Wuppertal Institute
for Climate, Environment
and Energy

Towards an Effective and Equitable Climate Change Agreement

A Wuppertal Proposal for Copenhagen

WUPPERTAL SPEZIAL 40







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Wolfgang Sterk, Christof Arens, Christiane Beuermann, Daniel Bongardt, Sylvia Borbonus, Carmen Dienst, Urda Eichhorst, Dagmar Kiyar, Hans-Jochen Luhmann, Hermann E. Ott, Frederic Rudolph, Tilman Santarius, Ralf Schüle, Meike Spitzner, Stefan Thomas, Rie Watanabe

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Preface

With this proposal, the Wuppertal Institute aims to present a comprehensive vision for a future climate regime that would be both environmentally effective and equitable. The new treaty needs to be robust enough to drive very ambitious emission reductions globally, but at the same time the effort that is necessary to achieve these reductions must be distributed equitably according to the Convention's core principle of common but differentiated responsibilities and respective capabilities.

Aimed to inform the negotiations, the aim of this proposal is therefore not to show how the climate challenge can be "solved", but how the international agreement to be reached in Copenhagen could be designed in a way to make solving the climate challenge possible. The parameters of the negotiations were set at the climate conference in Montreal in 2005, where negotiations on post-2012 emission targets for industrialised countries were started, and in the Bali Action Plan (BAP) agreed at the climate conference in Bali in 2007. The BAP calls for addressing four main "building blocks": mitigation, adaptation, financing, and technology co-operation. The proposal is structured along the negotiation mandates from Montreal and Bali. Due to this starting point and structure the proposal might in places seem to be overly reliant on government regulation and technological changes. In fact, preventing dangerous climate change will very likely also require more fundamental changes to the current patterns of production and consumption, particularly by the wealthy among the world's population. However, integrating such more fundamental concerns was not possible within the amount of time available to the project team.

The proposal is based on several background papers that were elaborated on the various building blocks of the BAP. These background papers contain the main body of analysis and weighing the advantages and disadvantages of design options for the post-2012 regime. The "Wuppertal Proposal" is the synthesis of the findings in the background papers. As such, it does not go deeply into the analysis itself but mainly focuses on laying out and integrating the conclusions from the background papers.

The proposal builds on the extensive work the Wuppertal Institute has done on international climate policy since it was founded almost 20 years ago. In this work, the Wuppertal Institute has always tried to step out of its German and European perspective and take on board the views from other parts of the world. The most prominent of these projects has been the South-North Dialogue on Equity in the Greenhouse, which brought together partners from 12 countries from all around the world to discuss an equitable framework for international climate policy.

While the Copenhagen project was conducted solely at the Wuppertal Institute, here as well we have tried to incorporate different perspectives by organising a side event at the Susidiary Body meeting in June 2009 to discuss a first draft and submitting the same draft to international experts for written review. We gratefully acknowledge the very helpful comments made by Chandra Bushan (Centre for Science and Enviroment, India), Niklas Höhne (Ecofys, Germany), Pan Jiahua (Chinese Academy of Social Sciences), Emilio Lèbre La Rovere (Centro Clima at the Federal University of Rio de Janeiro, Brazil), and Jake Schmidt (Natural Resources Defense Council, USA). Further very helpful comments were made by reviewers from inside the Wuppertal Institute: Raimund Bleischwitz, Rainer Lucas and Oscar Reutter.

We also gratefully acknowledge the financial support provided by the Friends of the Wuppertal Institute (Vereinigung der Freunde des Wuppertal Instituts e.V.), which made this project possible.

That said, full responsibility for the contents of this proposal lies with the authors and any bias, mistakes or omissions are our own.

Overview Shared Vision and Key Elements for the Copenhagen Deal

To prevent dangerous climate change, global temperature increase should be limited to below 2°C. To safeguard a high probability of meeting this target, global greenhouse gas emissions should peak until 2015 at the latest and be reduced to at least 80% below 1990 levels by 2050 and more thereafter. Against current projections for the global population in 2050 this translates to average global per capita emissions of at maximum 1 t. As no group of persons can claim a right to occupy significantly more environmental space than other persons, all countries should set themselves the long-term goal to bring their per capita emissions to this level by 2050 (see chapter 1).

In addition, the "negative" vision of emission reductions should be complemented by a positive vision of the direction society wants to travel in. One key element of this vision should be: Sustainable energy services for all. A global reduction of 80% will probably only be possible if emissions from use of fossil fuels are brought close to zero, to account for the smaller opportunities to reduce biogenic emissions. The Copenhagen agreement should therefore also include global targets for the reduction of energy consumption and the growth of renewable energy sources. The purpose of these targets would be to serve as strategic guidelines for the elaboration and implementation of mitigation actions by industrialised and developing countries. Although existing global energy scenarios have ambitious targets, none of them can achieve a reduction of global greenhouse gas (GHG) emissions by 80% below 1990 levels by 2050. Given the need for highly ambitious reductions of global emissions until 2050, much greater efforts are necessary than scheduled in the existing world energy scenarios. The pathways to allow such an increase in renewable energy technologies and decrease of energy intensity need to be further elaborated. Thus, the following figures are for the time being indicative illustrations and assumptions of the scale of transformation on a global scale that would be needed to meet the 2°C target (see chapter 2):

- Aim to improve global average energy intensity by at least 3.5% per year until 2050.
- Aim to reduce global per capita final energy demand by 5% in 2020, by 10% in 2030 and by 20 to 30% in 2050.
- A long-term goal should be set to obtain the complete global primary energy supply from renewable sources. The following mid-term assumptions could help to promote this development:
  - Share of renewable energy in primary energy supply (currently around 14%) should increase at least to 25% by 2020 and at least 40% by 2030.
  - The share of renewable energy in heat and power supply should increase close to 40% in 2020 and 55% in 2030. Currently, the share of renewable energy in heat supply is around 25% and in electrical power supply around 19%.
  - Global installed electricity generation capacity from renewable energy is currently around 1,200 GW and should increase to at least 3,000 GW by 2020 and 6,000 GW by 2030
- Global public funding for research, development and demonstration for mitigation and adaptation should be significantly increased to at least €15 billion/year by 2015 and to at least €20 billion/year by 2020 (currently assumed at €4–7 billion/a).
- To realise the component of achieving sustainable energy services *for all*, the goal should be set to secure access to modern energy services for everyone by 2025.

As regards the feasibility of meeting such targets, the growth of renewable energy use in Germany is one example where developments have constantly outperformed even optimistic assumptions. But it does indeed seem likely that the potential of technology to achieve the necessary reductions will be insufficient and will therefore have to be accompanied by more fundamental changes in the patterns of production and consumption, particularly by the wealthy among the world's population.

Due to their historical responsibility and much higher capability, industrialised countries need to take the lead and assume responsibility for 3/4 to 4/5 of the global mitigation effort required by 2020 (see chapters 3 and 4). They should therefore assume a two-fold obligation:

- Ambitious Kyoto-style national emission reduction targets of in aggregate at least 40% below 1990 levels by 2020. To start convergence of per capita emissions, at least 30% should be achieved through domestic action.
- A legally binding obligation to support Southern countries in mitigating their emissions by a specific amount to be laid down in the Copenhagen agreement. If the industrialised countries assume responsibility for 4/5 of the global mitigation effort required by 2020, this amount would roughly be equivalent to a further 20 % of their own 1990 emissions, in addition to the Kyoto-style target of at least 40% below 1990 levels.

In addition, industrialised countries should commit to developing Commitment Achievement Plans (CAPs) that lay out which measures they plan to take to fulfill their two-fold obligation. These plans should be subject to domestic and international review.

For developing countries, the climate regime should create a strategic global investment programme to enable them to shift to a low-emission development path (see chapters 3 and 5). This programme should be based on two pillars

- Guaranteed funding from industrialised countries through the above obligation;
- Country-driven low-carbon development strategies (LCDS) addressing all key sectors. These strategies should clearly identify which measures can be taken to reduce emissions and where support from industrialised countries is needed to implement these measures.

In addition to mitigation, all countries should commit to develop national adaptation plans, including industrialised countries. Southern countries are entitled to receive appropriate financial support and capacity building (see chapter 6).

Climate finance is not about about aid, with donors and recipients (see chapter 7). Instead, it is about taking joint responsibility for a common problem, with each side being accountable to the other and contributing according to their common but differentiated responsibilities and respective capabilities.

Where possible, financial support should be provided on a country basis to support comprehensive programmes, rather than on an activity basis. The international sale of assigned amount units (AAUs) is the "first-best" solution to generate the necessary financial resources. The proportion of the AAUs to be set aside would depend on the estimated revenue needed and the expected carbon price. To take into account countries' varying responsibility and capability, the quantity of AAUs to be withheld from each industrialised country could vary based on its comparative responsibility and capability. Further revenue should be sourced from international aviation and shipping.

To prevent cherry-picking by donors, maximise comprehensiveness and allow to exploit synergies, it seems recommendable to develop a consolidated financial mechanism at UNFCCC level. At the same time, care should be taken not to create an unwieldy and potentially undemocratic super-bureaucracy under the UNFCCC. The mechanism should therefore follow a hybrid centralised-decentralised model:

- Centralised: A global climate fund would collect and co-ordinate all financial flows from industrialised countries, review the mitigation and adaptation plans (e.g., LCDS) proposed by developing countries and on this basis disburse funding.
- Decentralised: Specific funding decisions should to a large extent be devolved to implementing entities at national and potentially also sub-national level. That is, developing countries should be given the possibility for direct access. These entities could take the form of national climate funds that would need to be accredited by the financial mechanism. Exceptions to this general approach could be international co-operation ventures, for example on technology, and direct access to adaptation funding for the groups that are most vulnerable to climate change.

Such a new global climate fund should be established and operate under the authority and guidance of the COP and be fully accountable to it.

Setting up these financing institutions at national and international level would be a lengthy process. In addition, industrialised countries are as a matter of principle very reluctant to decrease their control of the funding they provide. To accommodate these practical problems and divergent political positions, an evolutionary approach could be taken to the development of the financial architecture. A strong fund could be created under the UNFCCC, which could as a minimum receive the resources flowing from international aviation and maritime transport. The resources that flow directly from industrialised country governments could remain under their control for the time being, but the global climate fund should coordinate the resource flows.

The global climate fund could then develop fiduciary criteria for national climate funds within the recipient countries. Countries whose national funds meet these criteria could then become eligible to receive 100% of their financing needs through the global climate fund. As more and more countries meet these eligibility criteria, the required resources would start to exceed those available from international aviation and shipping and industrialised countries would hence be more and more required to channel their resources through the global fund. At the same time, developing countries would have an incentive to create and maintain robust national institutions in order to become eligible for funding through the global fund, instead of having to "shop for donors".

Combating climate change will hardly be possible without the rapid diffusion of mitigation and adaptation technologies, accompanied by more fundamental changes in the patterns of production and consumption. While the agreement should therefore include

strong provisions for enhanced technology cooperation, non-technological changes of societies should therefore form a key part of national mitigation actions, in particular in industrialised countries.

The technology provisions should include a Technology Objective (see above) and a Technology Cooperation Mechanism (see chapter 8). The Cooperation Mechanism should include elements that enable cooperative research, development and demonstration (RD&D) of new as well as the rapid diffusion of existing environmentally sound and low-carbon technologies. The mechanism could financially be based on a funding window under the global climate fund. With regard to content, strategic programming based on national need assessments and technology road maps will help to implement joint diffusion and RD&D programmes to achieve the ambitious Technology Objective.

The system to measure, report and verify (MRV) Parties' efforts should be as streamlined as possible (see chapter 9). Assessing the emission impacts of specific actions is far from straightforward. Therefore, MRV of emissions and of actions should be separated. Emissions should be MRVed at an aggregate level through robust national inventories. Implementation of actions should be MRVed based on performance indicators, including emission reductions achieved where this is possible in a straightforward manner, and documented in regular reports.

To be able to take into account the rapid advances of climate science, the Copenhagen agreement should contain a review clause combined with a full-scale evaluation of the environmental effectiveness of the provision or agreement (see chapter 10). At the latest, the first such review of the Copenhagen agreement should be conducted in 2014/15, after the release of the fifth IPCC assessment report as currently scheduled.

To make sure this review actually takes place, the Copenhagen agreement should include a default emission reduction obligation for industrialised countries. This default obligation would take effect if negotiations on future targets are delayed or unsuccessful and define a linear trajectory reducing the emissions of each industrialised country by 95% below 1990 levels by 2050.

1 Into the Anthropocene

The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner. (Art. 2 UNFCCC)

Humanity is conducting an unprecedented experiment with the natural basis of its very existence. The amount of fossil fuel resources that are currently burned per year required about 1 million years to be generated. Given the current state of the climate negotiations, the 21st century may well see a temperature increase of 3-6°C above pre-industrial levels. In the extreme this would even be more than the temperature difference between the last glacial maximum (18,000 years ago) and the present interglacial (Holocene). The temperature rise out of the last ice age took about 8,000 years — humanity is about to trigger an equivalent temperature increase within 200 years. Hence, Crutzen (2002) declared our geological age to be human-dominated and proposed to call it the "Anthropocene".

The "ultimate objective" of international climate policy is laid down in Art. 2 UNFCCC: To stop anthropogenic climate change, and to do this at a time scale that prevents an anthropogenic interference with the climate system of an extent that is to be judged as 'dangerous'. The aim to stabilise greenhouse gas (GHG) concentrations can be likened to stabilising the water level in a bathtub, or rather the level of liquid waste in a waste dump: The amount of anthropogenic inflows must at a minimum not exceed the level of outflows. The natural outflows, the absorption of GHGs by the oceans and other natural sinks, is below 10 Gt CO_2-eq. per year. Anthropogenic inflows are approaching 50 Gt CO_2-eq. per year (IPCC 2007: 36). That is, inflows are currently five tims higher than outflows. As a result the level of waste in the atmospheric "waste dump" is rapidly approaching the point of spillover.

Given these current emission trends the objective of the FCCC is on the one hand very clear and ambitious. But on the other hand this objective does not provide a clear direction, since there has so far not been any coordinated attempt at UNFCCC level to define what level of climate change should be considered to be "dangerous" — what is the atmospheric waste level that should not be exceeded? The EU and an increasing number of other countries have committed themselves to a definite understanding of the "danger" threshold as an increase of the global mean temperature above 2°C compared to pre-industrial levels. More than 100 countries, including the Alliance of Small Island States (AOSIS), the least developed countries (LDCs) and a number of other developing countries, have recently requested to aim for a global temperature increase of not more than 1.5°C.

However, even a definition of the "danger" threshold in terms of temperature change does not provide a clear direction of global emissions since temperature change is itself (only) one of the delayed manifestations of climate change, not the cause, which can be addressed by policy, that is, emissions. To make a temperature target operational, climate science first needs to determine which levels of GHG concentration in the atmosphere would lead to which level of temperature change, and which amount of GHG emissions over time would lead to which levels of GHG concentrations. That is, at which level should

the accumulated waste be stabilised and how much waste may flow into the waste dump for the total amount inside to still stay at or below the desired stabilisation level?

The fourth assessment report of the IPCC (AR4) (IPCC 2007) received enormous headlines, but the two most important findings were actually rarely covered, even though they have significant implications for reaching any given temperature target:

- The IPCC revised its "best estimate" of climate sensitivity. Climate sensitivity is a measure of how sensitive the climate system is to an increase in GHG concentrations, measured as the mean atmospheric temperature increase that may result from a doubling of atmospheric CO_2 concentrations. With the AR4, the IPCC revised its best estimate of this central parameter from 2.5 to 3°C, that is, it now estimates the climate system, indicated by its (longterm) temperature response, to be one fifth more sensitive than previously estimated by the IPCC in its history (1). This means, put the other way around, that if temperature increase is to be kept below a given level, such as 2 or 1,5°C, GHG concentrations — the waste level in the atmospheric waste dump — will have to be kept lower than previously assumed.
- How close humanity already is to the danger zone is not only dependent of climate sensitivity — what level of waste in the waste dump will have what temperature impact — but also of the amount of waste that has already flown into the dump. AR4 established that the level of GHG emissions reached in 2004 was about 49 Gt CO_2-eq. per year. This is 5 Gt, about 15%, higher than assumed in the emission scenarios developed by an IPCC working group 10 years before and which are the basis used in any backward calculation of GHG trajectories which are compatible with the 2°C target available from science so far. The increase stems mostly from inclusion of emissions from peat forests, which had so far not been included in the IPCC assessments. This means in terms of temperature targets that much of the (already limited) space for accumulated emissions of GHGs in the atmosphere that was previously thought to be still available has in fact already been consumed.

1 The 'pre-IPCC Assessments' derived a figure of 3°C, the value to which the IPCC now came back.

The lowest stabilisation scenarios assessed by the IPCC in AR4 — and which do not take into account the additional 5 Gt CO_2 emissions from peat forests highlighted above — consider stabilisation of atmospheric CO_2 concentrations at 350-400 ppm. The IPCC considers that stabilisation at this level would lead to an average temperature increase of 2.0 to 2.4°C (IPCC 2007: 67). That is, the IPCC has so far not considered any scenario that is consistent with the corrected amount of GHG emissions released so far and that would stabilise temperature increase below 2°C as the EU and other countries commited themselves to.

Moreover, in 2007 the atmospheric concentration of CO_2 had already reached 385 ppm CO_2, and is rising by 2 ppm per year. That is, the amount of waste accumulated in the dump is already at the level that the IPCC considered to lead to a temperature increase of 2-2.4°C. If the amount of waste was to be stabilised at this level, the ongoing inflow of waste would in principle have to be immediately reduced to the level of outflows. Obviously, such drastic reductions are phyiscally impossible. The world is therefore committed to overshooting the atmospheric GHG concentration that would correspond to the 2°C target (Richardson et al. 2009: 18).

The challenge is therefore to limit the "spillover" as much as possible. Annual inflows need to be brought back to the level of outflows as quickly as possible, and even further to in the future drain the surplus waste that is going to accumulate in the dump in the meantime. In addition, the size of the drain needs to be expanded where possible to allow for a quicker outflow of waste. One option here is to harvest the total mitigation potential of organic agriculture or other kinds of agriculture which utilise the sink capacity of soils. These have been estimated to offer a potential amounting to 4.5-6.5 Gt CO_2-eq. per year (Muller and Davis 2009).

As for the inflows, as the level of waste in the dump is the result of the cumulative inflows over time, the mitigation challenge can be framed in terms of a cumulative global carbon budget, that is, the amount of waste that may flow into the atmospheric dump over a certain period of time. According to new studies, meeting the 2°C target with a likelihood of 75% would require total global CO_2 emissions over the period 2000-2050 to be kept at a maximum of 1000 Gt CO_2. It bears noting that such a low probability of preventing damage would be inacceptable in other contexts such as traffic safety or infection risks. In addition, out of this budget, about 350 Gt have already been emitted from 2000 to 2009 (WBGU 2009: 24f).

The remaining cumulative budget from now to 2050 can be translated into various trajectories for annual emissions until 2050. If annual inflows start going down immediately, the annual rate of reduction can be kept relatively moderate. If annual inflows keep increasing over the next years, subsequent reductions will have to be much more ambitious. If it was possible to stop the growth of global CO_2 emissions in 2011, emissions would afterwards have to be reduced by on average 3.7% annually to keep a good chance of meeting the 2°C target. In this case, in 2050 there would still be space for global CO_2 emissions at about 6 Gt, about 20% of 1990 levels. That is, even if very swift and ambitious action is taken, global CO_2 emissions will have to be reduced by about 80% below 1990 levels by 2050 (WBGU 2009: 16).

If the global peak was delayed until 2015, annual global emissions would need to be reduced by 5% thereafter to achieve the same stabilisation level. If the peak was delayed until 2020, annual global emissions would need to be reduced by 9%, which hardly seems feasible. In these two cases, where the global emissions peak is delayed to 2015 or even 2020, the cumulative carbon budget would be exhausted before 2050. That is, the amount of waste in the atmospheric dump would reach such levels within the next few years that afterwards annual inflows would need to be reduced below zero to drain the surplus waste that would have accumulated (WBGU 2009: 16).

Given that the current economic crisis has led to some emission reductions and that the Copenhagen conference should have the aim to result in an ambitious agreement, the pathway leading to an 80% reduction by 2050 on a global scale may be taken as a viable basis for the moment. While the figures cited above are for CO_2 only, statically transposing such a minimum reduction of 80% to the whole Kyoto basket of greenhouse gases, which in 1990 stood at about 39.4 Gt CO_2-eq. per year, yields a requirement to reduce emissions to less than 10 Gt CO_2-eq. per year (cf. IPCC 2007: 36). Such reduction levels have to be put into relation to the global population in 2050, which is projected at around 9 billion people (UN DESA 2009a). This means that the global GHG budget in 2050 will average about 1 t per person.

Actual emissions in all countries should also equalise at about this level. If substantial parts of the global population still had substantially higher emissions in 2050, this would need to be compensated for by equally substantial parts of the world's population having emissions substantially below 1 t. However, there is no viable ethical basis to argue that some people should have a right to have a far greater access to the atmospheric commons than other people. And politically a long-term continuation of unequal per capita emissions will hardly be acceptable to developing countries.

2 Taking a Broader Perspective

In addition to emission targets, the future climate regime should take a broader perspective that departs from its so far exclusive focus on emission reductions. On the one hand, emission reduction targets are necessary as a yardstick to measure whether efforts are ecologically adequate. On the other hand, however, focussing exclusively on emission reductions is a solely "negative" perspective: To get out of something. This perspective has arguably so far not been able to engender the swift societal dynamics that are now necessary to fundamentally reorient the very basis of the economy.

Therefore, the "negative" vision of emission reductions should be complemented by a positive vision of the direction society wants to travel in. One key element of this vision should be: Sustainable energy services for all. The implications of the global 80% target become clear when looking at the shares of GHG sources. Energy-related CO_2 emissions account presently for about 60% of total GHG emissions. The other share of about 40 % comes from industrial gases and biogenic sources, in particular methane emissions from agriculture and CO_2 emissions from deforestation and forest degradation.

Changing forms of rice cultivation and livestock farming all around the world would seem to be rather more challenging than changing centrally-organised fossil-fuel based energy infrastructures. Hence, it will hardly be possible to reduce emissions from all sources at the same rate as the required global emission decrease. Instead, emissions from fossil fuels and industrial gases may have to be reduced to close to zero by mid-century, to account for the smaller opportunities to reduce biogenic emissions.

This implies a full shift to renewable energy sources, but it also implies a drastic reduction of energy consumption. Only if energy demand is reduced substantially below projected levels will it be possible for renewable sources to fully meet the remaining demand. If energy demand grows unabated, it will not be possible to scale up renewable energy supply quickly enough to fully meet this rising demand. What is therefore necessary is a fundamental economic societal transformation at a scale that is probably comparable only to the transformation engendered by the industrial revolution.

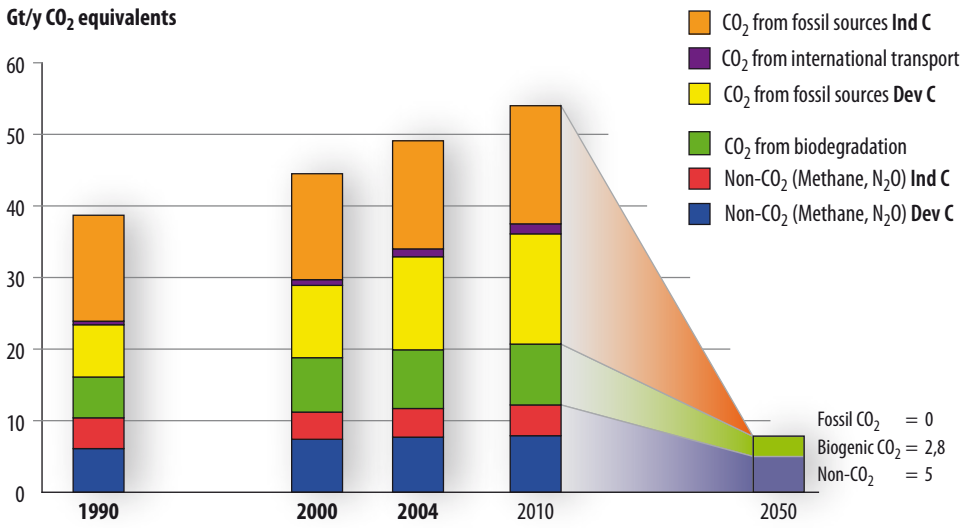


Figure 1: Current and Projected Global Emissions and Necessary Emission Reduction. Source: Wuppertal Institute 2009

In addition to global mid-term and long-term emission targets, the Copenhagen agreement should therefore also include global targets for the reduction of energy consumption and the growth of renewable energy sources. The purpose of these targets would be to serve as strategic guidelines for the elaboration and implementation of mitgation actions by industrialised and developing countries.

Such a complementary approach has in fact already been taken by the EU through its 20-20-20 target: to by 2020 achieve a renewable energy supply of 20%, efficiency improvements of 20% compared to baseline and emission reductions of at least 20% compared to 1990. The same approach will probably now be taken in the USA with the legislation currently in Congress. Apart from creating a positive vision such an approach can also serve a very practical purpose: To guard against meeting short-term emission targets through incremental improvements only, which may lead to stranded investments in high-emission infrastructure that, while compatible with short-term emission targets, would not be compatible with long-term requirements. Instead, the long-term goal of a zero-emission economy needs to be incorporated into all future investments decisions.

The current pace of climate science and climate change itself are leaving behind not only climate policy but also energy research. Although existing global energy scenarios have ambitious targets, none of them can achieve a reduction of global GHG emissions by 80% below 1990 levels by 2050 (e.g. EREC and Greenpeace 2008; WEO of IEA 2009). Given the need for highly ambitious reductions of global emissions until 2050, much greater efforts are necessary than scheduled in the existing world energy scenarios. The pathways to allow such an increase in RE technologies and decrease of energy intensity need to be further elaborated. Thus, the following figures are for the time being indicative illustrations and assumptions of the scale of transformation that would be needed to meet the 2°C target:

- Aim to improve global average energy intensity by at least 3.5% per year until 2050 (for example, the current target of China is to reduce energy intensity by 4% per year; Germany has the target to reduce it by 3% per year. Therefore it seems to be feasible to globally achieve a reduction of 3.5% per year).
- Aim to reduce global per capita final energy demand by 5% in 2020, by 10% in 2030 and by 20 to 30% in 2050 (2).
- A long-term goal should be set to obtain the complete global primary energy supply from renewable sources. The following mid-term assumptions could help to promote this development:
  - Share of renewable energy in primary energy supply (currently around 14%) should increase at least to 25% by 2020 and minimum 40% by 2030. (3)
  - The share of renewable energy in heat and power supply should increase to close to 40% in 2020 and 55% in 2030. (4) Currently, the share of RE in heat supply is around 25% and around 19% in electrical power supply.
  - Global installed electricity generation capacity from renewable energy is currently around 1200 GW and should increase to at least 3,000 GW by 2020 and 6,000 GW by 2030. (5)
- Global public funding for research, development and demonstration for mitigation and adaptation should be significantly increased to at least €15 billion/year by 2015 and to at least €20 billion/year by 2020 (currently assumed at €4 – 7 billion/a (EGTT 2009)).
- To realise the component of achieving sustainable energy services *for all*, the goal should be set to secure access to modern energy services for everyone by 2025.

2 Proposal based on the energy consumption trends underlying scenarios that achieve 50 % worldwide GHG emission reduction by 2050, such as Greenpeace/EREC 2008 or Lovins/Hennicke 1999. These show that global primary energy consumption can be kept stable through energy efficiency through to 2050, which is equivalent to a 30 % reduction of per capita primary energy consumption by 2050 compared to 2005. We estimate that this is equivalent to 20 % reduction of per capita final energy consumption by 2050, with the difference to 30 % in primary energy reduction coming from supply-side efficiency, such as cogeneration of heat and power. As we need to achieve much more than 50 % worldwide GHG emission reduction by 2050, we set the target for final energy somewhat higher than in the existing scenarios, without knowing whether 30 % will be attainable. We propose a final energy target to demonstrate the need to improve energy end-use efficiency, which has the biggest potential but tends too often to be neglected.

3 Global revolution scenario shows the option to increase the share of RE in PE to 31% by 2030 (Greenpeace/EREC 2008).

4 The global revolution scenario shows an increase of the share of RE in heat supply to 35% in 2020 and 45% in 2030; in electricity generation the share of RE is supposed to increase to 32.5% in 2020 and 48% in 2030 (Greenpeace /EREC 2008).

5 The installed capacity of renewable energy technologies varies widely in the alternative global energy… … scenarios, depending on the different development of primary energy demand in the scenarios (Martinot et al. 2007). Thus the given numbers are assumptions that will depend on the global development of the primary and final energy demand.

As regards the feasibility of meeting such targets, the growth of renewable energy use in Germany is one example where developments have constantly outperformed even optimistic assumptions. For example, the target of reaching a renewables share of 12.5% in electricity production in 2010 was already reached in 2007, in 2008 the share mounted further to 14.8% (Umweltbundesamt 2009). But it does indeed seem likely that the potential of technology to achieve the necessary reductions will be insufficient and will therefore have to be accompanied by more fundamental changes in the patterns of production and consumption, particularly by the wealthy among the world's population.

3 The Case for a Strategic Global Investment Programme for the Global South

The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of ***equity*** *and in accordance with their* ***common but differentiated responsibilities and respective capabilities****. Accordingly, the developed country Parties should take the lead in combating climate change and the adverse affects thereof.*
(Art. 3 UNFCCC)

When determining the consequences of the above findings, the cause behind this dilemma has some influence on the evaluation: the vast majority of historical emissions have been caused by industrialised countries. In addition, significant amounts of emissions have not been caused out of ignorance. Many industrialised countries have failed to rein in their emissions even after the consequences for the climate had become clear and the Convention been adopted, in which they committed to taking the lead in combating climate change. According to the latest compilation of data by the UNFCCC Secretariat, GHG emissions from all Annex I countries as a whole decreased by 6.4% from 1990 to 2000 (excluding LULUCF) (UNFCCC 2009a). Thus, Annex I Parties have jointly attained the aim of Article 4.2 of the Convention, to return emissions to 1990 levels by 2000. However, the decrease was mainly due to a 41.3% decline in emissions from Central and Eastern European countries with economies in transition to a market economy (EIT countries). Emissions from non-EIT countries increased by 9.4% until 2000 and in 2006 still stood at 9.1% above 1990 levels. Moreover, emissions in EIT have recently been growing again as well, in 2006 they stood at 37% below 1990 levels.

In addition, Annex I parties have increasingly "outsourced" parts of their industrial emissions through shifts of industrial production to developing countries. Most Annex I countries have become net importers of carbon dioxide emissions during the last one or two decades, while many developing countries have become net exporters. According to 2001 data, of the 3.6 Gt CO_2 imported by developed countries, 44% originated in developing countries (Peters and Hertwich 2008). This represents a substantial source of carbon leak-

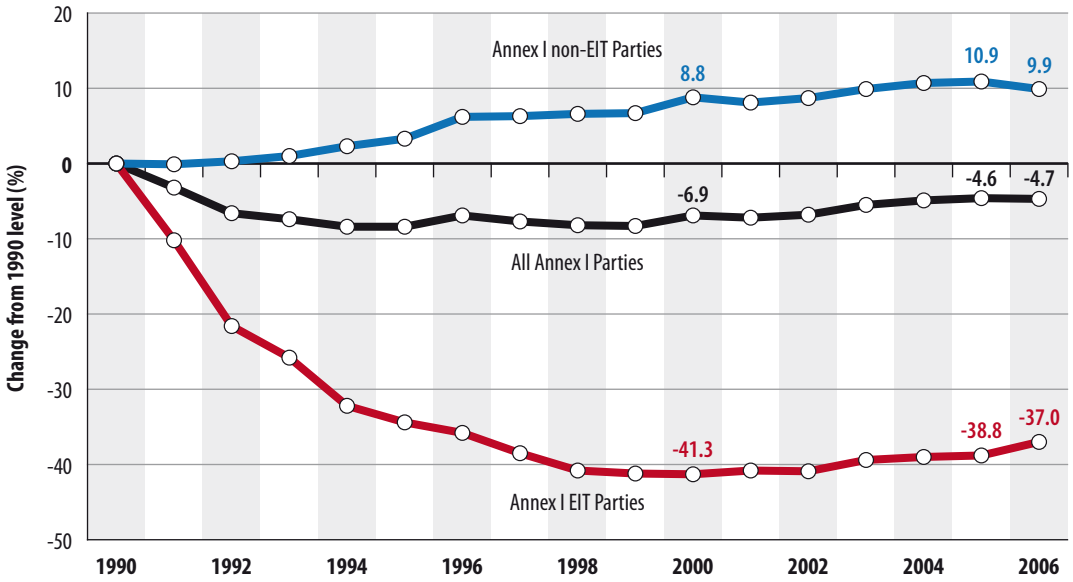


Figure 2: Trends in Annex I aggregate greenhouse gas emissions, 1990-2006 (excluding LULUCF). Source: UNFCCC 2009a

age, which in effect makes it easier for developed countries to comply with their Kyoto targets.

On the whole, industrialised countries can therefore hardly claim to have taken the lead in combating climate change as they committed to in the Convention.

Industrialised countries do have a point in highlighting that the current emissions increases in developing countries are not compatible with meeting the ultimate objective of the Convention. But while there is clearly a need to slow emissions growth *in* developing countries, the obligation of industrialised countries to take the lead and assume the major responsibility for reducing emissions is as valid today as it was in 1992, when the Convention was adopted.

First, the rapid increase of emissions in developing countries in recent years notwithstanding, emissions per capita of developed countries are still generally much higher than those of Southern countries. It would be patently inequitable if the industrialised countries, by virtue of being wealthier and consuming more fossils fuels both historically and currently, depleted the atmosphere's rapidly diminishing capacity to serve as a safe sink for GHG emissions.

Second, from the point of capability, developing countries face a much more daunting challenge than industrialised countries. While industrialised countries are basically finished with building up their physical infrastructure, in many developing countries the transport infrastructure is patchy to non-existent, decent housing is lacking and an estimated two billion people still have no access to modern energy services for basic needs such as lighting, heating and cooking, to name just a few areas. Any definition of human development that provides for basic human needs will require significant increases of energy-related services to provide for clean and healthy cooking facilities, lighting, access to water and sanitary facilities, health services etc.

Still, the easiest and most proven development pathway to alleviate poverty is the development pathway followed in Western countries on the basis of fossil fuel use. The looming climate crisis effectively closes this development pathway and even a highly renewables-based development pathway that provides decent living conditions to the billions of poor people would increase greenhouse gas emission to some extent. A fair distribution of what little remains of the atmospheric sink capacity and affordable access to emission-free energy sources are therefore at the heart of the climate challenge.

Figure 3 illustrates this crucial dilemma. It depicts an emissions trajectory reaching an 80% reduction of global CO_2 emissions by 2050 (red line). (6) Industrialised countries are assumed to pursue a very ambitious reduction path reaching a 90% reduction of domestic emission by 2050 (blue line). Subtraction yields the atmospheric space that remains for developing countries: Despite the very ambitious assumption for industrialised countries, developing country emissions would still also need to peak before 2020 and be rapidly reduced thereafter.

6 As Figure 1 has highlighted, this may not even be enough to achieve 80 % of GHG emissions reductions.

Developing countries therefore face a triple challenge: (1) to further build up their economies and basic infrastructure, and to do this in a way that (2) causes as few emissions as possible and (3) is adapted to the increasing impacts of climate change.

Furthermore, many developing countries do not even have the necessary capital to meet their basic development needs. To the contrary, most are reliant on international capital inflows. They will therefore hardly be able to muster the even higher investments that will be necessary to shift to a low-emission development path and to adapt to the impacts of climate change.

The only sensible way forward is therefore to approach the climate challenge as a development challenge. Meeting these challenges will require a bold strategic approach. Every

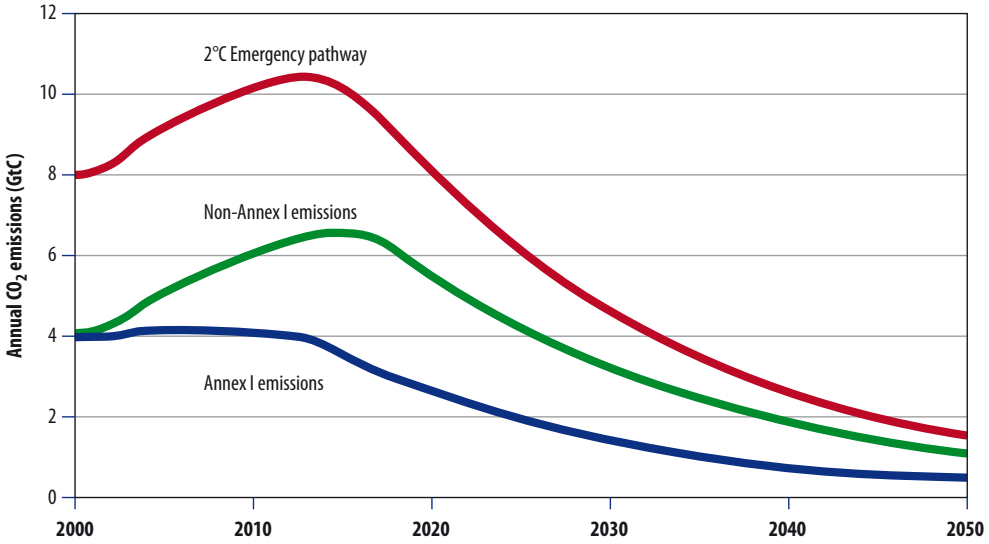


Figure 3: Global 80% trajectory, ambitious industrialised country reductions and the remaining atmospheric space for developing countries. (7) Source: Baer et al. 2008

7 It bears noting that these trajectories do not include the 5 Gt CO_2 from peat forests highlighted above.

coal-fired power plant that is still built today will emit CO_2 for the next 30-40 years, and thus make the goal of reducing emissions to 1 t per capita that much harder. What is therefore needed is a radical step-change, trillions of investments that under a BAU scenario are set to be invested in coal-fired power plants and other emission-intensive infrastructure will need to be redirected and additional investments mobilised; for example to meet the higher upfront costs of renewables. Driving capital from high-emission to low-emission ventures will require substantial government action in each country to make emission-intensive investments unprofitable and overcome the manifold financial, economic, institutional, technical, information and capacity barriers that stand in the way of actually capturing the available mitigation potential.

History provides an example of a successful investment programme that combined a strategic country-driven approach and massive support from outside: The Marshall Plan, through which the USA over a period of five years annually invested about 1% of its then GDP into the reconstruction of post-war Europe. The reason for the US engagement was the perceived strategic threat that Western Europe might fall into the orbit of the Soviet Union. If climate policy is to succeed, governments must start treating the climate challenge as an even more fundamental strategic challenge.

While the Marshall Plan cannot simply be adopted as a blueprint, it contained several principles and elements that appear highly relevant for overcoming the climate challenge, such as (UN DESA 2009b):

- Country-drivenness: As a precondition for support the USA required the European countries to elaborate reconstruction plans, which needed to include an identification of what the countries were prepared to do themselves as well as an identification of where they needed support.
- Non-project assistance to government budgets or for financing the balance of payments.
- Counterpart funds in local currency established through Marshall Plan aid inside the European countries, which lent money to private enterprises to finance their reconstruction.

These elements are easily recognisable in the current negotiations texts in the form of nationally appropriate mitigation actions, low-carbon development strategies, needs assessments and funding proposals. The challenge is to tie these elements together into a coherent strategic approach that is capable of driving the fundamental structural transition that is needed.

4 Developed Countries: Taking the Lead

What Should be the Targets?

To contribute the domestic emissions reductions required and to enable Southern countries to continue developing while at the same time reducing emissions and adapting to climate change, industrialised countries should assume responsibility for a major share of the *global* effort necessary to achieve an emission reduction trajectory as illustrated in Figure 1 as well as responsibility for adaptation costs. To the extent that mitigation and adaptation activities in developing countries require additional financial and technological resources, these resources should be provided by industrialised countries. The scale of industrialised country commitments should therefore be broadened and in the future consist of three pillars:

- Ambitious Kyoto-style national emission reduction targets.
- A legally binding obligation to support developing countries in mitigating their emissions to climate change.
- A quantified legally binding obligation to support developing countries in their adaptation efforts. At least for the Least Developed Countries and Small Island States this should include full coverage of adaptation costs.

What is the size of that major share of the global effort? In our assessment industrialised countries should take responsibility for about 3/4 to 4/5 of the total *global* mitigation effort required. This conclusion can be arrived at in different ways.

The first way is a principle-based approach that tries to interpret and quantify the Convention's criteria of responsibility and capability. One such interpretation has been elaborated in the the Greenhouse Development Rights (GDR) Framework (Baer et al. 2008). Crucially, the GDR framework takes into account *intra*national differences by introducing a "development threshold", a level of income put at 7,500 USD (adjusted for purchasing power parity). People above this threshold are assumed to have achieved meeting their basic needs to an acceptable extent and have some disposable income, whereas people below the threshold are assumed to be still struggling to meet basic needs and should therefore not be drawn on to combat climate change. This development thresholds acts as a form of tax exemption in the calculation of capability and responsibility. Looking at the aggregate Annex I and non-Annex I shares of the necessary global mitigation effort thus calculated, the share for Annex I in 2020 amounts to 69% while the share for non-Annex I amounts to 31%. If there was a global Kyoto-like emission trading system where each country assumed targets according to this calculation, for 2020, industrialised countries as a whole would receive an allocation of emission allowances equal to 37.9% of 1990 emissions levels whereas developing countries would receive allowances of 258.1% of 1990 levels. This means, the responsibility to reduce emissions for industrialised countries would be equal to around 62 % of their 1990 emissions.

The second way is a more pragmatic approach: To, first, analyse where emissions can be reduced and what costs would be involved with making these reductions, and then, second, apply the commitment in Art. 4(3) of the Convention according to which industrialised countries shall cover the full agreed incremental costs of actions in developing countries.

Such an analysis has been done by McKinsey on behalf of the ClimateWorks Foundation (2009). According to this analysis, global emissions can be reduced by 19 Gt below business-as-usual levels by 2020 at costs up to €60/t CO_2-eq. Of these 19 Gt of mitigation potential, 5 Gt are located in industrialised countries and 14 Gt are located in developing countries. Of these 14 Gt in developing countries, 4 Gt have negative abatement costs and 10 Gt have positive abatement costs. According to the Convention, these positive abatement costs should be covered by industrialised countries. Adding these 10 Gt to the 5 Gt of abatement potential that is available within industrialised countries leads to the conclusion that industrialised countries should cover 3/4 to 4/5 of the global mitigation potential as calculated by McKinsey.

Yet another approach which comes to a similar result is to define responsibilities on the basis of equal cumulative per capita emissions. The FCCC's criterion of responsibility has been defined in the Brazilian proposal as a country's contribution to temperature increase (UNFCCC 1997; La Rovere et al. 2002). As outlined above, keeping a good chance of meeting the 2°C target would require to cap cumulative CO_2 emissions in the period from now until 2050 at 650 Gt. Even if historical responsibility was completely neglected and only these 650 Gt CO_2 were distributed, most industrialised countries would receive a budget that would last them only for a few years and afterwards they would have to massively purchase allowances from developing countries. If historical emissions since 1990 were added to the 650 Gt CO_2 and the sum then distributed equally per capita, the budget for industrialised countries would already be lower than their actual emissions since 1990 and they would need to start buying allowances immediately (WBGU 2009). Going back even further than 1990 would put industrialised countries even further in the red (Pan et al. 2008).

Such a long-term budget approach would be especially helpful with regard to the USA. As a matter or practical reality it will probably not be possible for the USA to adopt a short-term emission target in the same order of magnitude as other industrialised countries when compared to 1990. Under an approach that assigns cumulative budgets, the USA could assume a somewhat more lenient short-term target, to be compensated by more stringent reductions in the mid- and long-term.

The climate negotiations could probably be much facilitated if it was possible to adopt a principle-based approach to assigning responsibilities such as the GDR Framework or the budget approach. For the purpose of the Copenhagen treaty, however, time is likely too short to develop such a "world formula" that would be acceptable to all countries. Instead, it will probably be necessary to stay within the Kyoto framework for the time being. The above considerations nevertheless illustrate that industrialised countries should raise their ambition level far above their current proposals.

To fulfil their domestic obligation, Annex I countries should therefore commit to Kyoto-style targets at least at the upper end of the 25-40% range considered by the IPCC for the 450 ppm scenario, that is, 40%. To ensure that strong cuts are done domestically in the Annex I countries and emissions start converging to equal per capita levels, only a limited use of offsets should be allowed: The use of offsets should be limited to a maximum of one quarter of this target, so that industrialised countries would in aggregate have to reduce domestic emissions by at least 30% below 1990 levels.

In addition, emission reductions that are achieved in developing countries through offset mechanisms count towards the emission targets of industrialised countries. They can therefore not be double-counted towards the obligation to financially support developing countries. Industrialised countries should therefore fulfill their international obligation through enabling nationally appropriate mitigation actions of developing countries with funding outside the carbon market (see section 7). Alternatively, if the carbon market was to be the primary channel to create financial flows, industrialised countries would need

to assume targets substantially beyond 40% to create the necessary demand for emission reduction credits from developing countries.

The overall responsibility to reduce emissions for the Annex I countries should be equal around 60% of their 1990 emissions, as was calculated above using the GDR approach. That is, either they adopt an obligation to reduce GHG emissions in developing countries through financial support outside the carbon market that together with their Kyoto-style targets adds up to 60%, or they increase their own Kyoto-style targets to 60% and accordingly increase the amount of offsets they use.

From Targets to Actions

As the first commitment period has shown, commitments to legally binding emission targets do not automatically mean that countries will in fact reduce their emissions. In most non-EIT industrialised countries, emissions have continued to increase, in some cases drastically, and Kyoto compliance is far from guaranteed. Canada has even officially announced that it is not going to meet its target.

Therefore, in addition to targets, industrialised countries should develop commitment achievement plans (CAPs). Achieving the necessary steep emission reductions will require a fast and fundamental redirection of investments and restructuring of society. This cannot be accomplished by incrementalist measures but will require a coherent and strategic approach that establishes climate protection as a fundamental objective of all policy areas and society as a whole. Each industrialised country should therefore develop a coherent

vision and action programme for how it wants to achieve a rapid transition to a low-emission society.

These plans should be developed in a transparent and participatory process within each country. To actually achieve the necessary radical step-change, broad-based support and ownership within each country will be needed. The vision and policies and measures pursued by government will need to be actively shared by society as a whole, or otherwise the programmes will have a high risk of never making it beyond the paper stage. Indeed, the national discussion itself can be a major stimulus for the needed changes.

Therefore, high level cross-ministerial and multi-stakeholder groups that include the government, technicians, representatives of the business community and civil society should be established in each country. These groups would be responsible for formulating CAPs and national adaptation plans of action (NAPAs) (see section 6). The final plans would be approved and submitted internationally by the national governments, which would also be responsible for the implementation. The multi-stakeholder groups would monitor implementation of the plans and actions and report to the FCCC, in parallel to the reporting by governments (Aprodev 2009).

The CAPs of industrialised countries should have two parts:

- A target achievement plan, laying out the policies and measures each country will use to meet its reduction commitment.
- A support achievement plan, laying out how each industrialised country is going to fulfill its obligation to deliver financial, technological and capacity building support for mitigation and adaptation to developing countries.

The CAPs should be submitted to an international review process. Such a process could help to achieve at least three goals:

1. Scrutiny by independent external experts would probably improve the quality of the plans and thus help to facilitate compliance with the commitments.
2. It would help to build the much-needed international trust by demonstrating that industrialised countries are indeed taking the lead and putting into effect the necessary short- and long-term measures to drastically reduce their emissions.
3. It could be very helpful for facilitating policy learning between countries.

The concrete modalities for the development and review of the CAPs should build on the modalities already in place for the development and review of national communications, GHG inventories etc. In addition, in its post-2012 communication the European Commission (2009a) has proposed very concrete ideas for how to ensure that developing countries achieve a pre-defined level of mitigation, which should first and foremostly be applied to industrialised countries. In particular, the modalities for CAPs should include the following elements:

- Under the Copenhagen agreement, all developed countries should commit to adopting Commitment Achievement Plans at least two years prior to the start of each new commitment period. To ensure that the CAPs have a level of ambition sufficient to meeting the country's obligations, the CAPs should be submitted to an international review.
- Draft CAPs for the second commitment period 2013-2017 should be submitted by 1 March 2010 at the latest and full plans by 30 September 2010.
- These CAPs should set out a credible pathway to limit the country's emissions in line with its reduction target through mitigation actions that cover all sectors. This path-

way should cover both medium-term goals, including the target for the next commitment period or periods as agreed in Copenhagen, as well as the long-term goal to lower emissions to 1 t per person by 2050. Ideally, the CAPs should break the national targets down to sectoral targets to end the current situation where for example transport emissions have been growing with hardly any constraint.

- In addition, the CAPs should set out reliable sources to generate new finances, so as to meet the country's international financial and technology obligations.
- The review process would be undertaken by the Mitigation Panel under a newly established Financial Mechanism Board (FMB) (see section 7) and could build on the procedures already in place for the assessment of Annex I national communications, initial resports, GHG inventories etc. (see section 9).
- Where the review process finds that a CAP is not in line with meeting the country's obligations, the analysis should explore options to raise the level of ambition of the CAP.
- The Conference of the Parties should review the results of the analysis and may decide to request industrialised countries to revise their CAPs to ensure that they are consistent with meeting their obligations.

5 Nationally Appropriate Mitigation Actions by Developing Countries

To give clear directions for all future investments and make strategic use of the resources to be provided by industrialised countries, Southern countries should ideally develop integrated Low-Carbon Development Strategies (LCDS). These LCDS should set out a long-term vision for low-emission development as well as comprehensive nationally appropriate mitigation actions (NAMAs) covering all the key emitting sectors that are needed to implement this vision. To benefit from synergies and to avoid trade-offs between mitigation and adaptation, LCDS and Adaptation Strategies or National Adaptation Plans of Actions (NAPAs) could be compiled into an integrated strategy for climate-proof development (see section 6).

As in the case of industrialised countries, these plans should be developed in a transparent and participatory process through high level cross-ministerial and multi-stakeholder groups for two reasons (UN DESA 2009b):

- As argued above for industrialised countries, actually achieving the necessary radical step-change will require broad-based support and ownership within each country.
- In addition, demonstrably broad-based popular support can be a powerful vehicle to persuade donors to tailor their support to the recipients' priorities, rather than cherry-picking measures according to their own priorities.

The actions taken by developing countries should be inscribed into an international register under the UNFCCC and would need to be "MRVable" — measurable, reportable and verifiable — to qualify for financial and technological support. The guidance and requirements for elaborating NAMAs, as well as the assessment process could be inspired by the reporting infrastructure that is already in place under the FCCC. However, the current provisions for non-Annex I reporting are probably not adequate for robustly assessing NAMAs, so the process could also incorporate elements of current Annex I reporting and reviewing. The following modalities for the elaboration and MRV of LCDS and NAMAs could be envisioned:

- LCDS should be grounded in a strategic vision to limit national emissions to 1 t per capita by 2050.
- LCDS should be organised by sectors and subdivided by greenhouse gas.
- Proposed NAMAs should include a robust assessment of their mitigation potential.
- Furthermore, they should include an elaboration of the costs and benefits of implementation and, where applicable, other constraints to implementation. In particular, NAMAs should clearly identify where financial and technological support is required.
- The description of the mitigation potential, costs and required support should include a description of the methodology and assumptions used.
- Proposed NAMAs should also include possible indicators to ex-post measure the success of each NAMA.
- The review process would be undertaken by the Mitigation Panel under a newly established Financial Mechanism Board (FMB) (see section 7) and could build on the procedures already in place for the assessment of Annex I national communications, initial reports, GHG inventories etc. (see section 9).

- Once a country's LCDS or NAMAs have been judged to be robust, the country qualifies for financial support as outlined in section 7.

Many developing countries have in recent years already formulated national mitigation strategies and have the capacity to further develop them. Most developing countries, however, will probably require significant capacity building to be able to prepare LCDS and NAMAs. Industrialised countries should commit to cover the full costs related to preparing NAMAs and LDCS and to deliver the necessary capacity building to enable developing countries to meet the related requirements. Nevertheless, development of comprehensive LCDS may be too onerous for many developing countries, at least in the short term. Development of comprehensive LCDS should therefore be voluntary for most developing countries, leaving them the option to propose specific individual NAMAs rather than comprehensive plans if they prefer.

To safeguard the environmental effectiveness of the agreement, however, development of comprehensive plans should be a requirement for countries exceeding a certain threshold, such as contributing at least 1% to global emissions. In addition, from a political point of view, ratification of the Copenhagen treaty by industrialised countries will probably hinge on knowing what the large developing countries are prepared to do. Therefore, for those countries that exceed the to-be agreed threshold, the following additional provisions should apply:

- These countries should commit to submitting a first draft LCDS by 1 June 2010 at the latest and a full strategy by 1 January 2011.
- In addition, the LCDS of these countries should establish credible pathways to limit emissions and indicate their level of ambition. To this end, two emission projections should be provided:
  - A projection without implementation of the proposed LCDS
  - A projection with implementation

Given the urgency of achieving a peak and decline of global emissions, the international framework should include the possibility to fast-track implementation of specific NAMAs where the assessment is straightforward. The selection of such NAMAs should be guided by the Technology Objectives and Roadmaps (see sections 2 and 8). As a new financial mechanism will probably take several years to establish, industrialised countries should pledge to provide adequate amounts of support for such fast-start strategies.

Finally, several non-Annex I countries have in the meantime attained levels of development and per capita emissions that are comparable to or even exceeding those of a number of Annex I countries. A situation where countries with comparable responsibility and capability are required to make contributions of a differing legal and substantive nature is clearly not equitable.

The South-North dialogue (Ott et al. 2003) therefore defined a category of countries called newly industrialised countries and proposed that these countries should be required to assume legally binding quantified emission targets. The group is composed of the countries that score highest on the South-North index, which includes criterias for responsibility, capability and mitigation potential. According to the South-North proposal, the list of newly industrialised countries would include: Bahrain, Brunei, Cuba, Israel, Kazakhstan, South Korea, Kuwait, Qatar, Saudi Arabia, Singapore, Suriname, Trinidad & Tobago, Turkmenistan, United Arab Emirates and Uzbekistan.

Meyer et al. (2009) propose that the Conference of the Parties should define a threshold, and countries that exceed this threshold should be required to assume legally binding quantified emission targets. They suggest that a GDP per capita at purchasing power parity higher than 20,000 USD/year could be an appropriate indicator. According to this threshold, this group of countries would include: Bahamas, Bahrain, Brunei, Kuwait, Oman, Qatar, Saudi-Arabia, Seychelles, Singapore, South Korea, Trinidad & Tobago and the United Arab Emirates.

Evidently, both approaches require further refinement as for some countries the appearance on these lists is rather surprising. In particular, the lists include small island developing states who will have to bear a heavy burden because of the impacts of climate change.

6 Facilitating Action on Adaptation in Developing Countries

As mentioned above, developed country Parties should take the lead in combating the adverse affects of climate change (Art. 3 UNFCCC). They should do so through a quantified legally binding obligation to support Southern countries in their adaptation efforts, both financially and through capacity building and knowledge sharing. To do so, international finance for adaptation needs to be scaled up massively (see chapter 7).

Similar to CAPs, NAMAs and LCDS, all countries should commit to develop National Adaptation Plans of Action (NAPAs) and — in the mid-term — more integrated National Adaptation Strategies to inform adaptation needs and facilitate adaptation. National Adaptation Strategies would be an iterative process, providing a national aim and vision for the compiled sub-national adaptation plans and needs (Meyer et al. 2009), and should be consistent with national Low-Carbon Development Strategies and poverty reduction goals. To best exploit synergies of adaptation and mitigation and avoid trade-offs, LCDS and Adaptation Strategies could be compiled into an integrated strategy for climate-proof development. These strategies and plans should also include disaster risk assessments and prevention planning to reduce disaster risk and to facilitate the development of insurance infrastructures.

Southern countries are entitled to receive appropriate financial support and capacity building for the development and implementation of NAPAs and National Adaptation Strategies according to their capabilities. Based on the polluter pays principle, finance for adaptation in developing countries must be regarded as compensation payments and should therefore be primarily provided in the form of grants not loans. It also has to be provided in addition to the 0.7% GDP commitment on Official Development Assistance (ODA). At least LDCs and SIDS should receive finance for the full coverage of adaptation costs.

Similar to providing support for fast-track NAMAs, industrialised countries should scale-up adaptation finance now to be used within this commitment period. Especially the $2 billion funding gap for existing NAPAs must be filled immediately (cf. Meyer et al. 2009).

A reformed financial mechanism should also include a climate risk insurance, as well as a compensation mechanism (Eichhorst et al. 2009). The insurance mechanism should consist of:

- An international climate insurance pool to cover high-level risks, and
- A Climate Insurance Assistance Facility (CIAF) for middle layer risks, which would offer capacity building and financial support for setting up and operating private and public-private disaster risk insurance schemes in developing countries.

The compensation mechanism would be designed to cover residual risks, i.e. those damages and losses that cannot be addressed by pro-active adaptation measures identified in national adaptation plans or strategies and cannot be covered by the insurance mechanism, such as inundation of low-lying island states by sea-level rise (Meyer et al. 2009; MCII 2008). Access to the compensation mechanism and the climate insurance pool could be contingent on the implementation of risk reduction measures identified in NAPAs or adaptation strategies, provided that those are adequately supported by developed countries.

As mentioned above, multi-stakeholder groups would be responsible for formulating NAPAs and National Adaptation Strategies, helping to ensure the participation of (advocates of) the most vulnerable groups. They would also monitor implementation, including risk prevention measures (cf. Aprodev 2009).

While additional finance needs to be generated at the international level, at the national level developing countries can improve their institutions/structures to identify and absorb both new and existing funding options for adaptation from within and outside of the UNFCCC. These processes can learn from the experiences made under the Global Mechanism of the United Nations Convention on Combating Desertification (UNCCD) in setting up country-specific Integrated Financing Strategies (IFCs) for sustainable land management and mainstreaming land management into countries' development. Transferring these experiences to the adaptation context holds a lot of potential for replication since land management is similarly cross-sectoral, even though the scope of adaptation is even larger.

The main idea of Integrated Financing Strategies for Adaptation would be to examine the national institutional, legislative and financial frameworks for adaptation activities and to identify current financial flows into adaptation to identify opportunities and barriers for implementation of adaptation projects, (ideally) as identified in NAPAs and National Adaptation Strategies (Eichhorst et al. 2009). In a next step all potential funding sources for adaptation, including both national public spending, private sector initiatives and international adaptation funding or other funding programmes, the resources of which could also be used for certain adaptation actions, would be identified and budgetary decision-making analysed. On this basis an action plan could be developed, highlighting the main activities necessary to mobilise additional resources for adaptation planning and implementation. These activities should address institutional and legal framework conditions (creating an enabling environment), internal budget distribution, as well as enhancing resource mobilisation from external sources of funding, such as the a new financial mechanism, but also funds outside of the UNFCCC. Where required, the UNFCCC should provide assistance and capacity building for the development of such integrated finance strategies for adaptation similar to the support provided for the development of NAPAs.

Developing Integrated Financing Strategies could help to improve the overall absorptive capacity in developing countries and to effectively use available funding. However, they cannot overcome the problem of the current lack of predictable funding for adaptation. This additional funding will have to be provided under a reformed financial mechanism, providing easy and direct access to adaptation funds.

Nevertheless, the analysis and development of an Integrated Financing Strategy for adaptation could also help identify the funding needs for adaptation sub-sectors in particular countries, identify synergies with other existing programmes such as the Hyogo Framework for Action on disaster risk reduction and promote mainstreaming of adaptation into national development planning. Integrated Finance Strategies could thus become an integral part of National Adaptation Strategies.

In the meantime, actions on adaptation should continue to follow a learning-by-doing approach and also explore the opportunities of public-private partnerships for adaptation. Even though public-private partnerships are not predictable on a large scale, they can play an important complimentary role to public funding. Finally, information sharing should be further supported through continuation of the Nairobi Work Programme on Impacts, Adaptation and Vulnerability, as well as through new or existing regional adaptation centres or networks.

7 A Reformed Financial Mechanism

The developed country Parties and other developed Parties included in Annex II shall provide new and additional financial resources … including for the transfer of technology, needed by the developing country Parties to meet the agreed full incremental costs of implementing measures … (Art. 4.3 UNFCCC)

Financial Requirements and Deficits of the Current Mechanisms

One figure that has often been cited in the financial flows paper of the UNFCCC Secretariat is that 86% of all global investment and financial flows come from private sources, i.e. businesses and private households (UNFCCC 2007). Industrialised countries have used this figure to argue that only limited public funding is necessary for climate protection and most of the costs can be borne by the private sector.

This argument is somewhat beside the point, however. Naturally, it is typically not governments but private actors who finance investments for insulating houses or building wind parks. But it cannot be expected that private businesess will reduce their profit margin and simply absorb the costs caused by choosing a less GHG-intensive investment. While the renewable energy boom in Germany is naturally financed mainly from private sources, it required policies to minimise the barriers for triggering these investments, most notably the renewables feed-in tariff (Mendonca 2009).

In addition, experience from industrialised countries shows that even where investments are in principle profitable, such as energy efficiency improvements, implementation is often nevertheless difficult. Industrialised countries dispose of gigatonnes of no-regret or even win-win potential that would generate a net economic benefit, and yet have so far not been very successful in actually achieving these emission reductions. Typically, a whole range of formidable financial, institutional, technical, information and capacity barriers prevent implementation, such as limited awareness of energy saving options, landlords unwilling to pay for efficiency measures that lower tenants' energy bills but without any benefit to themselves, tenants unwilling to invest in improvements that revert to the landlord on lease expiry, limited access to capital or small project sizes coupled with high transaction costs. Just as industrialised countries will have to significantly scale up policies and measures including public financial support to market actors to tap their own no-regret potential, developing countries will require significant capacity building and financial support for policies and measures to mobilise their no-regret potential.

Developing countries will be hard to motivate to develop ambitious mitigation and adaptation plans if they cannot be sure that these will in fact be adequately funded. Instead, every country should be reassured that they will receive the necessary funding if they submit robust programmes. Financial support will be needed for various aspects, such as:

- Incremental costs of climate-friendly investments compared to emission-intensive business-as-usual ones and financial incentives necessary to overcome non-economic barriers (mitigation)
- Compensating developing countries for foregoing the use of forest resources in the case of reducing emission from deforestation and forest degradation (REDD) (mitigation)

- Adapting infrastructure and economic development to changing climate conditions (adaptation)
- Establishing climate insurance schemes and providing compensation for unavoidable losses and damages, such as inundation by sea-level rise (adaptation)
- Technology cooperation, as large-scale and rapid diffusion of climate-friendly technologies and enhanced RD&D can help mitigate and adapt to climate change (technology)
- Capacity building.

In addition, in many developing countries coverage of additional costs and enabling policies may not be enough to trigger investments due to the lack of domestic capital. In less mature financial markets, public funding mechanisms are necessary to compensate for a lack of private capital and evolving policy environments. These can take a wide variety of forms such as grants, credit lines to local commercial finance institutions, credit guarantees, loan softening programmes and others. When seeing the commitment of governments or multilateral institutions, private investors will then often follow suit (MacLean et al. 2008).

The level of funding currently provided for mitigation and adaptation needs to be scaled up significantly, though estimations differ. For example, the 2007 report on investment and financial flows by the UNFCCC Secretariat estimated that additional investment and financial flows of 200-210 billion USD would be necessary in 2030 to reduce global GHG emissions by 25% below 2000 levels. Almost half of these would be needed in developing countries (UNFCCC 2007). McKinsey has estimated that financial needs for mitigation to cover incremental costs, higher financing rates in developing countries and transaction costs amount to annually 55-80 billion USD (ClimateWorks Foundation 2009). In contrast to these figures, a recent UN report argues that to really achieve the necessary drastic step-change, a "big push" will be needed. That is, much of the necessary investments to meet stabilisation targets will need to be frontloaded and probably more than one trillion USD in additional investments will be required annually for the next two decades (UN DESA 2009b). However, investment generates returns, e.g., on saved fossil fuels, so that the net annual financing flows will not be as high.

For adaptation in developing countries, several organisations, including the UNFCCC Secretariat estimated that several tens of billions will be needed annually (e.g. UNFCCC 2007, ClimateWorks Foundation 2009). However, a recent study by the International Institute for Environment and Development concluded that UNFCCC numbers vastly underestimate actual costs, which could range in the hundreds of billions of USD per year (Parry et al. 2009).

Regarding the additional financing that will be needed for research, development, demonstration, deployment and diffusion of mitigation technologies in order to stabilise levels of greenhouse gases in the atmosphere, the UNFCCC Expert Group on Technology Transfer has estimated that current financing for mitigation technologies needs to increase by USD 262-670 billion annually until 2030 — to a total of USD 332 — 835 billion annually (EGTT 2009). The estimates are sensitive to the baseline and mitigation scenarios used. Most R&D and technology transfer for technologies for adaptation is likely to be included in the adaptation project spending.

For mitigation, two basic types of financing mechanisms are currently in operation: Fund-based mechanisms and emission trading mechanisms, in particular a reformed Clean Development Mechanism (CDM). Resource flows from emissions trading will hardly be reliable enough nor adequate to incentivise mitigation actions at the scale needed to prevent dangerous climate change. Investments usually require financing before the start of the project. CDM credits, however, are only generated when the project is already opera-

tional. While there are some purchasing programmes where it is possible to receive part of the CDM revenue upfront, upfront payment is a trade-off between receiving early financing and the amount of CDM financing received: Since there is always a risk that a project will fail or not generate as many credits as expected, credits sold upfront fetch a lower price than issued credits.

Moreover, the additional CDM revenue is subject to high risks. Ex ante, project developers cannot be sure whether their project will be registered, whether it will actually achieve the expected amount of emission reductions and which price they will receive for the credits. Relying on CDM revenues to make an otherwise unprofitable project profitable is therefore a very uncertain proposition. Moreover, as a result of these risks banks often do not take credit revenues into account when deciding on giving a loan to a CDM project (Ecosecurities and UNEP Risø 2007: 73). This effectively shuts many project developers out from one of the most important financing options.

Finally, the environmental integrity of the CDM is very much in doubt. Several studies have come to the conclusion that the additionality of many projects is at least questionable (e.g. Schneider 2007; Wara and Victor 2008).

As for establishing new crediting mechanisms at government level, it is doubtful whether emission trading mechanisms can provide governments with a strong incentive to implement ambitious climate policies. Sectoral mechanisms would retain the limitations of the current project-based CDM in terms of receiving the revenue only ex-post and not being able to predict accurately how much revenue will be received. Instead, Southern countries would need to prefinance sectoral schemes or NAMAs and run the risk of not being able to recoup their costs. Due to these factors, Ward et al. (2008: 71) question whether sectoral mechanisms would in fact provide a strong incentive for developing countries to implement climate-friendly policies: "As governments are not investing in policies and measures to speculate in carbon markets, the volatility of carbon credits may be a serious problem for governments."

While we therefore consider that fund-based approaches hold a much better promise to incentivise the necessary structural changes, the currently existing funds are also characterised by significant shortcomings, many of them similar to the CDM's deficits.

Public funds should be able to support the countries that do not attract private finance. However, under the UNFCCC they have not played such a role so far. This is mainly because the Global Environment Facility (GEF) trust fund, the largest public fund currently, is provided on the basis of the resource allocation framework (RAF), which is based on the criteria of achieving a global environmental benefit and capacity to implement GEF projects. As a result, a large share of the funding is flowing to China, Brazil, and India. In order to provide financial resources to other countries, the Special Climate Change Fund (SCCF) and the Least Developed Countries Fund (LDCF) were established. In addition, the Adaptation Fund was established, which is not a public fund, but fed by a 2% share of proceeds on Certified Emission Reductions sales from CDM project activities. Yet, the size of these funds is inadequately small. Moreover, they focus on adaptation support.

Moreover, the requirement of incremental cost calculation causes problems for the countries with less administrative capacity to receive resources from public funds. The requirement of calculating incremental costs also results in eliminating many projects that could contribute to sustainable development but do not yield a large amount of GHG emissions reductions, such as small renewable power projects.

Under the existing financial mechanism the decision on the necessary amount of resources for multilateral environmental agreements operated by the GEF is taken by the GEF Assembly and the GEF Council. Although the COP provides guidance, it is difficult to judge if the GEF in reality reflects the guidance provided by the COP. For example, the fourth Overall Performance Study, an external evaluation of GEF operations, reaffirms that support is in line with the guidance of the COP, but COP guidance goes beyond the present GEF portfolio and strategy, e.g., into adaptation issues, where GEF support has reached a level of USD 350 million, but mainly through special funds and programmes (OPS4 2009). Moreover, the decision of the GEF Assembly and the GEF Council and even the COP guidance are based on the available resources, not on the amount needed to mitigate global warming at the required level (available-resources based approach).

Furthermore, currently no single organisation coordinates the total amount of resources that are available. This makes it difficult to efficiently utilise the limited amount of resources in an effective manner by avoiding duplicated funding for the same objectives.

To truly enable developing countries to shift to a low-carbon and climate-resilient development path, the current financial architecture therefore needs to be significantly reformed.

Functions and Requirements for a Reformed Financial Mechanism

The reformed financial mechanism should fulfill the following functions:

- To support the development of and to review the nationally appropriate mitigation actions, low-carbon development strategies and adaptation plans of developing countries
- To deliver financial, technological and capacity building support to developing countries for the implementation of these plans and actions
- To provide the resources necessary for establishing and managing the technology cooperation framework (see section 8)
- To review industrialised countries' Commitment Achievement Plans.

In fulfilling these functions, the reformed financial mechanism should meet the following requirements:

1. Adequacy and additionality: A new financial architecture must generate the amount of resources necessary for stabilising the GHG concentrations at a level that is sufficient to prevent dangerous climate change and sufficient to support developing countries in adapting to climate change that is unavoidable (or unavoided). In addition, the Bali Action Plan as well as the UNFCCC constitute the additionality of funds to Offical Development Assistance (ODA) as a key criterion.
2. Climate mitigation impact and reflection of common but differentiated responsibilities, i.e. historical responsibilities and capacity to pay: An instrument should directly provide additional incentives for reducing emissions by internalising their social costs into the polluters' calculations.
3. Representative and democratic governance.
4. Predictability: Resource availability must be reliable. This is important for building trust among different countries and for safeguarding the viability of the whole financial architecture, also regarding its catalytic effect on private investments. In particular, the system must not create "darlings" and "orphans", that is, countries and actions that everybody wants to fund and those that receive no funding at all.
5. Minimisation of overlaps and transaction costs.
6. Political feasibility.

While criteria 1 and 2 relate especially to how to raise funding, criteria 3-5 relate especially to how to manage and spend it and criterion 6 relates to both.

Sources of Funding

A variety of proposals has been made on how to finance the post-2012 regime, including:

- Assessed contributions from countries on the basis of their responsibility and capability.
- Selling or auctioning of assigned amount units (AAUs).
- Selling or auctioning of emission allowances in national or regional emission trading schemes.
- A levy or emissions trading with auctioning for international aviation and shipping
- A global carbon tax or other international taxes.
- Extending the share of proceeds on the CDM to the other flexible mechanisms.

We consider that the international sale of AAUs is the "first-best" solution, for the following reasons (Harmeling et al. 2009):

- Adequacy and additionality: The sale of AAUs is generally able to generate substantial resources in addition to already existing commitments (particularly to the 0.7% ODA target).
- Predictability: Selling AAUs has the potential to create an "automatic" funding mechanism and make the climate regime "self-financing". In addition, the revenue stream could be insulated from market price volatility by choosing to sell AAUs at a fixed price instead of auctioning.

- Climate mitigation impact and reflection of common but differentiated responsibilities, i.e. historical responsibilities and capacity to pay: Selling AAUs complies with the polluter-pays principle and provides incentives for further emission reductions in industrialised countries. Moreover, it guarantees the equitable inclusion of all industrialised countries (i.e. all countries that will commit to absolute emission targets in Copenhagen).
- Political feasibility. Selling AAUs functions as an "upscaling" of the approach already implemented by the EU (auctioning combined with earmarking of revenues), and therefore is politically feasible for the countries that have emissions trading schemes. In addition, this approach enables governments to pass the obligation to purchase AAUs and thereby the ultimate costs on to private emitters. At the moment, it appears as if most industrialised countries are going to introduce emission trading schemes within the next years.
- Finally, this approach is technically relatively easy to implement and consistent with the structure of the Kyoto Protocol.

In principle, assessed contributions on the basis of criteria for responsibility and capability would equally comply with the polluter-pays principle. However, industrialised countries do not have a good track record of complying with their financial commitments. Even in the case of member states' contributions to the UN regular budget, which are as legally binding as is possible under international law, many member states do not pay their full dues. Hence, additional enforcement rules — particularly a credible sanctioning mechanism — would be necessary to safeguard the reliability of the financial flows. However, the political feasibility of such an adequate sanctioning mechanism is probably very low. While there is also no final guarantee that countries will purchase AAUs, this approach has the advantage that they do not necessarily have to purchase the AAUs themselves but instead may pass on this obligation to private emitters in an emissions trading system.

An additional problem results from the current configuration of the negotiations. Currently, the financial contributions and the emission targets of industrialised countries are negotiated in separate tracks. Depending on AAU auctioning as a new financial source has not only the targets but also the financial contributions from the industrialised countries depend on the conclusions under the Kyoto Protocol. Recognising this problem, however, we still find that AAU auctioning is the best option since both commitments of industrialised countries should be linked.

The proportion of the AAUs to be set aside would depend on the estimated revenue needed and the expected carbon price. In particular, the scale of the funding should be based on an assessment of the needs for financial support for mitigation in Southern countries in order to achieve a peak of global emissions by 2015 and an 80% reduction below 1990 levels by 2050, as well as the needs for adaptation (assuming a temperature increase of a minimum of 2°C) (demand-based approach). The revenue needed should ultimately be decided by the COP, on the basis of a recommendation provided by the Financial Mechanism Board (FMB).

To take into account countries' varying responsibility and capability, the quantity of AAUs to be withheld from each industrialised country could vary based on its responsibility and capability. That is, countries with high responsibility and capability, in particular the G7 countries, could have a proportionally high share of their AAUs withheld for auctioning, whereas countries with a low responsibility and capability could receive more AAUs for free.

As so far international aviation and maritime transport are not covered by the Kyoto Protocol, it would reflect the polluter-pays principle, equity considerations and the sheer volume of required revenue inflows that these sectors should be obliged to contrib-

ute — ideally through their inclusion in an emissions trading system with auctioning of the allowances. This is a logical extension of selling AAUs, as international aviation and maritime traffic are relevant sectors that up to now are excluded from national emissions budgets.

Institutional Structure

A broad range of options for the future funding regime can be envisaged and has been proposed. These can be described in terms of three descriptive dimensions:

- Fragmented or consolidated flows, i.e. whether funds flow through one or multiple channels
- Centralised or decentralised decisions, i.e. whether funding decisions are taken by a central body or not
- Devolved or Retained, i.e. whether funding decisions are made by recipients themselves or not.

These dimensions are a matter of degrees and independent of each other (Müller 2009). Conceivable options based on the current negotiations are:

1. Fully fragmented, decentralised and retained: Donors themselves select activities they fund, either bilaterally or via established multilateral channels like the GEF. Such a system would match the preferences of donor governments, but would hardly be predictable for developing countries. In addition, if all donors made their own evaluations, transaction costs would be very high for both donors and recipients.
2. Fully consolidated, centralised and retained: A fund is created under the FCCC that takes all funding decisions. Such a system could ensure predictability but would entail creating a very large new institution, which could take very long to establish and might be very unwieldy. While such a system is being demanded by developing countries, it does not seem acceptable to industrialised countries.
3. Fragmented, decentralised and retained funding with a coordinating mechanism under the UNFCCC that brings together recipients and resources. Such an approach could enhance predictability, but could still involve significant transaction costs for all sides to match needs and resources.
4. Fragmented and decentralised funding with consolidation at recipient level. Under such a system, donors would negotiate funding with one central entity in each developing country. Such an approach would enhance coordination of investments, but not necesarily predictability of funding streams and could entail high transaction costs for all sides similar to option 1.
5. Fragmented and decentralised funding with consolidation at recipient level and coordination under the UNFCCC. This approach could enhance predictability compared to option 4.
6. Consolidation and centralisation of funding with devolution of funding decisions to the recipient countries. Such an approach could enhance predictability and coordination of funding streams, but would require reliable recipient country institutions as well as strong international oversight to maintain confidence among donors.
7. In addition to these archetypical options, a variety of hybrids are conceivable, such as creating a strong mechanism under the UNFCCC that is complemented by further bilateral and multilateral channels.

Based on the above criteria and considerations, a consolidated mechanism at UNFCCC level does seem recommendable. Such a system could prevent cherry-picking by donors, maximise comprehensiveness and allow to exploit synergies. At the same time, care should be taken not to create an unwieldy and potentially untransparent bureaucracy under the UNFCCC. The mechanism could therefore follow a consolidated-devolved model according to option 6:

- Consolidated: A global climate fund could collect and co-ordinate all financial flows from industrialised countries and review the NAMAs, LCDS and NAPAs of developing countries
- Devolved: Implementation and specific funding decisions would to a large extent be devolved to implementing entities at national and potentially also sub-national level. That is, countries should be given the possibility for direct access, instead of having to work through multilateral institutions. These entities could for example take the form of national climate funds that would need to be accredited by the financial mechanism. Exceptions could be international co-operation ventures, for example on technology, and direct access to adaptation funding for the groups that are most vulnerable to climate change.

Such a new global climate fund should be established and operate under the authority and guidance of the COP and be fully accountable to it. To secure the necessary amount of resources for adaptation and mitigation, the COP should determine the needed amount of resources every five years and review the decision every year.

The global climate fund could have the following structure:

- It could be governed by a Financial Mechanism Board that should be accountable to the COP. Its tasks could be to support the COP in taking the decision on the needed amount of resources, accredit national implementing entities, and to give instructions to the trustee on disbursement of resources. The FMB should consist not of governmental representatives but experts who have extensive knowledge about climate change, financing, development, infrastructure, forestry, etc. In particular, a specified number of seats with full voting rights should be reserved for civil society, as is the case in the Global Fund to Fight AIDS, Tuberculosis, and Malaria. At least one seat should be reserved for a representative of women's organisations.
- Mitigation, adaptation, technology and capacity building should be serviced by one specific funding window each under the fund. Each of the four windows might have further sub-windows, for example a REDD and transport sub-window under the mitigation window. REDD and transport have proven to be sectors which pose very particular challenges to reducing emissions and should therefore receive special attention (on transport approaches, cf. Bongardt et al. 2009). The adaptation window should at least include an implementation sub-window, an insurance sub-window, including climate risk pools, and a compensation window for unavoidable damages, such as forced migration due to inundation of low-lying islands because of sea-level rise.
- The windows should be overseen by independent expert panels for mitigation, adaptation, technology and capacity building. The current Adaptation Fund should become the adaptation window and its board become the adaptation panel. The responsibilities of the panels could include the review of CAPs, LCDS/NAMAs and NAPAs. Based on these reviews, the panels would make recommendations to the FMB on where to disburse funding. In addition, based on these plans and their assessments of financial and technology needs, the expert panels would give recommendations to the FMB on the size of funding needed, based on which the FMB would in turn make its recommendation to the COP.

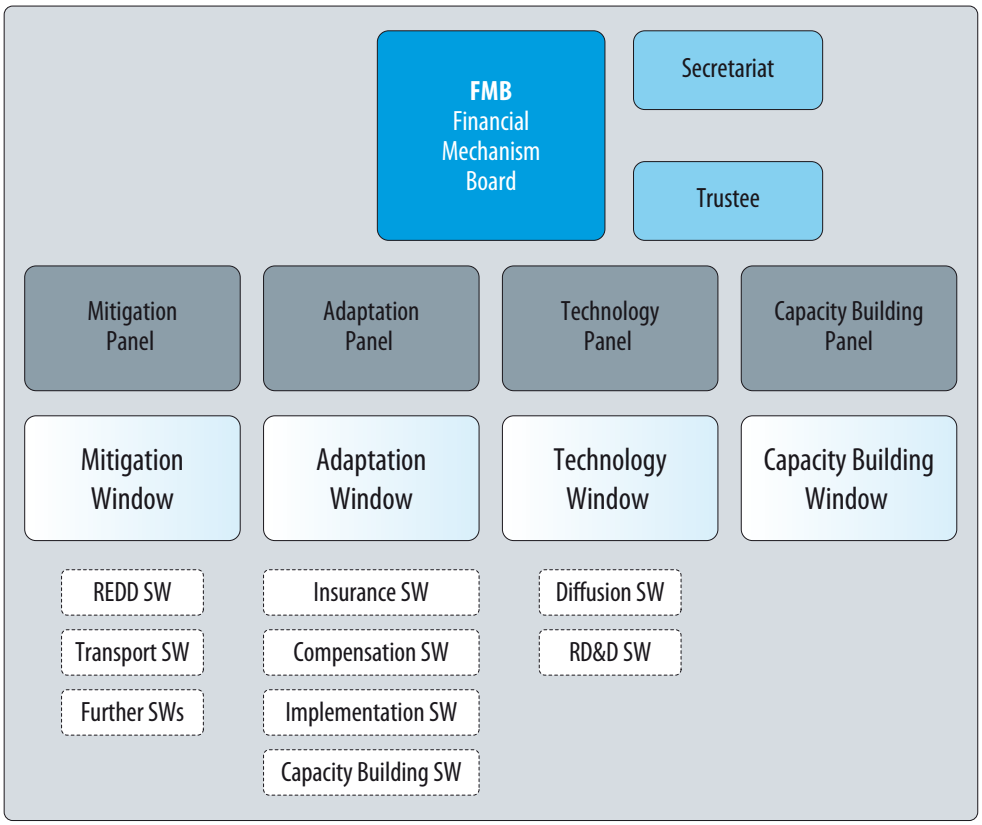


Figure 4: Suggested Structure of a Consolidated Financial Mechanism. Source: Wuppertal Institute

- The mitigation panel would also make calculations of the total emission reductions achieved in developing countries through support from industrialised countries and report annually to the COP. On this basis, the COP would then review the situation of MRV-supported mitigation in developing countries and request further action if needed. Similarly, the adaptation panel would assess the progress of the implementation of NAPAs and on risk prevention measures.
- The mechanism would be serviced by the UNFCCC secretariat and one or more trustee(s) selected through an open bidding process. The trustee would disburse funding on the instruction from the FMB.

Resource Disbursement

The post-2012 negotiations are now seeing a range of complex proposals on how to determine costs and what level of support developing countries would require to implement NAMAs. However, such an approach would threaten to replicate and exacerbate the substantial problems the Global Environmental Facility (GEF) has encountered with implementation of the incremental cost principle and the problems the CDM has encountered with the determination of "additionality".

In fact, since NAMAs would probably include policies and programmes, the problems would likely be even greater than encountered at the project level by the GEF and the CDM:

- How to prove that an action is not part of the baseline? Would this even be possible given that policies are usually introduced for a variety of reasons and that GHG emission reduction actions usually entail a number of benefits, such as reduction of pollutant emissions, technology promotion, creation of wealth and employment, decreased dependence on fossil fuel imports etc.?

- Establishment of baselines is in any case fraught with high uncertainties since it is by definition counter-factual. In the past, projections have often proven to be too high or too low. The German feed-in tariff is a positive example of an instrument that constantly outperforms expectations. Schneider and Cames (2009) have recently laid out in detail the many difficulties connected to establishing robust sectoral baselines.
- Appropriate or reliable data is often missing.
- Cost calculations very much depend on what economic conventions are used and are prone to manipulation. Tying support to proofs of incremental costs or additionality generates a strong perverse incentive to calculate costs as high as possible.
- Furthermore, it may in many cases be impossible to establish a direct link between an action and the climate benefit achieved. This applies especially to policies, since policies typically intervene in complex environments where many factors come into play. If a government, for example, introduces vehicle fuel efficiency standards and consequently a drop in transport emissions is measured, it would be necessary to differentiate to what extent this drop has been a result of the government policy and to what extent it has been due to other factors such as rising fuel prices.

Based on the many difficulties the GEF has encountered in application of the incremental cost principle, it has in fact recently moved away from calculating incremental costs to instead narratively explaining the increment.

As a result of these considerations, we recommend that financial support should not be based on a detailed assessment of the additionality of NAMAs and the incrementality of their costs. Doing so would require establishment of a substantial assessment bureaucracy to examine projected emissions reductions and costs for each NAMA or LCDS. Moreover, such an approach would incentivise Southern countries to calculate their baselines and mitigation costs as high as possible.

Similarly, for adaptation actions, it is also often difficult to identify which part of an investment or activity is "additional" adaptation and which is development, in particular in poor countries lacking investments in basic infrastructure. Here identifying incremental costs is absurd as it would basically translate into identifying the additional cost of climate-proofing an investment that does not exist (cf. Parry et al. 2009).

Where possible, funding should therefore be provided on a country basis to support comprehensive mitigation and adaptation programmes, rather than trying to track money flowing to individual projects. That is, the financial support should take the form of overall payments to cover administrative costs of registered NAMAs and NAPAs or National Adaptation Strategies and payouts that are part of them, such as feed-in tariffs or financial support for energy efficiency measures for mitigation or drought preparedness for adaptation.

To implement this principle, one or more national climate funds (for example separate funds for adaptation and mitigation, though integration may be preferrable where possible to promote climate-resilient development) could be established in each country and accredited by the Financial Mechanism Board. These funds could be based in already existing national development banks or investment authorities and should be supervised by the high-level cross-ministerial and multi-stakeholder groups that have been proposed above for the development of NAMAs/LCDS and NAPAs. Once accredited by the FMB, these funds would then be eligible to receive the funding from the trustee of the global climate fund and disburse it as foreseen in the NAMAs/LCDS and NAPAs. The standards for accreditation can build on the work that is currently done under the Adaptation Fund to enable direct access.

By contrast, the technology window would focus on supporting specific international activities for co-operative research and development, deployment and diffusion under a new Technology Cooperation Mechanism (see section 8).

Southern countries would have to account for the use they have made of the funding and the results they have achieved within the MRV framework (see section 9). If a country's use of the funds is deemed to not have been satisfactory, the FMB should enter into a dialogue with the respective country to identify ways to remedy the problems. If this process does not lead to a satisfactory solution, future funding would be suspended until the implementation deficits have been addressed.

An Evolutionary Approach

Clearly, setting up these institutions at the national and international level could be a very lengthy process. However, time is the very thing the international community does not have if the 2°C target is still to be met. In addition, industrialised countries are as a matter of principle currently very reluctant to provide funding that is not under their direct control.

To accommodate these practical problems and divergent political positions, an evolutionary approach could be taken following option 7 outlined above. A strong fund could be created under the UNFCCC, which could as a minimum receive the resources flowing from international aviation and maritime transport. Depending on the design of the regime for aviation and maritime transport, these resources could amount to several dozen billion USD per year, which would guarantee a strong basis to start from. For the time being, the resources that flow directly from industrialised country governments could remain under their control or be channelled through existing multilateral institutions like the regional development banks. The global climate fund, however, should coordinate the resource flows.

The global climate fund should also develop criteria for accreditation of national climate funds within the recipient countries. Countries whose national funds meet these criteria would become eligible to receive 100% of their financing needs as agreed with the FMB through the global climate fund. As more and more countries meet these eligibility criteria, the required resources would start to exceed those available from aviation and shipping and industrialised countries would hence be more and more required to channel their resources through the global fund. At the same time, developing countries would have an incentive to create and maintain robust national institutions in order to become eligible for funding through the global fund, instead of having to "shop for donors".

In this way, the system under the UNFCCC as well as trust between industrialised and developing countries could be built up step-by-step, and a competition for best solutions could be engendered. To accommodate the demands of developing countries, the new global climate fund should start at a size sufficient to actually make a difference. At the same time, to accommodate the preferences of industrialised countries, it could at first work in parallel to further bilateral and multilateral channels outside the UNFCCC and would need to prove that it can indeed perform better. In turn, if a strong fund is created under the UNFCCC, the channels outside the UNFCCC would be similarly pressed to show that they can perform better, as is being argued by industrialised countries.

8 International Technology Cooperation

The developed country Parties and other developed Parties included in Annex II shall provide new and additional financial resources … including for the transfer of technology, needed by the developing country Parties to meet the agreed full incremental costs of implementing measures … (Art. 4.3 UNFCCC).

Key Components of a Technology Framework

Technology has become a a key issue for the success of the negotiations. While the Convention already commits industrialised countries to facilitate technology transfer to developing countries, developing countries posit that this commitment has so far hardly been turned into action. They therefore demand the creation of a dedicated technology cooperation infrastructure as one key precondition for coming to an agreement in Copenhagen (Watanabe et al. 2008).

Combating climate change will indeed hardly be possible without the rapid diffusion of mitigation and adaptation technologies. However, as mentioned in section 2, the necessary drastic reductions will hardly be possible if technological changes are not accompanied by more fundamental changes in the patterns of production and consumption. While the following explores how technological change could be accelerated on the basis of the Bali Action Plan, it should therefore be kept in mind that technological change alone will not be sufficient and non-technological changes should therefore form a key part of national mitigation actions, in particular in industrialised countries.

Technology cooperation is here understood to address all stages of the innovation cycle. The transfer of technologies involves more than hardware supply (Bazilian et al. 2008). It encompasses the complex process of sharing knowledge and adapting technology to meeting local conditions. Domestic technical and managerial capacities, institutions and investments in technological learning all influence the effectiveness with which technologies can be absorbed, adapted and reproduced.

As is the case for the current financial mechanism, the existing technology mechanisms under the Convention and the Kyoto Protocol have significant deficits. The funding for the transfer of climate technologies is very limited and concentrates on the deployment and diffusion stages of the innovation cycle. The provided support covers only half of the technologies developing countries identified in their Technology Needs Assessments (TNAs). Some sectors that have been given much attention in the TNAs, such as buildings, transport and agriculture, are largely absent in the projects of the GEF and the CDM (EGTT 2009).

Besides, cap-and-trade systems at best indirectly promote RD&D, nor do the UNFCCC technology framework or the GEF support RD&D. As a result, programmatic approaches on RD&D with strategic importance are lacking.

A common criticism by developing countries refers to the fact that while UNFCCC agreements contain many references to technology transfer to developing countries, the focus of implementation has generally been on creating enabling environments, i.e. conditions conducive to foreign investment, as well as building capacities to absorb and utilize imported technologies (UN DESA 2008). Less emphasis has been placed on measures that governments of technology supplier countries could and should take to facilitate and accelerate technology transfer.

The challenge is to stimulate the development of hundreds of mitigation and adaptation technologies that are at different stages of technological development and that have their own needs for further development. These technologies need to be adapted and transferred to about 150 countries, also with own needs for their specific country conditions in terms of policies, markets, regulatory conditions, people and institutions.

Acknowledging the dramatically different national and regional capabilities, markets, and resource-bases that exist, an answer to the challenge is to bring forward technologies that are of strategic importance for mitigating and adapting to climate change. We propose the following elements for a successful technology cooperation and promotion of sustainable and climate friendly technologies:

- A Technology Objective as outlined in section 2
- A Technology Cooperation Mechanism that helps implement the objective
- A Sustainable Development Condition: Environmentally sound technologies should to the highest possible degree contribute to sustainable development by generating co-benefits in development-related areas like poverty reduction and income generation.

Technology Cooperation Mechanism

The Technology Cooperation Mechanism should include elements that enable the rapid diffusion of existing environmentally sound mitigation and adaptation technologies as well as cooperative research, development and demonstration (RD&D) of new or not yet fully developed technologies. The mechanism should aim at triggering impulses for the enhanced cooperation on technology and knowledge exchange.

The mechanism should be financially supported by a funding window for technology cooperation under the global climate fund (see section 7). To provide programmatic and strategic focusing, an overall Sustainable Mitigation and Adaptation Plan (SMAT-Plan) should be developed (see figure). This plan should define framework programmes for international cooperative action on technology diffusion and RD&D. The programmes are to be developed based on technology needs identified in national mitigation and adaptation actions (NAMAs/ NAPAs) ("bottom-up") and in technology road maps ("top-down").

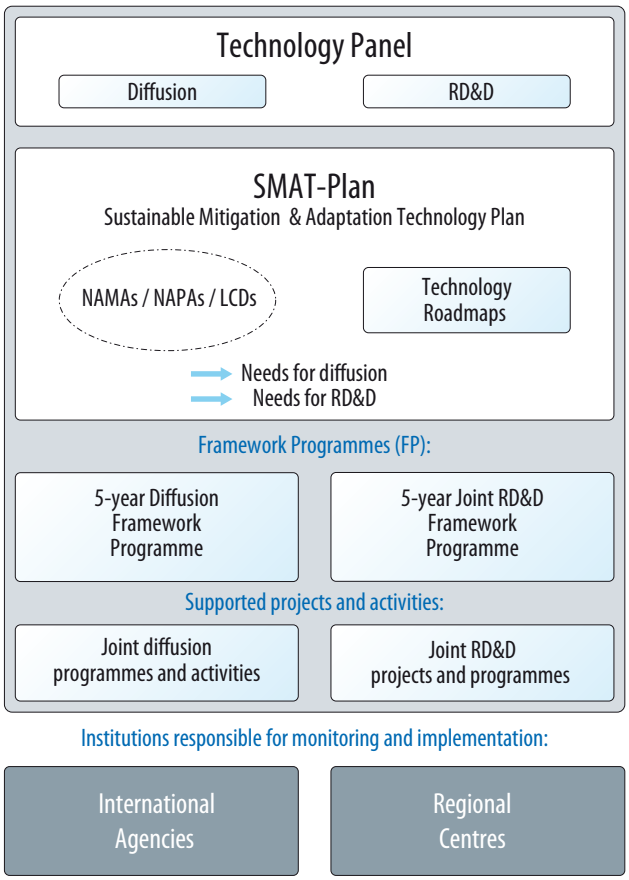


Figure 5: Suggested Technology Cooperation Mechanism. Source: Wuppertal Institute

Strategic Programming: Sustainable Mitigation and Adaptation Technology Plan (SMAT-Plan)

The Sustainable Mitigation and Adaptation Technology Plan (SMAT-Plan) should aim at strategic programming for a diffusion agenda and for RD&D on climate mitigation and adaptation technologies within the UNFCCC, and thus help achieve the overall technology objective and the targets agreed on in Copenhagen (see above). Diffusion of market-ready technologies in the respective countries would be a central point of national mitigation and adaptation plans, and supported through the mitigation and adaptation funding windows. However, for a rapid broad diffusion of existing key technologies a more comprehensive approach is needed. Thus, in addition to the mostly national NAMAs and NAPAs, concerted international activities for the diffusion of existing and near-market technologies through technology-oriented cooperation, barrier removal and incentives for the private sector should be developed.

To ensure that the programmes and supported activities will be in line with sustainable development conditions, key criteria should be set up under the SMAT-Plan that serve as guideline for the selection process of the supported technologies and projects or supported programmes.

Assessing Technology Needs: Country Plans and Roadmaps

NAMAs/NAPAs/LCDSs. The listing of national mitigation and adaptation actions or comprehensive national strategies should identify the financial and technological assistance that is needed in developing countries to implement the measures. These technology needs are the "bottom-up" source of information for the Technology Panel to develop appropriate Framework Programmes that are in line with countries' technology needs.

Technology road maps for diffusion and RD&D. The Technology Panel should develop roadmaps for key technologies that are of strategic relevance for achieving the mitigation and adaptation targets in developing countries. They serve as a top-down information source for the Technology Panel, and should encompass technologies that are in the beginning of the innovation chain as well as those that have reached advanced stages. According to their stage in the innovation chain, barriers and measures to accelerated technology transfer should be identified. The central questions to be dealt with in the roadmaps are: What are basic needs for R&D on a global and/or regional scale? What are the needs for demonstration projects and needs for diffusion activities in order to foster a certain technology? The roadmaps should be regularly updated by the panel and complemented by exchanges of experiences on conferences, and especially with the regional technology centres (see below).

The two sources to inform the Technology Panel and help establish strategic programmes are therefore: First, country-specific technology demand identified in the national plans, and second, policy options to overcome technology-specific barriers identified in the technology roadmaps.

Defining Areas for Support: Translating Needs into Action

Diffusion Framework Programme. The programmes should be prepared by the Technology Panel, last for 5 years and be approved by the COP. They should outline a clear strategy, and the tools needed to enhance the deployment of certain technologies or policies. Basis for the diffusion programmes should be the needs outlined in the LCDSs/NAMAs/NAPAs and technology roadmaps. Existing agencies and/or the newly established Regional Centres (see below) should be entrusted with implementation and/or monitoring of the programmes.

Joint diffusion projects should have the following features: In contrast to mitigation actions that can be implemented mostly at national level and would be financed through the mitigation window of the Financial Mechanism (see section 7), joint technology diffusion programmes require the active involvement of Northern or other Southern partners in order to cooperatively boost technology transfer. Strong involvement of the private sector should be sought for. Conditions for participation and eligibility criteria should be simple, and the project/programme cycle be as fast as possible. In contrast to mainly unilateral national mitigation actions, technology cooperation can also imply region-wide or multi-country support.

Possible programmes or activities as part of a programme could be:

- Technology-centred programmes: Trans-national programmes for the promotion of innovative high-cost climate technologies such as concentrating solar power including a public-private technology transfer partnership component. The role of the private sector would be to aim at establishing whole value-added chains in developing countries, whereas the public sector would facilitate the process of leveraging venture capital.
- A programme on supra-regional/trans-national cooperation on adaptation should not be organized by technology per se, but according to activities such as technology information transfer, infrastructure and hard technology transfer, capacity building, coordination and policy. "Soft" technology transfer will probably outweigh "hard" technology transfer.
- Programme on regionally-based property funds: A focused effort under the Convention could be to boost incentives and raise standards to accelerate low carbon investment in the property sector. An interconnected suite of regionally based property funds could be established to support entrepreneurs in gaining experience in reducing the environmental impacts of existing and new stock.

- International Integrated Experts Programme: Companies and institutions in developing countries are often unable to find the right people for key positions on their local job markets. The Expert Programme could link up partner country organisations needing qualified employees with highly qualified experts from other countries, thus paving the way for know-how transfer to developing countries.
- Explore opportunities to facilitate "South-South" collaborations: A model could be the International Energy Initiative, a "Southern-conceived, Southern-led and Southern-located South-South-North partnership".

The COP should guide the establishment of the different technology diffusion programmes in terms of balance between mitigation and adaptation technologies, and in terms of sustainable use of technologies.

Joint RD&D Framework Programme. For the promotion and initiation of new joint research cooperation as well as demonstration of existing promising technologies, a framework programme on RD&D should be established. The five-year programmes should focus on key topics, based on the roadmaps and the identified demand for RD&D in the SMAT-Plan. They should be proposed by the technology panel and approved by the *Subsidiary Body for Scientific and Technological Advice* (SBSTA). Support should be given to joint R&D projects and demonstration projects:

Joint R&D project conditions and options:

- A precondition for receiving support should be to establish multinational consortia, including "South and North" partners or "South and South" partners in a balanced way.
- Various stakeholders can qualify as partners: Not only research institutions can apply. Additionally, the engagement of the private sector and other international or civil society organizations should be facilitated.
- Project partners should also be able to apply for regional programmes that address specific regional research demand, e.g. for adaptation of existing technologies to regional or local conditions.

Demonstration projects:

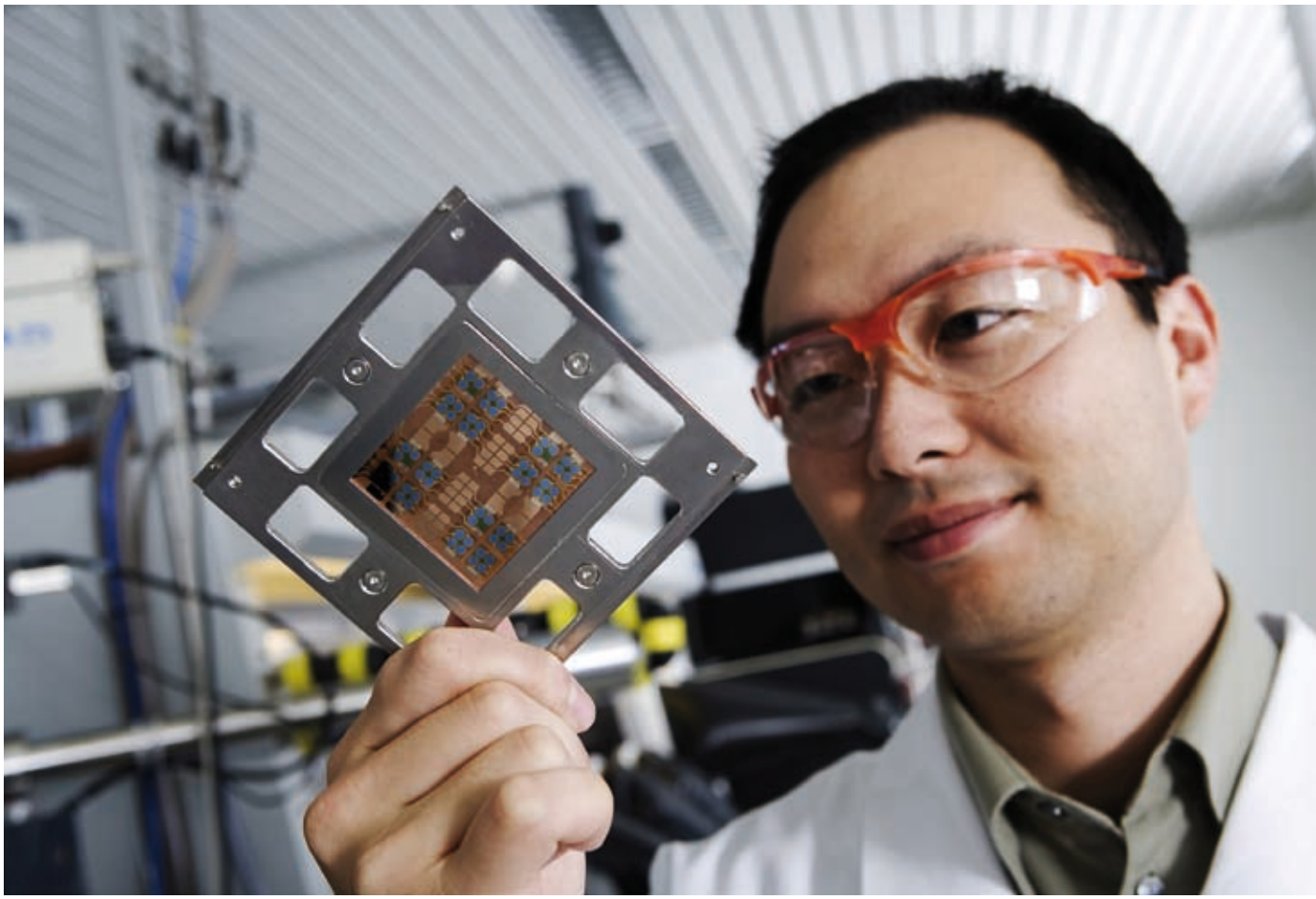
- They should encompass large-scale demonstration for key technologies (in DCs/LDCs).
- They should not only concentrate on regions with high demand and appropriate conditions, but also on regions that have not benefited from demonstration activities under the UNFCCC so far.

The R&D and demonstration projects should be attached to the Regional Centres that are responsible for the monitoring and evaluation (or regional coordination).

Institutional Requirements

The implementation of the Technology Cooperation Mechanism requires appropriate institutions. In addition to a Technology Panel, existing institutions can be hosts of the regional centres and existing international agencies can be entrusted with the implementation of diffusion programmes.

Technology Panel. A technology panel or board should be created under the UNFCCC to provide high-level strategic advice and to allocate financial resources under the guidance of the COP. As strategic coordination of all technology-related activities under the UNFCCC has been missing so far, the technology panel should ensure that knowledge is



pooled and programmes that are responsive to country needs will be set up. The technology panel works in close collaboration with the regional centres.

The UNFCCC Technology Panel should consist of key stakeholders and technology experts from different countries with a balanced participation of Annex I and Non-Annex I countries. The panel members should come from the scientific community, civil society organisations, the private sector as well as other international organizations. There should be a permanent and limited core staff that could be hosted by and be part of the Secretariat of the Convention. The Panel could fulfil the following tasks:

- Generate technology roadmaps and identify demand for cooperation on disseminating technologies.
- Generate technology roadmaps and identify demand for RD&D.
- Recommend key topics for the framework programmes to be approved by the COP.
- Monitor global progress of the roadmaps.
- Provide support on technology related issues for the development of NAMAs/NAPAs/LCDSs under the guidance of the COP.

Regional Centres. Regional technology centres should be established to do targeted research for regional requirements and act as regional centres of excellence to spread best practice. They should provide recommendations on diffusion activities as well as for R&D and for demonstration to the Technology Panel, and exchange experiences on regional

conferences. The regional centres could be based in existing independent research institutes, universities or newly created collaborating centres linked to existing research institutes and universities.

Proposed focus of their activities could be the following tasks:

- Needs assessments for regional RD&D, for joint R&D cooperation and knowledge transfer.
- Regional coordination of R&D on region-specific technologies (based on demand for adjustment of existing technologies and identification of new technology demand).
- Regional coordination of RD&D on adaptation.
- Fostering regional topical competence networks (bringing together research experts and related stakeholders for long-term cooperation).
- Acting as reference institution for Joint R&D and demonstration projects.
- Monitoring and supervision of implemented projects under the RD&D framework programme.
- Acting as information pool and dissemination point for established low-carbon technologies, appropriate for the regional conditions.

International Agencies. International agencies should implement the diffusion projects and activities according to their respective core competencies. Especially the recently launched International Renewable Energy Agency, IRENA, could play a major role in the coordination of the international diffusion projects for renewable energy technologies. In

parallel the establishment of an International Agency on Energy and Resource Efficiency would be helpful to disseminate low-demand technology options. Further important implementing agencies could be international organizations such as UNDP, UNEP, FAO, UNIDO etc., as well as the regional development banks.

Intellectual Property Rights

Finally, a failure to tackle the issue of IPRs constructively will limit the pace of innovation and diffusion and potentially poison the international climate negotiations. A constructive approach would be a "protect and share" agreement involving government-to-government commitments for IPRs and licensing of climate technology (Thomlinson et al. 2008). This agreement could include the use of existing flexibilities, which exist in the World Trade Organisation's agreement on Trade Related Aspects of Intellectual Property Rights and current national laws. This could include measures such as segmented/parallel markets (whereby IPR protection is enforced in some markets and provided freely in others), public sector purchasing of IPR and advance purchase commitments (such as under the Global Fund for HIV/Malaria and TB), compulsory licensing, pay to licence systems, and the use of Global Commons.

Questions related to intellectual property rights for a certain technology should be tackled within the respective Technology Diffusion Programme. The Technology Panel would be in charge of deciding which way best to choose in order to overcome barriers resulting from technology patents. In some cases mechanisms such as patent pools or libraries could be a solution to the IPR-related problem. In other cases the best way forward could be to finance the incremental costs resulting from licensing. Assigning the evaluation of IPR-related barriers to the Technology Panel makes sure that case-by-case decisions are taken according to the relevant technology and country.

9 Measuring, Reporting and Verification

The Bali Action Plan placed measuring, reporting and verification at the heart of the Copenhagen deal: Industrialised countries are to commit to and achieve absolute emissions caps, in particular the USA which has so far not ratified the Kyoto Protocol. Developing countries are to implement NAMAs and industrialised countries are to provide financial and technological support, and all of these are to happen in a measurable, reportable and verifiable manner. However, provisions for MRV need to be designed light so as not to block the speedy implementation of measures. Care should be taken to not create a cumbersome MRV bureaucracy that would smother the implementation of measures in red tape.

The rigour of the current MRV regime varies widely between Annex I and non-Annex I and between different aspects. As for their emissions, industrialised countries are required to submit annual inventories according to IPCC methodologies and reporting guidelines adoped by the Parties. These inventories are reviewed annually by independent expert teams, with in-country reviews taking place at least every five years. Given the intense focus put into improving the inventories over several years, they are nowadays fairly reliable. By contrast, while industrialised countries are also required to report on their policies and measures and their impacts as well as on the financial and technological support they provide to developing countries, so far no specific standards and metrics have been agreed and the quality of reporting differs widely.

Non-Annex I inventories are prepared using less rigorous standards, are submitted less frequently and not subject to an international review. Most developing countries have serious capacity constraints. While they are entitled to full cost coverage in the preparation of their inventories, this support is project-based for each individual submission. It is therefore episodic, which makes it difficult to maintain inventory capacity on a continuous basis. The reporting guidelines for policies and measures in developing countries are also less rigourous than for industrialised countries and the quality of reporting varies widely (Breideneich and Bodansky 2009).

Requirements for industrialised countries should therefore be strengthened in two regards. First, common metrics and standards should be defined for the reporting of the impact of policies and measures. Second, to satisfy the Bali Action Plan the provision of financial and technological support will need to be made MRVable. Industrialised countries should therefore commit to reporting the following

- The amount of finances delivered to the financial mechanism and other bilateral and multilateral initiatives if applicable.
- Information on and the financial amount of other technology cooperation activities.
- Information to demonstrate that all resources provided were new and additional.

The COP would need to develop performance indicators for these items, in particular for the demonstration that delivered resources were new and additional (which will be relatively easy, if financial resources are generated from selling AAUs). The system for monitoring flows of official development assistance under the OECD Development Assistance Committee may offer some lessons in this regard.

As for developing countries, what is emerging in the negotiations is a framework for highly diversified actions, based on countries' differing national circumstances. While some more advanced developing countries may adopt actions like sectoral no-lose targets, for the

most part developing country actions will not be target-based but consist of specific policies and measures. This makes MRV far more challenging.

As discussed in section 7, attempting to measure the emission impacts of a specific action is not at all straightforward. While it will be necessary to get a clear picture of both the implementation of NAMAs and the development of emissions in developing countries, we propose to separate MRV of the two.

To avoid establishing a massive review mechanism that would require substantial resources to assess the emission impacts of NAMAs and would nevertheless only yield approximate results, NAMAs should mainly be MRVed not as regards their emission impact but as regards their implementation. That is, the emission impact should be monitored to the extent possible and reported, but without an extensive verification and without attempting to make it as exact as possible. The level of monitoring and reporting would have to be defined in the framework of the Financial Mechanism, where developing countries would have to account for the use they have made of the funding and the results they have achieved (see section 7). However, for the general framework of implementation of the Copenhagen agreement, mainly the robustness of implementation should be MRVed. The Conference of the Parties should develop guidelines for what constitutes a robust NAMA, such as setting goals, implementing related actions, ensuring sufficient human and financial resources for these actions, documentation requirements and tracking progress over time. One possible approach has been proposed by the United Nations Foundation. According to this proposal the COP could request the International Organisation for Standardisation (ISO) to develop a management system standard for NAMAs. Developing countries could then develop a comprehensive climate management system according to this standard and request international certification. NAMAs that are developed within a successfully certified national management system would be automatically deemed to be MRVable. This approach would mirror the relationship the COP has with the IPCC as regards the development of emission inventory requirements (Kimble and Niederberger 2009).

How successful developing countries are in reducing their emissions should be assessed at the aggregate level through much more robust and frequent emission inventories and an international review process. All non-Annex I countries except LDCs and SIDS should commit to preparing robust emission inventories as early as possible and by 2013 at the

latest, with at least biannual updates thereafter. Requirements for newly industrialised countries that assume a binding national target should be the same as for Annex I countries. Requirements for countries that do not assume a target would not need to be as strict, but inventories should nevertheless follow the IPCC good practice guidance, include a full time-series of emissions data and document the methodologies and assumptions used.

One proposal that is currently on the table is to integrate the international reporting and verification of NAMAs and support obligations into the national communications. However, much of the information contained in national communications is not needed for the MRV requirements of the Bali Action Plan and more frequent submission would be very burdensome for countries, especially developing countries. Instead, more narrow NAMA and CAP implementation reports could be submitted regularly, for example biannually. They could be modelled on the policies and measures chapter currently required for Annex I national communications (Breideneich and Bodansky 2009). However, they would need more detailed requirements, for example through a management system standard approach as outlined above.

The reports as well as the emission inventories should be internationally reviewed by independent experts under the FMB, though resource-intensive in-country reviews might not be necessary for countries that do not assume a target. As a further layer of verification, the national multi-stakeholder groups proposed above for the development of NAMAs/LCDS and NAPAs could monitor implementation of the plans and actions and report to the FCCC, in parallel to the reporting by governments (Aprodev 2009).

Industrialised countries should commit to covering the full costs related to monitoring, reporting and verification of NAMAs and to deliver the necessary capacity building to enable developing countries to meet the related requirements.

10 Revisit and Improve

Both the speed of climate change and of climate science have recently increased significantly. As noted above, the findings in the IPCC's fourth assessment report were significantly more alarming than in the third. In addition, several scientists held that AR4 was already outdated when it was published and this impression has been confirmed by recent publications (Richardson et al. 2009). International climate policy, including a Copenhagen Agreement, therefore needs to be designed so as to be able to react most flexibly to new and reliable scientific evidence.

Therefore, the current five-year length of commitment periods should not be extended. Lengthening commitment periods could lock the world into a long-term trajectory that might later emerge to not be compatible with preventing dangerous climate change. Moreover, five years is compatible with the time horizon of most policy-makers. Commitments that are due longer into the future are quickly seen as somebody else's problem, as was demonstrated in the run up to the first commitment period. Most countries only started to significantly strengthen their climate policies when the start of the commitment period was imminent. As a result, most non-EIT countries will probably have to heavily rely on the flexible mechanisms if they are to meet their targets at all. Based on these considerations it might even be preferrable to move to annual or biannual commitment periods.

If five-year periods are retained, the negotiations for the third commitment period 2018-2022 should start in 2013 at the latest. In addition, there should be a review clause combined with a full-scale evaluation of the environmental effectiveness of the Copenhagen agreement. This has become a standard feature of international environmental agreements and has also been used by the FCCC and the Kyoto Protocol. However, the record for compliance with review clauses is not perfect and the provision should thus be formulated with stricter legal quality. At the latest, the first such review of the Copenhagen agreement should be conducted in 2014/15, after the release of the fifth IPCC assessment report as currently scheduled, and inform the negotiations for the third commitment period.

To make sure this review actually takes place and that the negotiations on the third commitment period are conclued in time, the Copenhagen agreement should additionally include a default emission reduction obligation for industrialised countries: In case negotiations on future targets are delayed or unsuccessful, the Copenhagen agreement should define a linear trajectory reducing each industrialised countries' emissions by 95% below 1990 levels by 2050.

11 Not at Any Cost: No Agreement May Be Better than a Weak Agreement

The consequences of Parties not coming to a new agreement are uncertain. Not agreeing on emission reduction targets and financing for developing countries would mean that a common effort to stop climate change had failed. However, failure of a common effort would not necessarily mean that there would be no further effort at all. The analysis of the IPCC that man-made climate change is accelerating would still be true and communicated by researchers, civil society organisations and the media. The concern about the future of the planet would still be a hot political topic, maybe even more directly linked to government action than in the current situation. Due to tactical reasons in waiting for the outcome of the negotiations, governments might currently even be slowing down action and commitment. Finally, it is not an agreement that saves the world, but practical action to reduce GHG emissions: Policies, measures, innovations, diffusion of technologies etc. The question is which modus of governance delivers the best results in respect to action. Is it a global deal possibly including many compromises? Or could action also be stimulated by other mechanisms? Research on the international diffusion of policies (e.g. Tews et al. 2003) and research on federal states show that other coordinating mechanisms do exist.

International arrangements like the European Union that are based on consensus can get stuck in the joint decision trap (Scharpf 1985), i.e. the impossibility of any progress due to the veto positions of individual states. However, harmonisation of policies can also be based on competition between nation states, as the research community, civil society, political parties and media continually observe activities in other countries and innovative approaches from there are thus inserted into national discussions. A good example is the German law on feed-in tariffs for renewable energy that is nowadays recognized globally. Such competition for the best solution can lead to a 'race to the top' and subsequently be stronger than agreements between governments. Another example for a 'race to the top' is the emission standard for cars (pollutants) in California that spread all over the USA (Scharpf 1997).

The reports by the IPCC already give a framework of reference to national emission reduction action: The problem is described. All governments have to justify their efforts against the scientific evidence of reduction needs. While small countries can demonstrate their innovative capacity and act quicker, large countries with a significant share of GHG emissions are under high international pressure to contribute to the solution. If these countries take action, lead markets for innovative technologies and solutions will develop and stimulate diffusion without formalized coordination. Such processes could even work for financing of activities in developing countries.

Whether such a 'race to the top' processes would really take place if no deal was reached internationally is quite open. However, if there is no ambitious deal, a weak agreement could even be a barrier to start competition between nation states. The pressure to act would be lifted off governments, as they could refer to the internationally "accepted" targets that would be more or less equal to a BAU scenario, and these might replace the reduction needs described by the IPCC as benchmarks.

Therefore, governments should take all possible efforts to come to a strong agreement at Copenhagen. This will in any case be better than a weak agreement, or no agreement at all. And it will be the only way commensurate with the challenges of climate change that are lying ahead of us.

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List of Abbreviations

AAU	Assigned Amount Unit
CAPs	Commitment Achievement Plans
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
COP	Conference of the Parties
CMP	Conference of the Parties serving as meeting of the Parties to the Kyoto Protocol
EIT-countries	Central and Eastern European countries with economies in transition
FCCC	see UNFCCC
FMB	Financial Mechanism Board
GDP	Gross Domestic Product
GDR	Greenhouse Development Rights
GEF	Global Environment Facility
GHG	Greenhouse Gas
IPCC	Intergovernmental Panel on Climate Change
IPRs	Intellectual Property Rights
LDCs	Least Developed Countries
LDCF	Least Developed Countries Fund
LCDS	Low-Carbon Development Strategies
LULUCF	Land Use, Land-Use Change and Forestry
MRV	Measurable, Reportable, Verifiable
NAMA	Nationally Appropriate Mitigation Action
NAPA	National Adaptation Plan of Actions

ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
RD&D	Research, Development and Demonstration
REDD	Reducing Emissions from Deforestation and Forest Degradation
SBI	Subsidiary Body for Implementation
SBSTA	Subsidiary Body for Scientific and Technological Advice
SCCF	Special Climate Change Fund
SIDS	Small Island Developing States
TNAs	Technology Needs Assessments
UNCCD	United Nations Convention on Combating Desertification
UNFCCC/FCCC	United Nations Framework Convention on Climate Change

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