

No development without addressing climate change

Intersections between climate and development policies

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Demos Helsinki is an independent think tank established in 2005 by a group of citizens interested in the future of society. Demos Helsinki is creating a society where people make social decisions instead of only participating by voting. Project director Tuuli Kaskinen M.Sc, the main author of this report, has previously worked as a climate specialist for the Finnish Association for Nature Conservation, and in development cooperation for the environmental organisation Dodo's Sinsibere project in Mali.

KEPA'S WORKING PAPERS 28, 2009

ISSN 1796-6469

ISBN 978-952-200-126-9 (PDF)

ISBN 978-952-200-125-2 (PB)

LAYOUT: AAPELI LAHTINEN



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Foreword

The climate negotiations have a great bearing on the living conditions and future of the developing countries. Climate change affects people's lives in them through many different mechanisms. It threatens to increase and deepen poverty and hinder the achievement of development objectives.

It is therefore important that people and organisations working with development policies and development cooperation are familiar with the debate and the decision-making about climate policies. KEPA commissioned the report "No development without addressing climate change" to present this information in a clear and concise way. On the basis of the report, it is possible to analyse the intersections between climate policy and development policy from the following three perspectives.

The first perspective is related to addressing climate change in development cooperation. Climate change and the activities concerning its mitigation will possibly change development cooperation more than any other factor in the coming decades. Development cooperation is of great significance both in adapting to climate change and in supporting the developing countries towards low-carbon development. It is important to address climate change if development cooperation is to be successful.

The second perspective concerns climate justice. The responsibility to mitigate climate change and adapt to it is a question of justice involving the relations between the South and the North. A fair sharing of the responsibility should take into account countries' responsibility for climate change (emissions) and their ability to participate in mitigating climate change (level of development).

In accordance with the principles of the UN climate agreement (UNFCCC), the industrialised countries must carry the main responsibility for mitigating climate change because it is their greenhouse emissions that have brought it about. The reform of the global energy system plays a key role in the mitigation process which means, above all, improving energy efficiency and abandoning the use of fossil fuels.

The emissions of the world's poorest countries are still negligibly small, but these countries are especially vulnerable to the effects of climate change. Accordingly, the developing countries' greatest and most urgent need is to adapt to climate change, and to do this they require international support. The central issue here is to tailor solutions to each specific local situation and to diversify the range of livelihoods available to people.

The global situation is changing to some extent, however, because the emissions of the large developing countries have increased significantly during recent decades. In 2007 the developing countries share of global emissions was already 53%, and in 2006 China overtook the United States as the world's biggest producer of carbon dioxide emissions. On the other hand, a significant share of their emissions is the result of export production – a third in the case of China – and is therefore ultimately caused by Western consumption.

The allocation of the emission reduction commitments between the countries is one of the core issues in the ongoing climate negotiations. The developing countries have not previously been set emission reduction commitments, but there are now different models on the table for allocating the commitments between the different countries. The traditional split into the industrialised countries and the developing countries will probably change.

The third perspective concerns the financial flows related to climate change. Climate change is a huge funding challenge. In the next few years a decision will have to be made on how the climate activities of the developing countries are financed.

The Kyoto Protocol gave the world a whole new product that can be traded: carbon dioxide emission reductions. So far the financial flows created by climate change have been small and most of the money transfers have been made within the industrialised countries and in their mutual carbon trading.

The new climate agreement is expected to create substantial new cash flows from the North to the South. The funding for mitigating and adapting to climate change raises many questions. What is the relationship between the current and new funding mechanisms and current development funding? How will the use of this funding be decided? What is the role of developing countries and civil society

in the decision-making? Who benefits from the funding? The solutions should be based on the fact that the new cash flows will promote socially just and ecologically sustainable development.

The utilisation of clean technology and mitigating deforestation are important climate policy issues for the developing countries that must not be by-passed in the climate negotiations. The industrialised countries must support this utilization of clean technology by development funding and by revising international trade agreements, especially concerning copyright issues. International solutions and funding are also required to slow down global deforestation, because it is a cause of a quarter of the world's carbon dioxide emissions. The majority of the world's indigenous forests are located in the developing countries, and more than half of them have already been destroyed.

There are no ready or easy answers to these problems. We hope that this report will assist organisations and people working on development and climate policy in seeking them.

Helsinki, 15 April 2009

Miia Toikka and Outi Hakkarainen

Service Centre for Development Cooperation - KEPA

Introduction

According to John Holdren, President of the American Association for the Advancement of Science, concerning climate change we have three options: mitigation, adaptation or suffering. We are doing all of them but the question is what is the relationship between them?

Adaptation to and mitigation of climate change are two of the key terms in the climate debate. The suffering mentioned by Holdren is less talked about, even though that too is evident to the world as a result of climate change.

The issue of how societies adapt to the effects of climate change has been first encountered in the developing countries. People have been forced to change their daily habits, develop new ways of doing things and even move to live in new areas because the climate has warmed, rainfall changed or extreme weather conditions have increased.

The onus for mitigating climate change is on the industrialized countries. The baseline for climate policy has been that the industrialized countries are responsible for climate change and therefore they will have to mitigate it. The term climate change mitigation describes the measures that are used to try slow down climate change, which in practice means reducing emissions and protecting forests.

At the climate conference to be held in December 2009, in Copenhagen, the traditional front line between developing and developed countries will be formed differently. For instance, Ethiopian Prime Minister Meles Zenawi said in September 2009 that Africa will veto any climate change deal that does not meet its demand for money from rich nations to cut the impact of global warming on the continent. Zenawi has sent a strong message to world leaders: developing countries are not merely silent sufferers, but are willing to shape the climate negotiations agenda.

However, the developing countries' contribution to the discussion concerning climate policy continues to grow in importance. In this report we examine the intersections between climate policy and development policy. Many of the themes dealt with have already been covered by countless bookshelves worth of material from the development perspective alone. Here we attempt to condense this material into five chapters.

Chapter 1 deals with the effects of climate change on the developing countries and the ways in which climate change makes it more difficult to achieve development aims.

Chapter 2 presents the concepts of adaptation to climate change and the mitigation of climate change, and examines the measures taken by the developing countries in these respects.

Chapter 3 examines international climate policies, especially the UN climate agreement and the Kyoto Protocol, and their extension after 2012, and the role of the different countries in the negotiations. The chapter explains the different models for allocating responsibility.

Chapter 4 evaluates the funding needs for climate policy and presents the mechanisms for climate funding. It is estimated that the developing countries will require at least 100 billion US dollars annually to implement climate measures, which equals the annual amount of development aid. This chapter introduces the most common alternatives proposed as the funding sources of the future, which are increased budget support, the CDM tax, a levy on air travel and shipping, and the global auction for emission credits.

Chapter 5 focuses on the effects on development cooperation work caused by climate change. The chapter shows how development projects are evaluated from a climate perspective and how climate change is addressed in Finland's development policy programme.

The report also contains a list of abbreviations and a list of the main concepts used in the climate debate (Appendix 1).

Tuuli Kaskinen,
Helsinki, 1 October 2009

Abbreviations

AF	Adaptation Fund
BAT	best available technology
CAN	Climate Action Network
CCS	carbon capture and storage
CCSF	Climate Change Special Fund
CDM	Clean Development Mechanism
DFID	UK's Department for International Development
EGTT	Expert Group on Technology Transfer
EU ETS	European Union Emissions Trading Scheme
EU-15	Netherlands, Belgium, Spain, Ireland, Italy, Austria, Greece, Luxemburg, Portugal, France, Sweden, Germany, Finland, Denmark and UK.
FAO	UN Food and Agriculture Organization
GDP	Gross Domestic Product
GDR	Greenhouse Development Rights
GEF	Global Environmental Facility
HDI	UN Human Development Index
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
JI	Joint Implementation
LDCF	Least Developed Countries Fund
MEM	Major Emitters Meeting
MNP	Netherlands Environmental Assessment Agency
MRV	measurable, reportable and verifiable
NAMA	nationally appropriate mitigation actions
NAPAs	National Adaptation Programmes of Action
NAPs	National Allocation Plans
ODA	official development assistance
OECD	Organisation for Economic Cooperation and Development
REDD	Reduced Emissions from Deforestation and Forest Degradation
SCCF	Special Climate Change Fund
SYKE	Finland's Environmental Administration
TRIPS	Agreement on Trade-Related Aspects of Intellectual Property Rights
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNFPA	United Nations Population Fund
WBGU	Germany's Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen
WIPO	World Intellectual Property Organization
WTO	World Trade Organization
WWF	World Wildlife Fund

More abbreviations can be found on the web pages of the UN Climate Secretariat (UNFCCC 2008a).

1. The effects of climate change on developing countries and poverty reduction

The basic information about the effects of climate change on the developing countries is readily available. The main international development organisations have carried out important work to compile this information. Nevertheless, climate change is one of those issues whose effects on industrialised countries are much better understood than their current or future effects on developing countries. For example, Britain's Department for International Development (DFID) states that so far we know very little about Africa's climate and that the continent's monitoring systems are weak and unreliable (DFID 2005,7).

According to the Intergovernmental Panel on Climate Change (IPCC), the main effects of climate change in developing countries are very high temperatures, heatwaves, more frequent torrential rain, more powerful tropical hurricanes, an increase in rainfall at high latitudes and a decrease in rainfall in the sub-tropical continental areas. The IPCC states that it is either probable or very probable that these effects will take place. Regarding the strengthening tropical hurricanes, the panel adds that there may also be a decrease in their number, although this prediction is relatively uncertain. (IPCC 2007)

The rise in sea level may complicate people's lives in the long term. For example, it is estimated that at the current rate of warming Greenland's continental ice shelf will melt almost completely. This will raise the sea level by about seven meters (Savolainen et al. 2008, 19). However, this rise in sea level related to the melting ice will happen slowly, over a period of centuries.

We live in a world that is getting warmer, but in daily life the slow pace of change is unlikely to feel much different than it is today. The situation is similar in developing countries, where it is difficult to distinguish the effects of climate change from the normal variations in the weather. Dry spells may be slightly longer than before, wells have a few litres less water, and a storm may hit

the coast perhaps every other year instead of on a three year cycle.

The slowness and uncertainty of environmental changes slows down the political decisions that need to be made. This is unfortunate, because long-term changes in the natural world can have a dramatic impact on human wellbeing. The depth of the slow transformation is illustrated by the UN Human Development Report's evaluation of the effects of drought in Kenya. According to the report, Kenyan children are as much as 50% more likely to be malnourished if they were born during a dry period. As a result of the drought in 2005, there were more than two million malnourished children in Ethiopia. Natural disasters also affect school attendance: Indian women born during the floods of the 1970s attended school 20% less than those born before or after the floods. (UNDP 2007)

The UN Human Development Report presents five transmission mechanisms through which the effects of climate change either become dramatically visible or indirectly affect developing countries and the lives of the people living in them (UNDP 2007):

1. **Reduction in arable land and the weakening of food security.** Areas affected by drought in Africa may increase by 60-90 million hectares, which would mean the loss of 26 billion US dollars by the year 2060.
2. **Shortage of water.** Changes in precipitation and the melting of the glaciers hinder the storage and availability of fresh water. By the year 2080, more than 1.8 billion more people may become vulnerable to water shortages. The worst situation is in the Himalayan region where seven major Asian river systems may suffer from a lack of water as the glacier melts.
3. **Rise in the sea level and more frequent storms.** If the climate is allowed to warm by 3-4 degrees, 330 million people will have to leave their homes due to flooding. For example, Bangladesh will face great difficulties because its people live in very low-lying areas. The warming of the seas increases the risk of storms. Storms would create severe problems to the one billion people living in the slums of the big cities, because floods and landslides threaten their homes, which are very densely built on slopes.

4. **Changes in eco-systems and biodiversity.** If the climate warms by three degrees, about a third of all land organisms will be in danger of becoming extinct. Countless numbers of essentially important medicinal plants would disappear. The disappearance of whole eco-systems would reduce the biocapacity of the planet.
5. **Increase in diseases.** About 440 million more people could die of malaria annually, which currently kills about one million people in a year. Dengue fever has already become prevalent at higher altitudes than at any time before.

Table 1. Highly probable effects of climate change in Africa, Asia and Latin America (IPCC 2007)

Africa	<p>By 2020, between 75-250 million people are projected to be exposed to an increase of water stress exacerbated by climate change.</p> <p>Rain-fed agriculture may be halved in some countries from the current level by 2020. Agricultural production and access to food will worsen significantly in many African countries. This would further weaken the security of food production and increase malnutrition.</p> <p>The projected sea-level rise will affect low-lying, densely populated coastal areas by the end of this century. The cost of adaptation could amount to at least 5-10 % of the countries' GDP.</p> <p>In many climate scenarios the share of land in Africa that is arid or semi-arid is expected to increase to 5-8%.</p>
Asia	<p>Climate change will reduce the availability of fresh water by 2050 in Central, East and South-East Asia, particularly in the large river basins.</p> <p>Coastal areas are the most vulnerable, especially the densely inhabited river deltas of South, East and South-East Asia. They will face flooding from the sea, while some areas will also be affected by river floods.</p> <p>Climate change is expected to intensify other pressures on natural resources and the environment, such as rapid urbanisation and industrialisation.</p> <p>Endemic morbidity and mortality caused by floods and droughts is expected to increase in East, South and South-East Asia due to projected changes in the hydrological cycle.</p>
Latin America	<p>Increases in temperature and associated decreases in ground water reserves are projected to lead to the gradual replacement of tropical forest by savanna in eastern Amazonia. Semi-arid vegetation will tend to be replaced by arid-land vegetation.</p> <p>There is a risk of significant biodiversity loss through species extinction in many areas of tropical Latin America.</p> <p>The productivity of some important crops is projected to decrease and livestock productivity to decline, with adverse consequences for food security. In temperate zones soybean yields are projected to increase. The general forecast is that the number of people starving will increase (medium certainty).</p> <p>The change in rainfall patterns and the disappearance of the glaciers will greatly affect the availability of water. This will affect water servicing, agriculture and hydropower generation.</p>
<p>These observations are, unless otherwise stated, drawn from the IPCC's Second Working Group's Synthesis Report, and their reliability is assessed as high or very high. They concern different sectors (agriculture, ecosystems, water, health, industry and communities). The Synthesis Report includes the references and estimates about the timing of the impacts and the changes in temperature. The force and timing of the impacts will ultimately be defined by the speed of climate change and adaptation. (IPCC 2007)</p>	

The transmission mechanisms involved affect each other closely. For example, weakening food security exposes people to serious illnesses, like malaria. Different mechanisms are at work in different areas, and some areas are already more vulnerable to the effects of climate change due to their economic circumstances.

Climate change also affects development by weakening the security situation. A report by the German Advisory Council on Global Change (WBGU) presents the effects of development goals and international security on each other. For example, the water shortage caused by climate change and the consequent rise in the number of environmental refugees may cause friction in inter-governmental decision-making. (Schubert et al. 2007, 117)

The projections for the number of refugees caused by climate change vary widely. In the mid-1990s, it was estimated that the figure in 2050 would be about 1.5 million. Stern, for example, still views this figure as being credible in his renowned report on the economic effects caused by climate change (Schubert et al. 2007, 118).

In practice, most migration will take place inside and among developing countries, and only a very small part of the refugee flow will be directed to industrialised countries. (UNFPA 2006)

Those areas suffering the most from climate change are already being evacuated. Papua New Guinea's Carteret Islands will be emptied during the next ten years. Tuvalu's island state has already agreed that its inhabitants can move to New Zealand. Evacuating the small island states is fairly easy and these first plans have been followed closely by the media (see, for example, Digitaljournal 2008).

2. Adaptation to climate change and its mitigation in developing countries

It is necessary to start adaptation and mitigation activities throughout the world. The effects of climate change require the most attention in developing countries, where living conditions are already more difficult than in industrialised countries. Due to the poor social infrastructure in developing countries, even small changes are a challenge, and so their need for adaptation is particularly acute. The industrialised countries, on the other hand, produce most of the emissions, so for them it is the mitigation or prevention of climate change that is the most important activity. In addition to mitigation, it is possible to reduce the amount of greenhouse gases in the atmosphere by Carbon Capture and Storage (CCS). This technology is still under development, however.

It is generally accepted that the more preventive measures that are taken against climate change, the less need there is for adaptation. For example, the projections on the economic impacts of climate change are based on this idea in the report by Nicholas Stern, former chief economist of the World Bank and currently, the advisor on climate change to the British government. According to Stern, the 20% fall in GDP that threatens all the countries in the world in a hundred years time can be avoided by directing about 1% of GDP to climate change mitigation (Stern 2006). Environmental organisations also believe that there should be investment particularly in climate change mitigation.

However, since the 2006 climate conference in Nairobi, adaptation has become a more important topic of debate. Because greenhouse gas emissions have increased more strongly than expected, it is predicted that the need for adaptation will grow commensurately. The Nairobi work programme was created precisely to focus on evaluating the need for adaptation and to securing the funding required for adaptation measures (UNFCCC 2008b). Accordingly, both the political process and the research data support

the view that the role of adaptation in climate policies is still set to increase further. Many environmental and development organisations have since then supported the emphasis on adaptation measures (CAN 2008).

Adaptation is necessary

Throughout history human communities have survived the effects of phenomena related to the weather and the climate. However, the effects of current climate change are simultaneously both remarkably big and fast, so the adaptability of the environment and the human population is stretched to the limit.

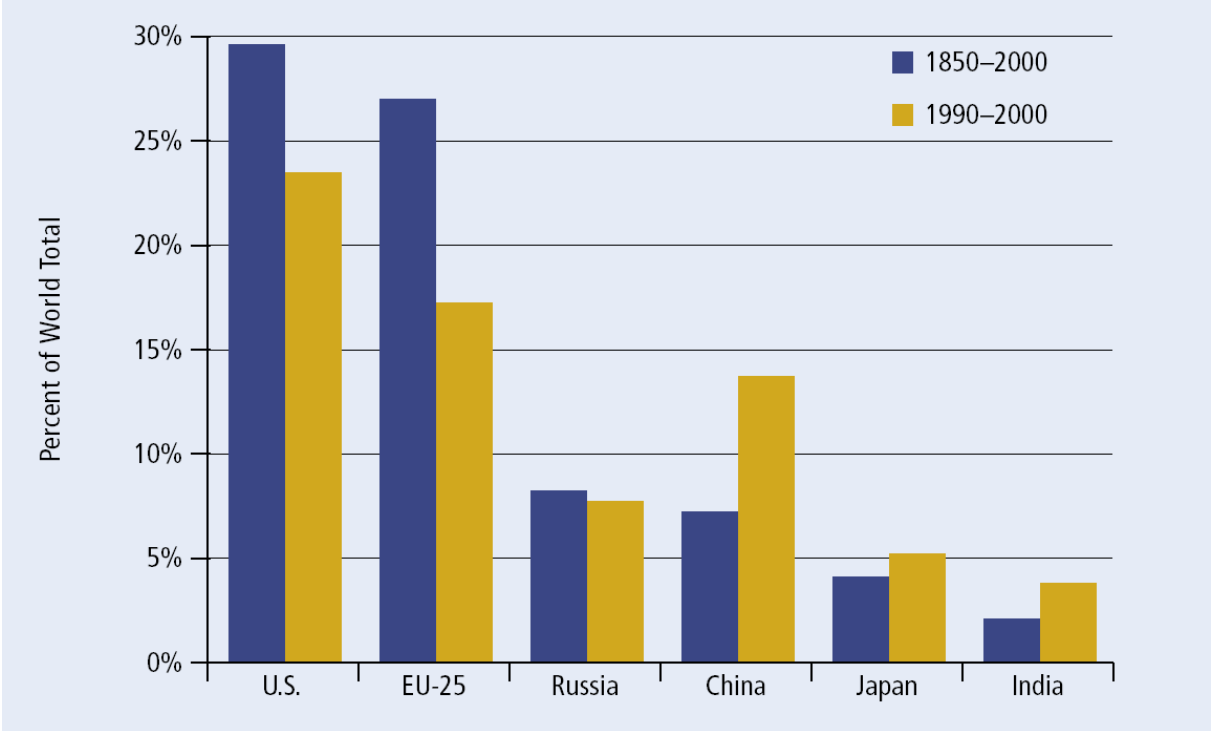
The ability of local communities to adapt to climate change may depend on many factors. Their adaptability is influenced, for example, by their natural resources, economic situation, social networks and rights, human capital and institutions, governance, national income, health and technology. Nevertheless, even the above-mentioned strengths do not make communities invulnerable to changes in the weather and extreme phenomena. Hurricanes and the rising sea level can ravage the major cities of the rich coun-

tries just as easily as the most remote rural areas of developing countries (IPCC 2007).

Adaptation to climate change has already started in a limited way in many areas. In 2005, the Tyndall Centre’s research programme examined the adaptation methods of rural communities in South Africa after the region’s rainfall had decreased and become more unpredictable. The people living there said they were trying to adapt, for example, by eating fruits from the forest, planting species that produce a quick harvest, selling animals, trying to start new livelihoods, and by looking for temporary work (Thomas et al. 2005, 15). However, most of the measures taken by the local community can only temporarily improve the situation. As harvesting seasons decline, the volume of natural fruits decreases and short season crops produce less.

The adaptability of local communities is limited. Developing new livelihoods is a central part of adapting to climate change in areas where the output of traditional livelihoods like agriculture is decreasing. Developing new models is expensive and difficult, however. Most people are not able to create the capacity for new livelihoods for themselves and their families.

Figure 1. Cumulative carbon dioxide emissions in 1850-2000 and 1990-2000 (Baumert et al., 2005, 33).



Percentage of the world's total emissions

In its report on adaptation, the international development organisation Oxfam suggests that the efforts of local communities to adapt to climate change bring sustainable results when they are integrated with strategic decisions on the national level and with international support. According to Oxfam, adaptation work has a chance of succeeding when:

- Its starting point is based on the local understanding of the situation and local needs.
- The adaptation measures are linked to wider development plans.
- Institutions and structures are developed to support the adaptation work.
- All the parties involved are given adequate information.
- Appropriate technology is provided for the target areas.
- The vulnerability of livelihoods to the climate is reduced.
- The ecosystems and infrastructure are protected from the effects of climate change. (Oxfam 2007, 15)

The costs of adaptation to climate change are significant on a global scale but still smaller than, for example, the current development aid funds. Oxfam estimates that additional funding of 50 billion US dollars is required for adaptation to climate change in the developing countries. This is about half the current level of public overseas development assistance (Oxfam 2007, 17).

Mitigation is a great challenge

The objective of preventing climate change is to influence the warming of the climate in such a way that it does not cause permanent changes to the climate system. In practice, this means reducing the levels of the six greenhouse gases in the atmosphere. The UN climate agreement is based on the idea of responsibility: the industrialised countries have caused climate change, so they must stop it. The starting point is justified because industrialised countries have produced many times the amount of emissions per capita compared to developing countries. Figure 1 (page 10) shows that from 1850-2000 the United States, the European countries and Russia produced the most emissions. They are therefore responsible for a large part of the emissions that are currently warming up the atmosphere.

Figure 1 also shows that the big developing countries are increasing their emissions. China overtook the United States as the world's largest producer of carbon dioxide emissions in 2006 (MNP 2007). One third of China's emissions is caused by the production of export goods, but China's domestic consumption is also constantly growing (Peters 2008). At the same time, emissions of other large developing countries like India and Brazil have been growing. However, the emissions of the world's poorest countries, for example the whole of the African continent, are still very small on a global scale.

In recent years all the industrialised countries have been speaking strongly about reducing emissions and the need to also mitigate climate

Figure 2. Emissions from the industrialised countries and developing countries in 1990 and 2050. (Criqui et al. 2003)

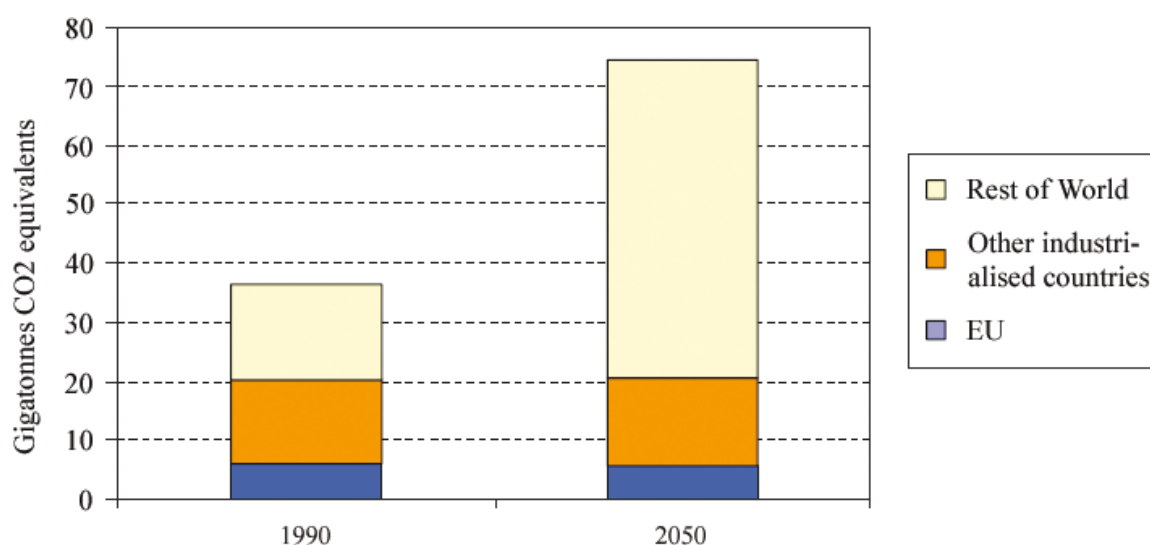
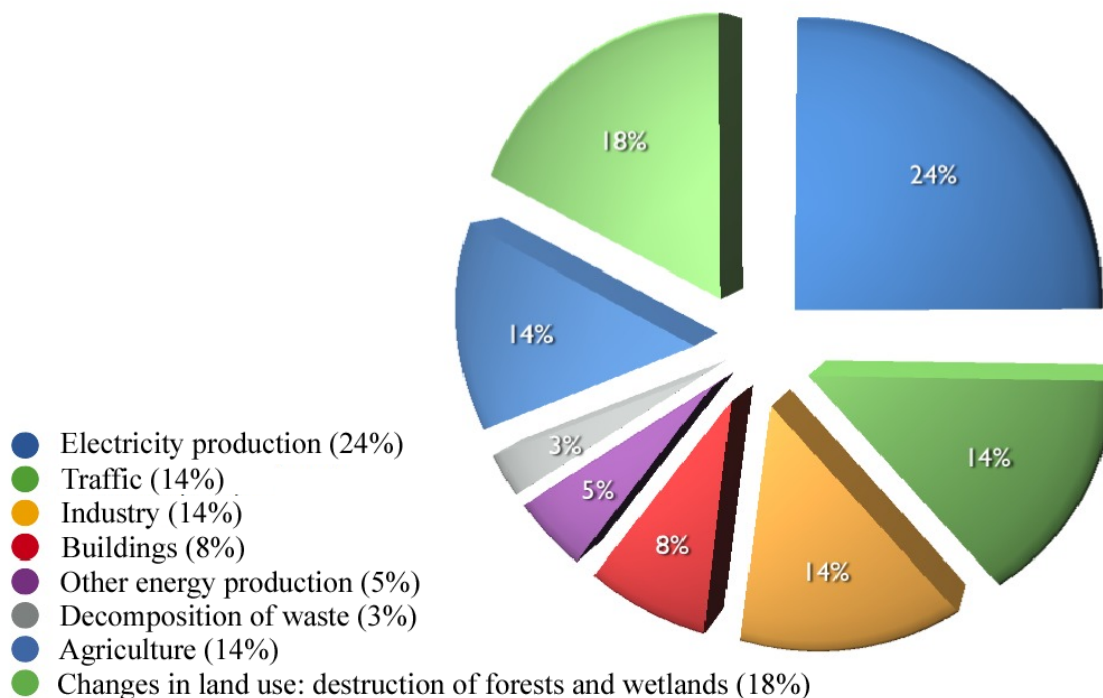


Figure 3. Global distribution of the world's greenhouse gases by sector (Stern 2006)

Sources of greenhouse gases



change in the developing countries. At the Nairobi climate conference in 2007, the EU presented a picture (Figure 2, page 11) of the emissions by the industrialised countries and developing countries in 1990 and 2050 with the objective of reminding everyone that emission limits in the industrialised countries are not enough to prevent climate change. Unless the emissions from the developing countries are controlled, by 2050 they will increase to twice the level currently produced by the industrialised countries.

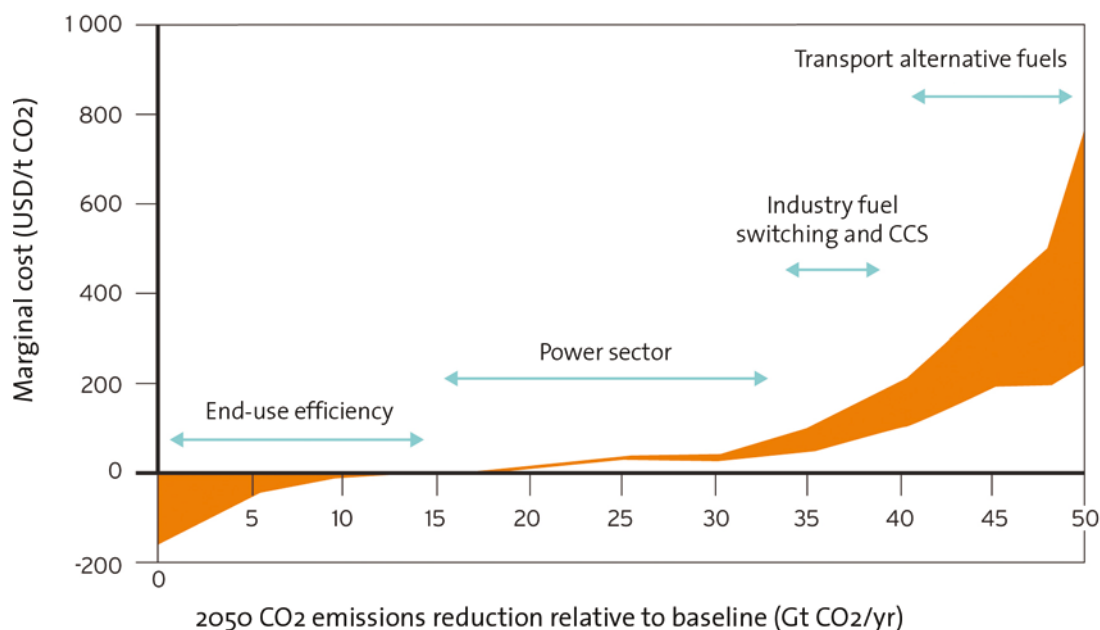
Preventing a climate catastrophe requires rapid measures to reform the global energy system. As mentioned, changes will need to be made both in industrialised and developing countries. Since the beginning of industrialisation, the economic growth of most of the world's countries has been tied to the use of fossil fuels and consequently to the increase in greenhouse gas emissions. Therefore a transition to a low-carbon world where the wellbeing is built on renewable energy, services and know-how, is inevitably a major transformation.

Stern's report presents perhaps the most useful picture (Figure 3) about the sources of the world's greenhouse gas emissions. No single sector causes more than a quarter of the global warming, so the problem of climate change cannot be resolved by individual measures, such as wind energy or electric cars, but by a diverse range of different measures. According to the IPCC, there is a need for technological measures and those related to lifestyles, so that the necessary reductions in emissions can be achieved (Stern 2006; IPCC 2007).

The methods of mitigating climate change are often the same in the industrialised countries and developing countries. As shown in Figure 4 (page 13), the cheapest method is usually to improve energy efficiency. According to the International Energy Agency (IEA), energy saving investments are usually profitable to companies because the repayment periods for these investments are typically short (IEA 2008).

The IPCC's Fourth Assessment Report has compiled measures for mitigating climate change that have proved to be particularly effective from

Figure 4. Marginal emission reduction costs for the global energy system, 2050 (OECD/IEA, 2008).



the environmental perspective. According to the report, different price control systems like taxes, charges and emission trading systems are the most effective national measures to mitigate climate change. The price of carbon should always be included in the assessment of all production costs. The IPCC also raises the importance of building regulations and restrictions in reducing emissions (IPCC 2007).

In addition to emission reductions and afforestation, there has recently been much debate about the importance of Carbon Capture and Storage (CCS). According to the IPCC's special report on carbon capture, a fifth of the reductions in 2100 can be accomplished with carbon capture (IPCC 2005, 13). The problem with carbon capture is that the first capture technology will not become commercially available until the 2020s.

Of the developing countries, China has already presented a wide-ranging climate programme to reduce emissions. The programme aims to increase energy efficiency by 20% and increase the use of renewable energy sources to 10% by 2010. As for the necessary political measures, the report discusses reforms in legislation and taxation, cutting down on wasted energy use, reforming forest management and rice cultivation methods, as well as increasing hydro and nuclear power (China's National Climate Change Program 2007).

China is not the only developing country striving for emission reductions. Already in 2002, the Pew Center on Global Climate Change examined climate activities in Brazil, China, India, Mexico, South Africa and Turkey. The main results of the report are still valid. According to the report, active measures have already slowed down the growth rate of emissions in developing countries. The objective of the climate measures is not only to achieve emission reductions, but also to promote development, poverty reduction, local environmental protection and energy availability. Decision-makers should link the emission reduction measures to development objectives, so that there are benefits from both (Chandler et al. 2002).

Speeding up technological development

From the climate perspective, the last hundred years has been a very damaging phase in the industrialisation process of the industrialised countries. The developing countries should avoid the strong growth phase based on the use of fossil fuels during their process of industrialisation. If the industrialisation of the developing countries follows the model of the industrialised countries, the crises caused by global environmental problems will undermine international security.

The prevention of climate change requires the transfer of modern technology to the developing countries and the rapid utilisation of the innovations being developed. The industrialised and developing countries consider it important that new technological innovations support the development of the national economies in addition to their beneficial impacts on the climate (WIPO 2008). Research shows that technology transfer to the developing countries has improved industrial productivity in the target countries. There are good examples of this, for example in India (Kinge 2005). Technology transfer is believed to support both micro and macro-level economic development in the developing countries (Jochem & Madlener 2003). In particular, involving the poorest countries in the prevention of climate change requires an investment in technology transfer (Tiilikainen 2007). In addition to the climate agreements, technology transfer is affected by the trade agreements currently in force.

Climate friendly technology is not just about high technology. The daily activities of individual people, such as heating and cooking, have a central role in preventing climate change. In practice this means that the familiar ways of doing things will be replaced by new technologies and practices. One example is the parallel use of solar and anila cookers (see pages 15-16).

Development cooperation should support the participation of the developing countries in technological development in order to produce local, easy to apply technological solutions. The role of consumers in the developing countries in developing this type of technology may be decisive. Consumers can pressurize and encourage companies to develop better products, which can in turn influence political decisions at the national level.

Slowing down deforestation

Preventing global deforestation is also important in mitigating climate change. More than half of the world's original forests have been destroyed. According to the UN Food and Agriculture Organisation (FAO), deforestation already causes a quarter of the world's carbon dioxide emissions. The IPCC has also stressed that mitigating deforestation has a significant role in preventing climate change. It is very problematic that climate change and the destruction of the forests have an accelerating effect on each other. The destruction

of the tropical rain forests may in particular lead to unexpectedly large disasters (WWF 2008d).

Deforestation is a threat to the national economies of many developing countries, as well as to the wellbeing of people and the whole animal domain. Deforestation is most intense in Indonesia, where almost half of the forests have been destroyed during the last 50 years. Although deforestation has been more successfully managed elsewhere, the deforestation of Brazil and Indonesia is of the same magnitude as the fossil fuel emissions of the EU (WWF 2008c).

The Amazonian rainforests, most of which are in Brazil, have been called the lungs of the world for good reason. The rainforest area acts as a carbon sink and stores almost 12% of the carbon dioxide in the atmosphere. According to some researchers, the destruction of the Amazon rainforests is approaching the point beyond which the forests can no longer renew themselves (Ministry for Foreign Affairs of Finland, Development Communications Group 2008). The UNEP web page provides a good description of the carbon dioxide captured by the rainforests (UNEP 2008a).

From a sotrama to a private car or to demand responsive public transport?

In Bamako, the capital of Mali, in Western Africa, public transport is taken care of by the same minibuses as in thousands of other cities in developing countries. In Bamako the minibus is called a *sotrama* and it follows a predetermined route without a timetable.

As the country becomes wealthier, there is a danger that people are starting using private cars instead of the sotramas. From the perspective of preventing climate change, it would be much wiser to develop the minibus transport with a demand responsive public transport model where the passengers either inform the minibus company in advance what time and where they will be boarding, or the route can be notified through the internet or by mobile phone. The minibus then collects the passengers from their homes and takes them to their destination, just like a private car, but causing fewer emissions.

Solar cooker and anila stove – an unbeatable combination?

No other appliances can produce energy as cheaply and cleanly as solar cookers. Solar cookers could significantly reduce the consumption of both fossil fuels and firewood. This, in turn, would reduce the carbon dioxide and soot emissions and the amount of microparticles in the air, which are dangerous to humans. It would also ease the renewal of trees and other vegetation, which would remove a lot of carbon dioxide from the atmosphere and increase groundwater formation, especially in mountainous areas.

However, solar cookers have not yet become the essential appliance found in every home. Instead of billions, only a few million solar cookers have been produced. The solar cookers that are currently on the market are still much too expensive for the world's poor families. Even more importantly, they cannot be used when it is raining or after sunset. This is a major flaw since most cooking takes place in the evening or early morning. Due to this hard fact, people therefore always also need another type of cooker, which can easily make the solar cooker seem like something of an extra luxury.

Perhaps Third World governments and the different national and NGO development cooperation organisations should start distributing packages consisting of two different types of cookers instead of just the solar cooker. All the poor families should also be given or sold (at a heavily subsidised price) a combination that includes a parabolic solar cooker and another type of cooker that can be used when the sun is not shining.

The parabolic solar cooker can also be used for many other purposes, in addition to making food. If a transparent glass bottle with dirty water is placed at the focal point of the solar cooker, the concentrated ultraviolet radiation kills the different bacteria from the water more efficiently than boiling. If the contents of a 15 litre water bottle are heated near to boiling point and the bottle is lifted inside a hut in the evening, it warms up the hut for a few hours just as efficiently as a small electric radiator. The parabolic solar cooker can of course also be used to strengthen the signals for television, radio and mobile phone networks. It works for this purpose even after sunset!

The best companion for a solar cooker could be the anila stove, technically known as the "household level biomass gasifier" developed in Mysore in the Karnataka state of India. The word "anila" means "gas" in the Kannada language.

At the centre of the anila stove is a high 16 litre combustion chamber. This is surrounded by a 33 litre, ring-shaped container that can be closed airtight. At the bottom of the airtight container is a series of small holes leading to the combustion chamber. When the cooker is in use, the hollow outer ring is filled with any kind of biomass such as tree needles, leaves, single cell blue-green algae mass, hay, straw or other leftovers from the harvest. Then this ring-shaped space is closed as airtight as possible and the combustion chamber itself is filled with some dry, flammable material.

The combustion chamber is lit from the top so that the gassy substances and soot particles cannot escape through the flame without burning. When the biomass inside the airtight ring heats up, it releases gasses that expand through the holes to the combustion chamber. This is why the stove still burns with a clean gas flame a long time after the biomass has finished burning in the actual combustion chamber.

With regular heaters and stoves most of the energy content from the wood or other biomass is lost along with the evaporating gases. The anila stove can also utilise these burning gases, which makes it uniquely efficient among the small stoves. The combustion is also very clean. Above all, the biomass stuffed inside the airtight ring does not burn completely but is merely carbonised. Each time the stove is used for cooking, it therefore produces 33 litres of fine charcoal.

If fine charcoal is mixed with chemical fertilizer or organic fertilizer, there is much less need for fertilizer because the nutrients are attached to the surface of the charcoal fragments and do not drain away with water to the lower soil layers. The more it rains and the harder the downpours are, the greater the benefit for a particular location. Adding charcoal to the soil also builds up the soil's carbon stock. More information about the use of charcoal in agriculture can be found on the internet by searching the words *terra preta*, *terra preta do Indio*, *Amazonian dark soil/earth* or *biochar*.

If the anila stove's lower part is not closed carefully enough, a small part of the carbon monoxide that forms inside the ring can escape outside the stove instead of going into the combustion chamber. For this reason it is recommended that the stove is not used for cooking indoors.

- Risto Isomäki

Figure 5. As a by-product of cooking, Anila stoves can carbonize fine biomass (such as pine needles, leaves and ears of maize) into high quality charcoal in the cylinder surrounding the combustion chamber. This can be used as fertilizer on fields and gardens or be compressed into combustible charcoal briquettes.

PHOTOGRAPHER: JANI MÄNNIKÖ



Climate change mitigation changes daily life in developing countries

More than a billion people – every sixth one of us – live on less than a dollar a day. The daily life and standard of living of these people is often not dependent on fossil fuels to the same extent as the world's richest people living in the industrialised countries. Consequently, the mitigation measures that will probably increase the price of energy will not cut into the essential prerequisites of life for people living in the developing countries in the same way.

Nevertheless, a large part of the world's poor also belong to the global economic system. Justin Yifu Lin, the chief economist of the World Bank, has predicted that the crisis will cause serious damage when it reaches the developing countries (KEPA 2008). If the increasing demand for biofuels holds back food production further and increases the price of food, the cost of daily food may rise to an unreasonable level. The increasing price of fertilizers and seeds may mean smaller harvests for the poor farmers.

Climate change will probably also affect the price of the products used in the developing countries. In African villages, people watch television and usually use electric lighting in the evenings, powered by oil-powered generators. The cost of these kinds of arrangements will increase, and hopefully they will be replaced by some strong local renewable energy production. Household solar panels, small wind turbines and biogas use are especially promising alternatives. The small-scale production of human-created electricity may also become more common. A mobile phone is fully charged by a dynamo fixed to a bicycle wheel during a half-hour ride. New products that can be assembled and improved from parts may reduce the energy consumption of appliances and ease the daily life of the poorest people.

In addition to the small local changes, preventing climate change also alters the division of labour between countries in the production of goods and services. The biggest losers will be the oil and coal producing countries. For example, 90% of Saudi Arabia's export earnings currently consist of oil production (EIA 2008). Many other developing countries are also wrestling with the same problem. As natural resources diminish, the volume of primary production is also likely to fall. If the consumption habits of the industrialised countries really do start favouring more locally grown food as transport costs increase, the problem may also reach agricultural producers like fresh vegetable and fruit producers.

A decrease in the total use of natural resources would also lead to a fall in the production of clothes and consumer goods. In the current situation, this would have a negative economic impact particularly in the Asian countries. It is also probable that energy-intensive heavy industry will relocate to areas where emission-free energy production is the easiest. This would favour the areas around the equator, where the opportunities to increase solar, wind and bioenergy are substantial. Energy production for both export and domestic needs will probably employ considerably more people on the equator than at present.

The community planning decisions made in the developing countries have a major impact from the perspective of climate change. The world's population growth is currently almost completely focused on the cities, and in the future town planning and construction will also drive emissions in the developing countries. It is already a familiar sight for us to see the streets of Beijing full of cars, but the same phenomenon can be seen in all the world's major cities. We are now living in decisive times: will the major cities in the developing countries be built to benefit cars or as holistically planned zones that favour cycling and walking, and where services and workplaces are easily accessible?

3. International climate policy and the developing countries

The UN climate agreement was made at the UN Conference on Environment and Development in Rio de Janeiro in 1992. Two other environmental agreements were made at the same time: the agreements on biodiversity and desertification. The commitments of the biodiversity agreement are directed to developing and industrialised countries. The desertification agreement focuses on preventing soil degradation in areas affected by desertification, particularly in Africa. From the outset, the desertification agreement has been at least symbolically important especially to the developing countries.

The three UN environmental agreements were established on an equal footing to guide the countries of the world towards sustainable development. Almost two decades after the agreements were made, it is clear that the climate agreement has grown into an incomparably wider agreement that defines the relations between the countries that have ratified it. The significance of the agreement in directing money flows is also increasing all the time. At the same time, the desertification agreement, the favourite of the developing countries, has deteriorated to an almost non-existent talking shop that some EU countries have even suggested be discontinued.

The climate agreement has been ratified by 192 countries, all the countries of the world. It defines the main principles of the climate process and, for example, the majority of the funding directed from the industrialised countries to the developing countries has been settled through the climate agreement. The agreement was supplemented by the Kyoto Protocol in 1997, which defines the continuation of the framework agreement: the percentage emission targets for the industrialised countries in the period 2008-2012.

There was a drawn out period of suspense before the Kyoto Protocol came into effect because Russia, Australia and the United States delayed the ratification of the agreement into this decade. Russia finally joined the agreement in 2005,

after holding negotiations with the EU regarding its membership in the World Trade Organisation (WTO). The Kyoto Protocol came into effect when Russia ratified it. Australia ratified the agreement after the Labour Party won the parliamentary elections in 2007. The United States has not joined the agreement and can no longer join it because the emission reduction target would be too demanding. Instead, the United States and all other countries can join in the second phase of the Kyoto Protocol starting from 2012.

Country-specific commitments in the climate agreement and the Kyoto Protocol

The climate agreement and Kyoto Protocol are based on a system where different commitments regarding climate change are targeted at different groups of countries. These apply to all the signatories to the agreements, including the developing countries. The diversity of these commitments is often forgotten, for example in the public debate in Finland. The media has started to view the emission reduction commitments as the only binding commitments in the agreement. However, all the signatories to the UN climate agreement have committed themselves to implement programmes for mitigating and adapting to climate change, to protect carbon stocks and sinks (forests), to pay attention to the technology transfer directed to the developing countries, to study the quantity of their greenhouse gas emissions and report this to the secretariat of the agreement, and to support climate observation and research.

All the signatories to the agreement can also participate in the Kyoto project mechanisms, i.e. in the Clean Development Mechanism (CDM) and Joint Implementation (JI) (see page 26). The industrialised countries are funding emission reduction projects in the developing countries in the CDM framework and in the transition countries within the JI framework.

The climate agreement is based on the principle of joint but differentiated commitments. Accordingly, the industrialised countries have a special responsibility to lead the measures for mitigating climate change. In the language of the agreement, the industrialised countries are called Annex I countries and they include the EU countries, transition-economy countries, as well

as Norway, Switzerland, Canada, Japan, New Zealand, Australia and the United States. The first phase target set for the industrialised countries in Rio was to return to the level of greenhouse gas emissions of 1990 by the year 2000. There were no sanctions linked to reaching the target, which in practice meant that the countries failed to reach the target.

A document was made from the Kyoto Protocol that is more binding on the industrialised countries. The agreement limits the emissions of the six greenhouse gases in the period 2008-2012 by an average of 5% of the 1990 level. No emission reduction targets have been set for the developing countries so far in the climate process (Ministry of the Environment of Finland 2008).

The industrialised countries can decide themselves what kind of measures they will use to reach their emission reduction targets. For example, Finland decided in 2002 that building more nuclear power stations was the most important emission reduction measure. The industrialised countries can also make emission reductions outside their borders by acquiring emission reduction credits from developing countries and transition-economy countries under the so-called Kyoto mechanisms.

Many of the tasks mentioned above are a challenge to the developing countries and they need additional funds and capacity building to implement them. Calculating the climate emissions and reporting the quantities in national country reports is a fairly complicated task, which in Finland has been given to Statistics Finland (see, for example, Statistics Finland 2006).

There are considerably less parties in the developing countries able to produce the calculations, and the quality of the information they produce varies widely. The developing countries have also been half-hearted about developing the calculation. Accurate calculation data could gradually give the industrialised countries an opportunity to demand different kinds of emission reduction measures, and finally a commitment to an emission reduction target. The least-developed countries receive special funding for adaptation measures through the climate agreement. In order to get this support, the countries have to prepare a National Adaptation Programme of Action (NAPA), which is used to identify the major adaptation measures for each country. The objective is to create a special support mechanism for the least developed countries that are suffering the most from climate change. The objective of

the NAPA programmes is to examine the adaptation needs locally, even at a grassroots level. The planning of the measures aims to satisfy the everyday adaptation needs of people as effectively as possible (UNFCCC 2008c).

Towards the Copenhagen climate agreement

The term of the Kyoto Protocol expires at the end of 2012. Negotiations are currently taking place about the structure of the new agreement and its specific emission reduction commitments for different countries. The task is even more difficult than before because global emissions have grown more than predicted a few years ago (see for example WWF 2008a). Hopes have been raised because the United States, led by President Barack Obama, will probably participate in the negotiations more keenly than before.

The negotiations about the follow-up to the Kyoto Protocol began already in 2005 at the Montreal Climate Conference. Since then negotiations have been held on several tracks, because the parties to the climate agreement are in very different positions in the follow-up negotiations.

The countries that signed the Kyoto Protocol are negotiating in their own group about the follow-up measures¹. It has been possible to negotiate directly about binding emission reductions and their quantities because all the countries are already within the scope of the emission reductions. However, the negotiations on the other, so-called climate agreement track have made slower progress. The developing countries do not readily discuss the emission reduction targets that concern them, and the industrialised countries are not eager to put themselves forward as funders of the emission reductions or adaptation measures.

In December 2007 the Bali climate conference agreed on the so-called Bali Action Plan. It decided that the follow-up negotiations on the climate agreement should be completed at the Copenhagen Climate Conference in December 2009. A new ad hoc working group was established to reach the agreement².

In addition to the joint vision aiming for agreement at the Copenhagen climate confer-

¹ *Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol, AWG-KP.*

² *Ad Hoc Working Group on Long-Term Cooperative Action under the Convention, AWG-LCA.*

Implementation of the Kyoto Protocol commitments in the EU

The European Union acts as a single negotiating group in the UN climate negotiations and forms a so-called emissions 'bubble' concerning the allocation of emission rights. This means that a single emission reduction target has been formulated for the EU as a whole, which it has been able to allocate freely among its member countries. For example, in practice Finland can keep its emissions at the 1990 level, although the EU's target as a whole is to reduce its emissions by 8%.

The EU countries are jointly responsible for reaching their emission targets, so the measures for emission reductions are also decided in the framework of the EU's joint climate policy:

- The EU has established the European Union Greenhouse Gas Emission Trading Scheme (EU ETS), which is the world's largest and most comprehensive system for trading emissions. This started operations in 2005 and the EU has already stated that the emission trading scheme will continue even after 2012. The emission trading scheme equalises the incremental costs in the EU area. At the same time, the EU has increased the use of the Kyoto flexible mechanisms (CDM and JI), because the emission rights gained through the mechanisms can be brought into the emissions trading. During the current emission trade period the emissions have been divided by country according to the National Allocation Plans (NAPs) (European Commission 2008).
- The EU's climate and energy package is the second central tool for reaching the emission target. The package includes the so-called 20-20-20 targets: by the year 2020 the EU will reduce emissions by at least 20%, improve energy efficiency by 20% and increase renewable energy to 20% of total energy production.
- The emission reduction measures have required weighty negotiations from the EU countries. In practice, the European Commission makes the proposals about the measures, the European Parliament comments on them, and the decision is made by the ministerial council, which consists of the representatives of the member countries. Typically, the commission's proposals are significantly watered down as the negotiations progress. The negotiations have, however, led to positive results because at the moment it seems that the EU-15 countries will reach their target of reducing emissions by 8% (EEA 2008).

ence, the Bali Action Plan includes four themes: climate change mitigation, climate change adaptation, technology transfer and funding. Technology transfer has always been on the agenda of international climate negotiations, but in Bali technology transfer was no longer discussed as merely a technical issue and was given a more important role than before.

The real significance of technology transfer has only been recognised recently and is now seen as an important tool in preventing climate change. An important proposal was made in Bali regarding the emission reductions of the developing countries. Previously the developing countries were not even willing to discuss their emission reductions, because they wanted to keep to the basic idea that the industrialised countries should reduce their emissions first. In Bali a new term came into use, Nationally Appropriate Mitigation Actions (NAMA), which refers to the different emission reduction measures undertaken in the developing countries. These are not the

same, however, as the emission reduction commitments of the industrialised countries, which result in sanctions if they are broken.

The industrialised countries have demanded that the measures by the developing countries are measurable, reportable and verifiable. The MRV acronym therefore refers to the developing countries' commitments to mitigate climate change. It also requires that the industrialised countries support the technology transfer from the industrialised countries to the developing countries and strengthen the know-how of the developing countries in climate matters.

According to the Bali Action Plan, the negotiations will include all the signatories to the climate agreement, discuss the activities of the Kyoto Protocol signatories and the climate measures of the developing countries and the United States.

The Bali Action Plan started an intensive negotiation process under the climate agreement, which aims towards a longer-term climate agree-

ment by the end of 2009. The agreement should therefore be reached at the Copenhagen Climate Conference in December 2009 (UNFCCC 2007a).

Burden sharing in the forthcoming Climate Agreement

The discussion about the new climate agreement is in practice a discussion about the rights and responsibilities of different countries concerning climate change after 2012. Burden sharing usually refers to the distribution of the emission reduction commitments. Funding issues will play an even more important role in the new agreement, so many countries have started using the term 'commitment sharing' to refer to both the emission reduction commitments as well as the funding commitments.

When the climate agreement was signed in 1992, the emissions of the developing countries were small compared to the industrialised countries. In 2007 the share of the developing countries' emissions was already 53%. During the follow-up negotiations to the Kyoto Protocol, it has become clear that the majority of the industrialised countries can no longer accept an agreement that would only reduce emissions in the industrialised countries. The most intense debate is currently about the quantities of and timetable for the developing countries' emissions.

All countries have until now been divided into two groups in the climate negotiations: the

industrialised countries, with their emission reduction commitments, and the developing countries, whose commitments are considerably less. It seems that reaching a new agreement will require the reform of this division and especially the division of the developing countries into several groups based on their level of development. There have been many models proposed for dividing the groups. The reasons behind them can be summarised by dividing the countries into four groups as shown in Table 2.

The countries have been divided into four groups on the basis of three different indicators:

- Opportunities (emissions per capita and emissions per GDP)
- Responsibility (old emissions)
- Readiness (GDP per capita or the Human Development Index)

Many different criteria need to be used to form the groups. In addition to the level of economic development and emissions, the commitments that are allocated to different countries are influenced by their internal distribution of income, structure of production and level of technological development. This makes the negotiations more difficult and inevitably leads to a situation where the final allocation of commitments is the combination of many benefit perspectives that does not correspond to the individual ideal models.

The Climate Action Network (CAN), which coordinates the policy work of the environmental and development organisations regarding the climate agreement, has not recently expressed a

Table 2. Possible division of countries in the new climate agreement and ideas about country group-specific commitments (adapted from Ott et al. 2004, 46; in Finnish Kyllönen 2006,5)

Country group	Countries	Commitments
1. Old and new industrialised countries	Current industrialised countries, i.e. Annex 1 countries plus Turkey, Kazakstan, South Korea, Mexico, Saudi Arabia	Emission reduction targets according to the Kyoto Protocol model but significantly bigger.
2. The world's new industrialised areas	China, Thailand, Malaysia, most of Latin America, part of North Africa, South Africa	Sector-specific emission reduction targets (MRV). The country would benefit economically from a result below the target level but failure would not lead to sanctions (no-lose).
3. Countries undergoing industrialisation	For example India, Indonesia, Egypt	Measures to reduce emissions funded by the industrialised countries (MRV), but the main emphasis is on adaptation, at least in the initial stage.
4. The poorest countries	The least developed countries, among them all the target countries of Finland's development cooperation.	The most important target is adaptation to climate change with funding from the industrialised countries.

view on how the country groups should be divided. Instead, CAN presented its general positions about the forthcoming climate agreement before the Bali Climate Conference. They emphasize the need for developing countries to have emission reduction commitments and are very similar to the division of countries presented above (CAN 2008).

Suggestions for burden sharing and a funding system in the future

In the follow-up negotiations to the Kyoto Protocol, many countries have presented their views on the structure of the future climate agreement and how the funding issues should be addressed. These countries share the view that the emission reductions and the need for funding will grow substantially from the current levels.

Below is an summary of the initiatives made by different countries regarding the burden sharing and funding mechanisms for the forthcoming climate agreement, and the related critical debate.

Brazil already presented its calculation model based on old emissions at the negotiations for the Kyoto Protocol in the 1990s. Brazil's idea is that all the world's countries have the right to produce equal emissions per capita, and the quantities are calculated cumulatively since the industrial revolution. Britain has the most historical emissions due to its early industrialisation. In the future, the countries that have until now produced very little emissions would be allowed to produce the most emissions. The industrialised countries have produced 72% of emissions from 1950-2000. The Brazilian proposal is supported by many developing countries. Implementing this burden sharing model would be very hard for some industrialised countries. Also, the gradually increasing emission targets would probably delay the low-carbon development of industry and society in developing countries (UNFCCC 2008d)

Mexico has proposed the establishment of a World Climate Change Fund. All the countries would invest in the fund according to their income, and it would fund the implementation of the climate agreement in the industrialised and developing countries. Under Mexico's proposal, the fund would need at least 10 billion US dollars

annually. Part of the money could be collected from emission trading schemes by auction or through a tax, or as taxes on air traffic and shipping. The likely problem with this proposal is that the industrialised countries are not ready release funds and largely relinquish decision-making power over their use. Underlying Mexico's proposal is also its desire to mute discussion on whether the country should be moved to the group of industrialised countries and so within the scope of the binding emission reductions (UNFCCC 2008e).

China and India have highlighted the fact that the funding requirements will increase substantially and emphasized that the funding should not mean reducing the current level of development aid. According to China's position in June 2008, the funding should be 0.5% of the industrialised countries' GDP. India estimated that the funding requirement is 0.3-1% of the world's GDP. India has also emphasized the importance of the climate agreement's criteria in forceful terms. In late 2008, India even stated that it would refuse climate funding if it came from World Bank funds that are not part of the climate agreement. China's and India's positions on the emission reduction commitments diverge significantly. China is quite willing to limit the growth of its emissions, and the country is believed to be ready for no-lose commitments that would enable its participation in the international carbon markets. India, on the other hand, is strictly against even discussing emission reduction targets (UNFCCC 2008f; UNFCCC 2008g).

Japan made a proposal for sector-specific burden sharing at the Bali climate negotiations in late 2008. Industries that produce large amounts of emissions, such as the metal, oil or cement industries would be separated from the countries' emission quotas. These sectors would be given their own quota that applied across the world's industrial plants and would be introduced to companies on the basis of efficiency. Japan's proposal would benefit the efficient production plants of the industrialised countries, such as Finnish steel factories. It would cause problems for industrial plants in developing countries, which are much less efficient than those in the West. In practice, the system would have to include a major economic support package for the factories in developing countries and strict country-specific emission targets for industries outside the specific sectors, as well as traffic, agricultural and other national emissions (UNFCCC 2008h).

The European Union's strongest emphases in the negotiations are the need for a timetable and emission reductions based on climate science, as well as the agreement architecture created by the Kyoto Protocol. For the EU it is central that the rise in temperature is kept below two degrees. More than the others, the EU has been open to discuss how the economic growth of the developing countries can be secured despite the climate measures and how the poorest developing countries can be supported in adapting to climate change. The EU's own climate and energy package is a very good way of taking the negotiations forward. In the package the EU unilaterally commits itself to reducing emissions 20% by the year 2020, and if the other countries are willing to join in, the EU is ready to reduce emissions by 30% (Finland's Ministry of the Environment 2008b). The preparation of the package has eaten up the EU's resources, so it has not made any significant proposals on issues concerning the developing countries and funding.

The United States started its own negotiating process alongside the UN process, called the Major Emitters Meeting (MEM), at the beginning of 2007. The world's largest greenhouse gas producer countries are involved in the negotiations led by the United States, which it was initially feared would break up the UN climate process. The countries of the world have nevertheless maintained the UN process as the primary one. At the Bali Climate Conference in late 2007, it was decided that the MEM reports on its progress to the UN climate process. Concerning the calculation of emissions, the United States has proposed that the emissions of different countries should not be measured in absolute terms or per capita, but in relation to the countries' GDP. On this basis Ukraine would be in the worst position because its emissions are 651 tons of carbon dioxide equivalent per million dollars of GDP. There are large differences between the countries, for example the United States produces 196 tons of carbon dioxide equivalent and France 94 tons. (Walser 2008) The United States has emphasized the importance of funding outside the climate agreement. It would like the funders to have as much control as possible to decide on the targets. This type of funding, external to the climate agreement, could be channelled through the World Bank for example.

Switzerland's proposal is that the funds required for adaptation to climate change could be collected by a global carbon tax. The tax would

target all fossil fuel emissions and would be two dollars per ton of carbon dioxide equivalent. The energy supply of the poorest people would be secured by making the emissions tax-free for up to 1.5 tons of carbon dioxide equivalent per capita. The tax would raise just under 50 billion US dollars a year, which is the projected amount of funding required for adaptation (UNFCCC 2008i).

Norway has proposed that the climate funding is raised by auctioning a part of the emission rights agreed in the burden sharing process to the countries or companies of the world. Some of the emission rights would be handed over to the banking companies for auction, and the countries of the world would buy them with budget funding. Norway has estimated that an auction of 2% of the emission rights would bring in 15-20 billion US dollars annually (UNFCCC 2008j).

Many research institutions have also presented their own models for allocating commitments, but only a few of them are noted in the political debate. The Stockholm Environment Institute and Christian Aid have developed their own Greenhouse Development Rights (GDR) model, versions of which have been published in many European countries and which Finnish Church Aid published in March 2009 (Kärtha et al. 2009).

The GDR model aims to resolve climate and development problems simultaneously. The starting point for the model is that global warming should be kept below two degrees celsius, which means that global emissions have to be reduced radically from the current level. Another basic idea is the right of the poor to development, which means strong financial support for creating low-emission economic development in the developing countries. The model calculates a percentage share of the burden for all the world's countries based on their resources and responsibility, according to which they should participate not only in domestic and international emission reductions, but also in funding the adaptation to climate change and clean development.

The model's particular strength is its ability to take account of the income differences within countries. This is important because the UN system that directs the international debate does not take account of the countries' internal emission differentials and income differentials, which significantly affects the ability of a country to adapt to climate change and its possibilities to reduce emissions.

The GDR model produces interesting country-specific results. For example, the EU should reduce its emissions by over 100% by 2025. Most of these emission reductions would be achieved by funding the emission reductions of the developing countries. Funding from the rich countries would enable a large portion of the emission reductions required in countries like China and India (EcoEquity 2008; Baer et al. 2007).

Technology as part of the new agreement

Technology issues have long been on the agenda in the climate negotiations. They took on a special role at the Bali Climate Conference because the technology transfer to the developing countries is inadequate (see for example Nakicenovic 2003; Forum for the Future 2008). Technology transfer may have a major significance in the creation of

the new agreement and it is also being discussed on many other forums.

In February 2005 the G8 countries discussed climate change at Gleneagles, Scotland. An idea came up for an international technology agreement that would commit the parties to increasing climate technology cooperation with the developing countries. According to the countries that participated in the meeting, the best forum to deal with these issues is the UN climate agreement.

The so-called +5 countries (Brazil, India, China, Mexico and South Africa) demanded an addition to the conclusions of the Gleneagles meeting that the industrialised countries have the primary responsibility for technology transfer. They also expressed their fear that the current copyright laws would prevent the transfer from taking place (Vanhanen 2004).

At the moment the agreements for climate technology transfer and funding mechanisms include the following:

Climate policy actors in the EU and Finland

The preparation of the EU's climate policy is undertaken by DG Environment, the European Commission's environmental department, and its climate policy unit. Decisions are taken by the European Council based on the initiative of the European Commission.

In the actual negotiations, for example during the climate conferences, the EU is led by a troika comprising the country holding the EU presidency and those holding the previous and next terms of presidency, plus representation of the European Commission. In practice the commission has much power in the actual negotiations, even though the speeches are made by the country holding the EU presidency.

In Finland, the Ministry of the Environment is responsible for the country's international climate policy. Finland's chief negotiator is currently Sirkka Haunia. The Ministry of the Environment is responsible for forming the positions of the country on the central issues under negotiation and for coordinating the negotiations. It is also responsible for the negotiations concerning the future agreement, reporting to the countries, the implementation of the commitments, and other general themes. It is, however, joined in the negotiations by negotiators and experts from the Ministry for Foreign Affairs, Ministry of Agriculture and Forestry, Ministry of Employment and the Economy, and the Ministry of Finance.

Issues related to climate funding are dealt with through the cooperation of the Ministry of the Environment and the Ministry for Foreign Affairs. The funding negotiations are led by an official from the Ministry of the Environment but also include representatives from the Ministry for Foreign Affairs. In the negotiations about market mechanisms, the Ministry for Foreign Affairs and the Ministry of Employment and the Economy have a central role, because they are responsible with the Ministry of the Environment for acquiring emission rights for Finland. Finland's CDM expert sits in the Ministry for Foreign Affairs.

Finland's specialist in technology transfer is Jukka Uosukainen. He has also chaired an international working group that discusses technology transfer in the new climate agreement.

The Ministry of Agriculture and Forestry is responsible for the negotiations on forests and carbon sinks in Finland.

- The EU's IPPC directive that commits companies and countries to use the Best Available Technology (BAT) (Vanhanen 2004).
- The UN-based Special Climate Change Fund (SCCF), which has technology transfer as one of its central tasks. However, the role of the fund is informal and its activities are based on voluntary funding (Ilmasto.org 2008).
- The Expert Group on Technology Transfer (EGTT), which operates under the UN climate agreement has produced much useful information about the introduction of climate-friendly technology in developing countries. The group's research has been little utilised so far (Ilmasto.org 2008).

The international administration and monitoring systems for immaterial rights are important from the perspective of technology transfer. The most important is the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). With the help of this agreement it should be possible to support the development and transfer of climate-saving technology to the countries that need it. In reality, many parties believe, in opposition to the official position of the WTO, that the TRIPS Agreement reduces innovation and slows down technology transfer. Many parties to the UN climate agreement have demanded that immaterial rights should support global climate governance. The post-Kyoto climate agreement should therefore include measures that speed up the development and use of climate friendly technology (ICTSD 2008). This type of technology is significant to the future of the developing countries but, for example, the role of the African countries in the international climate negotiations and WTO is weak. It is also seen as problematic that the immaterial rights do not distinguish between climate friendly technology and other technology.

4. Climate funding from the industrialised countries to the developing countries

Funding issues are central to the climate agreement system and their significance is growing all the time. The Kyoto Protocol created a whole new product in the world, the carbon dioxide emission reductions, that can be traded. The Kyoto mechanisms and their regional applications like the EU's emissions trade have created the first global markets for environmental rights. So far the cash flows created by climate change have been fairly small (Appendix 2), and the majority of the money transfers have been made in the emissions trading within the industrialised countries or between them.

Climate change is a huge funding challenge, however. In the coming years it has to be decided how the developing countries can adapt to climate change and with whose money climate change will be mitigated in the developing countries. This will probably lead to an annual transfer of hundreds of billions of US dollars from the industrialised countries to the developing countries. In this chapter we evaluate the size of the funding requirement and present climate policy funding mechanisms. At the end of the chapter there is also a summary of the possible future funding models that were already referred to in the previous chapter.

The need for funding

Predicting the long-term global need for climate funding is very difficult because the results depend on the assumptions underlying national economic models. In particular, the size of the discount rate from which the current value of the coming money flow is calculated affects the results significantly in the long term (for example, see Liski 2007). It is therefore hard to compare the funding predictions that come from different sources.

The IPCC (2007) has compiled projections about the need for funding until 2030. According to the IPCC's report, stabilising the greenhouse gas content of the atmosphere near the 2% target would reduce the world's GDP by about 3%.

The Stern report estimates that 1% of the world's GDP has to be used for climate change mitigation measures. In his view this would prevent the permanent 5-20% decrease that threatens the global GDP. The IEA's (2008) estimate about the additional investments required by mitigation measures is of the same order of magnitude. Stern reminds us, however, that the measures to reduce emissions may even increase the world's GDP, if the technology is developed in the best possible way.

The figures presented above concern global costs. It has been estimated by the UN Development Fund's Human Development Index that the support required by the developing countries from the industrialised countries to mitigate climate change will be 25-50 billion US dollars a year. The Fund suggests the establishment of a Climate Change Mitigation Facility for this sum. Support would be given to national energy programmes through which the developing countries could build low-carbon energy production and improve their energy efficiency (UNDP 2007, 156).

There is also a need for separate funds for protecting forests, in addition to the other mitigation measures. Stern estimates that the funds needed for the protection of forests are about five billion US dollars a year (Stern 2006). Estimating the funds for adapting to climate change is difficult because adaptation typically covers a diverse set of measures around the world. The costs of adaptation are also little researched, which is why typically only two sources are referred to when estimating these costs. According to a World Bank (2006) estimate, the funding requirement is 10-40 billion dollars per year. The more recent and currently more frequently used estimate is that of Oxfam (2007), according to which 50 billion US dollars is closer to the actual figure. Oxfam makes the point that the costs of adaptation increase extremely fast as the emission reductions slow down and the effects of climate change become stronger.

The total funding requirement of the developing countries – including the mitigation of climate change, the protection of forests and adaptation – is about 100 billion US dollars per year. This is of the same magnitude as the current level of official development aid (104 billion US

dollars per year), and just a fraction of the sum with which the United States has supported its banks in autumn 2008. As a comparison, the City of Helsinki's expenses in 2007 were about 3.9 billion euros, which is almost the same amount as required for the global protection of forests.

Clean Development Mechanism (CDM)

The Clean Development Mechanism (CDM) is a funding tool for climate measures in the developing countries, which has been set two tasks. Its purpose is to reduce the global cost of climate change prevention by complementing the emission reductions made in the industrialised countries and to support the achievement of sustainable development goals in the developing countries.

The total value of the carbon markets related to mitigating climate change in 2007 was 64 billion US dollars, of which 50 billion was created by emissions trading in the EU. About 14 billion of the funds ended up in the developing countries through the CDM projects. The value of the JI projects in transition economy countries is under half a billion US dollars (World Bank 2008a,1).

A CDM project is implemented by defining the emission reduction target in the host developing country. For example, it can be changing the fuel used in an energy plant from fossil fuel to a renewable fuel or capturing gases from a landfill. First the baseline level of the emissions in the target is worked out and then the amount of emissions that can be reduced is calculated. The industrialised country or a company operating in the industrialised country then funds the project and can include the project's emission reductions in its emission balance.

In order to work in practice, the mechanism requires numerous stages where a consultancy office selected for the job produces studies and reports about the baseline situation of the target and the project in general. The host country has to approve the implementation of the project, and the CDM executive board established by the parties to the climate agreement also needs to approve the project.

The ambitious objectives set for the CDM have panned out in two contrasting ways. The CDM has succeeded well in its first objective. With its help, cheap emission reduction projects have been implemented, and it has helped to

make emission reductions in the industrialised countries. The implementation of the projects has been guided by the emission reduction target: the funding has been arranged according to the rules defined by the Kyoto Protocol and it has been focused on the cheapest projects that produce emission reductions. In the early stage, most of the completed projects were those with fairly small preparation and total implementation costs.

On the other hand, the CDM's second objective of supporting sustainable development has received much less attention. Its achievement is only guided by the implementation rules of the Kyoto Protocol, which leave the evaluation of sustainable development as the responsibility of the project actors. According to the most usual explanation, the developing country should approve the project and monitor that only projects that fulfil the characteristics of sustainable development are implemented in its area. Of course in practice countries value the investments coming to them so much that they do not want to jeopardize the implementation of the project and accept almost all the proposals.

By October 2008, 1197 CDM projects had been registered. Thousands of other projects are still waiting for approval, and their implementation is supposed to start before the Kyoto Protocol expires at the end of 2012. Information about all the projects, their size and location, has been recorded on the internet pages of the climate agreement secretariat (UNFCCC 2008k).

One problem with the CDM mechanism is its regional and technological bias. In 2007, 73% of the CDM projects were implemented in China and just a few percent in Central Asia and Africa. In addition to South Africa, there were projects only in Nigeria, Tanzania, Congo and Uganda in sub-Saharan Africa. It has therefore become clear that CDM investments cannot be directed with the current system to the areas that already have a shortage of investments (World Bank 2008a, 27).

In addition to the weakness of the infrastructure, the launch of the projects in Africa has been slowed down by a lack of know-how. Conducting the baseline evaluation requires professionalism. The bureaucracy required to implement the projects is also so complicated that even in the wealthier developing countries a consulting company is paid to do the job. There are few African countries where the know-how is even available for purchase (Desanker 2005, 25).

The completed projects have also been qualitatively more one-sided than was originally hoped. More than half of the emission reductions from the projects approved so far consist of projects which collect very harmful HFC gases from landfills. However, there are only a few of these projects, which means that they were substantially bigger than the other projects (UNFCCC 2008k).

Landfill gas projects are justified only if their emission reduction impacts are evaluated. Their effect on sustainable development and the transfer of climate friendly technology from the industrialised countries to the developing countries has been criticised. For example, China has been accused of deliberately producing the gases and then capturing them in order to earn billions of dollars in the carbon trade. From the CDM projects that develop the know-how of the developing countries, it is the projects that increase the production of renewable energy or aim to reduce emissions in agriculture that are closer to the original idea.

According to the update of its the procurement strategy made at the beginning of 2008, the Finnish state has decided to acquire about seven million tons worth of emission rights via the Kyoto mechanisms by 2012. Finland's largest single source of emissions, the Rautaruukki steel factory in Raahe, produces about 4.5 million tons of carbon dioxide.

Finland will acquire emission rights with direct investments in CDM and JI projects and also through investments in funds. It will acquire emission reductions from the following carbon funds, among others: the World Bank's Prototype Carbon Fund, the Asian Development Bank's Asia Pacific Carbon Fund, the Finnish Fine Carbon Fund, Nefcon Testing Ground Facility, and the Multilateral Carbon Credit Fund of the European Bank for Reconstruction and Development. The monitoring and administration for the first three funds is undertaken by the Ministry for Foreign Affairs, and for the last two by the Ministry of the Environment (Ministry for Foreign Affairs of Finland 2008). In Finland the purchase of the emission rights is carried out jointly by the Ministry of the Environment, the Ministry for Foreign Affairs, the Ministry of Employment and the Economy, and the the Finnish Carbon Procurement Programme (Finnder) of the Finnish Environmental Institute (SYKE) which comes under the Kyoto mechanisms.

Gold Standard guarantees the sustainability of the projects

The Gold Standard certification was launched in 2003 under the leadership of the World Wildlife Fund (WWF), which operates according to the Kyoto Protocol CDM regulations but with stricter requirements for sustainable development. The certification is only granted to projects that use renewable energy and energy-saving methods.

When the CDM project requirements were created, many organisations expressed their disappointment at how loose they were. They were particularly concerned that the projects are not necessarily additional, which means they would have been implemented even without funding from the Kyoto Protocol project mechanisms. The organisations created the Gold Standard to show that it is possible to implement genuinely sustainable and additional projects. The standard was designed to ensure that the projects' carbon credits really do exist and can be verified, and that the results of the projects are clearly measurable.

The Gold Standard is a combination of different quality assurance criteria. Among other things, it uses a detailed test to filter out projects that would be implemented even without the CDM mechanism. The certification is only granted to projects that use renewable energy and focus on energy efficiency linked to demand, because the environmental risk of these operators is low. By September 2008, more than a hundred projects had received the Gold Standard certificate, some of which have been completed, some are ongoing and some have been certified for implementation (WWF 2008b; CDM Gold Standard Organisation 2008).

Finnder currently has eight CDM and four JI projects in its portfolio. Four of the CDM projects are located in Honduras and are part of Finland's wider development cooperation programme. The other CDM projects include two small hydro-power projects in China, one landfill gas project in Jordan and one solar cooker project in China (Ministry of the Environment 2008c).

The Finnish projects have not been assigned descriptions that are stricter than the Kyoto Protocol, but Finland's investments are so small that, at least until now, it has not been worth participating in the bigger and often problematic hydropower and landfill projects.

Carbon funding outside the climate agreement

There is also carbon funding directed to the developing countries that is not linked to the climate agreement. For example, companies that offer carbon compensation from air miles are investing in different projects through which the emissions caused by air travel are tied to investment in cleaner technology or tree planting (for example, see Carbon-Neutral 2008). The voluntary carbon funding to the developing countries tripled from the year before but was still only about 2%

of the CDM funding in 2007, which means a few hundred thousand dollars.

There was controversy in Britain already in 2006 about the reliability of the compensation projects. Especially reforestation projects are seen as having a major risk that the money channelled into compensation will not necessarily produce "additional" emission reductions (Appendix 1). Following criticism, the British Department for Environment, Food and Rural Affairs published guidelines for emission compensation based on best practices (Defra 2008).

It is still quite likely, however, that the volume of voluntary emission compensation and carbon funding will increase further. More companies are joining the sector and consumer awareness about the impact of their activities on the climate has deepened. If it is well directed, voluntary funding can also significantly help the spread of some low emission technologies, for example.

Public funding

In addition to market-based funding, the climate agreement directs funding to the developing countries by more traditional means like different types of funds. These funds usually come straight from the budgets of the industrialised

countries, according to the commitments made in the climate agreement Conferences of Parties. However, the industrialised countries have not fulfilled all their commitments and so far the funds have very little money compared to the magnitude of the problem that needs to be resolved.

The Global Environmental Facility (GEF) is the central channel for climate funding. Currently the total amount in the funds of the climate agreement and Kyoto Protocol is about 300 million dollars per year. GEF also channels about 250 million US dollars of other funding per year into mitigating climate change. GEF operates under the direction of the climate agreement and, for example, the amount of funding is decided in the Conferences of Parties.

Two special funds have been established to implement the climate agreement. The Least Developed Countries Fund (LDCF) is the largest of the funds under the agreement. It funds the preparation and implementation of the least developed countries' National Adaptation Programmes of Action, (NAPAs, see page 19). Finland and 18 other countries are committed to support LDCF's work with a total of 170 million US dollars.

The Climate Change Special Fund (CCSF) could also fund different kinds of climate change mitigation activities within its rules, but the majority of its funding is directed at adaptation measures. Thirteen countries, including Finland, are committed to funding CCSF with a total of 90 million dollars for the duration of the Kyoto Protocol.

The Adaptation Fund (AF) that also operated under the Kyoto Protocol differs from the

other funds in that its funding consists of a 2% tax linked to CDM projects. The poorest developing countries suspected from the start that their share of CDM may remain small. The separate tax was used to make sure that the poorest countries which have the biggest need for adaptation also benefit from the CDM. Since the implementation of CDM projects did not start until the beginning of 2008, the operations of the fund have not really started as such but will do so during 2009 (GEF 2008; UNFCCC 2008).

GEF's operations have been severely criticised recently. For example, major problems have emerged in the funding of the NAPAs and the least developed countries have been justifiably disappointed at the way the funding is working. Even the European Parliament has commented on the problems of the funding and called on the European Commission to pay careful attention in connection with funding decisions to the inadequacy of the funding, the under-estimation of adaptation costs, the poor consideration given to human development, and the excessively bureaucratic working methods, among other things (European Parliament 2008).

The World Bank has also established many funds that work in different ways for various objectives, and which are not under the climate agreement. These funds have been established by the industrialised countries or companies operating in the industrialised countries and their function is to channel carbon funding.

The developing countries have viewed the external funds as problematic because they shift the funding away from the jointly agreed proce-

Climate funding and development cooperation funding

The relationship between climate funding and public development funding has stirred much debate. Many parties, among them the environmental organisations, have the opinion that the climate funding and development cooperation funding should be kept separate, so that instead of simply transferring funds from one budget item to another, genuinely new funding is made available for the climate change measures.

Nevertheless, Nicholas Stern calculates the total amounts of the economic investments moving from the public sector to the developing countries and does not separate development aid and climate funding. Stern even suspects that the ear-marked funds are difficult to integrate in the public development funding, which aims to produce balanced development in different sectors (Stern 2006, 627).

The report on climate funding by the climate agreement's secretariat does not take a position on public development aid, but outlines extensively the role of development aid in the adaptation to climate change (UNFCCC 2007b).

dures of the climate agreement. The aid recipient countries have much less decision-making power in the World Bank funds than in the climate agreement funds. The developing countries fear that the money which goes through the World Bank funds reduces the funding given to the developing countries, which has been jointly agreed in the climate agreement.

These funds include BioCarbon which invests in forestation projects and is funded by Canada, Italy and Spain. Finland supports forestation projects with the goal of carbon sequestration through the Forest Carbon Partnership Facility, which does not necessarily fulfil the requirements of the climate agreement (World Bank 2008b). For the time being these funds are still only in their planning stage.

Programme to decelerate deforestation

Reducing deforestation is a very cost-efficient way to slow down climate change. Measures to decelerate deforestation also improve the quality of life for the inhabitants of developing countries. Funding issues have been the biggest obstacle to this work. There may already be a solution to the structural challenge in the form of the Reduced Emissions from Deforestation and Forest Degradation (REDD) programme, established by the UN. Its aim is to target funding to countries with

Subsidies for fossil fuels and renewable energy

The problem of climate change was recognised already 15 years ago, but many countries are still supporting the use of fossil fuels and the energy intensive industry that creates much of the emissions. The OECD countries have reduced subsidies to coal-intensive investments, but at the same time some developing countries have even increased them. Globally, fossil fuels are subsidised by about 300 billion US dollars a year. By comparison, renewable energy sources are subsidised by 16 billion dollars. In the EU the fossil fuel subsidies are estimated to be more than 8 billion dollars per year. From the perspective of building a low-carbon world, this is a very bad signal to investors (UNEP 2008c).

a problem of deforestation so that the money can act as an incentive to prevention. The funding mechanism could impact very positively on the national economies of many developing countries. According to some estimates, Indonesia by itself could get funding of a billion US dollars if it reduced deforestation in its area by a million hectares per year (UNEP 2008b).

Although substantial amounts of money have been promised for the REDD projects, concrete funding issues are still open. The establishment of an international fund is seen as a possibility. In addition, there has been the idea of bilateral agreements and tying the funding to the carbon markets. The integration of REDD in the next climate agreement requires that a generally acceptable funding mechanism is found for the programme (UNEP 2008b).

Future funding sources

Climate funding has a central significance in the climate agreement for the period after 2012. As we saw in the chapter on burden sharing (see page 22), many countries have made different proposals about how money should be collected for climate activities.

Funding proposals are so far quite rare and they are not often referred to in the literature. Before the Bali Climate Conference, the climate agreement's secretariat did publish a report about the money flows related to the climate agreement. The report includes possible funding sources and their amounts (UNFCCC 2007b,186). From the four most commonly suggested alternatives, three are linked to the global pricing of carbon emissions by taxes or market mechanisms. The auction of emission rights to the industrialised countries suggested by Norway was already presented in the previous chapter (see page 23) and the three others are presented in the following.

Developing countries in particular often emphasize that the industrialised countries have the responsibility to fund the consequences of climate change which they have caused, and therefore support the continuation of the present system. However, the industrialised countries have not kept their international commitments. The decades-long debate about increasing Finland's development funding is a good example of this. Industrialised countries have also not managed to make the climate funds grow according

to their promises, and they have so far collected relatively little money.

In contrast to the other funding methods, there is no guiding mechanism linked to budget funding to reduce emissions, so its impact is one-sided.

On a global scale, the CDM mechanism is the first significant method to create a price for greenhouse gas emissions. It has not managed to fulfil expectations but its development is still seen as a crucial method in the future climate agreement.

A 2% tax is already linked to the CDM projects, the proceeds from which will fund the adaptation measures of the least developed countries. The funds going through the market mechanism are expected to multiply in the future. Many parties have suggested that the tax linked to the mechanisms should be increased. For example, the Climate Action Network (CAN) has suggested a quick expansion of the tax to emission trading and joint implementation, but also pointed out that this alone would probably not be enough to cover the funding requirement (CAN 2008, 2).

The international air and shipping traffic is currently completely outside the climate agreement. The emissions from the traffic are created in international waters and airspace, so they are not part of any country's emission balance sheet. The negotiations about integrating the international traffic to the agreement have moved slowly, but one possible source of funding would be a tax on international air travel and shipping traffic. Its proceeds could be about 10-15 billion dollars per year (UNFCCC 2007b, 186). Emission rights could also be auctioned to the air travel and shipping companies.

Microfinance for climate projects in the developing countries

Kiva.org is a non-profit mediation service for microloans. Anyone can lend money to their chosen small entrepreneur in a developing country through Kiva's website. The profiles of the entrepreneurs can be browsed on Kiva's home pages. The service enables business in developing countries and supports the livelihood of local people. The process has been made simple for the individual lender, who also knows how the loan money is spent (Kiva 2008).

A similar, microloan mediation organisation that works like Kiva but is based on the Green Jobs ideology could be a useful internet service. Climate-friendly small entrepreneurs in developing countries could be funded through the service, and the conditions of the loan could be an incentive to low-carbon entrepreneurship. The model could help to reduce poverty and also get the poorest countries to join in the climate campaign. Micro-level innovations could have a significant impact on the national economies of the developing countries as well as climate change.

5. Climate change and development cooperation

In the development cooperation debate climate issues are approached especially from the viewpoint of adaptation, because the negative effects of climate change are the worst in the poorest developing countries.

The objectives of climate change adaptation measures are largely the same as in traditional development cooperation: supporting the poor and the weak to survive different tribulations and trying to guarantee them the basic needs of life. Many of the policies and methods at the interface of development cooperation and climate change, such as climate proofing, are based precisely on the primacy of adaptation.

One of the most important messages of the IPCC's Fourth Assessment Report was that the global mitigation of climate change also requires a reduction in the coal-intensiveness of the developing countries' economies. A climate disaster is inevitable if the emissions of the developing countries continue to grow at their current rate (IPCC 2007).

Supporting the developing countries in low-carbon development will become increasingly important in development cooperation. The idea that developing countries will leapfrog over some costly and inefficient stages of technological development is familiar from many other areas of the development debate. The concept was first presented in 1962 by Alexander Gerschenkron in his text *Economic Backwardness in Historical Perspective* (Gerschenkron 1962).

The need to mitigate climate change further strengthens this kind of debate. The developing countries could leapfrog over the technology based on fossil fuels and start utilising solar power on a large scale. It could be assumed that many developed industrialised countries would be willing to focus their development investment in exactly this kind of activity. From the perspective of Finland's development cooperation, it is important to ask whether Finnish actors have something to give in promoting this technological leap.

The mitigation of climate change challenges our understanding about the objective of development in both the industrialised and developing countries. A good life in the coming decades can no longer mean increasing material consumption, a diet based on more animal protein than now, and more cars. This situation should also be somehow reflected in development cooperation, although a large part of the current beneficiaries of development cooperation is still only trying to satisfy its basic needs. Development cooperation and its actors are just as important as television and product marketing in defining the direction that development is taking.

Finland's development policy programme of 2007 presents general positions about the concept of a good life. The programme states quite unambiguously: "While the development of the industrialised countries has until now been directed towards strong quantitative material growth, in the future we should be striving for the quality of life." (Ministry for Foreign Affairs of Finland 2007, 12). The long-term objective of development cooperation is defined as carbon neutrality, and it particularly emphasizes the effect of technological development on climate change and the mitigation of other environmental impacts (Ibid. 2007, 13, 18). The policy lines are still at a general level and their project-specific implementation will only start to be seen in the next few years.

Evaluating the climate impacts and sustainability of development projects

The term climate proofing means an evaluation of how political measures or development projects work as the climate changes, on the one hand, and how they help to prevent the warming of the climate on the other. This proofing is an attempt to get the traditional development projects and political measures linked to a new world, where climate change is one of the major factors that guides and constrains development work.

In many cases climate proofing is defined as including only adaptation to climate change. For example, the Asian Development Bank developed the method with six case studies, but focused only on adaptation in its report. It states that climate proofing helps to identify the harm-

ful factors caused by climate change in development cooperation projects, and helps to minimize them (ADB 2005, xii). The basic assumption of this comprehensive report is that climate change threatens traditional development goals and this is why the impacts of climate change have to be taken into account, for example when building houses and intensifying cultivation methods.

National climate proofing projects have been started in some European countries. DANIDA, the development cooperation unit of Denmark's Ministry for Foreign Affairs, started a major project in 2005 that evaluates Denmark's development cooperation projects from a climate perspective. It also aims to support the adaptation of developing countries towards climate change in particular (DANIDA 2005).

The UN Development Programme's Human Development Report 2007/2008 examines the costs of climate proofing from the perspective of strengthening infrastructure. The report has collected cost estimates of the NAPAs. For example, in Cambodia ten million US dollars are required for constructing bridge culverts and dams so that the new road network does not suffer the consequences of climate change. In Bangladesh 23 million US dollars are needed for the construction of a buffer zone for coastal areas vulnerable to flooding (UNDP 2007, 175).

Climate proofing can also be applied to the projects and policies implemented in the industrialised countries. The EU's Green Book, which discusses Europe's adaptation to climate change, encourages both the EU's organs and member

countries to analyse their activities from a climate perspective. The Green Book includes an evaluation of whether measures increase greenhouse emissions or help to mitigate climate change (European Commission 2007).

The central findings of the comprehensive climate proofing report conducted by the Asian Development Bank also usefully bring together the conclusions other studies:

- Proofing is much cheaper when it is conducted during the planning stage of the project and not during the implementation.
- The costs of proofing are quite small compared to the total budget of the project. The proofing should be carried out especially because, in the worst case, climate change can threaten the success of the whole project.
- In addition to development projects, the climate impacts should also be evaluated when there are changes in the law or when new regulations are drawn up (ADB 2005, 75).

A review of environmental policy within development policy is currently underway in Finland, which is likely to propose the use of climate proofing methods as an indicator in Finland's development cooperation. Project-specific methods and their usefulness in different situations are analysed in the joint guide "Kehitysyhteistyö muuttuvassa ilmastossa" (SLL 2007) by the Finnish Association for Nature Conservation, the Service Centre for Development Cooperation - KEPA and Friends of the Earth. 🗨️

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Appendix 1: Key concepts

Adaptation to climate change. Taking the effects of climate change into account when planning for the future.

Additional project. The projects under the project mechanism have to produce additional emission reductions or additional carbon sinks which would not have materialised without the projects. The projects also have to be such that they would not be implemented without the opportunities brought by the project mechanisms, i.e. they cannot be so-called business as usual cases.

Bali Action Plan. The 192 parties to the UN climate agreement (UNFCCC) agreed in Bali that they will “launch a comprehensive process to enable the full, effective and sustained implementation of the Convention through long-term cooperative action, now, up to and beyond 2012”. This process is called the Bali Action Plan. It aims to establish a new climate agreement at the Copenhagen Climate Conference in December 2009.

Carbon dioxide equivalent. CO₂e is a quantity used in climate science that describes the climate forcing of different greenhouse gases, i.e. their warming effect on the climate. This way the warming effect of different greenhouse gases can be compared with each other.

Carbon intensity. The ratio of money (GDP) produced to a particular quantity of greenhouse gas emissions.

Carbon markets. The trade in carbon dioxide emissions, which is based on determining emission quotas for those involved in the trading. In this way a price is created for carbon on the carbon markets, which is visible, for example in a company’s accounts. Other greenhouse gas emissions can also be traded on the markets.

Carbon neutrality. Balancing a certain amount of carbon released into the atmosphere with an equivalent amount of carbon sequestration activity, such as tree planting or the introduction of low-emission technology.

Carbon sink. A carbon storage that grows in size, i.e. the opposite of a carbon source. The major natural carbon sinks are seas, forests and marshes.

Carbon tax. A tax imposed on the carbon dioxide or other greenhouse gases that are released into the atmosphere.

Climate proofing. This means taking a climate perspective into consideration in development cooperation work. Development cooperation projects help to prevent global warming by not causing additional emissions and also help in the adaptation to climate change. It should also be ensured that the rise in the sea level does not ruin the project.

Convention on Biological Diversity. This is a general UN agreement established in Rio de Janeiro in 1992. Its objective is to protect the diversity of organisms and ecosystems. It includes 191 countries, of which 168 have signed the convention.

Emission rights. The allowed quantity of emissions. One emission credit gives a right to release one ton of carbon dioxide. Emission rights are allocated to countries in the climate agreement that can further allocate them to companies, for example.

Fossil fuels. Fossil fuels have been created over millions of years from the remains of organic matter compressed in layers of earth. Fossil fuels include oil, coal and natural gas. Fossil fuels contain a lot of carbon and produce a lot of carbon dioxide when burnt.

Greenhouse gas. A gas in the atmosphere that absorbs and reflects the heat radiating from the sun and reflected from the planet Earth, causing the greenhouse effect. Climate change is caused by six gases: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂), hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride. Water vapour is also a significant contributor to the greenhouse effect, but human impact on the cycle of water in the atmosphere is small.

Kyoto mechanisms. The Kyoto Protocol allows three mechanisms based on international cooperation, with the help of which emission restrictions and reductions can be achieved flexibly and cost-efficiently: emission trading, CDM projects and JI projects. The mechanisms can only complement domestic emission reductions.

Kyoto Protocol. The Kyoto Protocol is an addition to the United Nations Framework Convention on Climate Change (UNFCCC). The industrialised countries that ratified the Kyoto Protocol are committed to reducing their greenhouse gas emissions below a certain percentage of their emissions in 1990.

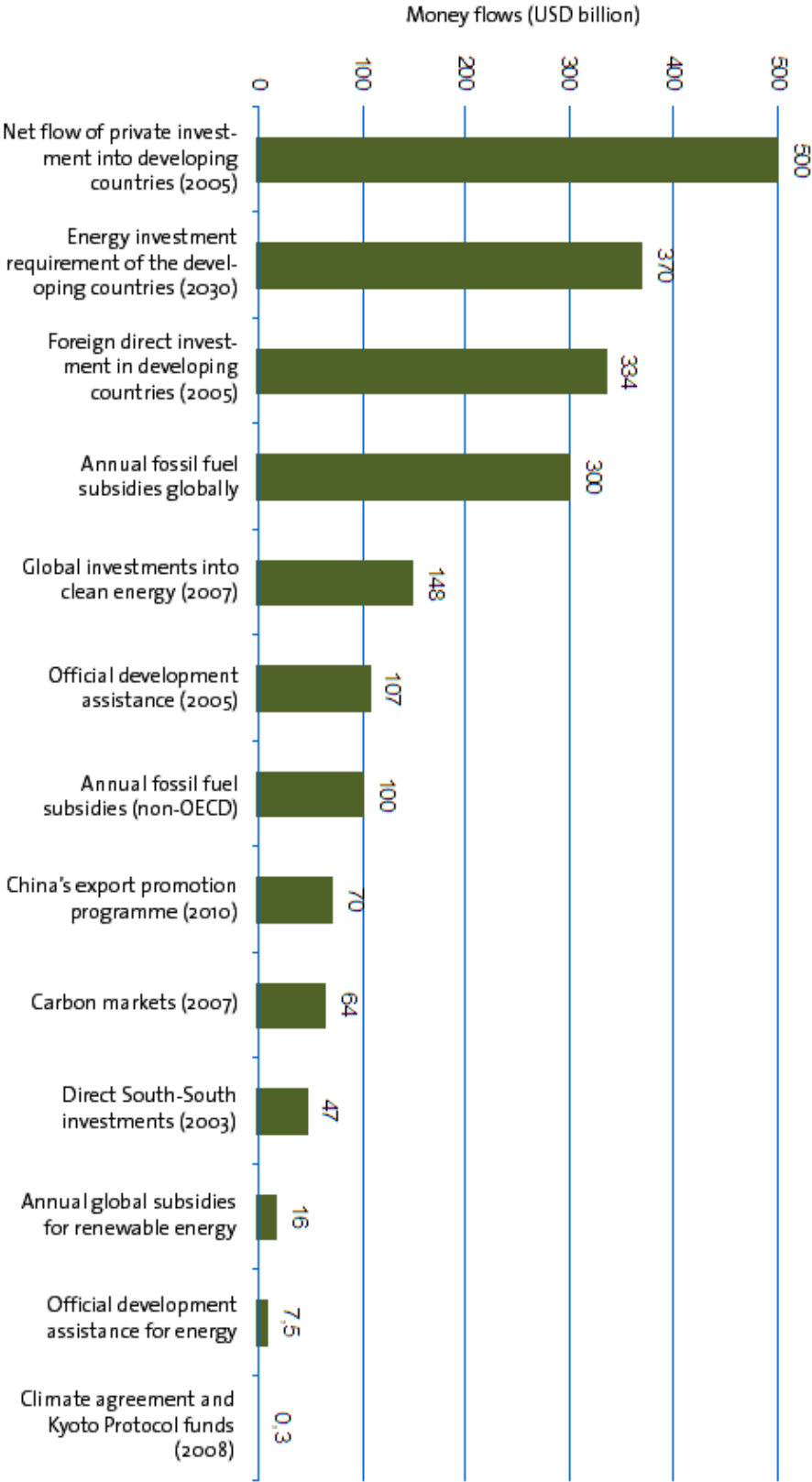
Leapfrogging. The developing countries speed up their development by skipping directly to using more advanced and efficient technology and missing environmentally harmful stages of development.

Mitigation of climate change. Limiting the advance of climate change and its effects.

Rio Agreements. Two environmental agreements were established at the UN Conference on Environment and Development held in Rio de Janeiro in 1992: the biodiversity agreement and the climate agreement. The climate agreement is a broad agreement about the general objectives and methods for the mitigation of and adaptation to climate change. It also includes a directive objective to the developed countries to freeze emissions at the 1990 level by 2000. The objective of the biodiversity agreement is the protection of equatorial areas' ecosystems, plant and animal species, and the protection of their genetic diversity, the sustainable use of natural resources, and the fair distribution of benefits from the use of nature's genetic resources. The Rio conference also started a working group to create the agreement on desertification, which was established two years later in 1994.

UN Convention to Combat Desertification. The convention aims to prevent desertification by creating long-term strategies that take account of sustainable management of natural resources, improving the productivity of the soil and environmental protection. Desertification was included in the Agenda 21 of the 1992 UN Conference on Environment and Development, which established a working group to create the desertification agreement. The convention itself was established in Paris in 1994 and came into force in the signatory countries in 1996.

Appendix 2: Magnitude of the annual investment and financial flows



Source: Greenstream Network (2009) (Original sources: Clean Edge 2008, World bank 2008a, Miller 2008, Tirpak & Adams 2008, UNEP 2008c, UNFCCC 2007b)



No development without addressing climate change

Intersections between climate and development policies

Climate change threatens to increase and deepen poverty in the developing countries and impede the achievement of development goals. Climate negotiations therefore have a great impact on the living conditions and future of people living in the developing countries.

The responsibility for the mitigation of climate change and adaptation to it is both a question of justice in the relations between the South and the North as well as a huge funding challenge. A solution has to be found during the next few years to how the climate measures in the developing countries will be funded. The solutions should be based on the premise that the new money flows promote socially just and ecologically sustainable development.

It is important for the people and organisations working with development policies and development cooperation to be familiar with the debate and decision-making about climate policies. The report *No development without addressing climate change* presents this information clearly and concisely.

KEPA's Working Papers

KEPA's Working Papers series offers information on development issues. Studies, seminar memos, and articles produced or commissioned by KEPA are published in the series. The papers cover e.g. topics of Southern civil societies, development work and political advocacy work of civil society organisations, development cooperation, impact assessment and international trade issues. The papers will be published in several languages.

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