			
NGO	8	63%	25%		13%	
Officials	20	67%	28%	6%		
Research	12	78%	11%		11%	
IC	65	73%	20%	2%	5%	
DC	14	73%	27%			
EU-25	37	79%	18%	3%		
USA	10	56%	11%		33%	
Promote unilateral CDM	84	39%	30%	21%	10%	8%
Business	12	38%	25%	13%	25%	20%
Consultants	19	61%	33%	6%		
NGO	8	13%	13%	50%	25%	
Officials	20	35%	35%	29%		6%
Research	12	14%	43%	14%	29%	22%
IC	65	36%	30%	21%	13%	9%
DC	14	55%	27%	18%		
EU-25	37	38%	31%	19%	13%	6%
USA	10	43%	14%	14%	29%	22%

Source: Öko-Institut

Table 53: Which CDM or JI project types are particularly attractive from …? (Question 4)

	All	Busi-ness	Consul-tants	NGO	Offi-cials	Re-search	IC	DC	EU-25	USA
n	76	12	18	5	19	10	60	11	36	8
a) the investor's perspective	- share of all answers -									
Landfills	76%	75%	72%	80%	79%	80%	77%	82%	72%	88%
HFC23 from HCFC22 production	63%	58%	61%	80%	68%	60%	63%	64%	75%	25%
Wind power generation	49%	58%	33%	60%	63%	60%	52%	45%	50%	63%
Fuel switch in energy and industry	49%	67%	44%	60%	47%	50%	53%	36%	44%	88%
Coal Mine Methane	42%	25%	61%	60%	42%	20%	45%	27%	50%	38%
N_2O from nitric or adipic acid production	46%	25%	56%	60%	37%	50%	47%	27%	47%	25%
Large hydro power generation	26%	25%	17%	40%	26%	40%	27%	27%	31%	25%
Biomass power generation	45%	67%	39%	80%	37%	40%	47%	45%	50%	75%
Supply-side efficiency	29%	42%	28%	40%	21%	30%	30%	36%	25%	50%
Carbon capture and storage	16%		11%	60%	16%	40%	15%	27%	11%	25%
Waste water treatment	14%	8%	28%	20%	5%	10%	17%	9%	17%	25%
Geothermal power generation	8%	8%	11%	20%	5%	10%	10%		8%	25%
Small hydro power generation	17%	33%	17%	20%	11%	20%	20%	9%	25%	25%
Demand-side efficiency	16%	8%	22%	20%	11%	20%	17%	18%	11%	50%
Afforestation and reforestation	16%	8%	33%	40%	5%	20%	17%	18%	11%	38%
Solar thermal power generation	9%	17%	11%	20%	11%		12%		14%	25%
Photovoltaics	9%	17%	11%	20%	5%	10%	12%		11%	38%
Transport	8%		17%	20%	5%		7%	18%	8%	
b) the government of the host country's perspective										
Biomass power generation	84%	92%	89%	80%	79%	80%	88%	64%	89%	75%
Small hydro power generation	75%	83%	72%	80%	68%	70%	73%	82%	72%	50%
Wind power generation	68%	75%	67%	80%	63%	60%	70%	55%	75%	50%
Transport	58%	33%	67%	80%	58%	40%	53%	73%	47%	38%
Landfills	58%	50%	50%	60%	63%	50%	60%	45%	47%	75%
Fuel switch in energy and industry	49%	50%	44%	80%	53%	40%	50%	45%	47%	63%
Demand-side efficiency	50%	25%	61%	60%	47%	60%	50%	45%	56%	50%
Afforestation and reforestation	49%	25%	72%	60%	47%	20%	43%	73%	39%	50%
Geothermal power generation	22%	25%	17%	60%	16%	30%	25%	9%	25%	38%
Supply-side efficiency	32%	25%	39%	60%	16%	30%	32%	18%	31%	38%
Waste water treatment	34%	17%	39%	80%	37%	30%	33%	45%	33%	38%
Photovoltaics	28%	33%	22%	60%	16%	40%	27%	18%	25%	63%
Solar thermal power generation	25%	25%	22%	60%	11%	30%	25%	9%	28%	25%
Large hydro power generation	26%	25%	22%	40%	26%	40%	27%	27%	33%	38%
Coal Mine Methane	17%	17%	28%	40%	11%		20%	9%	22%	25%
Carbon capture and storage	12%		22%	20%		30%	12%	9%	6%	38%
HFC23 from HCFC22 production	11%	8%	6%	40%	16%	10%	13%		17%	25%
N_2O from nitric or adipic acid production	14%	17%	17%	40%	16%	10%	15%	18%	19%	25%

Source: Öko-Institut

Table 54: What do you expect will be the typical transaction costs for the development of CDM and JI projects by 2010? (Question 5)

	n	Less than 50,000 US$	50,000 - 100,000 US$	100,000 - 200,000 US$	More than 200,000 US$	I don't know
		- share of all answers -				
CDM large scale projects	**77**	**8%**	**67%**	**20%**	**5%**	**21%**
Business	13		75%	13%	13%	33%
Consultants	19	24%	71%	6%		33%
NGO	6		67%		33%	50%
Officials	20		53%	41%	6%	15%
Research	9	14%	71%	14%		22%
IC	61	9%	66%	19%	6%	22%
DC	12	9%	73%	18%		8%
EU-25	34	13%	67%	17%	4%	29%
USA	8		50%	17%	33%	25%
CDM small scale projects	**77**	**70%**	**28%**		**2%**	**20%**
Business	13	50%	50%			33%
Consultants	19	76%	24%			33%
NGO	6	75%			25%	33%
Officials	20	65%	35%			15%
Research	9	86%	14%			22%
IC	61	70%	28%		2%	20%
DC	12	73%	27%			8%
EU-25	34	68%	32%			26%
USA	8	33%	50%		17%	25%
JI first track projects	**77**	**78%**	**20%**		**2%**	**32%**
Business	13	80%	20%			23%
Consultants	19	77%	23%			23%
NGO	6	33%	33%		33%	50%
Officials	20	69%	31%			35%
Research	9	100%				33%
IC	61	79%	19%		2%	28%
DC	12	67%	33%			45%
EU-25	34	75%	25%			29%
USA	8	67%			33%	63%
JI second track projects	**77**	**12%**	**78%**	**8%**	**2%**	**32%**
Business	13		100%			25%
Consultants	19	23%	69%	8%		25%
NGO	6	33%	33%		33%	50%
Officials	20		77%	23%		35%
Research	9	17%	83%			33%
IC	61	12%	81%	5%	2%	28%
DC	12	17%	50%	33%		45%
EU-25	34	17%	75%	8%		29%
USA	8		75%		25%	50%

Source: Öko-Institut

Table 55: What do you expect will be the typical annual costs for the monitoring and verification of CDM or JI projects by 2010? (Question 6)

	n	Less than 5,000 US$	5,000 - 10,000 US$	10,000 - 20,000 US$	20,000 - 50,000 US$	More than 50,000 US$	I don't know
		- share of all answers -					
Renewables	**78**	**18%**	**64%**	**16%**		**2%**	**27%**
Business	15		73%	18%		9%	21%
Consultants	20	29%	59%	12%			15%
NGO	6		50%	50%			67%
Officials	21	7%	80%	13%			29%
Research	9	43%	29%	29%			22%
IC	62	23%	61%	14%		2%	28%
DC	12		70%	30%			17%
EU-25	35	22%	61%	17%			34%
USA	8	20%	40%	20%		20%	38%
Fuel switch in energy and industry sectors	**78**	**16%**	**55%**	**23%**	**4%**	**2%**	**25%**
Business	15	9%	55%	27%	9%		21%
Consultants	20	24%	53%	24%			11%
NGO	6			67%		33%	50%
Officials	21	14%	64%	14%	7%		30%
Research	9	29%	43%	29%			22%
IC	62	18%	57%	20%	2%	2%	25%
DC	12	10%	40%	40%	10%		17%
EU-25	35	23%	68%	9%			33%
USA	8	17%	33%	17%	17%	17%	25%
Supply-side efficiency	**78**	**8%**	**51%**	**39%**	**2%**		**30%**
Business	15		55%	36%	9%		21%
Consultants	20	13%	53%	33%			17%
NGO	6		50%	50%			67%
Officials	21		62%	38%			35%
Research	9	29%	14%	57%			22%
IC	62	10%	53%	35%	3%		31%
DC	12		40%	60%			17%
EU-25	35	10%	57%	33%			38%
USA	8	20%	40%	20%	20%		38%
Carbon capture and storage (CCS)	**78**	**6%**	**24%**	**36%**	**18%**	**16%**	**34%**
Business	15		40%	30%	20%	10%	33%
Consultants	20	12%	24%	47%	6%	12%	15%
NGO	6			67%		33%	50%
Officials	21		22%	33%	33%	11%	53%
Research	9	14%	14%	14%	43%	14%	22%
IC	62	8%	28%	33%	20%	13%	33%
DC	12			50%	13%	38%	33%
EU-25	35	10%	15%	40%	25%	10%	39%
USA	8		17%	33%		50%	25%

Source: Öko-Institut

Table 55: What do you expect will be the typical annual costs for the monitoring and verification of CDM or JI projects by 2010? (Question 6) – continued

	n	Less than 5,000 US$	5,000 - 10,000 US$	10,000 - 20,000 US$	20,000 - 50,000 US$	More than 50,000 US$	I don't know
		- share of all answers -					
Demand-side efficiency	**78**	**8%**	**39%**	**33%**	**18%**	**2%**	**30%**
Business	15		55%	36%		9%	21%
Consultants	20	13%	47%	20%	20%		17%
NGO	6		100%				67%
Officials	21		33%	33%	33%		37%
Research	9	29%		43%	29%		22%
IC	62	10%	39%	37%	12%	2%	31%
DC	12		38%	13%	50%		20%
EU-25	35	10%	33%	43%	14%		36%
USA	8	20%	20%	40%		20%	38%
Non-CO2 projects	**78**	**9%**	**30%**	**55%**	**5%**		**25%**
Business	15		20%	70%	10%		29%
Consultants	20	12%	41%	41%	6%		15%
NGO	6		50%	50%			60%
Officials	21	7%	27%	60%	7%		29%
Research	9	29%	14%	57%			13%
IC	62	11%	31%	56%	2%		24%
DC	12		22%	56%	22%		25%
EU-25	35	13%	17%	65%	4%		32%
USA	8		17%	83%			14%
Transport	**78**	**4%**	**18%**	**43%**	**29%**	**6%**	**30%**
Business	15		9%	64%	27%		21%
Consultants	20	7%	21%	50%	14%	7%	26%
NGO	6		33%	33%		33%	50%
Officials	21		23%	31%	38%	8%	35%
Research	9	17%		33%	50%		25%
IC	62	5%	13%	48%	30%	5%	30%
DC	12		33%	22%	33%	11%	25%
EU-25	35	5%	5%	45%	41%	5%	33%
USA	8	20%		60%		20%	29%
Afforestation and reforestation	**78**	**6%**	**31%**	**37%**	**20%**	**6%**	**33%**
Business	15		10%	60%	30%		29%
Consultants	20	13%	27%	47%	7%	7%	25%
NGO	6		67%			33%	50%
Officials	21		54%	31%	8%	8%	38%
Research	9	14%	14%	14%	57%		22%
IC	62	5%	29%	39%	20%	7%	33%
DC	12	11%	33%	33%	22%		25%
EU-25	35	10%	24%	29%	29%	10%	40%
USA	8		14%	71%		14%	13%

Source: Öko-Institut

Table 56: What will be the three most important drivers for transaction costs by 2010? (Question 7)

	n	Most important	Second most important	Third most important	Impor-tance
		- share of all answers -			
PDD development (including baseline determination)	**76**	**62%**	**20%**	**13%**	**181**
Business	14	79%	7%	14%	37
Consultants	20	55%	20%	20%	45
NGO	7	29%	43%	14%	13
Officials	20	60%	15%	15%	45
Research	9	67%	33%		24
IC	59	63%	22%	12%	144
DC	14	50%	14%	21%	28
EU-25	33	64%	21%	12%	81
USA	8	63%	13%	25%	19
Monitoring and verification	**76**	**17%**	**37%**	**22%**	**112**
Business	14	14%	36%	14%	18
Consultants	20	15%	35%	25%	28
NGO	7	14%	43%	14%	10
Officials	20	20%	45%	10%	32
Research	9	33%	22%	44%	17
IC	59	19%	37%	22%	90
DC	14	14%	36%	21%	19
EU-25	33	21%	39%	18%	53
USA	8	13%	25%	38%	10
Validation	**76**	**1%**	**18%**	**36%**	**58**
Business	14		36%	36%	15
Consultants	20		5%	40%	10
NGO	7	14%		14%	4
Officials	20		15%	35%	13
Research	9		44%	44%	12
IC	59	2%	19%	39%	48
DC	14		14%	21%	7
EU-25	33		18%	42%	26
USA	8	13%	38%	38%	12
Negotiation of emission reduction purchase agreements	**76**	**1%**	**8%**	**12%**	**24**
Business	14		14%	14%	6
Consultants	20	5%	10%		7
NGO	7			29%	2
Officials	20		10%	15%	7
Research	9			11%	1
IC	59	2%	8%	14%	21
DC	14		7%		2
EU-25	33		9%	12%	10
USA	8		13%		2

Source: Öko-Institut

Table 56: What will be the three most important drivers for transaction costs by 2010?(Question 7) – continued

	n	Most important	Second most important	Third most important	Impor-tance
		- share of all answers -			
Registration	**76**	**3%**	**5%**	**8%**	**20**
Business	14	7%		14%	5
Consultants	20		15%	5%	7
NGO	7			14%	1
Officials	20	5%		10%	5
Research	9				
IC	59	3%	5%	7%	16
DC	14		7%	14%	4
EU-25	33	3%	3%	6%	7
USA	8		13%		2
Host country approval	**76**	**3%**	**1%**	**1%**	**9**
Business	14			7%	1
Consultants	20	5%	5%		5
NGO	7				
Officials	20	5%			3
Research	9				
IC	59	3%	2%	2%	9
DC	14				
EU-25	33	3%		3%	4
USA	8	13%			3
Project development (not related to CDM/JI)	**76**	**12%**	**8%**	**5%**	**43**
Business	14		7%		2
Consultants	20	20%	10%	10%	18
NGO	7	29%	14%		8
Officials	20	10%	5%	10%	10
Research	9				
IC	59	8%	7%	5%	26
DC	14	29%	7%	7%	15
EU-25	33	9%	9%	6%	17
USA	8				

Source: Öko-Institut

Table 57: What project size is necessary to make a CDM or JI projects feasible (taking into account transaction costs)? (Question 8)

	n	Less than 10,000	10,000 - 20,000	20,000 - 50,000	50,000 - 100,000	100,000 - 250,000	250,000 - 500,000	More than 500,000	I don't know
		emission reductions during crediting period (t CO_2e)							
		- share of all answers -							
CDM large scale projects	**74**	**2%**	**2%**	**7%**	**42%**	**17%**	**19%**	**12%**	**19%**
Business	12	10%			20%	30%	20%	20%	17%
Consultants	20		6%	6%	59%	12%	18%		15%
NGO	5					25%	25%	50%	20%
Officials	19			7%	43%	14%	21%	14%	22%
Research	9			29%	43%	14%		14%	22%
IC	58	2%	2%	9%	37%	20%	22%	9%	19%
DC	13				58%	8%	8%	25%	8%
EU-25	32		4%	13%	29%	33%	8%	13%	25%
USA	8	14%			43%		29%	14%	13%
CDM small scale projects	**74**	**2%**	**37%**	**41%**	**17%**	**2%**		**2%**	**19%**
Business	12	10%	10%	40%	40%				17%
Consultants	20		53%	24%	24%				15%
NGO	5			50%		25%		25%	20%
Officials	19		36%	50%	14%				22%
Research	9		29%	71%					22%
IC	58	2%	37%	39%	20%			2%	19%
DC	13		33%	50%	8%	8%			8%
EU-25	32		33%	42%	25%				25%
USA	8	14%	14%	43%	14%			14%	13%
JI first track projects	**74**	**2%**	**16%**	**22%**	**49%**	**7%**	**2%**	**2%**	**38%**
Business	12	10%		20%	60%		10%		17%
Consultants	20		18%	18%	55%	9%			42%
NGO	5					50%		50%	60%
Officials	19			30%	60%	10%			47%
Research	9		43%	29%	29%				22%
IC	58	3%	18%	24%	45%	5%	3%	3%	34%
DC	13			17%	67%	17%			50%
EU-25	32		19%	19%	52%	5%	5%		34%
USA	8	20%		40%	20%			20%	38%
JI second track projects	**74**	**2%**	**4%**	**20%**	**49%**	**16%**	**4%**	**4%**	**38%**
Business	12	10%		30%	20%	30%	10%		17%
Consultants	20		9%	27%	55%	9%			42%
NGO	5					50%		50%	60%
Officials	19			10%	60%	10%	10%	10%	47%
Research	9			29%	71%				22%
IC	58	3%	5%	21%	45%	18%	5%	3%	34%
DC	13			17%	67%			17%	50%
EU-25	32		5%	14%	48%	29%	5%		34%
USA	8	20%		20%	40%			20%	38%

Source: Öko-Institut

Table 58: What is the overall risk associated with the generation of CERs or ERUs? (Question 9)

	n	Very low	Low	High	Very high	I don't know
		- share of all answers -				
Renewables	75	15%	66%	19%		3%
Business	15	13%	73%	13%		
Consultants	20	25%	50%	25%		
NGO	5		80%	20%		
Officials	20	11%	78%	11%		10%
Research	9	22%	33%	44%		
IC	60	14%	62%	24%		3%
DC	12	25%	75%			
EU-25	33	13%	65%	23%		6%
USA	8	25%	50%	25%		
Fuel switch in energy and industry sectors	75	23%	60%	12%	4%	1%
Business	15	14%	64%	21%		
Consultants	20	20%	70%	10%		
NGO	5		80%		20%	
Officials	20	32%	58%	11%		5%
Research	9	44%	33%	11%	11%	
IC	60	24%	59%	12%	5%	2%
DC	12	25%	67%	8%		
EU-25	33	24%	61%	12%	3%	
USA	8	38%	38%		25%	
Supply-side efficiency	75	17%	56%	27%		8%
Business	15	29%	43%	29%		
Consultants	20	11%	50%	39%		5%
NGO	5	20%	60%	20%		
Officials	20		82%	18%		15%
Research	9	50%	25%	25%		
IC	60	17%	56%	28%		5%
DC	12	20%	50%	30%		17%
EU-25	33	13%	57%	30%		3%
USA	8	43%	29%	29%		13%
Carbon capture and storage (CCS)	75		2%	38%	60%	11%
Business	15		7%	29%	64%	
Consultants	20			47%	53%	
NGO	5			20%	80%	
Officials	20			57%	43%	30%
Research	9			33%	67%	
IC	60			41%	59%	7%
DC	12		10%	30%	60%	17%
EU-25	33			37%	63%	6%
USA	8			13%	88%	

Source: Öko-Institut

Table 58: What is the overall risk associated with the generation of CERs or ERUs? (Question 9) – continued

	n	Very low	Low	High	Very high	I don't know
		- share of all answers -				
Demand-side efficiency	75	9%	23%	62%	6%	7%
Business	15	14%	43%	43%		
Consultants	20	5%	5%	79%	11%	5%
NGO	5	20%	40%	20%	20%	
Officials	20		35%	65%		15%
Research	9	22%	11%	56%	11%	
IC	60	11%	23%	61%	5%	3%
DC	12		30%	60%	10%	17%
EU-25	33	6%	26%	65%	3%	6%
USA	8	38%	13%	38%	13%	
Non-CO2 projects	75	8%	73%	16%	3%	12%
Business	15		75%	17%	8%	14%
Consultants	20	6%	72%	22%		5%
NGO	5		75%	25%		20%
Officials	20	12%	76%	12%		15%
Research	9	13%	63%	13%	13%	11%
IC	60	9%	72%	15%	4%	9%
DC	12		78%	22%		25%
EU-25	33	10%	79%	10%		9%
USA	8		57%	14%	29%	13%
Transport	75	3%	10%	55%	31%	9%
Business	15		14%	64%	21%	
Consultants	20	6%	6%	56%	33%	10%
NGO	5		20%	60%	20%	
Officials	20		18%	53%	29%	15%
Research	9	13%		50%	38%	11%
IC	60	4%	9%	60%	27%	7%
DC	12		20%	40%	40%	17%
EU-25	33	3%	6%	55%	35%	6%
USA	8	14%		57%	29%	13%
Afforestation and reforestation	75	4%	7%	56%	32%	8%
Business	15		15%	38%	46%	7%
Consultants	20	11%	5%	53%	32%	5%
NGO	5			50%	50%	20%
Officials	20		6%	71%	24%	15%
Research	9			56%	44%	
IC	60	2%	9%	56%	33%	7%
DC	12	10%		50%	40%	17%
EU-25	33	3%	6%	55%	36%	
USA	8		25%	13%	63%	

Source: Öko-Institut

Table 59: Characteristics of project types: Project size (Question 10)

	n	Very small	Small	Large	Very large	I don't know
		- share of all answers -				
Renewables	76	9%	72%	19%		5%
Business	15	7%	79%	14%		5%
Consultants	21	6%	61%	33%		5%
NGO	5		100%			
Officials	20	6%	83%	11%		10%
Research	9	11%	67%	22%		
IC	60	9%	76%	15%		5%
DC	13		64%	36%		8%
EU-25	33	9%	72%	19%		3%
USA	8		86%	14%		13%
Fuel switch in energy and industry sectors	76		20%	75%	4%	4%
Business	15		14%	79%	7%	4%
Consultants	21		28%	72%		5%
NGO	5		20%	80%		
Officials	20		6%	94%		10%
Research	9		25%	63%	13%	
IC	60		13%	82%	5%	4%
DC	13		45%	55%		8%
EU-25	33		10%	87%	3%	6%
USA	8			75%	25%	
Supply-side efficiency	76		25%	72%	3%	8%
Business	15		21%	71%	7%	8%
Consultants	21		18%	82%		11%
NGO	5		20%	80%		
Officials	20		29%	71%		15%
Research	9		44%	44%	11%	
IC	60		22%	75%	4%	5%
DC	13		40%	60%		17%
EU-25	33		16%	81%	3%	6%
USA	8		25%	63%	13%	
Carbon capture and storage (CCS)	76	3%	10%	34%	52%	15%
Business	15		17%	42%	42%	15%
Consultants	21	6%	19%	31%	44%	11%
NGO	5			20%	80%	
Officials	20	7%		33%	60%	25%
Research	9		11%	33%	56%	
IC	60	4%	10%	35%	52%	9%
DC	13		13%	38%	50%	33%
EU-25	33	3%	7%	41%	48%	9%
USA	8		25%	25%	50%	

Source: Öko-Institut

Table 59: Characteristics of project types: Project size (Question 10) – continued

	n	Very small	Small	Large	Very large	I don't know
		- share of all answers -				
Demand-side efficiency	76	12%	58%	29%		10%
Business	15		43%	57%		10%
Consultants	21	19%	50%	31%		16%
NGO	5	20%	20%	60%		
Officials	20	12%	76%	12%		11%
Research	9		89%	11%		
IC	60	9%	61%	30%		7%
DC	13	22%	44%	33%		18%
EU-25	33	9%	56%	34%		3%
USA	8		71%	29%		13%
Non-CO2 projects	76		6%	47%	47%	10%
Business	15			67%	33%	10%
Consultants	21			53%	47%	6%
NGO	5		20%	20%	60%	
Officials	20		11%	42%	47%	5%
Research	9		17%	50%	33%	25%
IC	60		8%	47%	45%	5%
DC	13			44%	56%	25%
EU-25	33		7%	50%	43%	3%
USA	8		17%	33%	50%	25%
Transport	76	5%	35%	58%	2%	15%
Business	15		46%	54%		15%
Consultants	21	7%	27%	67%		21%
NGO	5			100%		20%
Officials	20	6%	38%	50%	6%	20%
Research	9		56%	44%		
IC	60	4%	42%	52%	2%	14%
DC	13	11%	11%	78%		25%
EU-25	33	3%	40%	53%	3%	9%
USA	8		50%	50%		25%
Afforestation and reforestation	76	8%	39%	45%	8%	14%
Business	15		46%	46%	8%	14%
Consultants	21	14%	57%	21%	7%	22%
NGO	5			50%	50%	20%
Officials	20	12%	29%	53%	6%	15%
Research	9	11%	44%	44%		
IC	60	8%	42%	44%	6%	12%
DC	13	10%	30%	40%	20%	17%
EU-25	33	7%	40%	43%	10%	9%
USA	8	13%	25%	63%		

Source: Öko-Institut

Table 60: Characteristics of project types: Determination of the baseline (Question 10)

	n	Very easy	Easy	Difficult	Very difficult	I don't know
		- share of all answers -				
Renewables	76	10%	74%	13%	4%	3%
Business	15	8%	85%	8%		3%
Consultants	21	16%	58%	26%		5%
NGO	5		80%		20%	
Officials	20	15%	80%	5%		
Research	9		78%	22%		
IC	60	9%	74%	14%	4%	3%
DC	13	17%	75%	8%		
EU-25	33	9%	72%	19%		3%
USA	8	13%	63%		25%	
Fuel switch in energy and industry sectors	76	7%	75%	15%	3%	4%
Business	15	15%	54%	31%		4%
Consultants	21	11%	79%	11%		5%
NGO	5		60%	20%	20%	
Officials	20	5%	89%	5%		5%
Research	9		78%	11%	11%	
IC	60	7%	72%	18%	4%	3%
DC	13	9%	91%			8%
EU-25	33	9%	72%	19%		3%
USA	8		75%		25%	
Supply-side efficiency	76	4%	63%	29%	3%	8%
Business	15	15%	46%	38%		8%
Consultants	21	5%	53%	42%		5%
NGO	5		60%	20%	20%	
Officials	20		78%	22%		10%
Research	9		78%	11%	11%	
IC	60	5%	63%	29%	4%	5%
DC	13		60%	40%		17%
EU-25	33	6%	63%	31%		3%
USA	8	14%	57%		29%	13%
Carbon capture and storage (CCS)	76	9%	29%	40%	22%	18%
Business	15	8%	17%	58%	17%	18%
Consultants	21	6%	31%	38%	25%	11%
NGO	5		25%	50%	25%	
Officials	20	8%	23%	46%	23%	35%
Research	9	11%	44%	22%	22%	
IC	60	10%	30%	42%	18%	12%
DC	13		29%	29%	43%	36%
EU-25	33	14%	25%	43%	18%	13%
USA	8		57%	14%	29%	

Source: Öko-Institut

Table 60: Characteristics of project types: Determination of the baseline (Question 10) – continued

	n	Very easy	Easy	Difficult	Very difficult	I don't know
		- share of all answers -				
Demand-side efficiency	76	1%	15%	67%	16%	9%
Business	15	8%	31%	62%		9%
Consultants	21		6%	72%	22%	10%
NGO	5		20%	60%	20%	
Officials	20		18%	71%	12%	15%
Research	9		11%	67%	22%	
IC	60	2%	15%	67%	16%	7%
DC	13		20%	70%	10%	17%
EU-25	33		13%	68%	19%	6%
USA	8	13%	25%	38%	25%	
Non-CO2 projects	76	8%	65%	23%	5%	8%
Business	15		50%	42%	8%	8%
Consultants	21	18%	65%	18%		6%
NGO	5		80%		20%	
Officials	20	5%	68%	26%		5%
Research	9	13%	50%	25%	13%	11%
IC	60	9%	64%	22%	5%	4%
DC	13		67%	33%		25%
EU-25	33	10%	71%	19%		3%
USA	8		29%	29%	43%	13%
Transport	76		7%	37%	55%	9%
Business	15		8%	38%	54%	9%
Consultants	21		11%	37%	53%	5%
NGO	5				100%	20%
Officials	20		6%	35%	59%	15%
Research	9			50%	50%	11%
IC	60		2%	43%	55%	10%
DC	13		27%	9%	64%	8%
EU-25	33		3%	34%	63%	3%
USA	8			71%	29%	13%
Afforestation and reforestation	76	2%	16%	38%	44%	13%
Business	15		17%	8%	75%	13%
Consultants	21	6%	24%	47%	24%	11%
NGO	5				100%	20%
Officials	20		13%	50%	38%	16%
Research	9		11%	56%	33%	
IC	60		15%	38%	46%	10%
DC	13	11%	22%	33%	33%	18%
EU-25	33		6%	35%	58%	6%
USA	8		25%	38%	38%	

Source: Öko-Institut

Table 61: Characteristics of project types: Demonstration of additionality (Question 10)

	n	Very easy	Easy	Difficult	Very difficult	I don't know
		- share of all answers -				
Renewables	76	14%	69%	13%	4%	3%
Business	15	14%	64%	14%	7%	3%
Consultants	21	21%	68%	5%	5%	5%
NGO	5	50%	25%		25%	20%
Officials	20	10%	85%	5%		
Research	9		56%	44%		
IC	60	16%	65%	14%	5%	3%
DC	13	8%	83%	8%		
EU-25	33	19%	63%	16%	3%	3%
USA	8	13%	50%	25%	13%	
Fuel switch in energy and industry sectors	76	3%	54%	37%	7%	4%
Business	15		31%	62%	8%	4%
Consultants	21	11%	47%	37%	5%	5%
NGO	5		40%	40%	20%	
Officials	20		79%	21%		5%
Research	9		56%	33%	11%	
IC	60	4%	49%	39%	9%	3%
DC	13		82%	18%		8%
EU-25	33	3%	44%	50%	3%	3%
USA	8		63%	13%	25%	
Supply-side efficiency	76	5%	30%	53%	12%	10%
Business	15		21%	57%	21%	10%
Consultants	21	18%	18%	53%	12%	11%
NGO	5		60%	20%	20%	
Officials	20		41%	59%		15%
Research	9		33%	56%	11%	
IC	60	4%	28%	54%	15%	7%
DC	13	10%	40%	50%		17%
EU-25	33	3%	19%	69%	9%	3%
USA	8	14%	43%		43%	13%
Carbon capture and storage (CCS)	76	17%	44%	22%	17%	19%
Business	15	9%	45%	18%	27%	19%
Consultants	21	24%	35%	24%	18%	11%
NGO	5		20%	60%	20%	
Officials	20	23%	54%	8%	15%	35%
Research	9	22%	44%	33%		
IC	60	20%	46%	18%	16%	14%
DC	13		38%	50%	13%	33%
EU-25	33	19%	44%	22%	15%	16%
USA	8		63%	13%	25%	

Source: Öko-Institut

Table 61: Characteristics of project types: Demonstration of additionality (Question 10) – continued

	n	Very easy	Easy	Difficult	Very difficult	I don't know
		- share of all answers -				
Demand-side efficiency	76	3%	22%	60%	15%	8%
Business	15		29%	64%	7%	8%
Consultants	21	11%	5%	68%	16%	10%
NGO	5		20%	60%	20%	
Officials	20		41%	53%	6%	15%
Research	9		13%	63%	25%	
IC	60	2%	22%	60%	16%	5%
DC	13	9%	18%	64%	9%	15%
EU-25	33	3%	19%	65%	13%	3%
USA	8		25%	38%	38%	
Non-CO2 projects	76	13%	57%	19%	11%	14%
Business	15		45%	18%	36%	14%
Consultants	21	18%	59%	18%	6%	11%
NGO	5		50%	25%	25%	20%
Officials	20	17%	56%	28%		10%
Research	9	13%	63%	13%	13%	11%
IC	60	12%	58%	19%	12%	10%
DC	13	11%	56%	22%	11%	25%
EU-25	33	10%	62%	17%	10%	9%
USA	8		29%	29%	43%	13%
Transport	76	1%	7%	54%	37%	9%
Business	15		8%	50%	42%	9%
Consultants	21	5%	10%	45%	40%	5%
NGO	5			80%	20%	
Officials	20		6%	71%	24%	15%
Research	9		13%	38%	50%	11%
IC	60	2%	8%	57%	34%	10%
DC	13		8%	50%	42%	8%
EU-25	33	3%	6%	55%	35%	6%
USA	8		14%	29%	57%	13%
Afforestation and reforestation	76	8%	23%	51%	18%	15%
Business	15		17%	58%	25%	15%
Consultants	21	19%	25%	44%	13%	16%
NGO	5			50%	50%	20%
Officials	20	7%	27%	53%	13%	21%
Research	9	11%	11%	56%	22%	
IC	60	4%	24%	53%	20%	12%
DC	13	38%	13%	38%	13%	27%
EU-25	33	6%	6%	65%	23%	6%
USA	8		38%	38%	25%	

Source: Öko-Institut

Table 62: Characteristics of project types: Sustainability benefits (Question 10)

	n	Very high	High	Low	Very low	I don't know
		- share of all answers -				
Renewables	76	61%	36%	3%		
Business	15	67%	33%			
Consultants	21	65%	35%			
NGO	5	80%	20%			
Officials	20	60%	40%			
Research	9	78%	22%			
IC	60	63%	35%	2%		
DC	13	67%	33%			
EU-25	33	67%	33%			
USA	8	63%	25%	13%		
Fuel switch in energy and industry sectors	76	8%	68%	21%	3%	
Business	15	7%	86%	7%		
Consultants	21	21%	37%	37%	5%	
NGO	5		80%		20%	
Officials	20		95%	5%		
Research	9	11%	56%	33%		
IC	60	8%	69%	19%	3%	
DC	13	9%	73%	18%		
EU-25	33	12%	79%	9%		
USA	8		50%	38%	13%	
Supply-side efficiency	76	10%	68%	21%	1%	4%
Business	15	21%	71%	7%		4%
Consultants	21	11%	47%	37%	5%	5%
NGO	5	20%	80%			
Officials	20		84%	16%		5%
Research	9	11%	67%	22%		
IC	60	9%	72%	19%		2%
DC	13	18%	45%	27%	9%	8%
EU-25	33	6%	84%	9%		3%
USA	8	13%	50%	38%		
Carbon capture and storage (CCS)	76	1%	15%	31%	53%	8%
Business	15		8%	38%	54%	8%
Consultants	21	5%	11%	37%	47%	5%
NGO	5			40%	60%	
Officials	20		28%	28%	44%	10%
Research	9		13%	25%	63%	11%
IC	60	2%	16%	32%	50%	5%
DC	13		10%	30%	60%	17%
EU-25	33	3%	13%	34%	50%	3%
USA	8		14%	14%	71%	13%

Source: Öko-Institut

Table 62: Characteristics of project types: Sustainability benefits (Question 10) – continued

	n	Very high	High	Low	Very low	I don't know
		- share of all answers -				
Demand-side efficiency	76	22%	68%	10%		1%
Business	15	21%	71%	7%		1%
Consultants	21	15%	65%	20%		
NGO	5	20%	80%			
Officials	20	25%	70%	5%		
Research	9	22%	78%			
IC	60	25%	68%	7%		
DC	13		75%	25%		
EU-25	33	21%	76%	3%		
USA	8	38%	50%	13%		
Non-CO2 projects	76	2%	28%	51%	20%	11%
Business	15		38%	38%	23%	11%
Consultants	21	6%	17%	67%	11%	5%
NGO	5			50%	50%	20%
Officials	20		37%	53%	11%	5%
Research	9		33%	50%	17%	33%
IC	60	2%	31%	44%	22%	7%
DC	13		11%	89%		25%
EU-25	33	3%	41%	38%	19%	
USA	8		20%	20%	60%	38%
Transport	76	26%	60%	13%	1%	5%
Business	15	14%	57%	29%		5%
Consultants	21	42%	47%	5%	5%	5%
NGO	5	20%	60%	20%		
Officials	20	22%	67%	11%		10%
Research	9	25%	75%			11%
IC	60	30%	55%	14%		5%
DC	13	9%	73%	9%	9%	8%
EU-25	33	26%	61%	13%		6%
USA	8	29%	43%	29%		13%
Afforestation and reforestation	76	32%	35%	24%	9%	8%
Business	15	23%	31%	23%	23%	8%
Consultants	21	63%	11%	26%		5%
NGO	5		33%	33%	33%	40%
Officials	20	17%	50%	22%	11%	10%
Research	9	22%	44%	33%		
IC	60	29%	33%	27%	11%	7%
DC	13	50%	40%	10%		17%
EU-25	33	19%	32%	35%	13%	6%
USA	8	38%	38%	13%	13%	

Source: Öko-Institut

Table 63: What will be the typical mitigation costs in 2010? (Question 11)

	n	Less than 0 US$/t CO_2e	0 - 5 US$/t CO_2e	5 - 10 US$/t CO_2e	10 - 25 US$/t CO_2e	25 - 50 US$/t CO_2e	Higher than 50 US$/t CO_2e	I don't know
		- share of all answers -						
Large hydro	**73**		**53%**	**38%**	**4%**	**2%**	**2%**	**36%**
Business	13		63%	25%	13%			38%
Consultants	20		38%	46%	8%		8%	35%
NGO	5		50%	50%				60%
Officials	20		71%	21%		7%		30%
Research	9		43%	57%				22%
IC	58		56%	33%	6%	3%	3%	38%
DC	12		50%	50%				17%
EU-25	32		60%	25%	5%	5%	5%	38%
USA	8		50%	50%				50%
Small hydro	**73**		**9%**	**51%**	**32%**	**6%**	**2%**	**36%**
Business	13		13%	75%		13%		38%
Consultants	20			38%	46%	8%	8%	35%
NGO	5			100%				60%
Officials	20		21%	43%	29%	7%		30%
Research	9			57%	43%			22%
IC	58		8%	58%	22%	8%	3%	38%
DC	12		10%	30%	60%			17%
EU-25	32		10%	50%	25%	10%	5%	38%
USA	8			100%				50%
Biomass	**73**		**7%**	**70%**	**17%**	**4%**	**2%**	**36%**
Business	13			75%	13%	13%		38%
Consultants	20		7%	71%	14%		7%	30%
NGO	5		50%	50%				60%
Officials	20			67%	33%			37%
Research	9		14%	71%	14%			22%
IC	58		9%	66%	17%	6%	3%	39%
DC	12			80%	20%			17%
EU-25	32		10%	55%	20%	10%	5%	35%
USA	8			100%				38%
Wind	**73**		**2%**	**39%**	**48%**	**9%**	**2%**	**36%**
Business	13			50%	38%	13%		38%
Consultants	20			38%	38%	15%	8%	32%
NGO	5			50%	50%			60%
Officials	20			31%	69%			35%
Research	9		14%	43%	43%			22%
IC	58		3%	40%	43%	11%	3%	39%
DC	12			40%	60%			17%
EU-25	32		5%	30%	45%	15%	5%	35%
USA	8			75%	25%			50%
Solar thermal power	**73**		**2%**	**33%**	**38%**	**22%**	**4%**	**38%**
Business	13			25%	38%	25%	13%	38%
Consultants	20			27%	45%	18%	9%	45%
NGO	5				100%			60%
Officials	20			43%	29%	29%		30%
Research	9			57%	29%	14%		22%
IC	58		3%	34%	31%	26%	6%	40%
DC	12			33%	56%	11%		25%
EU-25	32			37%	21%	32%	11%	41%
USA	8			50%	50%			50%

Source: Öko-Institut

Table 63: What will be the typical mitigation costs in 2010? (Question 11) – continued

	n	Less than 0 US$/t CO_2e	0 - 5 US$/t CO_2e	5 - 10 US$/t CO_2e	10 - 25 US$/t CO_2e	25 - 50 US$/t CO_2e	Higher than 50 US$/t CO_2e	I don't know
		- share of all answers -						
Photovoltaics	**73**			**7%**	**19%**	**33%**	**42%**	**39%**
Business	13				17%	50%	33%	45%
Consultants	20			15%	8%	23%	54%	35%
NGO	5				50%	50%		60%
Officials	20				31%	31%	38%	35%
Research	9			14%	14%	29%	43%	22%
IC	58			9%	18%	29%	44%	40%
DC	12				25%	38%	38%	27%
EU-25	32				20%	20%	60%	35%
USA	8			50%		25%	25%	50%
Geothermal	**73**		**5%**	**30%**	**43%**	**18%**	**5%**	**45%**
Business	13		14%	29%	57%			46%
Consultants	20			27%	36%	27%	9%	45%
NGO	5			50%	50%			60%
Officials	20		8%	25%	50%	17%		40%
Research	9			33%	33%	17%	17%	33%
IC	58		6%	35%	39%	13%	6%	47%
DC	12				63%	38%		33%
EU-25	32		6%	18%	53%	12%	12%	47%
USA	8			75%	25%			50%
Landfills	**73**	**4%**	**71%**	**24%**				**36%**
Business	13		71%	29%				46%
Consultants	20	8%	75%	17%				29%
NGO	5		100%					80%
Officials	20	7%	60%	33%				25%
Research	9		67%	33%				33%
IC	58	3%	71%	26%				36%
DC	12	11%	67%	22%				25%
EU-25	32	5%	71%	24%				30%
USA	8		50%	50%				50%
HFC23 from HCFC22 production	**73**	**19%**	**74%**	**5%**	**2%**			**39%**
Business	13		86%	14%				46%
Consultants	20	25%	67%	8%				33%
NGO	5		100%					80%
Officials	20	33%	60%		7%			25%
Research	9		100%					56%
IC	58	18%	79%	3%				41%
DC	12	22%	56%	11%	11%			25%
EU-25	32	16%	84%					39%
USA	8		67%	33%				63%
N2O from nitric or adipic acid production	**73**	**14%**	**76%**	**10%**				**40%**
Business	13		88%	13%				38%
Consultants	20	17%	67%	17%				33%
NGO	5		100%					80%
Officials	20	29%	64%	7%				30%
Research	9		100%					56%
IC	58	16%	78%	6%				42%
DC	12	11%	67%	22%				25%
EU-25	32	15%	80%	5%				35%
USA	8		50%	50%				71%

Source: Öko-Institut

Table 63: What will be the typical mitigation costs in 2010? (Question 11) – continued

	n	Less than 0 US$/t CO_2e	0 - 5 US$/t CO_2e	5 - 10 US$/t CO_2e	10 - 25 US$/t CO_2e	25 - 50 US$/t CO_2e	Higher than 50 US$/t CO_2e	I don't know
		- share of all answers -						
Waste water treatment	**73**	**2%**	**36%**	**50%**	**10%**		**2%**	**40%**
Business	13		43%	43%	14%			46%
Consultants	20		25%	58%	8%		8%	37%
NGO	5			100%				60%
Officials	20	8%	38%	46%	8%			32%
Research	9		40%	60%				38%
IC	58	3%	39%	52%	3%		3%	41%
DC	12		25%	50%	25%			27%
EU-25	32	5%	37%	53%			5%	39%
USA	8		33%	33%	33%			63%
Coal Mine Methane	**73**	**2%**	**63%**	**19%**	**12%**	**2%**	**2%**	**39%**
Business	13		50%	38%	13%			38%
Consultants	20		67%	17%	8%		8%	33%
NGO	5		50%	50%				60%
Officials	20	8%	69%	8%	15%			35%
Research	9		75%		25%			50%
IC	58	3%	68%	15%	9%	3%	3%	38%
DC	12		50%	25%	25%			33%
EU-25	32	5%	65%	15%	10%		5%	38%
USA	8			67%		33%		57%
Fuel switch in energy and industry	**73**	**2%**	**35%**	**49%**	**12%**		**2%**	**33%**
Business	13		63%	25%	13%			38%
Consultants	20	7%	20%	60%	7%		7%	25%
NGO	5		50%	50%				60%
Officials	20		36%	50%	14%			30%
Research	9		33%	33%	33%			33%
IC	58	3%	29%	50%	16%		3%	34%
DC	12		60%	40%				17%
EU-25	32		41%	36%	18%		5%	31%
USA	8		25%	75%				50%
Supply-side efficiency	**73**	**7%**	**33%**	**51%**	**7%**		**2%**	**39%**
Business	13	14%	29%	57%				42%
Consultants	20	17%	17%	42%	17%		8%	40%
NGO	5		100%					60%
Officials	20		36%	57%	7%			30%
Research	9		50%	50%				50%
IC	58	9%	30%	55%	3%		3%	41%
DC	12		44%	33%	22%			25%
EU-25	32	11%	33%	44%	6%		6%	42%
USA	8		25%	75%				50%
Carbon capture and storage	**73**		**6%**	**3%**	**26%**	**31%**	**34%**	**49%**
Business	13		14%		43%	14%	29%	46%
Consultants	20			11%	11%	22%	56%	47%
NGO	5				100%			80%
Officials	20				33%	44%	22%	55%
Research	9		17%		17%	33%	33%	33%
IC	58		3%	3%	23%	37%	33%	46%
DC	12		20%		40%		40%	55%
EU-25	32		6%		22%	44%	28%	42%
USA	8			25%			75%	50%

Source: Öko-Institut

Table 63: What will be the typical mitigation costs in 2010? (Question 11) – continued

	n	Less than 0 US$/t CO_2e	0 - 5 US$/t CO_2e	5 - 10 US$/t CO_2e	10 - 25 US$/t CO_2e	25 - 50 US$/t CO_2e	Higher than 50 US$/t CO_2e	I don't know
		- share of all answers -						
Demand-side efficiency	**73**	**5%**	**19%**	**42%**	**30%**	**2%**	**2%**	**40%**
Business	13		38%	38%	25%			38%
Consultants	20		9%	36%	36%	9%	9%	42%
NGO	5		50%	50%				60%
Officials	20	8%	8%	46%	38%			35%
Research	9		40%	40%	20%			44%
IC	58	3%	21%	36%	33%	3%	3%	42%
DC	12	11%	11%	56%	22%			25%
EU-25	32		17%	39%	39%		6%	44%
USA	8	25%	50%	25%				50%
Transport	**73**		**5%**	**38%**	**31%**	**23%**	**3%**	**44%**
Business	13		13%	50%	13%	25%		38%
Consultants	20			20%	30%	40%	10%	44%
NGO	5			50%	50%			60%
Officials	20			58%	33%	8%		40%
Research	9		20%	20%	40%	20%		38%
IC	58		3%	45%	31%	17%	3%	47%
DC	12		11%	22%	22%	44%		25%
EU-25	32			47%	29%	18%	6%	47%
USA	8			100%				71%
Afforestation and reforestation	**73**	**5%**	**33%**	**44%**	**7%**	**7%**	**5%**	**40%**
Business	13		57%	29%		14%		46%
Consultants	20	8%	23%	38%	8%	8%	15%	32%
NGO	5			100%				80%
Officials	20	8%	25%	58%	8%			40%
Research	9		17%	50%	17%	17%		33%
IC	58	3%	36%	45%	3%	9%	3%	42%
DC	12	11%	22%	33%	22%		11%	25%
EU-25	32	5%	37%	42%	5%	5%	5%	41%
USA	8		50%	50%				50%

Source: Öko-Institut

Table 64: What will be the market price of temporary and long-term CERs relative to CERs from other project types in 2010? (Question 12)

	n	≤ 20 %	≤ 40 %	≤ 60 %	≤ 80 %	≤ 100 %	> 100 %	Average	I don't know
		- share of all answers -							
Long-term CERs (lCERs)	**70**	**9%**	**24%**	**24%**	**36%**	**6%**		**55%**	**53%**
Business	13		20%	40%	40%			54%	62%
Consultants	20	18%	18%	27%	18%	18%		54%	45%
NGO	4								100%
Officials	18		29%	29%	43%			59%	61%
Research	9	11%	33%	11%	44%			51%	
IC	55	13%	21%	29%	33%	4%		52%	56%
DC	12		38%	13%	38%	13%		59%	33%
EU-25	30		27%	27%	40%	7%		59%	50%
USA	8		25%	50%	25%			52%	50%
Temporary CERs (tCERs)	**70**	**15%**	**52%**	**24%**	**6%**	**3%**		**39%**	**53%**
Business	13		80%		20%			41%	62%
Consultants	20	18%	64%	9%		9%		39%	45%
NGO	4								100%
Officials	18	29%	14%	57%				37%	61%
Research	9	11%	56%	33%				37%	
IC	55	17%	58%	17%	4%	4%		37%	56%
DC	12	13%	38%	50%				41%	33%
EU-25	30	7%	67%	13%	7%	7%		41%	50%
USA	8		75%	25%				40%	50%

Source: Öko-Institut

Table 65: Future development of CDM and JI (Do you agree with the following statements?) (Question 13)

	All	Busi-ness	Consul-tants	NGO	Offi-cials	Re-search	IC	DC	EU-25	USA
n	75	13	21	5	20	9	59	13	33	8
Question	- share of affirmative answers ("I agree") -									
Industrialized countries will mainly use project-based mechanisms to fulfill their Kyoto commitments.	22%	31%	15%	20%	25%		17%	33%	22%	13%
Industrialized countries will mainly implement domestic measures and use international emissions trading but not project-based mechanisms to fulfill their Kyoto commitments.	37%	15%	40%	40%	47%	43%	39%	27%	29%	43%
Industrialized countries will mainly use international emissions trading and project-based mechanisms to fulfill their Kyoto commitments.	54%	54%	50%	25%	56%	63%	52%	58%	55%	50%
Companies covered under emissions trading schemes will mainly use project-based mechanisms to fulfill their commitments.	21%	38%	20%		11%	25%	18%	36%	19%	29%
Companies covered under emissions trading schemes will mostly carry out internal abatement measures and/or use emissions trading but not project-based mechanisms to meet their commitments.	78%	62%	75%	100%	82%	89%	79%	73%	74%	88%
By 2010, the demand for CERs and ERUs will be dominated by governmental procurement tenders.	35%	23%	26%		47%	50%	32%	45%	29%	67%
By 2010, the demand for CERs and ERUs will be dominated by companies covered under emissions trading schemes.	69%	69%	81%	100%	65%	56%	69%	67%	61%	86%
Buyers using CERs or ERUs for voluntary compensation of greenhouse gas emissions will make up more than 3 % of the overall demand for CERs and ERUs.	51%	90%	40%	67%	46%	13%	48%	67%	48%	50%
Most companies covered under emissions trading schemes will use carbon funds to purchase CERs or ERUs.	85%	100%	68%	80%	88%	88%	88%	64%	90%	83%
Most companies covered under emissions trading schemes will directly invest in CDM or JI projects.	8%		25%				7%	10%	7%	
By 2010, 20 % of all projects will provide more than 80 % of all CERs and ERUs.	76%	100%	71%	100%	78%	56%	79%	73%	75%	75%
By 2010, more than two thirds of the global CERs will come from China and India.	32%	31%	30%		37%	50%	31%	36%	32%	50%
Only large host countries will utilise the domestic JI or CDM mitigation potential.	19%		11%	33%	29%	25%	19%	9%	19%	33%
By 2010, most procurement tenders and carbon funds will also purchase tCERs and lCERs from afforestation and reforestation projects.	48%	25%	48%	20%	64%	56%	51%	33%	53%	50%
The temporary character of lCERs and tCERs is in many cases prohibitive to the implementation of afforestation or reforestation projects under the CDM.	84%	91%	84%	100%	86%	78%	86%	82%	80%	88%
Most afforestation and reforestation projects aim at a temporary storage of carbon (such as, for example, commercial plantations).	84%	90%	67%	100%	94%	100%	84%	91%	91%	71%
On a global scale, less than 10 % of the carbon stored in afforestation and reforestation projects will be released unintentionally (e.g. as a result of fires, illegal logging, etc)	63%	45%	79%		92%	44%	59%	91%	64%	29%
Carbon revenues significantly increase the profitability of CDM and JI projects.	57%	69%	55%	50%	60%	43%	58%	58%	55%	38%
In many cases, carbon revenues are the icing on the cake, but are not decisive for the investment decision.	86%	77%	85%	75%	100%	88%	84%	100%	87%	75%
Many projects would also be implemented without registration under the CDM.	71%	67%	74%	100%	63%	89%	65%	100%	61%	100%
Many CDM electricity generation projects result in an increased consumption of electricity.	50%	50%	40%	100%	42%	71%	58%	20%	52%	67%
Most CDM projects have sustainable development benefits (health, poverty alleviation, etc).	79%	92%	79%	80%	79%	63%	84%	64%	90%	75%
Most CDM projects lead to a transfer of technology to developing countries.	63%	92%	47%	60%	63%	56%	71%	27%	71%	86%
Transaction costs are significantly reduced once project developers can draw on approved methodologies and projects of the same type.	99%	100%	95%	100%	100%	100%	98%	100%	100%	100%

Source: Öko-Institut

Table 66: Evolution of the climate mitigation regime (By when do you expect the following to happen?) (Question 14)

	n	2010	2020	2030	2040	2050	Later or never	I don't know
		- share of all answers -						
More than 80 % of global GHG emissions will be regulated by binding and quantitative reduction commitments under national or international law.	**74**	**1%**	**30%**	**45%**	**4%**	**6%**	**14%**	**4%**
Business	13		38%	23%		8%	31%	
Consultants	21	5%	33%	43%	5%	5%	10%	
NGO	5			50%	25%		25%	20%
Officials	20		26%	63%		5%	5%	5%
Research	9		22%	44%	11%		22%	
IC	58	2%	28%	46%	5%	4%	16%	2%
DC	13		33%	42%		17%	8%	8%
EU-25	32	3%	25%	47%	3%		22%	
USA	8		43%	14%		29%	14%	13%
All major industrialized countries will have introduced emissions trading schemes.	**74**	**4%**	**84%**	**7%**		**1%**	**3%**	**4%**
Business	13		85%	15%				
Consultants	21	10%	76%	10%		5%		
NGO	5		100%					20%
Officials	20	6%	83%	6%			6%	5%
Research	9		89%				11%	
IC	58	4%	86%	9%			2%	2%
DC	13	9%	73%			9%	9%	8%
EU-25	32	6%	81%	13%				
USA	8		86%				14%	13%
Emissions trading schemes in industrialized countries will have been extended to most sectors of the economy (i.e. including the transport, residential, and commercial sectors).	**74**	**3%**	**68%**	**16%**	**1%**	**1%**	**10%**	**4%**
Business	13		85%	15%				
Consultants	21	5%	71%	5%	5%	5%	10%	
NGO	5		25%	75%				20%
Officials	20	5%	63%	21%			11%	
Research	9		50%	13%			38%	
IC	58	4%	65%	18%	2%		11%	4%
DC	13		75%	8%		8%	8%	
EU-25	32	6%	52%	26%			16%	3%
USA	8		71%	14%			14%	13%
Emissions trading schemes in industrialized countries will cover all GHGs.	**74**	**6%**	**70%**	**12%**	**3%**	**1%**	**9%**	**4%**
Business	13		77%	15%	8%			
Consultants	21	20%	60%	5%	5%	5%	5%	
NGO	5		25%	75%				20%
Officials	20		79%	11%			11%	
Research	9		78%				22%	
IC	58	7%	65%	15%	4%		9%	4%
DC	13		83%			8%	8%	
EU-25	32	6%	65%	19%			10%	3%
USA	8	14%	57%		14%		14%	13%

Source: Öko-Institut

Table 66: Evolution of the climate mitigation regime (By when do you expect the following to happen?) (Question 14) – continued

	n	2010	2020	2030	2040	2050	Later or never	I don't know
		- share of all answers -						
Emissions trading will have been extended to most countries and sectors worldwide.	**74**	**1%**	**23%**	**45%**	**7%**	**3%**	**20%**	**5%**
Business	13		23%	46%	15%		15%	
Consultants	21	5%	20%	35%	10%	5%	25%	
NGO	5		25%	75%				20%
Officials	20		26%	53%	5%	5%	11%	5%
Research	9		22%	33%			44%	
IC	58	2%	25%	43%	7%	2%	21%	3%
DC	13		9%	55%	9%	9%	18%	8%
EU-25	32	3%	13%	45%	3%	3%	32%	3%
USA	8		57%	14%	14%		14%	13%
More than 80 % of global CO2 emissions from energy-intensive industries will be covered under emissions trading schemes.	**74**	**1%**	**54%**	**30%**	**3%**	**3%**	**9%**	**5%**
Business	13		38%	46%			15%	
Consultants	21	5%	43%	33%	10%	5%	5%	
NGO	5		100%					40%
Officials	20		74%	21%			5%	5%
Research	9		44%	22%		11%	22%	
IC	58	2%	54%	32%	2%	2%	9%	3%
DC	13		58%	17%	8%	8%	8%	8%
EU-25	32	3%	48%	32%		3%	13%	3%
USA	8		71%	14%			14%	13%
The market price for emission allowances (AAUs, ERUs, CERs, etc) will exceed 50 US$/t CO2e.	**74**	**6%**	**40%**	**17%**	**6%**	**3%**	**28%**	**12%**
Business	13	8%	25%	17%	17%	8%	25%	8%
Consultants	21	10%	29%	19%	5%		38%	
NGO	5		67%		33%			40%
Officials	20	6%	56%	17%			22%	10%
Research	9		43%	29%			29%	22%
IC	58	8%	40%	19%	6%	4%	25%	9%
DC	13		36%	9%	9%		45%	15%
EU-25	32	10%	38%	21%		7%	24%	9%
USA	8		33%		17%		50%	25%
The market price for emission allowances (AAUs, ERUs, CERs, etc) will exceed 100 US$/t CO2e.	**74**	**2%**		**16%**	**8%**	**8%**	**66%**	**16%**
Business	13			23%	15%	15%	46%	
Consultants	21	5%		10%			85%	5%
NGO	5						100%	80%
Officials	20			24%	12%	18%	47%	15%
Research	9				14%		86%	22%
IC	58	2%		18%	10%	10%	61%	12%
DC	13			10%			90%	23%
EU-25	32	3%		17%	17%	10%	52%	9%
USA	8			17%		17%	67%	25%

Source: Öko-Institut

Table 66: Evolution of the climate mitigation regime (By when do you expect the following to happen?) (Question 14) – continued

	n	2010	2020	2030	2040	2050	Later or never	I don't know
		- share of all answers -						
A sectoral CDM will be introduced, which allows developing countries to obtain credits for reducing emissions in a sector or subsector of the economy (e.g. through respective policies)	**74**	**13%**	**69%**	**11%**			**8%**	**12%**
Business	13		75%	17%			8%	8%
Consultants	21	6%	72%	11%			11%	10%
NGO	5		75%				25%	20%
Officials	20	12%	76%	12%				15%
Research	9	33%	44%	11%			11%	
IC	58	12%	71%	10%			8%	9%
DC	13	10%	60%	20%			10%	23%
EU-25	32	10%	70%	10%			10%	6%
USA	8	13%	63%	13%			13%	
The project-based CDM will completely disappear.	**74**	**2%**	**2%**	**16%**	**13%**	**3%**	**64%**	**16%**
Business	13			31%	8%		62%	
Consultants	21			16%	16%		68%	5%
NGO	5	25%	25%	25%			25%	20%
Officials	20				20%	7%	73%	25%
Research	9			25%		13%	63%	11%
IC	58	2%	2%	20%	14%	4%	58%	14%
DC	13				10%		90%	17%
EU-25	32		4%	29%	7%	7%	54%	13%
USA	8	14%		14%	14%		57%	13%
The role of JI in reducing GHG emissions will be negligible in comparison to emissions trading.	**74**	**29%**	**53%**	**8%**	**3%**		**7%**	**18%**
Business	13	17%	67%		8%		8%	8%
Consultants	21	35%	40%	10%	5%		10%	5%
NGO	5	33%	33%	33%				40%
Officials	20	31%	54%	8%			8%	35%
Research	9	14%	86%					13%
IC	58	31%	49%	10%	2%		8%	14%
DC	13	22%	67%		11%			31%
EU-25	32	26%	56%	4%			15%	16%
USA	8	33%	33%	17%	17%			14%
JI will completely disappear.	**74**	**6%**	**31%**	**31%**	**3%**	**3%**	**25%**	**12%**
Business	13		33%	33%	8%	8%	17%	8%
Consultants	21	10%	35%	20%			35%	5%
NGO	5	33%		33%		33%		40%
Officials	20		35%	41%			24%	15%
Research	9	13%		50%			38%	11%
IC	58	6%	31%	35%	2%	4%	22%	7%
DC	13	11%	22%	11%	11%		44%	31%
EU-25	32	3%	34%	41%			21%	9%
USA	8	29%	14%		14%	14%	29%	13%

Source: Öko-Institut

Table 67: What will be the global annual market size of project-based mechanisms (JI and CDM) in 2010, 2020 and 2050? (Question 15)

	n	**< 100 Mt CO_2e**	**100 - 250 Mt CO_2e**	**250 - 500 Mt CO_2e**	**500 - 1,000 Mt CO_2e**	**1,000 - 2,000 Mt CO_2e**	**2,000 - 5,000 Mt CO_2e**	**> 5,000 Mt CO_2e**	**I don't know**
		- share of all answers -							
2010	**74**	**7%**	**54%**	**30%**	**6%**		**2%**	**2%**	**27%**
Business	13	13%	50%	38%					38%
Consultants	21	7%	71%	14%				7%	33%
NGO	5	33%	33%		33%				40%
Officials	20	6%	53%	29%	12%				15%
Research	9		50%	38%			13%		11%
IC	58	9%	51%	28%	7%		2%	2%	26%
DC	13		70%	30%					23%
EU-25	32	10%	57%	19%	10%			5%	34%
USA	8	25%	38%	25%			13%		
2020	**74**	**2%**	**10%**	**51%**	**22%**	**8%**	**2%**	**4%**	**33%**
Business	13		25%	38%	25%	13%			38%
Consultants	21			62%	23%		8%	8%	38%
NGO	5	33%		33%		33%			40%
Officials	20		13%	44%	31%	13%			20%
Research	9		14%	71%				14%	13%
IC	58	3%	11%	55%	16%	11%		5%	33%
DC	13		10%	40%	40%		10%		23%
EU-25	32		11%	63%	11%	11%		5%	41%
USA	8	13%	13%	50%		13%		13%	
2050	**74**	**10%**	**6%**	**2%**	**35%**	**24%**	**14%**	**8%**	**34%**
Business	13	13%				63%		25%	38%
Consultants	21	8%			62%	15%	8%	8%	38%
NGO	5	33%			33%	33%			40%
Officials	20	13%		7%	27%	13%	40%		25%
Research	9		38%		38%	13%		13%	11%
IC	58	10%	8%	3%	33%	28%	10%	8%	33%
DC	13	11%			44%		33%	11%	31%
EU-25	32	5%	11%	5%	21%	37%	11%	11%	41%
USA	8	13%	13%		38%	25%		13%	

Source: Öko-Institut

Table 68: Expansion of the climate regime (By when do you expect that the country or region has adopted absolute or relative greenhouse gas emission targets?) (Question 16)

	n	2020	2030	2040	2050
China	**72**	**60%**	**21%**	**8%**	**11%**
Business	13	77%	15%		8%
Consultants	19	58%	21%	11%	11%
NGO	5	40%	40%		20%
Officials	18	56%	17%	17%	11%
Research	11	64%	18%	9%	9%
IC	55	60%	18%	11%	11%
DC	13	62%	31%		8%
EU-25	33	61%	15%	9%	15%
USA	7	57%	14%	14%	14%
India	**72**	**59%**	**25%**	**4%**	**11%**
Business	13	75%	17%		8%
Consultants	19	47%	42%		11%
NGO	5	40%	40%		20%
Officials	18	61%	17%	11%	11%
Research	11	64%	18%	9%	9%
IC	55	61%	22%	6%	11%
DC	13	46%	46%		8%
EU-25	33	59%	25%		16%
USA	7	57%	14%	14%	14%
Rest of Asia	**72**	**31%**	**46%**	**15%**	**9%**
Business	13	33%	50%	8%	8%
Consultants	19	17%	50%	17%	17%
NGO	5	20%	40%	20%	20%
Officials	18	31%	56%	13%	
Research	11	45%	27%	27%	
IC	55	22%	53%	18%	8%
DC	13	62%	23%	8%	8%
EU-25	33	17%	55%	21%	7%
USA	7	29%	43%	14%	14%
Brazil	**72**	**67%**	**19%**	**10%**	**4%**
Business	13	75%	8%	8%	8%
Consultants	19	63%	26%	11%	
NGO	5	60%	20%	20%	
Officials	18	72%	11%	11%	6%
Research	11	64%	27%	9%	
IC	55	67%	19%	11%	4%
DC	13	69%	23%	8%	
EU-25	33	63%	19%	13%	6%
USA	7	71%	14%	14%	

Source: Öko-Institut

Table 68: Expansion of the climate regime (By when do you expect that the country or region has adopted absolute or relative greenhouse gas emission targets?) (Question 16) – continued

	n	2020	2030	2040	2050
Rest of Latin America	**72**	**31%**	**43%**	**22%**	**3%**
Business	13	42%	42%	17%	
Consultants	19	17%	44%	33%	6%
NGO	5	20%	40%	40%	
Officials	18	31%	56%	13%	
Research	11	45%	27%	27%	
IC	55	27%	47%	24%	2%
DC	13	46%	31%	23%	
EU-25	33	24%	48%	28%	
USA	7	43%	29%	14%	14%
Africa	**72**	**9%**	**23%**	**37%**	**31%**
Business	13	17%	17%	33%	33%
Consultants	19		29%	29%	41%
NGO	5	20%		80%	
Officials	18	6%	25%	63%	6%
Research	11	10%	40%		50%
IC	55	10%	22%	38%	30%
DC	13	8%	33%	33%	25%
EU-25	33	7%	20%	40%	33%
USA	7	33%	17%	17%	33%
Rest of developing countries	**72**	**12%**	**35%**	**27%**	**26%**
Business	13	15%	23%	23%	38%
Consultants	19		35%	41%	24%
NGO	5	20%	40%	20%	20%
Officials	18	13%	50%	25%	13%
Research	11	10%	40%	10%	40%
IC	55	12%	35%	27%	25%
DC	13	8%	42%	25%	25%
EU-25	33	10%	29%	26%	35%
USA	7	17%	50%	17%	17%
USA	**72**	**76%**	**13%**	**4%**	**7%**
Business	13	62%	8%	15%	15%
Consultants	19	89%	5%		5%
NGO	5	60%	20%		20%
Officials	18	78%	11%	6%	6%
Research	11	70%	30%		
IC	55	73%	16%	5%	5%
DC	13	83%			17%
EU-25	33	70%	18%	3%	9%
USA	7	71%	29%		

Source: Öko-Institut

Table 69: Introduction of emissions trading schemes for companies (By when do you expect that the country or region has established trading scheme for companies?) (Question 16)

	n	2020	2030	2040	2050
China	**72**	**54%**	**33%**	**7%**	**6%**
Business	13	67%	25%		8%
Consultants	19	42%	42%	11%	5%
NGO	5	60%		20%	20%
Officials	18	71%	18%	12%	
Research	11	36%	55%		9%
IC	55	57%	30%	8%	6%
DC	13	46%	38%	8%	8%
EU-25	33	52%	32%	10%	6%
USA	7	43%	43%		14%
India	**72**	**57%**	**32%**	**6%**	**6%**
Business	13	58%	33%		8%
Consultants	19	53%	42%	5%	
NGO	5	40%	20%		40%
Officials	18	71%	18%	12%	
Research	11	45%	36%	9%	9%
IC	55	58%	32%	6%	4%
DC	13	46%	31%	8%	15%
EU-25	33	48%	42%	3%	6%
USA	7	57%	29%	14%	
Rest of Asia	**72**	**29%**	**49%**	**18%**	**3%**
Business	13	33%	42%	17%	8%
Consultants	19	22%	67%	11%	
NGO	5		40%	40%	20%
Officials	18	33%	53%	13%	
Research	11	40%	30%	30%	
IC	55	24%	57%	16%	2%
DC	13	46%	23%	23%	8%
EU-25	33	21%	54%	21%	4%
USA	7	50%	50%		
Brazil	**72**	**65%**	**28%**	**4%**	**3%**
Business	13	67%	17%	8%	8%
Consultants	19	63%	37%		
NGO	5	40%	20%	20%	20%
Officials	18	75%	19%	6%	
Research	11	55%	45%		
IC	55	65%	29%	6%	
DC	13	54%	31%		15%
EU-25	33	57%	37%	7%	
USA	7	71%	29%		

Source: Öko-Institut

Table 69: Introduction of emissions trading schemes for companies (By when do you expect that the country or region has established trading scheme for companies?) (Question 16) – continued

	n	2020	2030	2040	2050
Rest of Latin America	**72**	**35%**	**42%**	**17%**	**6%**
Business	13	42%	25%	25%	8%
Consultants	19	24%	59%	18%	
NGO	5		60%		40%
Officials	18	47%	40%	13%	
Research	11	36%	36%	18%	9%
IC	55	33%	47%	16%	4%
DC	13	38%	31%	15%	15%
EU-25	33	32%	39%	21%	7%
USA	7	50%	50%		
Africa	**72**	**11%**	**25%**	**34%**	**30%**
Business	13	27%	9%	27%	36%
Consultants	19		38%	38%	25%
NGO	5			80%	20%
Officials	18	13%	40%	40%	7%
Research	11	11%	22%	11%	56%
IC	55	11%	24%	35%	30%
DC	13	17%	33%	33%	17%
EU-25	33	11%	18%	39%	32%
USA	7	20%	20%	20%	40%
Rest of developing countries	**72**	**18%**	**23%**	**33%**	**25%**
Business	13	30%	10%	30%	30%
Consultants	19		38%	44%	19%
NGO	5	20%	20%		60%
Officials	18	20%	33%	33%	13%
Research	11	22%	11%	22%	44%
IC	55	18%	22%	36%	24%
DC	13	17%	33%	17%	33%
EU-25	33	19%	11%	33%	37%
USA	7	20%	40%	20%	20%
USA	**72**	**88%**	**9%**	**1%**	**1%**
Business	13	83%	17%		
Consultants	19	100%			
NGO	5	80%			20%
Officials	18	88%	6%	6%	
Research	11	80%	20%		
IC	55	85%	11%	2%	2%
DC	13	100%			
EU-25	33	87%	6%	3%	3%
USA	7	71%	29%		

Source: Öko-Institut

Table 70: Share of the global CDM and JI market by mitigation options (What will be the distribution of CDM and JI projects across mitigation options in 2020 and 2050?) (Question 17)

	All	Business	Consultants	NGO	Officials	Research	IC	DC	EU-25	USA
	- weighted average -									
2020										
Non-CO2 projects	27%	23%	24%	36%	26%	29%	27%	27%	28%	31%
Renewables	18%	17%	17%	19%	22%	15%	18%	20%	16%	20%
Fuel switch in energy and industry sectors	13%	13%	17%	16%	11%	10%	13%	18%	11%	13%
Supply-side efficiency	12%	13%	12%	10%	10%	14%	12%	9%	13%	9%
Demand-side efficiency	8%	8%	9%	5%	6%	13%	8%	8%	8%	10%
Afforestation and reforestation	7%	11%	5%	7%	9%	5%	8%	5%	9%	6%
Transport	7%	7%	7%	5%	7%	8%	7%	6%	7%	6%
Carbon Capture and Storage (CCS)	4%	5%	4%	1%	4%	3%	4%	3%	5%	2%
Other projects	4%	4%	4%	1%	5%	3%	3%	4%	4%	2%
2050										
Non-CO2 projects	15%	15%	15%	12%	13%	17%	15%	16%	16%	13%
Renewables	25%	23%	24%	27%	28%	21%	25%	26%	22%	31%
Fuel switch in energy and industry sectors	9%	11%	9%	14%	7%	7%	9%	8%	9%	9%
Supply-side efficiency	9%	10%	9%	8%	7%	11%	9%	5%	11%	7%
Demand-side efficiency	7%	8%	8%	6%	7%	9%	7%	10%	7%	7%
Afforestation and reforestation	9%	9%	9%	9%	11%	7%	9%	8%	8%	8%
Transport	11%	10%	13%	7%	10%	10%	10%	15%	10%	8%
Carbon Capture and Storage (CCS)	12%	10%	11%	16%	11%	15%	13%	5%	13%	15%
Other projects	3%	3%	3%	3%	7%	2%	3%	7%	3%	2%

Source: Öko-Institut

8.2 Questionnaire

8.2.1 First round

Delphi questionnaire on the perspectives of JI and CDM

Dear colleague,

Thank you very much for participating in the Delphi questionnaire on the perspectives of JI and CDM.

Several pre-tests have shown that answering the questionnaire takes about 30 to 45 minutes. If you wish to, you have the possibility after each question of stopping answering the questionnaire; you can then resume it at a later moment by opening the link provided in the email.

Some of the questions address rather uncertain future developments. These questions are difficult to answer: we would, however, like to encourage you to answer these questions to the best of your knowledge and to estimate future developments against the background of your expertise even if your answers are then somewhat speculative.

In answering the questions, please take into account that project-based mechanisms will not necessarily prevail in all countries. International emissions trading may replace project-based mechanisms in certain countries or sectors.

For all currency-related statements, please assume constant 2005 US$ prices.

Start the questionnaire

Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit

Umwelt Bundes Amt
Für Mensch und Umwelt

Öko-Institut e.V.
Institut für angewandte Ökologie
Institute for Applied Ecology

Delphi questionnaire on the perspectives of JI and CDM

1. What is your background in project-based mechanisms?

Broker	○
Designated Operational Entity	○
Project developer	○
Public buyer of CERs and/or ERUs	○
Enterprise buying CERs and/or ERUs	○
Research organisation	○
Government representative	○
Development cooperation agency	○
Multilateral organisation	○
Consultant	○
NGO	○
Business association	○
Bank	○
Other (please specify) [ ]	○

How many years of experience do you have in the field of project-based mechanisms? [ ]

Your citizenship: [▾]

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Delphi questionnaire on the perspectives of JI and CDM

2. What are the most important barriers to the implementation of CDM and JI projects?

Note: Please tick the relevant boxes. You may add additional barriers.

Barrier	CDM	JI
Lack of knowledge about the CDM/JI	☐	☐
Low market price for emission allowances	☐	☐
Uncertainty about demand for carbon credits after 2012	☐	☐
Project implementation and operation risks (national approval, validation, registration, technical failure, etc)	☐	☐
Difficulties in establishing contacts between project developers and potential investors	☐	☐
Lack of access to capital	☐	☐
Lack of upfront payment for CERs or ERUs	☐	☐
Difficulties in preparing relevant documents (PDD, determination of baseline etc.)	☐	☐
Projects are not easily replicable	☐	☐
Time consuming approval and registration process	☐	☐
Validation costs / requirements	☐	☐
Monitoring costs / requirements	☐	☐
Share of proceeds (CDM)	☐	
	☐	☐
	☐	☐
	☐	☐

Your level of expertise on this question/statement:

Expert ○ ○ ○ ○ Unfamiliar

Please submit any comments you may have on this question/statement:

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Delphi questionnaire on the perspectives of JI and CDM

3. Which measures do you consider most important to overcome the barriers to the project-based mechanism?

Note: Tick the relevant boxes. You may add additional measures.

	Very important	Important	Less important	Not important	I don't know
Strengthen international institutions					
CDM Executive Board	○	○	○	○	○
CDM Methodological Panel	○	○	○	○	○
JI Supervisory Committee	○	○	○	○	○
UNFCCC Secretariat	○	○	○	○	○
Revise regulatory framework (Modalities and Procedures for the CDM, etc.)					
Simplify procedures	○	○	○	○	○
Concretise procedures	○	○	○	○	○
Clarify procedures	○	○	○	○	○
Remove share of proceeds	○	○	○	○	○
Make JI procedures simpler than CDM procedures	○	○	○	○	○
Streamline national approval process	○	○	○	○	○
PDD pre-check by designated operational entity or other institution	○	○	○	○	○
Intensify capacity building for PDD preparation and baseline development	○	○	○	○	○
Standardisation of baselines	○	○	○	○	○
Standardisation of the monitoring process	○	○	○	○	○
Pooling of similar projects (use of same baseline etc.)	○	○	○	○	○
Information campaigns about the CDM and JI in general among companies in the investor and host countries	○	○	○	○	○
Public procurement tenders	○	○	○	○	○
Private carbon funds	○	○	○	○	○
Public-private partnerships	○	○	○	○	○

Upfront payment for CERs or ERUs	○	○	○	○	○
Special credit lines for financing investments in CDM or JI projects (e.g. in combination with procurement tenders)	○	○	○	○	○
Investor's forum (carbon expo, etc.)	○	○	○	○	○
Set up a clearing house for CDM and JI projects	○	○	○	○	○
Debt guarantees for national project developers	○	○	○	○	○
Debt guarantees for exporters of technologies for CDM or JI projects	○	○	○	○	○
Cooperation with chambers of commerce and national investment authorities	○	○	○	○	○
	○	○	○	○	○
	○	○	○	○	○
	○	○	○	○	○

Your level of expertise on this question/statement:
Expert ○ ○ ○ ○ Unfamiliar

Please submit any comments you may have on this question/statement:

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Delphi questionnaire on the perspectives of JI and CDM

4. Which CDM or JI project types are particularly attractive from a) the investor's perspective and b) the government of the host country's perspective

Note: Please tick the relevant boxes.

	Investor	Host country
Renewable power generation		
Large hydro	☐	☐
Small hydro	☐	☐
Biomass	☐	☐
Wind	☐	☐
Solar thermal power	☐	☐
Photovoltaics	☐	☐
Geothermal	☐	☐
Fuel switch in energy and industry	☐	☐
Supply-side efficiency	☐	☐
Carbon capture and storage	☐	☐
Demand-side efficiency	☐	☐
Non-CO_2 projects		
Landfills	☐	☐
HFC23 from HCFC22 production	☐	☐
N_2O from nitric or adipic acid production	☐	☐
Waste water treatment	☐	☐
Coal Mine Methane	☐	☐
Transport	☐	☐
Afforestation and reforestation	☐	☐

Your level of expertise on this question/statement:
Expert ○ ○ ○ ○ Unfamiliar

Please submit any comments you may have on this question/statement:

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Delphi questionnaire on the perspectives of JI and CDM

5. What do you expect will be the typical transaction costs for the development of CDM and JI projects by 2010?

Note: Transaction costs include, for example, costs for PDD development and baseline determination, approval from the relevant designated national authorities (DNAs), validation by a designated operational entity (DOE), registration at the CDM Executive Board and negotiation of emission reductions purchase agreements (ERPAs). Costs for monitoring and verification are addressed in the following questions and should not be taken into account here. Moreover, transaction costs not directly related to the CDM or JI (such as technical design and planning, financing, etc.) should not be considered.

	US$ per project				I don't know
	Less than 50,000	50,000 - 100,000	100,000 - 200,000	More than 200,000	
CDM large scale projects	○	○	○	○	○
CDM small scale projects	○	○	○	○	○
JI first track projects	○	○	○	○	○
JI second track projects	○	○	○	○	○

Your level of expertise on this question/statement:
Expert ○ ○ ○ ○ Unfamiliar

Please submit any comments you may have on this question/statement:

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Delphi questionnaire on the perspectives of JI and CDM

6. What do you expect will be the typical annual costs for the monitoring and verification of CDM or JI projects by 2010?

	US$ per project and year					I don't know
	Less than 5,000	5,000 - 10,000	10,000 - 20,000	20,000 - 50,000	More than 50,000	
Renewables	○	○	○	○	○	○
Fuel switch in energy and industry sectors	○	○	○	○	○	○
Supply-side efficiency	○	○	○	○	○	○
Carbon capture and storage (CCS)	○	○	○	○	○	○
Demand-side efficiency	○	○	○	○	○	○
Non-CO_2 projects	○	○	○	○	○	○
Transport	○	○	○	○	○	○
Afforestation and reforestation	○	○	○	○	○	○

Your level of expertise on this question/statement:
Expert ○ ○ ○ ○ Unfamiliar

Please submit any comments you may have on this question/statement:

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Delphi questionnaire on the perspectives of JI and CDM

7. What will be the three most important drivers for transaction costs by 2010?

Note: You may add additional cost drivers.

	Important cost drivers
PDD development (including baseline determination)	
Host country approval	
Validation	
Registration	
Negotiation of emission reduction purchase agreements	
Monitoring and verification	

Your level of expertise on this question/statement:

Expert ◯ ◯ ◯ ◯ Unfamiliar

Please submit any comments you may have on this question/statement:

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Delphi questionnaire on the perspectives of JI and CDM

8. What project size is necessary to make a CDM or JI project feasible (taking into account transaction costs)?

	Emission reductions during crediting period (t CO_2e)							I don't know
	Less than 10,000	10,000 - 20,000	20,000 - 50,000	50,000 - 100,000	100,000 - 250,000	250,000 - 500,000	More than 500,000	
CDM large scale projects	○	○	○	○	○	○	○	○
CDM small scale projects	○	○	○	○	○	○	○	○
JI first track projects	○	○	○	○	○	○	○	○
JI second track projects	○	○	○	○	○	○	○	○

Your level of expertise on this question/statement:
Expert ○ ○ ○ ○ Unfamiliar

Please submit any comments you may have on this question/statement:

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Delphi questionnaire on the perspectives of JI and CDM

9. What is the overall risk associated with the generation of CERs or ERUs?

Note: Consider all the relevant risks, including, for example, the risk of non-approval, non-validation or non-registration of the project (by the host country, the validator or the CDM Executive Board/JI Supervisory Committee) or the risk of non-delivery during project implementation and operation (e.g. due to technical failure, lower performance, non-permanence in the case of forestry projects, etc).

	Very low	Low	High	Very high	I don't know
Renewables	○	○	○	○	○
Fuel switch in energy and industry sectors	○	○	○	○	○
Supply-side efficiency	○	○	○	○	○
Carbon capture and storage (CCS)	○	○	○	○	○
Demand-side efficiency	○	○	○	○	○
Non-CO_2 projects	○	○	○	○	○
Transport	○	○	○	○	○
Afforestation and reforestation	○	○	○	○	○

Your level of expertise on this question/statement:
Expert ○ ○ ○ ○ Unfamiliar

Please submit any comments you may have on this question/statement:

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Delphi questionnaire on the perspectives of JI and CDM

10. Please classify the project types according to their characteristics.

Project size	Very small	Small	Large	Very large	I don't know
Renewables	○	○	○	○	○
Fuel switch in energy and industry sectors	○	○	○	○	○
Supply-side efficiency	○	○	○	○	○
Carbon capture and storage (CCS)	○	○	○	○	○
Demand-side efficiency	○	○	○	○	○
Non-CO_2 projects	○	○	○	○	○
Transport	○	○	○	○	○
Afforestation and reforestation	○	○	○	○	○
Baseline determination	Very easy	Easy	Difficult	Very difficult	I don't know
Renewables	○	○	○	○	○
Fuel switch in energy and industry sectors	○	○	○	○	○
Supply-side efficiency	○	○	○	○	○
Carbon capture and storage (CCS)	○	○	○	○	○
Demand-side efficiency	○	○	○	○	○
Non-CO_2 projects	○	○	○	○	○
Transport	○	○	○	○	○
Afforestation and reforestation	○	○	○	○	○
Demonstration of additionality	Very easy	Easy	Difficult	Very difficult	I don't know
Renewables	○	○	○	○	○
Fuel switch in energy and industry sectors	○	○	○	○	○
Supply-side efficiency	○	○	○	○	○
Carbon capture and storage (CCS)	○	○	○	○	○
Demand-side efficiency	○	○	○	○	○
Non-CO_2 projects	○	○	○	○	○
Transport	○	○	○	○	○
Afforestation and reforestation	○	○	○	○	○
Sustainability benefits	Very high	High	Low	Very low	I don't know
Renewables	○	○	○	○	○
Fuel switch in energy and industry sectors	○	○	○	○	○
Supply-side efficiency	○	○	○	○	○
Carbon capture and storage (CCS)	○	○	○	○	○

Demand-side efficiency	○	○	○	○	○
Non-CO_2 projects	○	○	○	○	○
Transport	○	○	○	○	○
Afforestation and reforestation	○	○	○	○	○

Your level of expertise on this question/statement:

Expert ○ ○ ○ ○ Unfamiliar

Please submit any comments you may have on this question/statement:

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Delphi questionnaire on the perspectives of JI and CDM

11. What will be the typical mitigation costs in 2010?

Note: Transaction costs (related to project development as well as monitoring) should not be taken into account.

	US$/t CO_2e						
	Less than 0	0 - 5	5 - 10	10 - 25	25 - 50	Higher than 50	I don't know
Renewable power generation							
Large hydro	○	○	○	○	○	○	○
Small hydro	○	○	○	○	○	○	○
Biomass	○	○	○	○	○	○	○
Wind	○	○	○	○	○	○	○
Solar thermal power	○	○	○	○	○	○	○
Photovoltaics	○	○	○	○	○	○	○
Geothermal	○	○	○	○	○	○	○
Fuel switch in energy and industry	○	○	○	○	○	○	○
Supply-side efficiency	○	○	○	○	○	○	○
Carbon capture and storage (CCS)	○	○	○	○	○	○	○
Demand-side efficiency	○	○	○	○	○	○	○
Non-CO_2 projects							
Landfills	○	○	○	○	○	○	○
HFC23 from HCFC22 production	○	○	○	○	○	○	○
N_2O from nitric or adipic acid production	○	○	○	○	○	○	○
Waste water treatment	○	○	○	○	○	○	○
Coal Mine Methane	○	○	○	○	○	○	○
Transport	○	○	○	○	○	○	○
Afforestation and reforestation	○	○	○	○	○	○	○

Your level of expertise on this question/statement:
Expert ○ ○ ○ ○ Unfamiliar

Please submit any comments you may have on this question/statement:

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Delphi questionnaire on the perspectives of JI and CDM

12. What will be the market price of temporary and long-term CERs relative to CERs from other project types in 2010?

Note: CERs from afforestation and reforestation projects differ from CERs from other projects, since they have to be replaced after a certain time. For that reason, the market price between these two types of CERs might be different. For example, 50 % means that the market price for a temporary or a long-term CER is only half of that for other project types.

	%	I don't know
Long-term CERs (lCERs)		☐
Temporary CERs (tCERs)		☐

Your level of expertise on this question/statement:
Expert ○ ○ ○ ○ Unfamiliar

Please submit any comments you may have on this question/statement:

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Delphi questionnaire on the perspectives of JI and CDM

13. Do you agree with the following statements?

Statement	I agree	I don't agree	I don't know
By 2010, 20 % of all projects will provide more than 80 % of all CERs and ERUs.	○	○	○
By 2010, more than two thirds of the global CERs will come from China and India.	○	○	○
By 2010, most procurement tenders and carbon funds will also purchase tCERs and lCERs from afforestation and reforestation projects.	○	○	○
By 2010, the demand for CERs and ERUs will be dominated by governmental procurement tenders.	○	○	○
By 2010, the demand for CERs and ERUs will be dominated by companies covered under emissions trading schemes.	○	○	○
Carbon revenues significantly increase the profitability of CDM and JI projects.	○	○	○
Companies covered under emissions trading schemes will mainly use project-based mechanisms to fulfill their commitments.	○	○	○
Companies covered under emissions trading schemes will mostly carry out internal abatement measures and/or use emissions trading but not project-based mechanisms to meet their commitments.	○	○	○
On a global scale, less than 10 % of the carbon stored in afforestation and reforestation projects will be released unintentionally (e.g. as a result of fires, illegal logging, etc)	○	○	○
The temporary character of lCERs and tCERs is in many cases prohibitive to the implementation of afforestation or reforestation projects under the CDM.	○	○	○
In many cases, carbon revenues are "the icing on the cake", but are not decisive for the investment decision.	○	○	○
Industrialized countries will mainly use project-based mechanisms to fulfill their Kyoto commitments.	○	○	○
Industrialized countries will mainly implement domestic measures and use international emissions trading but not project-based mechanisms to fulfill their Kyoto commitments.	○	○	○
Industrialized countries will mainly use international emissions trading and project-based mechanisms to fulfill their Kyoto commitments.	○	○	○
Most afforestation and reforestation projects aim at a temporary storage of carbon (such as, for example, commercial plantations).	○	○	○
Many CDM electricity generation projects result in an increased consumption of electricity.	○	○	○

Most companies covered under emissions trading schemes will use carbon funds to purchase CERs or ERUs.	◯	◯	◯
Most companies covered under emissions trading schemes will directly invest in CDM or JI projects.	◯	◯	◯
Many projects would also be implemented without registration under the CDM.	◯	◯	◯
Most CDM projects have sustainable development benefits (health, poverty alleviation, etc).	◯	◯	◯
Most CDM projects lead to a transfer of technology to developing countries.	◯	◯	◯
Transaction costs are significantly reduced once project developers can draw on approved methodologies and projects of the same type.	◯	◯	◯
Only large host countries will utilise the domestic JI or CDM mitigation potential.	◯	◯	◯
Buyers using CERs or ERUs for voluntary compensation of greenhouse gas emissions will make up more than 3 % of the overall demand for CERs and ERUs.	◯	◯	◯

Your level of expertise on this question/statement:

Expert ◯ ◯ ◯ ◯ Unfamiliar

Please submit any comments you may have on this question/statement:

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Delphi questionnaire on the perspectives of JI and CDM

14. By when do you expect the following to happen?

Statement	2010	2020	2030	2040	2050	Later or never	I don't know
More than 80 % of global GHG emissions will be regulated by binding and quantitative reduction commitments under national or international law.	○	○	○	○	○	○	○
All major industrialized countries will have introduced emissions trading schemes.	○	○	○	○	○	○	○
Emissions trading schemes in industrialized countries will have been extended to most sectors of the economy (i.e. including the transport, residential, and commercial sectors).	○	○	○	○	○	○	○
Emissions trading schemes in industrialized countries will cover all GHGs.	○	○	○	○	○	○	○
Emissions trading will have been extended to most countries and sectors worldwide.	○	○	○	○	○	○	○
More than 80 % of global CO_2 emissions from energy-intensive industries will be covered under emissions trading schemes.	○	○	○	○	○	○	○
The market price for emission allowances (AAUs, ERUs, CERs, etc) will exceed 50 US$/t CO_2e.	○	○	○	○	○	○	○
The market price for emission allowances (AAUs, ERUs, CERs, etc) will exceed 100 US$/t CO_2e.	○	○	○	○	○	○	○
A sectoral CDM will be introduced, which allows developing countries to obtain credits for reducing emissions in a sector or subsector of the economy (e.g. through respective policies)	○	○	○	○	○	○	○
The project-based CDM will completely disappear.	○	○	○	○	○	○	○
The role of JI in reducing GHG emissions will be negligible in comparison to emissions trading.	○	○	○	○	○	○	○
JI will completely disappear.	○	○	○	○	○	○	○

Your level of expertise on this question/statement:

Expert ◯ ◯ ◯ ◯ Unfamiliar

Please submit any comments you may have on this question/statement:

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Delphi questionnaire on the perspectives of JI and CDM

15. What will be the global annual market size of project-based mechanisms (JI and CDM) in 2010, 2020 and 2050?

	Million tons of CO_2 equivalents (Mt CO_2e)							I don't know
	Less than 100	100 - 250	250 - 500	500 - 1,000	1,000 - 2,000	2,000 - 5,000	More than 5,000	
2010	◯	◯	◯	◯	◯	◯	◯	◯
2020	◯	◯	◯	◯	◯	◯	◯	◯
2050	◯	◯	◯	◯	◯	◯	◯	◯

Your level of expertise on this question/statement:
Expert ◯ ◯ ◯ ◯ Unfamiliar

Please submit any comments you may have on this question/statement:

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Delphi questionnaire on the perspectives of JI and CDM

16. What will be the geographic distribution of CDM and JI projects in 2020 and 2050?

Note: Indicate the market share of the regions in terms of CO_2 equivalents. You may enter relative or absolute numbers. Your entries will be scaled to sum to 100 %.

Region	2020 [%]	2050 [%]
Non-Annex I countries		
China		
India		
Rest of Asia		
Brazil		
Rest of Latin America		
Africa		
Rest of developing countries		
Annex I countries		
EU-15 (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom)		
EU-10 (Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovak Republic, Slovenia)		
USA		
Former Soviet Union		
Rest of industrialized countries		

Your level of expertise on this question/statement:

Expert ○ ○ ○ ○ Unfamiliar

Please submit any comments you may have on this question/statement:

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Delphi questionnaire on the perspectives of JI and CDM

17. What will be the distribution of CDM and JI projects across mitigation options in 2020 and 2050?

Note: Estimate the market share of the mitigation options below in terms of CO_2 equivalents. You may enter relative or absolute numbers. Your entries will be scaled to sum to 100 %.

Mitigation option	2020 [%]	2050 [%]
Renewables Hydro, biomass, wind, solar, geothermal, etc.		
Fuel switch in energy and industry sectors between fossil fuels		
Supply-side efficiency Clean coal, cogeneration, etc.		
Carbon capture and storage (CCS)		
Demand-side efficiency Households, Commercial, Industry		
Non-CO_2 projects Landfills, HFC23 from HCFC22 production, N_2O from nitric or adipic acid production, waste water treatment, coal mine, methane, etc.		
Transport Fuel switch, changes in the modal split, efficiency improvements, etc.		
Afforestation and reforestation		
Other projects		

Your level of expertise on this question/statement:
Expert ○ ○ ○ ○ Unfamiliar

Please submit any comments you may have on this question/statement:

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Delphi questionnaire on the perspectives of JI and CDM

18. Any other comments:

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Delphi questionnaire on the perspectives of JI and CDM

Thank you for having taken the time to participate in this questionnaire.

You will receive the results of the assessment of the first round and may revise your answers in the second round in the light of your colleagues' answers. The second round will probably take place in early September.

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Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit

Umwelt Bundes Amt
Für Mensch und Umwelt

Öko-Institut e.V.
Institut für angewandte Ökologie
Institute for Applied Ecology

8.2.2 Second round

Delphi questionnaire on the perspectives of JI and CDM

Dear colleague,

Thank you very much for participating in the first round of the Delphi survey on the perspectives of JI and CDM. More than 250 experts have participated in the first round. On the next pages you will find the results of the questionnaire together with the questions which you are already familiar with. Please have a look at these results and answer the questions again in the light of your colleagues' answers. Click here if you wish to print out your entries in the first round.

For each question you will find the numbers of answers to each option either in relative or absolute terms and the number of experts who have answered that question (n). If applicable, the number of experts who have answered "I don't know" (idk) is given as a percentage of the total number of answers (idk / n). The percentage distribution of the answers to the other options always refers to the number of experts who have not answered "I don't know" (n - idk).

Answering the questionnaire will take about 30 minutes again. If you wish to, you have the possibility after each question of stopping answering the questionnaire; you can then resume it at a later moment by opening the link provided in the email.

Some of the questions address rather uncertain future developments. These questions are difficult to answer: we would, however, like to encourage you to answer these questions to the best of your knowledge and to estimate future developments against the background of your expertise even if your answers are then somewhat speculative. Taking into account other experts' answers, some of these questions might be easier to answer in the second round.

In answering the questions, please take into account that project-based mechanisms will not necessarily prevail in all countries. International emissions trading may replace project-based mechanisms in certain countries or sectors. For all currency-related statements, please assume constant 2005 US$ prices.

Start the questionnaire

Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit

Umwelt Bundes Amt Für Mensch und Umwelt

Öko-Institut e.V. Institut für angewandte Ökologie Institute for Applied Ecology

Delphi questionnaire on the perspectives of JI and CDM

1. What is your background in project-based mechanisms?

Broker	○
Designated Operational Entity	○
Project developer	○
Public buyer of CERs and/or ERUs	○
Enterprise buying CERs and/or ERUs	○
Research organisation	○
Government representative	○
Development cooperation agency	○
Multilateral organisation	○
Consultant	○
NGO	○
Business association	○
Bank	○
Other (please specify)	○

How many years of experience do you have in the field of project-based mechanisms?

Your citizenship:

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Delphi questionnaire on the perspectives of JI and CDM

2. What are the most important barriers to the implementation of CDM and JI projects?

Number of answers to this question (n): 221

CDM		Results
Time consuming approval and registration process	☐	67%
Uncertainty about demand for carbon credits after 2012	☐	63%
Project implementation and operation risks (national approval, validation, registration, technical failure, etc)	☐	63%
Lack of knowledge about the CDM/JI	☐	50%
Difficulties in preparing relevant documents (PDD, determination of baseline etc.)	☐	43%
Lack of access to capital	☐	38%
Lack of upfront payment for CERs or ERUs	☐	31%
Difficulties in establishing contacts between project developers and potential investors	☐	31%
Low market price for emission allowances	☐	26%
Validation costs / requirements	☐	26%
Monitoring costs / requirements	☐	19%
Projects are not easily replicable	☐	13%
Share of proceeds (CDM)	☐	8%
Problems in project development not specifically related to CDM or JI	☐	not in the 1st round

JI		Results
Project implementation and operation risks (national approval, validation, registration, technical failure, etc)	☐	40%
Uncertainty about demand for carbon credits after 2012	☐	39%
Lack of knowledge about the CDM/JI	☐	35%
Time consuming approval and registration process	☐	34%
Difficulties in preparing relevant documents (PDD, determination of baseline etc.)	☐	23%
Difficulties in establishing contacts between project developers and potential investors	☐	18%
Low market price for emission allowances	☐	15%
Validation costs / requirements	☐	14%

Lack of upfront payment for CERs or ERUs	☐	14%
Lack of access to capital	☐	12%
Monitoring costs / requirements	☐	10%
Projects are not easily replicable	☐	8%
Problems in project development not specifically related to CDM or JI	☐	not in the 1st round

Please submit any comments you may have on this question/statement:

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Delphi questionnaire on the perspectives of JI and CDM

3. Which measures do you consider most important to overcome the barriers to the project-based mechanism?

	n	Very important	Important	Less important	Not important	I don't know
Strengthen international institutions						
CDM Executive Board	189					4%
CDM Methodological Panel	191					3%
JI Supervisory Committee	171					20%
UNFCCC Secretariat	181					8%
Revise regulatory framework (Modalities and Procedures for the CDM, etc.)						
Simplify procedures	191					1%
Concretise procedures	183					3%
Clarify procedures	186					1%
Remove share of proceeds	172					22%
Streamline national approval process	187					6%
PDD pre-check by designated operational entity or other institution	184					7%
Intensify capacity building for PDD preparation and baseline development	189					2%
Standardisation of baselines	197					3%

Standardisation of the monitoring process	195	4%
Pooling of similar projects (use of same baseline etc.)	195	3%
Information campaigns about the CDM and JI in general among companies in the investor and host countries	188	1%
Public procurement tenders	181	8%
Private carbon funds	184	5%
Public-private partnerships	182	6%
Upfront payment for CERs or ERUs	183	5%
Special credit lines for financing investments in CDM or JI projects (e.g. in combination with procurement tenders)	184	10%
Investor's forum (carbon expo, etc.)	187	3%
Set up a clearing house for CDM and JI projects	188	11%
Debt guarantees for national project developers	181	17%
Debt guarantees for exporters of technologies for CDM or JI projects	177	19%
Cooperation with chambers of commerce and national investment authorities	178	10%
Clarify perspective of JI/CDM after 2012	not in the 1st round	
Promote unilateral CDM	not in the 1st round	

Please submit any comments you may have on this question/statement:

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Delphi questionnaire on the perspectives of JI and CDM

4. Which CDM or JI project types are particularly attractive from a) the investor's perspective and b) the government of the host country's perspective

n: 194

Investor	Results
Landfills	70%
HFC23 from HCFC22 production	64%
Wind power generation	58%
Fuel switch in energy and industry	57%
Coal Mine Methane	53%
N_2O from nitric or adipic acid production	51%
Large hydro power generation	48%
Biomass power generation	47%
Supply-side efficiency	39%
Waste water treatment	33%
Carbon capture and storage	33%
Geothermal power generation	29%
Small hydro power generation	27%
Demand-side efficiency	24%
Afforestation and reforestation	22%
Solar thermal power generation	18%
Photovoltaics	16%
Transport	16%

Host country	Results
Biomass power generation	73%
Small hydro power generation	65%
Wind power generation	65%
Transport	64%
Landfills	62%
Fuel switch in energy and industry	61%
Demand-side efficiency	56%
Afforestation and reforestation	56%
Supply-side efficiency	52%
Geothermal power generation	52%
Waste water treatment	49%
Photovoltaics	48%
Solar thermal power generation	48%

Large hydro power generation	☐	38%
Coal Mine Methane	☐	33%
Carbon capture and storage	☐	22%
HFC23 from HCFC22 production	☐	20%
N_2O from nitric or adipic acid production	☐	18%

Please submit any comments you may have on this question/statement:

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Delphi questionnaire on the perspectives of JI and CDM

5. What do you expect will be the typical transaction costs for the development of CDM and JI projects by 2010?

Note: Transaction costs include, for example, costs for PDD development and baseline determination, approval from the relevant designated national authorities (DNAs), validation by a designated operational entity (DOE), registration at the CDM Executive Board and negotiation of emission reductions purchase agreements (ERPAs). Costs for monitoring and verification are addressed in the following questions and should not be taken into account here. Moreover, transaction costs not directly related to the CDM or JI (such as technical design and planning, financing, etc.) should not be considered.

	n	US$ per project				I don't know
		Less than 50,000	50,000 - 100,000	100,000 - 200,000	More than 200,000	
CDM large scale projects		9%	38%	36%	17%	20%
	190	152				38
CDM small scale projects		51%	39%	9%	1%	19%
	188	152				36
JI first track projects		52%	31%	14%	3%	46%
	178	96				82

JI second track projects		25%	40%	26%	8%	46%
	177	95				82

Please submit any comments you may have on this question/statement:

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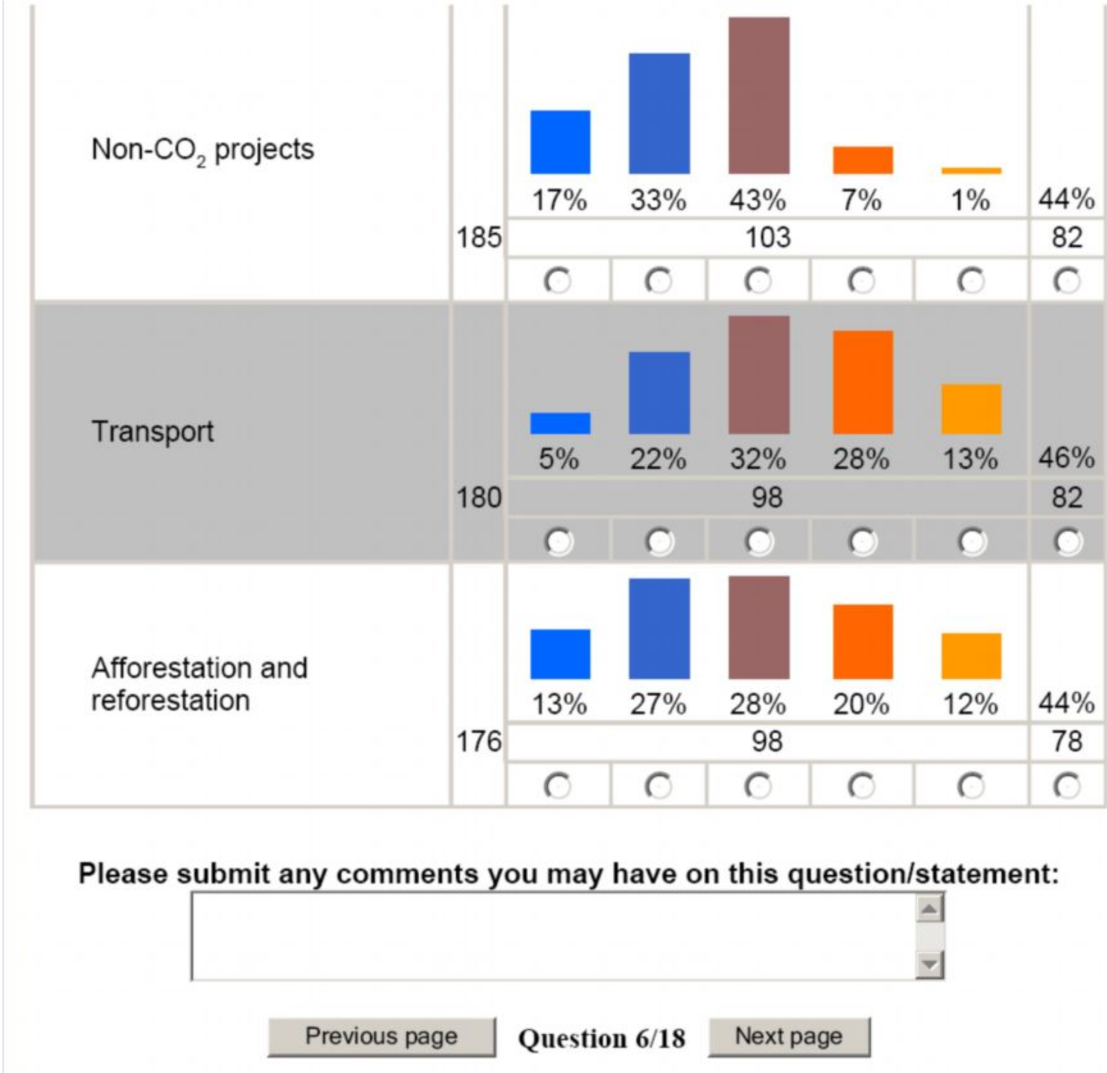
Delphi questionnaire on the perspectives of JI and CDM

6. What do you expect will be the typical annual costs for the monitoring and verification of CDM or JI projects by 2010?

	n	US$ per project and year: Less than 5,000	5,000 - 10,000	10,000 - 20,000	20,000 - 50,000	More than 50,000	I don't know
Renewables	185	23%	38%	29%	7%	3%	28%
		133					52
Fuel switch in energy and industry sectors	183	19%	37%	31%	7%	7%	33%
		123					60
Supply-side efficiency	181	15%	34%	38%	10%	4%	39%
		110					71
Carbon capture and storage (CCS)	179	8%	23%	27%	24%	19%	46%
		97					82
Demand-side efficiency	181	8%	28%	31%	26%	7%	37%
		114					67


Non-CO2 projects
17% 33% 43% 7% 1% 44%
185 103 82
Transport
5% 22% 32% 28% 13% 46%
180 98 82
Afforestation and reforestation
13% 27% 28% 20% 12% 44%
176 98 78
Please submit any comments you may have on this question/statement:
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Delphi questionnaire on the perspectives of JI and CDM

7. What will be the three most important drivers for transaction costs by 2010?

n: 186

	Important cost drivers	1st	2nd	3rd
PDD development (including baseline determination)		85	40	35
Monitoring and verification		29	47	39
Validation		24	45	35
Negotiation of emission reduction purchase agreements		20	17	26
Registration		17	7	21
Host country approval		7	21	16
Project development (not related to CDM/JI)		not in the 1st round		

Please submit any comments you may have on this question/statement:

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Delphi questionnaire on the perspectives of JI and CDM

8. What project size is necessary to make a CDM or JI project feasible (taking into account transaction costs)?

	n	Emission reductions during crediting period (t CO_2e): Less than 10,000	10,000 - 20,000	20,000 - 50,000	50,000 - 100,000	100,000 - 250,000	250,000 - 500,000	More than 500,000	I don't know
CDM large scale projects	179	1%	3%	11%	21%	19%	22%	22%	22%
		140							39
CDM small scale projects	178	4%	27%	23%	21%	14%	7%	4%	21%
		140							38
JI first track projects	167	6%	15%	17%	25%	16%	15%	6%	48%
		87							80
JI second track projects	168	1%	10%	22%	22%	19%	14%	13%	48%
		88							80

Please submit any comments you may have on this question/statement:

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Delphi questionnaire on the perspectives of JI and CDM

9. What is the overall risk associated with the generation of CERs or ERUs?

Note: Consider all the relevant risks, including, for example, the risk of non-approval, non-validation or non-registration of the project (by the host country, the validator or the CDM Executive Board/JI Supervisory Committee) or the risk of non-delivery during project implementation and operation (e.g. due to technical failure, lower performance, non-permanence in the case of forestry projects, etc).

	n	Very low	Low	High	Very high	I don't know
Renewables	185					5%
Fuel switch in energy and industry sectors	186					8%
Supply-side efficiency	182					15%
Carbon capture and storage (CCS)	185					24%
Demand-side efficiency	184					14%
Non-CO_2 projects	184					21%
Transport	184					13%
Afforestation and reforestation	185					14%

Please submit any comments you may have on this question/statement:

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Delphi questionnaire on the perspectives of JI and CDM

10. Please classify the project types according to their characteristics.

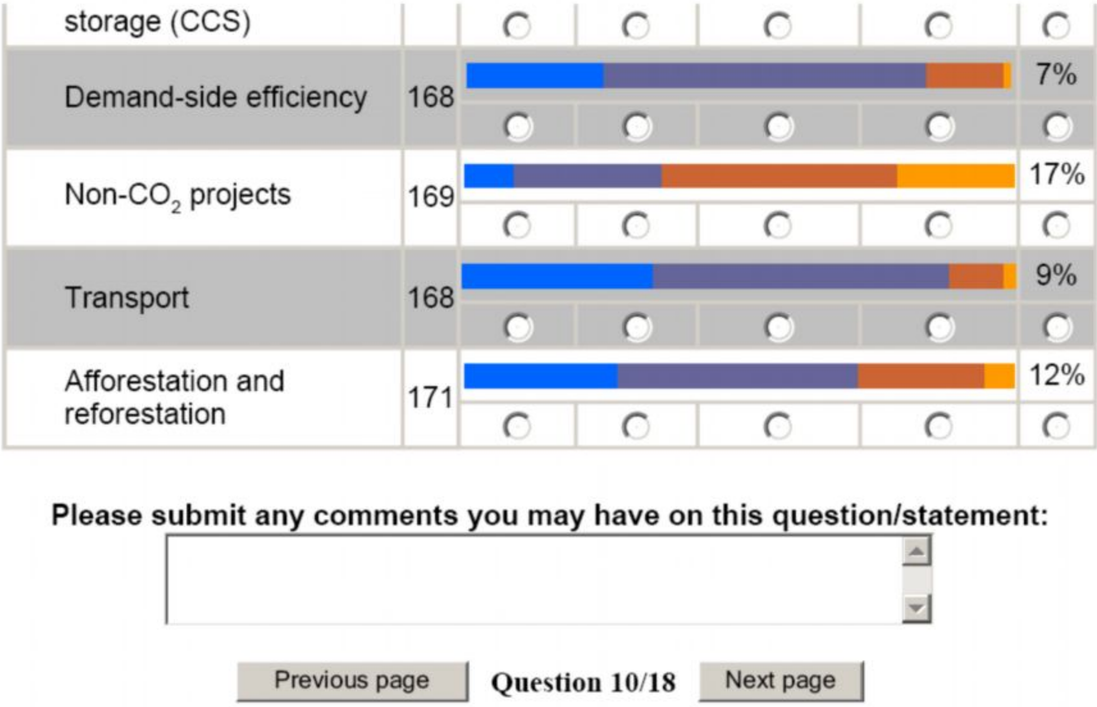
Project size	n	Very small	Small	Large	Very large	I don't know
Renewables	167					10%
Fuel switch in energy and industry sectors	164					9%
Supply-side efficiency	163					17%
Carbon capture and storage (CCS)	162					31%
Demand-side efficiency	159					19%
Non-CO_2 projects	161					17%
Transport	161					24%
Afforestation and reforestation	160					25%

Baseline determination	n	Very easy	Easy	Difficult	Very difficult	I don't know
Renewables	174					6%
Fuel switch in energy and industry sectors	169					9%
Supply-side efficiency	167					13%
Carbon capture and storage (CCS)	168					29%
Demand-side efficiency	168					16%

	n					
Non-CO_2 projects	164					21%
Transport	168					14%
Afforestation and reforestation	169					20%

Demonstration of additionality	n	Very easy	Easy	Difficult	Very difficult	I don't know
Renewables	171					9%
Fuel switch in energy and industry sectors	169					11%
Supply-side efficiency	168					15%
Carbon capture and storage (CCS)	167					29%
Demand-side efficiency	167					16%
Non-CO_2 projects	164					21%
Transport	167					17%
Afforestation and reforestation	165					23%

Sustainability benefits	n	Very high	High	Low	Very low	I don't know
Renewables	172					2%
Fuel switch in energy and industry sectors	170					3%
Supply-side efficiency	168					7%
Carbon capture and	168					16%


storage (CCS)
Demand-side efficiency
168
7%
Non-CO2 projects
169
17%
Transport
168
9%
Afforestation and reforestation
171
12%
Please submit any comments you may have on this question/statement:
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Delphi questionnaire on the perspectives of JI and CDM

11. What will be the typical mitigation costs in 2010?

Note: Transaction costs (related to project development as well as monitoring) should not be taken into account.

	n	US$/t CO_2e						I don't know
		Less than 0	0 - 5	5 - 10	10 - 25	25 - 50	Higher than 50	
Renewable power generation								
Large hydro	158	6%	40%	28%	17%	6%	3%	44%
		89						69
Small hydro	157	2%	19%	34%	29%	13%	3%	39%
		96						61
Biomass	158	4%	23%	36%	32%	5%	1%	36%
		101						57
Wind	157	1%	12%	32%	38%	13%	4%	38%
		98						59
Solar thermal power	155	3%	10%	26%	26%	23%	11%	43%
		88						67

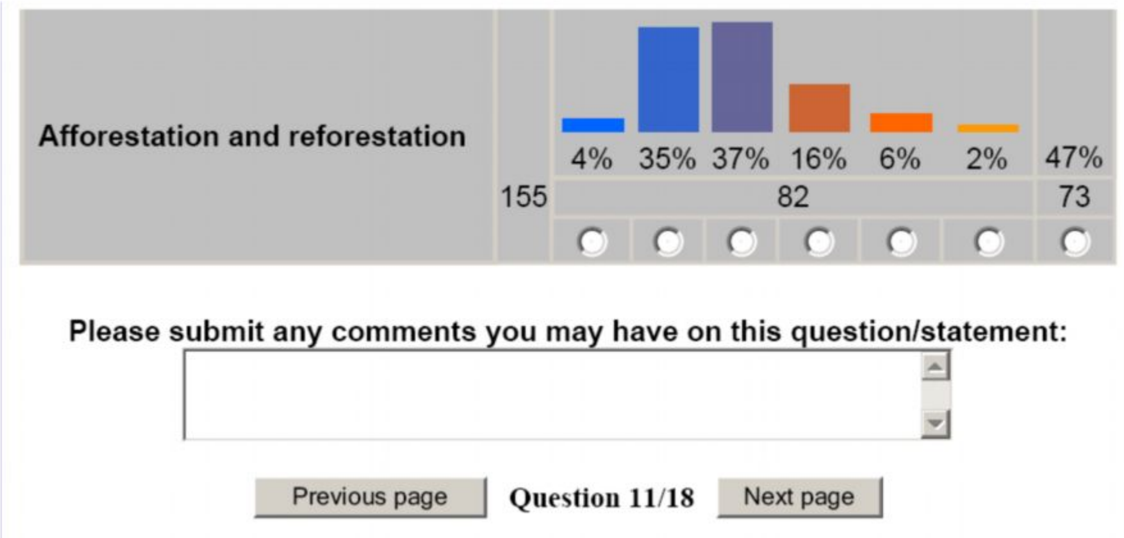
Photovoltaics		0%	3%	13%	24%	29%	31%	41%
	155	91						64
Geothermal		1%	14%	25%	35%	16%	8%	49%
	154	79						75

Fuel switch in energy and industry		6%	29%	34%	26%	3%	2%	41%
	152	90						62
Supply-side efficiency		8%	31%	36%	18%	4%	2%	46%
	153	83						70
Carbon capture and storage (CCS)		0%	14%	9%	29%	25%	23%	55%
	155	69						86
Demand-side efficiency		12%	22%	35%	26%	4%	1%	45%
	150	82						68

Non-CO_2 projects

Landfills	154	6%	48%	30%	9%	5%	1%	38%
		96						58
HFC23 from HCFC22 production	153	13%	60%	12%	11%	2%	1%	46%
		82						71
N_2O from nitric or adipic acid production	152	10%	62%	14%	10%	1%	1%	55%
		69						83
Waste water treatment	154	1%	36%	35%	21%	5%	1%	50%
		77						77
Coal Mine Methane	155	4%	43%	27%	18%	6%	3%	49%
		79						76

Transport	152	0%	9%	28%	32%	19%	11%	51%
		74						78


Afforestation and reforestation
4% 35% 37% 16% 6% 2% 47%
155
82
73
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Delphi questionnaire on the perspectives of JI and CDM

12. What will be the market price of temporary and long-term CERs relative to CERs from other project types in 2010?

Note: CERs from afforestation and reforestation projects differ from CERs from other projects, since they have to be replaced after a certain time. For that reason, the market price between these two types of CERs might be different. For example, 50 % means that the market price for a temporary or a long-term CER is only half of that for other project types.

	n	%	I don't know	less 20	20-40	40-60	60-80	80-100	greater 100	avg.
Long-term CERs (lCERs)				7%	11%	36%	32%	11%	4%	63.3%
	162	56	106	56						
Temporary CERs (tCERs)				25%	25%	33%	14%	4%	0%	42.5%
	164	57	107	57						

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Delphi questionnaire on the perspectives of JI and CDM

13. Do you agree with the following statements?

Statement	n	I agree	I don't agree	I don't know
By 2010, 20 % of all projects will provide more than 80 % of all CERs and ERUs.	179			15%
By 2010, more than two thirds of the global CERs will come from China and India.	180			11%
By 2010, most procurement tenders and carbon funds will also purchase tCERs and lCERs from afforestation and reforestation projects.	178			24%
By 2010, the demand for CERs and ERUs will be dominated by governmental procurement tenders.	180			20%
By 2010, the demand for CERs and ERUs will be dominated by companies covered under emissions trading schemes.	178			15%
Carbon revenues significantly increase the profitability of CDM and JI projects.	176			10%
Companies covered under emissions trading schemes will mainly use project-based mechanisms to fulfill their commitments.	176			13%
Companies covered under emissions trading schemes will mostly carry out internal abatement measures and/or use emissions trading but not project-based mechanisms to	178			12%

meet their commitments.		
On a global scale, less than 10 % of the carbon stored in afforestation and reforestation projects will be released unintentionally (e.g. as a result of fires, illegal logging, etc)	179	47%
The temporary character of lCERs and tCERs is in many cases prohibitive to the implementation of afforestation or reforestation projects under the CDM.	175	30%
In many cases, carbon revenues are "the icing on the cake", but are not decisive for the investment decision.	176	6%
Industrialized countries will mainly use project-based mechanisms to fulfill their Kyoto commitments.	176	9%
Industrialized countries will mainly implement domestic measures and use international emissions trading but not project-based mechanisms to fulfill their Kyoto commitments.	179	10%
Industrialized countries will mainly use international emissions trading and project-based mechanisms to fulfill their Kyoto commitments.	176	10%
Most afforestation and reforestation projects aim at a temporary storage of carbon (such as, for example, commercial plantations).	176	36%
Many CDM electricity generation projects result in an increased	174	22%

Statement	N	Result
consumption of electricity.		
Most companies covered under emissions trading schemes will use carbon funds to purchase CERs or ERUs.	176	28%
Most companies covered under emissions trading schemes will directly invest in CDM or JI projects.	178	19%
Many projects would also be implemented without registration under the CDM.	176	22%
Most CDM projects have sustainable development benefits (health, poverty alleviation, etc).	178	7%
Most CDM projects lead to a transfer of technology to developing countries.	179	10%
Transaction costs are significantly reduced once project developers can draw on approved methodologies and projects of the same type.	179	3%
Only large host countries will utilise the domestic JI or CDM mitigation potential.	178	21%
Buyers using CERs or ERUs for voluntary compensation of greenhouse gas emissions will make up more than 3 % of the overall demand for CERs and ERUs.	176	45%

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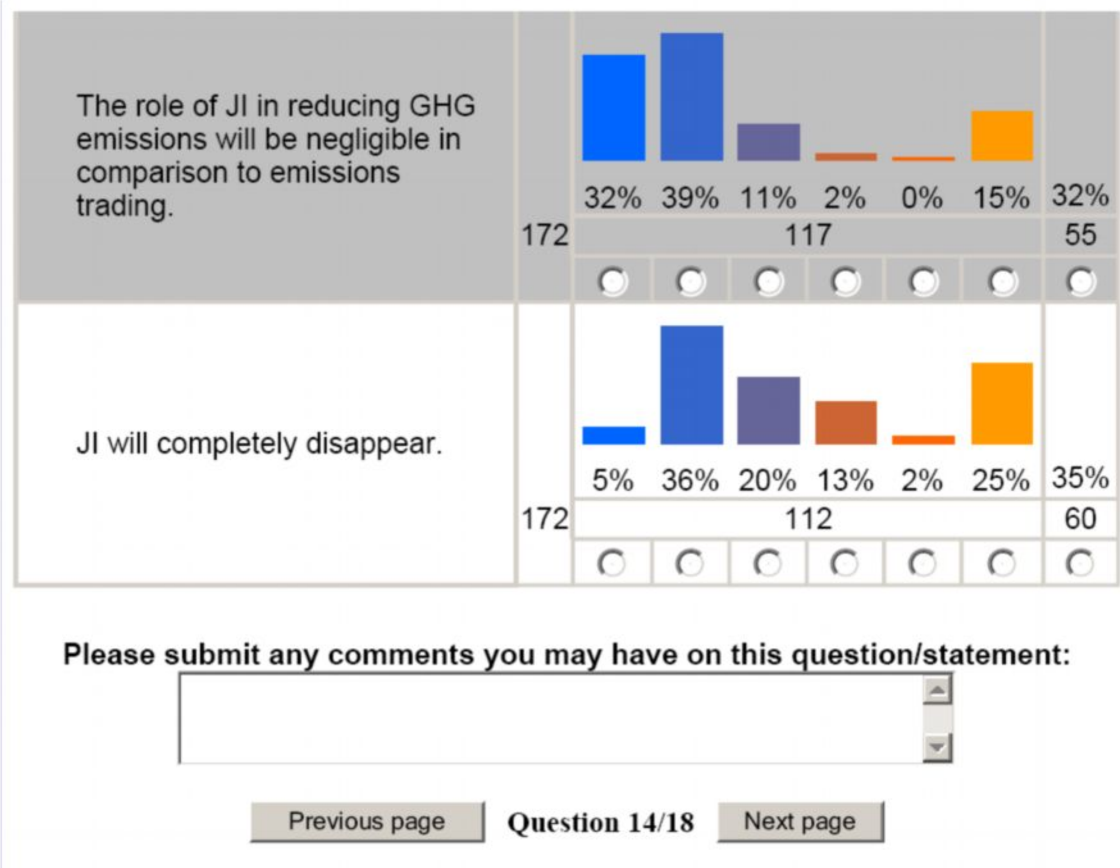
Delphi questionnaire on the perspectives of JI and CDM

14. By when do you expect the following to happen?

Statement	n	2010	2020	2030	2040	2050	Later or never	I don't know
More than 80 % of global GHG emissions will be regulated by binding and quantitative reduction commitments under national or international law.	178	1%	33%	32%	8%	8%	18%	11%
		158						20
All major industrialized countries will have introduced emissions trading schemes.	179	23%	57%	9%	3%	2%	6%	6%
		168						11
Emissions trading schemes in industrialized countries will have been extended to most sectors of the economy (i.e. including the transport, residential, and commercial sectors).	177	8%	53%	21%	4%	3%	12%	10%
		159						18
Emissions trading schemes in industrialized countries will cover all GHGs.	177	10%	49%	16%	5%	1%	20%	12%
		156						21
Emissions trading will have been extended to most countries and sectors worldwide.		1%	24%	32%	18%	7%	19%	13%

	175	152						23
More than 80 % of global CO_2 emissions from energy-intensive industries will be covered under emissions trading schemes.		4%	39%	29%	9%	8%	11%	10%
	173	156						17
The market price for emission allowances (AAUs, ERUs, CERs, etc) will exceed 50 US$/t CO_2e.		12%	29%	20%	7%	9%	23%	22%
	173	135						38
The market price for emission allowances (AAUs, ERUs, CERs, etc) will exceed 100 US$/t CO_2e.		2%	13%	15%	8%	9%	53%	25%
	169	127						42
A sectoral CDM will be introduced, which allows developing countries to obtain credits for reducing emissions in a sector or subsector of the economy (e.g. through respective policies)		19%	56%	12%	2%	1%	11%	18%
	173	142						31
The project-based CDM will completely disappear.		2%	17%	14%	11%	3%	52%	27%
	172	126						46


The role of JI in reducing GHG emissions will be negligible in comparison to emissions trading.
172
32% 39% 11% 2% 0% 15% 32%
117
55
JI will completely disappear.
172
5% 36% 20% 13% 2% 25% 35%
112
60
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Delphi questionnaire on the perspectives of JI and CDM

15. What will be the global annual market size of project-based mechanisms (JI and CDM) in 2010, 2020 and 2050?

	n	Million tons of CO_2 equivalents (Mt CO_2e): Less than 100	100 - 250	250 - 500	500 - 1,000	1,000 - 2,000	2,000 - 5,000	More than 5,000	I don't know
2010	169	14%	31%	25%	14%	11%	5%	1%	36%
		108							61
2020	167	6%	10%	30%	18%	15%	17%	4%	47%
		89							78
2050	166	10%	6%	9%	16%	19%	16%	23%	54%
		77							89

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Delphi questionnaire on the perspectives of JI and CDM

16. By when do you expect the following to happen?

Note: This question is new in the second Delphi round since question 16 of the first round (What will be the geographic distribution of CDM and JI projects in 2020 and 2050?) was neither easy to answer nor to evaluate and did not deliver the intended results.

The country or region has adopted absolute or relative greenhouse gas emission targets.	2020	2030	2040	2050
China	○	○	○	○
India	○	○	○	○
Rest of Asia	○	○	○	○
Brazil	○	○	○	○
Rest of Latin America	○	○	○	○
Africa	○	○	○	○
Rest of developing countries	○	○	○	○
USA	○	○	○	○

The country or region has established trading scheme for companies.	2020	2030	2040	2050
China	○	○	○	○
India	○	○	○	○
Rest of Asia	○	○	○	○
Brazil	○	○	○	○
Rest of Latin America	○	○	○	○
Africa	○	○	○	○
Rest of developing countries	○	○	○	○
USA	○	○	○	○

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Delphi questionnaire on the perspectives of JI and CDM

17. What will be the distribution of CDM and JI projects across mitigation options in 2020 and 2050?

n: 112

2020		Results
Non-CO_2 projects Landfills, HFC23 from HCFC22 production, N_2O from nitric or adipic acid production, waste water treatment, coal mine, methane, etc.		25%
Renewables Hydro, biomass, wind, solar, geothermal, etc.		18%
Fuel switch in energy and industry sectors between fossil fuels		13%
Supply-side efficiency Clean coal, cogeneration, etc.		12%
Afforestation and reforestation		8%
Demand-side efficiency Households, Commercial, Industry		8%
Transport Fuel switch, changes in the modal split, efficiency improvements, etc.		7%
Carbon capture and storage (CCS)		5%
Other projects		4%

2050		Results
Renewables Hydro, biomass, wind, solar, geothermal, etc.		23%
Non-CO_2 projects Landfills, HFC23 from HCFC22 production, N_2O from nitric or adipic acid production, waste water treatment, coal mine, methane, etc.		13%
Carbon capture and storage (CCS)		11%
Transport Fuel switch, changes in the modal split, efficiency improvements, etc.		10%
Fuel switch in energy and industry sectors between fossil fuels		10%
Supply-side efficiency Clean coal, cogeneration, etc.		10%
Afforestation and reforestation		9%
Demand-side efficiency Households, Commercial, Industry		9%
Other projects		5%

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Delphi questionnaire on the perspectives of JI and CDM

18. Any other comments:

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Delphi questionnaire on the perspectives of JI and CDM

Thank you for having taken the time to participate in this Delphi survey.

You will receive the results of the assessment of the first and second round early next year.

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Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit

Umwelt Bundes Amt Für Mensch und Umwelt

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