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The International Development Agenda and the Climate Change Challenge

United Nations

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Committee for Development Policy

Policy Note

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DESA

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Foreword

The United Nations Secretary-General has described climate change as a "defining issue of our era". The present Policy Note of the Committee for Development Policy (CDP) examines the severity of the problem and its implications for the international development agenda. It elaborates further on the background and the main findings that were presented by the Committee in its official report to the Economic and Social Council of the United Nations.

The urgency of the challenge posed by climate change is now widely acknowledged and an agenda for internationally concerted action is being developed. Two recent events underscore the commitment of the United Nations to the issue of climate change. The first of these events is the two-day thematic debate on climate change convened by the United Nations General Assembly on 31 July and 1 August 2007. The second is the high-level event on climate change convened by the Secretary-General at the United Nations on 24 September 2007, to map out how the world can move forward to address climate change and promote sustainable development at the Climate Change Conference in Bali in December 2007. The present Policy Note represents an important input to these international discussions.

The Policy Note represents the collective view of the CDP members. I would like to thank all members for their work. I would like also to express special gratitude to Professors Tariq Banuri and Hans Opschoor who prepared a background note which served as an important input to the deliberations of the CDP and this Policy Note.

Sha Zukang
Under-Secretary-General for Economic and Social Affairs
United Nations
September 2007

Summary

The extent of the climate change challenge is such that it makes it impossible for the world to continue along a path of "business as usual". The present mechanisms in place are grossly inadequate. Focusing international cooperation on climate change solely on the establishment of emission targets is far from adequate. Such an approach will not properly address development challenges or help achieve internationally agreed goals. The current international development agenda needs to set forth the actions and approaches required to ensure that economic behaviour is compatible with environmental constraints in a way in which aggregate costs are minimized, the vulnerable are protected and economic growth is maximized. The integration of climate change and development goals will require a fundamental reorientation in the current developmental trajectory so that the carbon intensity of production is reduced while economic growth is maintained. It will also require a renewed and more effective partnership between the developed and developing countries as well as between the public and the private sectors.

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ALGAS	Asia Least Cost Greenhouse Gas Abatement Strategies
CDM	Clean Development Mechanism
CDP	Committee for Development Policy
CER	Certified Emission Reduction
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CSD	Commission on Sustainable Development
G8	Group of Eight
GDP	gross domestic product
GEF	Global Environment Facility
GHG	greenhouse gases
GJ	gigajoule of energy
GtC	billion tons of carbon
$GtCO_2$	gigatons of carbon dioxide
IPCC	United Nations Intergovernmental Panel on Climate Change
IPRs	intellectual property rights
KgC	kilograms of carbon
LDC	least developed countries
MJ	megajoule of energy
NAPA	National Adaptation Programmes of Action (in least developed countries)
ODA	official development assistance
PCP	patterns of consumption and production
ppm	parts per million
SIDS	small island developing States
tCO_2	metric tons of carbon dioxide
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WMO	World Meteorological Organization

The international development agenda and the climate change challenge

"Climate change is… a defining issue of our era."

Ban Ki-moon

Introduction

Can the international development goals still be achieved at a time when international, regional and national actions must be taken to confront the challenge of climate change? The present Policy Note of the Committee for Development Policy (CDP) argues that combating climate change and achieving internationally agreed development goals can no longer be placed in separate boxes, but efforts to pursue both objectives should be coherent and mutually reinforcing.

Climate change is the most serious emerging threat that, if not confronted properly, may soon disrupt life on this planet. Climate change, manifested in the rise of the earth's mean temperature, is already taking its toll in the form of widespread melting glaciers, sea-level rise, extreme weather patterns and other adverse phenomena, as documented by the recent report of the United Nations Intergovernmental Panel on Climate Change (IPCC, 2007a).[1] The IPCC report also confirmed that concentrations of greenhouse gases (GHGs) have increased markedly as a result of human activity, with global increases in carbon dioxide (CO_2)—the main GHG—being primarily the result of fossil fuel use and land use change.

There is no way to stop the process of climate change other than to undertake deep cuts in GHG emissions. The main initiative in stopping climate change has to come from developed countries, which have been largely responsible for the increase in the

1 The IPCC was set up in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) to assess, on a comprehensive, objective, open and transparent basis, the scientific, technical and socio-economic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts and options for adaptation and mitigation.

GHG concentration in the earth's atmosphere over the last 200 years since the beginning of the Industrial Revolution. The Revolution started the present process of unprecedented economic growth and improved living standards. A massive increase in energy power was, however, necessary to support this process of economic progress. Mainly fossil, and therefore carbon-based, sources of energy, such as coal and petroleum, have been used over the past two centuries. The burning of coal and petroleum discharged gases into the atmosphere which could not be absorbed, thus contributing to the emergence of the greenhouse phenomenon and its impact on climate. The earth can absorb about 5 billion metric tons[2] of carbon dioxide equivalent (CO_2e) each year. However, annual global emissions of CO_2 alone from fossil fuel combustion are now over 27 billion tons.

Climate change is not a zero-sum game in which some regions will benefit in the long run while others will lose: the atmosphere is probably our most important "global public good", and eventually all regions will be adversely affected by its deterioration. In order to implement the deep cuts in GHG emissions required to stop the process of climate change, the industrialized countries in particular will have to engage in a fundamental rethinking of their production and consumption patterns (PCPs) and lifestyle. The Stern Review (Stern, 2007), conducted for the British Government by Sir Nicholas Stern, shows that the costs of climate change could be dramatic: welfare could be reduced by an amount equivalent to a reduction in consumption per head of between 5 and 20 per cent, with the higher estimate considered the more likely outcome. Determined action henceforth can enable mankind to avoid these costs at a reasonable expense.

While the main responsibility for cutting emissions lies with developed countries, developing countries also have a vital interest in climate change. The adverse effects of climate change are proving, and will continue to prove, particularly severe for developing countries because of their (i) geographical location, (ii) reliance on climate-related economic activities (such as agriculture), and (iii) weak coping capability. Moreover, developing countries have a vital role to play in mitigating climate change.

The recommendations of the CDP in the present Policy Note aim at furthering the quest for ways in which to make development sustainable in the face of the challenges posed by climate change and at examining the roles that both developing countries and developed countries have to play in this regard. The Committee recognizes the existing international framework and the important work being done on climate change-related issues under the United Nations Framework Convention on Climate Change (UNFCCC), by the Commission on Sustainable Development (CSD) and by other United Nations agencies, including the United Nations Environment Programme (UNEP). It points to the necessity to develop further and better integrate mitigation and adaptation policies related to climate change into the international development agenda, particularly in view of the need to promote a decarbonized pattern of economic development worldwide while,

2 All tons refer to metric tons (tonnes) of 1,000 kilograms (kgs), equal to 2204.6 lbs.

at the same time, meeting countries' goals of improved standards of living and welfare for their populations. This note also puts forward a role that the Economic and Social Council of the United Nations may wish to consider to play in this regard.

The greenhouse challenge

According to IPCC (2007a), the earth's temperature is rising because of human activity, and further temperature increases contain the threat of catastrophic consequences. The scientific community has long considered an increase of 2° C above the pre-industrial level as a threshold beyond which dramatic changes are likely (Baer, 2007; IPCC, 2007a; Stern, 2007; United Nations Foundation and Sigma Xi Scientific Expert Group on Climate Change, 2007). Yet, the danger is that mutually reinforcing effects of global warming may take the world to a temperature increase of 3° C or higher very soon.[3] A temperature increase of 3° C or more may lead to, among other adverse consequences, melting of the Greenland ice sheet, which in turn may cause the sea level to rise by up to 7 meters, inundating many low-lying densely populated countries and large coastal cities all over the world.[4] The impact will be hardest on developing countries, and particularly on the small island developing States (SIDS), many of which would—in the case of temperature rises of 3 degrees or more—run the risk of being completely submerged.

Within developing countries, the most affected by any level of climate change will be the poor, who have to rely more on climate-related activities for their livelihood, who are more exposed to the elements of nature, and who have the least resources to cope. Climate change will thus inflict damage precisely on those nations and people who are the least responsible for its cause and the least prepared to deal with its consequences.

Greenhouse gases and their impact

The most important GHG is CO_2 (currently constituting 77 per cent of the climate change potential). According to the Stern Review, current levels of GHGs in the atmosphere are 430 parts per million (ppm) of CO_2e as compared to 280 parts per million (ppm) before the Industrial Revolution. These concentrations have already caused the world to warm by more than half a degree Celsius and will lead to at least a further half a degree of warming

3 It may be noted that the difference between the earth's current temperature and that during the last Ice Age is only 5° C.

4 This and other large-scale impacts are highlighted in Stern (2007); IPCC (2007b) states that it does not expect these impacts to occur in the twenty-first century. Measurements of the melting of ice caps since the finalization of the IPCC report cited here suggest that melting may take place at a faster pace than assumed by the report. See also IPCC (2007a).

over the next few decades because of the inertia in the climate system. Yet, even if the annual flow of emissions were not to increase beyond today's rate, the stock of GHGs in the atmosphere would reach double the pre-industrial levels by 2050, that is to say, 550 ppm CO_2e. At the current rate of increase in the annual flow of emissions, however, this level of 550 ppm CO_2e could be reached as early as 2035. There is a very high likelihood—with a probability of 77 to 99 per cent, depending on the climate model used—that, with this flow of emissions, the global average temperature will rise by more than 2°C. This demonstrates the urgency of initiating action to sharply reduce GHG emissions.

The effects of climate change will be felt over time as the earth's temperature rises. Figure 1, taken from Stern (2007), is probably the best illustration of the results of research into the likely effects of different increases in global temperature relative to that of the pre-industrial period. It shows the expected (probabilistic) relationship between different levels of greenhouse gas concentrations (400, 450, 550, 650, and 750 ppm CO_2e) and temperature increase. The lower panel translates this information into the potential impacts on food supply, water and ecosystems, the effects for extreme weather events, and risk of irreversible system changes. These are colour coded for confidence: yellow for likely, orange for very likely, and red for extremely likely.

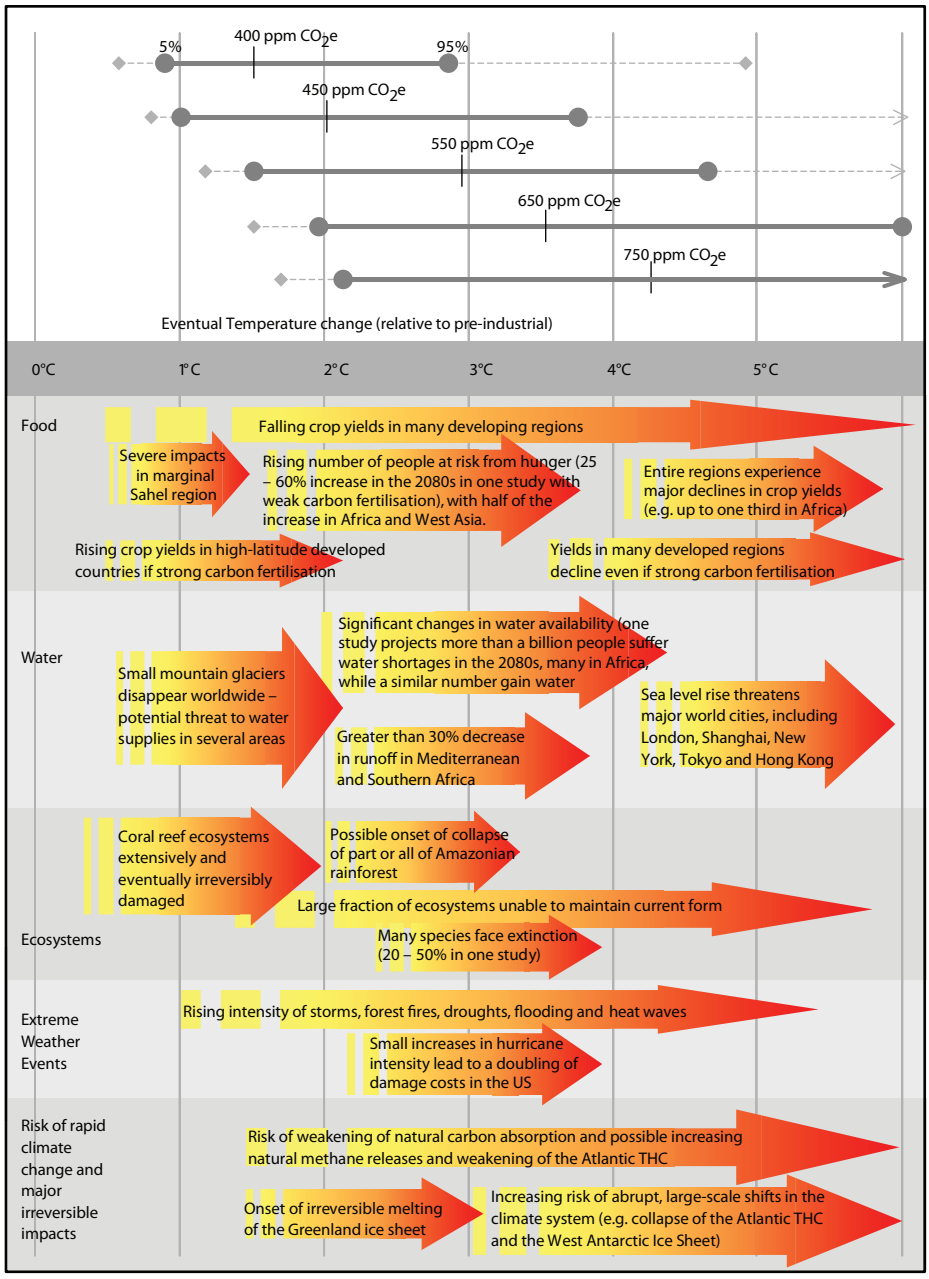
For instance, the last row of the figure, related to the onset of the irreversible melting of the Greenland ice sheet, illustrates the effects of such a warming. Other consequences, such as extreme weather events, are also shown. Even though discussions on the probability of such warming—as well as of other projected impacts of climate change—are ongoing, the events to which they relate are clearly of a magnitude that would render it vital to avoid them.

Ongoing research indicates that the problem is more serious and more urgent than previously thought. For instance, a study undertaken by the University of East Anglia, United Kingdom, and the Max Planck Institute for Biogeochemistry in Jena, Germany, found that the increase in winds over the Southern Ocean, caused by man-made climate change and ozone depletion, had led to the release of stored carbon dioxide in the ocean into the atmosphere, which in turn is preventing the further absorption of GHGs. Thus a carbon "sink"—a means of absorbing carbon dioxide from the atmosphere, such as a wooded area—will prove less effective than anticipated. In addition, the release of the carbon dioxide is itself contributing to the acidification of the Southern Ocean (Le Quéré and others, 2007).

The current level of GHG emissions

Despite the targets established by the Kyoto Protocol (see discussion below), GHG emissions have continued to increase. Global CO_2 emissions increased 17 per cent between

Figure 1:
Climate change and its probable consequences



Source: *The Stern Review*, available from http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/sternreview_index.cfm; Executive Summary, Figure 2. Reproduced under the terms of the Click-Use Licence.

Note: The figure illustrates the types of impacts that could be experienced as the world comes into equilibrium with more greenhouse gases. The top panel shows the range of temperatures projected at stabilization levels between 400ppm and 750ppm CO_2e at equilibrium. The solid horizontal lines indicate 5-95% range based on climate sensitivity estimates from the IPCC 2001 and a recent Hadley Centre ensemble study. The vertical line indicates the mean of the 50th percentile point. The dashed lines show the 5-95% range based on eleven recent studies. The bottom panel illustrates the range of impacts expected at different levels of warming. The relationship between global average temperature changes and regional climate changes is very uncertain, especially with regard to changes in precipitation. This figure shows potential changes based on current scientific literature.

1990 and 2003 (from 22 to 26 $GtCO_2$).[5] All regions contributed to the increase in emissions, with the exception of the countries of the former Soviet Union and other Eastern European countries, where there had been a decline owing to their severe recession and the closing down of many of their worst polluting industries following the transition from centrally planned to market economies. Emissions in North America increased by 16 per cent (from 5.5 to 6.4 $GtCO_2$), in Western Europe by 4.5 per cent, in Asia and the Pacific by 53 per cent (from 6.3 to 9.7 $GtCO_2$), in Africa by 47 per cent (from 0.6 to 0.9 $GtCO_2$) and in Latin America and the Caribbean by 24 per cent (from 1.0 to 1.3 $GtCO_2$) (see table 1).

Most of the increase in carbon concentration in the atmosphere is the result of emissions from the industrialized world. In 2003, North America and Europe contributed 55 per cent of total CO_2 (down from 62 per cent in 1990), while Asia and the Pacific contributed 37 per cent. Annual per capita emissions in North America and Western Europe were 19.8 and 9 tCO_2, respectively, while they were 1.2 and 1 tCO_2 in South Asia and Central and East Africa, respectively.

Table 1.
Emissions, population, GDP and energy supply by region, 1990 and 2003

	CO_2 emissions (billions of metric tons)		*Population (millions)*		*CO_2 emissions per capita (metric tons)*		*GDP (constant, $2000)*		*Energy supply per $1000 GDP (PPP) (kilogram oil equivalent)*	
Regions	*1990*	*2003*	*1990*	*2003*	*1990*	*2003*	*1990*	*2003*	*1990*	*2003*
Africa	0.6	0.9	637	881	1.0	1.1	425	645	299	299
Asia and the Pacific	6.4	9.7	3 054	3 674	2.1	2.6	6 119	9 154	271	207
China	..	..	1 155	1 304	..	..	551	1 732	485	220
India	..	..	860	1 099	..	..	268	544	253	191
Europe	8.2	6.8	800	824	10.3	8.3	7 814	9 904	256	203
Eastern Europe	3.3	..	231	223	14.3	..	496	376	557	513
Central Europe	1.4	1.2	188	199	7.7	6.0	523	685	290	211
Western Europe	3.5	3.6	381	403	9.1	9.0	6 795	8 842	173	154
Latin America and the Caribbean	1.1	1.3	444	544	2.4	2.4	1 458	2 066	169	165
North America	5.5	6.4	284	325	19.3	19.8	7 591	11 097	277	228
Western Asia	0.4	0.8	75	110	6.0	7.2	(264)	440	..	..
Global	**22.2**	**26.0**	**5 295**	**6 359**	**4.2**	**4.1**	**23 671**	**33 305**	**261**	**213**

Source: Geodata, UNEP (http://geodata.grid.unep.ch).

5 $GtCO_2$ refers to gigatons of carbon dioxide. A gigaton is equal to 1 billion metric tons.

The absolute levels of emissions are thus moving the world away from the Kyoto targets with respect to emission reductions by 2012. In order to move towards these targets (and especially those of UNFCCC) without jeopardizing the economic growth needed for achieving developmental goals, there will have to be a significant *decoupling* or *delinking* of GHG emissions from economic growth. The main initiative in cutting carbon emissions will have to come from developed countries, because of both their historical responsibility and their continued high current volumes of emissions.

The challenge of stabilization

The volume of carbon emissions depends on four factors: population size, per capita income, energy intensity (or total primary energy use—from whatever source—per unit of GDP) and carbon intensity (carbon emissions per unit of energy consumption).

Their effect can be summed up in the following identity (United Nations Foundation and Sigma Xi Scientific Expert Group on Climate Change, 2007):

$$C = P \times (Y/P) \times (E/Y) \times (C/E),$$

where:

- C is carbon dioxide emissions, E is energy use, Y is GDP (gross domestic product) and P is population.
- E/Y is called the "energy intensity of GDP".
- C/E is called the "carbon intensity" of energy supply.

In 2005, out of the total emission of 36 $GtCO_2$, about three quarters, i.e., 27.5 $GtCO_2$ (equivalent to 7.5 billion tons of carbon),[6] were emitted by energy systems alone, with the following numerical breakdown in terms of the above equation:

$$C = 6.42 \times 10^9 \text{ persons} \times \$6{,}541 \text{ per person} \times 12.1 \text{ MJ/\$} \times 54.3 \text{ kgC/GJ} = 27.5 \times 10^{12} \text{ kg}CO_2$$

where:

- GJ is giga (billion) joules of primary energy.
- MJ is mega (million) joules of primary energy.
- $KgCO_2$ is kilograms of carbon emitted, with there being 1,000 kilograms in a metric ton.

The magnitude of the challenge facing mankind can be appreciated by looking at the projections for the year 2100 under the IPCC baseline scenario IS92a. According to this scenario, the world population will increase from 6.42 billion in 2005 to 11.3 billion by 2100, world GDP will increase eightfold, and energy use will triple from current levels, even though the fraction of energy supplied from fossil fuels will drop from over

6 One ton of carbon is equivalent to 3.67 tons of CO_2.

80 per cent to under 60 per cent and the energy intensity of production will fall. Thus, notwithstanding improvements in energy efficiency and reduction in dependence on fossil fuels,[7] CO_2 emissions would reach 75 $GtCO_2$ by 2100 (and atmospheric CO_2 concentration would amount to over 700 ppm).

The identity defined above shows that a reduction in carbon emissions requires a reduction in one or more of the following:

- *Population*: A decline in population growth would bring about a proportional reduction in emissions, without any change in affluence, energy efficiency or carbon intensity.
- *Income*: A slowdown in growth of per capita income (although not considered desirable by most analyses) would similarly reduce emissions proportionately.
- *Energy and carbon intensity*: By investing in energy-efficient production, fuel switching, land-use changes, carbon storage and sequestration, and by improving the efficiency of the conversion of fossil fuels into energy, the volume of emissions would be reduced for a given quantum of energy use and, ultimately, production. Where feasible and appropriate, less energy- and carbon-intensive PCPs would reconcile economic growth and GHG emissions.

As table 2 illustrates, there is some scope for action with respect to each of these three factors that determine carbon emissions.

Table 2.
IS92a Projections of key drivers and parameters of climate change

	Population (billions)	*GDP/capita (PPP$)*	*Energy intensity (MJ/$)*	*CO_2 intensity ($KgCO_2$/GJ)*	*CO_2 emissions ($GtCO_2$)*
2005 data	6.42	6 541	12.1	54.3	27.5
2100 projections	11.30	29 730	4.5	49.2	75.0
Measures needed for limiting atmospheric CO_2 concentration to 450 ppm	Little change possible, but final figure could be between 9 and 11 billion	Higher income considered desirable, but quality of growth would need to be improved	Major potential for change is in this area. Energy and carbon intensities need to be about 5 per cent of the projected numbers		~4.0

Source: IPCC Special Report 1994: Radioactive Forcing of Climate Change and An Evaluation of the IPCC IS92 Emissions Scenarios.

7 If there were no improvements in efficiency, the emissions would be three times higher (i.e., roughly 165 $GtCO_2$).

Regarding population growth, for example, efforts could be made to bring the global population more in line with the carrying capacity of the earth. Yet, population change can take place only gradually, especially as many people born at the present time can expect to live an average of 80 years. At the same time, fertility rates are falling in many countries, a factor which, together with increased longevity, is posing socio-economic challenges (United Nations, 2007a). In any case, changes in the overall size of the world's population cannot be expected to take place within the required time frame—the next three decades—on a sufficient scale to have a major effect on mitigating climate change.

Regarding GDP growth, developed countries would need to focus much more on the quality of growth rather than just the quantity. Alternative settlement and consumption patterns in these countries can probably lead to a more satisfying life even at current or somewhat reduced income levels. Changes in PCPs may be needed to help reduce the energy intensity of income. Progress is already being seen in this direction: for example, with the enactment of tighter emission standards for vehicles, charges for bringing vehicles into the most congested parts of major cities (thereby also reducing pollution and traffic jams, and encouraging the use of public transport), stricter building codes, and the use of more fuel-efficient light bulbs. These can only be seen as modest and preliminary steps, and no doubt additional measures will be needed to reduce energy consumption.

The most promising area of action relates to CO_2 intensity of energy, which, under the IS92 scenario, is expected to show only a modest decline from 54.3 to 49.2 $KgCO_2/GJ$ (kilograms of CO_2 per gigajoule of energy). Fortunately, many technologies for low- and non-carbon energy generation are already available in developed countries and further progress can be made through vigorous research (Pacala and Socolow, 2004; Stern, 2007; United Nations Foundation and Sigma Xi Scientific Expert Group on Climate Change, 2007). Wind and solar power could provide sources of carbon-free energy in countries with the right conditions. Wave power is at an early stage of development. Nuclear and hydropower are also alternatives, but both are problematic: nuclear, because of both the dangers of a plant malfunctioning and problems with the disposal of the radioactive waste; and hydroelectricity, because of the effects of climate change in reducing the flow of water into glacier-fed rivers, as is occurring in the Andes (Vergara and others, 2007).

Biomass technology is also advancing, but there are considerable disputes as to whether the production of some fuels, such as ethanol, is really cost and energy efficient and whether a surge in the production of biofuels from corn, wheat and soybeans would push up food prices, as already appears to be happening (United Nations, 2007b). Moreover, if forested land were cleared to make way for biofuel production, this could have a negative effect on climate change by reducing the size of carbon sinks.

At present, subsidies are often used to encourage the construction of facilities for generating clean power, and these might be needed for some time to come. However, recent calculations for Denmark have indicated that wind power actually saves consumers

money, as the benefits resulting from lower power prices outweigh the falling costs of the subsidy.[8]

As evidence accumulates on the damaging effects of climate change and the impossibility, as illustrated above, of "business as usual", it begs the question: have the steps taken so far been adequate—and, in particular, were the goals realistic and have they been actually attained. If the answer is in the negative, the need for even more drastic action than presently contemplated is reinforced.

Policy responses so far

Mitigation

Article 2 of the 1992 UNFCCC set the goal of stabilizing the GHG concentration at a level that would allow "development to proceed in a sustainable manner". Following up on this goal, the Kyoto Protocol of 1997 focused on reduction of GHG emissions by the developed countries (Annex I Parties). According to the Protocol, these countries were committed to reducing their emissions by 5.2 percent (relative to the level in 1990) over the period from 1997 and 2008-12. The Protocol refrained from imposing emission limits on developing countries in view of their (a) negligible historical role in the creation of the GHG concentration, (b) current relatively low levels of total and (particularly) per capita emissions, and (c) urgent need to grow rapidly in order to deal with the problems of poverty.

The Kyoto Protocol developed so-called flexible instruments for realizing GHG emissions reductions in efficient ways, including carbon trading and the Clean Development Mechanism (CDM). These instruments were also supposed to create some link between developed and developing countries' climate change-related efforts. The aim of the CDM is to help the Annex I countries meet their emission-reduction obligations by investing in cost-effective solutions in developing countries, a link that could also help the developing countries (non-Annex I Parties) achieve sustainable development goals.

Unfortunately, even the modest targets of the Kyoto Protocol are not being fulfilled. Instead of decreasing, global CO_2 emissions actually increased between 1990 and 2003, as discussed above. Efforts by developed countries to reduce emissions domestically have proved inadequate. Carbon trading is not proving to be as effective and suitable a policy instrument as was expected. The CDM often seems to be used by developed countries to avoid deeper changes in their own PCPs. Overall, the Kyoto Protocol was a step in the right direction, though important parties have still to sign and ratify it. However, given the enormity and urgency of the challenge faced, it must be concluded that the Kyoto Pro-

8 Information from the Danish Wind Power Association, available from http://www.windpower.org/composite-1475.htm.

tocol remains an inadequate and limited mitigation response. A post-Kyoto agreement is thus necessary, and it will have to include much more ambitious targets, with appropriate and effective mechanisms to achieve them. Experience acquired during the operation of the Kyoto Protocol can be very helpful in the forthcoming international discussions.

Most recently, considerable momentum towards achieving a successful post-Kyoto agreement was provided by the Group of Eight (G8) Summit, held in Heiligendamm, Germany, in June 2007. In their Summit declaration, participants accepted the conclusions of the recent IPCC report (its Fourth Assessment Report, released earlier in 2007),[9] namely, "that global temperatures are rising, that this is caused largely by human activities and, in addition, that for increases in global average temperature, there are projected to be major changes in ecosystem structure and function with predominantly negative consequences for biodiversity and ecosystems, e.g. water and food supply".

Participants also agreed that improving energy efficiency worldwide is the "fastest, the most sustainable and the cheapest way to reduce greenhouse gas emissions and enhance energy security". Moreover, they noted the decisions made by the European Union, Canada and Japan—which include at least a halving of global emissions by 2050—committed themselves to achieving these goals and invited the major emerging economies to join them in this endeavour. (This represented a significant advance from the Kyoto Protocol, which excluded the developing countries from obligations to reduce GHG emissions.) The participants committed themselves to taking a leading role in international efforts to combat global warming and to supporting the work of the United Nations in this field.[10]

The United Nations climate process was acknowledged as the "appropriate forum for negotiating future global action on climate change". Participants also acknowledged that further action should be based on the UNFCCC principle of common but differentiated responsibilities and respective capabilities. G8 representatives had also met with representatives of Brazil, China, India, Mexico and South Africa in Berlin in May 2007 and will continue to meet with high representatives of these and other major energy-consuming and GHG-emitting countries to consider the necessary components for successfully combating climate change. The United States agreed to host such a meeting later in the year. The major emitters' process should include "inter alia, national, regional and international policies, targets and plans, in line with national circumstances, an ambitious work program within the UNFCCC, and the development and deployment of climate-

9 The relevant documents are available from http://www.mnp.nl/ipcc/pages_media/AR4-chapters.html.

10 The two major G8 Summit documents are the "Chair's Summary" and the Summit Declaration on "Growth and Responsibility in the World Economy". Both documents, as all G8 documents, can be found on the website of the University of Toronto, http://www.g7.utoronto.ca/ as well as on websites of the Governments organizing the various summits, in this case, http://www.g-8.de/Webs/G8/EN/Homepage/home.html.

friendly technology". This dialogue would support the UN climate process and report back to the UNFCCC. As shall be argued in more detail below, it is of the utmost importance that in this dialogue the mutual links (both positive and negative) between climate change (and policies addressing it), on the one hand, and development, on the other, be duly considered and elaborated. Chapter 12 of the 2007 Fourth Assessment Report of the Working Group III of the IPCC, entitled "Sustainable Development and Mitigation" has begun to address these issues, but more work will be needed (see IPCC, 2007c).

No specific mechanisms have been elaborated as yet on how to achieve the goals, and much discussion still lies ahead. However, the summary of the G8 Chair stated that "technology, energy efficiency and market mechanisms, including emission trading systems or tax incentives are key to mastering climate change as well as enhancing energy security".

Adaptation

In addition to the *mitigation* efforts envisaged by the Kyoto Protocol (that is to say, efforts to reduce the emission of GHGs), there have been some efforts at *adaptation* (i.e., adjusting to the consequences of climate change). In particular, efforts will be needed to assist those countries that will be most affected by the present and future effects of climate change to adjust to the inevitable difficulties that they will face, and which, it should be added, are overwhelmingly not of their own making. Even if—as is clearly impossible—the emission of GHGs were to cease immediately, climate change and the adverse effects already noted can be expected to worsen.

Several funds have been set up to promote adaptation measures at the national level, particularly in developing countries. The Global Environment Facility (GEF) provides about US$ 50 million per year for building capacity for adaptation. The Special Climate Change Fund (Adaptation Programme), finances technology transfer and economic diversification. Funding is at the $50 million level, though part of it will come from regular official development assistance (ODA) sources; this fund has a development focus. The Least Developed Countries (LDC) Fund finances the preparation and implementation of National Adaptation Programmes of Action (NAPAs) in LDCs. This development-focused fund has a volume of $115 million. A final example is the Adaptation Fund, set up under the Kyoto process to finance the implementation of adaptation projects. It is financed by a levy on CDM projects (2 per cent of Certified Emission Reduction (CER) revenues) and by other contributions, with a possible reach of $100 million towards 2012 (Stern, 2007).

As these examples show, although steps are being taken to address the matter of adaptation, the sums involved are, at this stage, fairly small, compared to the billions of dollars worth of damage that the most vulnerable countries can be expected to suffer, especially as the adverse effects of climate change can be anticipated to worsen in future. Altogether, the adaptation-oriented measures remain inadequate in comparison with the

challenges faced, and a considerable ratcheting-up must be planned. Any new protocol or agreement will need not only to recognise this but also to articulate an adequate approach towards the development and implementation (including measures ensuring the facilitation thereof) of options for adaptation, especially in LDCs and SIDS.

Development and climate change: rethinking the current approach

The Secretary-General of the United Nations, Ban Ki-moon, has called climate change a "defining issue of our era", stressing that:

> there is likely to be no single path or solution to all our problems [related to climate change]. New technologies, conservation and fuel efficiency programmes, carbon-trading, improving land use practices, national environmental regulation all are part of the solution. The important thing is … that these policies be complementary and mutually reinforcing. The many strands must be woven into one cloth.[11]

Climate change should thus be coordinated with social and economic development in an integrated manner, with a view to avoiding adverse impacts on the latter, taking into full account the legitimate priority needs of developing countries for the achievement of sustained economic growth and the eradication of poverty.

In the long run, mankind may want to go beyond the UNFCCC stabilization goal and strive to reverse the increase in mean temperature of the earth that has taken place since industrialization. The measures taken so far appear to be aimed at modifying behaviour only at the margin, whereas the challenge requires much more fundamental change, with an entirely different level of motivation and effort in order to reduce drastically the carbon intensity of human activity on the planet. Even with present targets for reductions in global emissions, global climate change will continue as anticipated emissions are still far greater than the earth's absorptive capacity. The earth will simply be warming at a slower pace than if no action were taken.

As mentioned above, developed countries have to continue to take the initiative and play the major role in confronting the threat of climate change. Several lines along which future efforts in these countries may proceed are as follows:

- Wider and deeper recognition that climate change threatens the sustainability of life and societies in all countries.
- Greater awareness that human intervention in the form of carbon emissions is the main cause of climate change, and that deep reductions are necessary to arrest the process of climate change.

11 For the full text, see http://www.un.org/apps/sg/offthecuff.asp?nid=1035.

- Recognizing that the current lifestyle and consumption pattern of developed countries (as well as those of the rich in developing countries) are not sustainable, and that fundamental changes are required if carbon emissions are to be decreased to the desired level. An outline of such changes needs to be developed and a societal agreement reached about this outline. The suggested changes could involve a greater focus by the developed countries on the quality and long-run sustainability of life rather than on the further augmentation of material possessions without regard to the consequences for the climate. Already, initiatives have been taken to make individuals aware of their "carbon imprint", with, for instance, the British Royal Society of Arts' initiation of a carbon calculator so that individuals can see the impact of changes in lifestyle (Acher, 2006).
- Forging an extensive partnership between Governments and the private sector to implement the agreed outline and bring about the necessary changes in infrastructure and industrial production, as well as in the development and deployment of the necessary technologies. Developed countries may launch a massive effort at further development and deployment of these technologies.
- Renewing commitment towards helping developing countries to develop quickly and to do so in a way that will ensure sustainability and help confront, by adaptation, the dangers of climate change.

It is therefore recommended that, in the context of the renewed debate and negotiations on an international approach to climate change beyond the Kyoto Protocol, developed countries immediately start working on post-Kyoto steps. These should aim at deep cuts in carbon emissions through appropriate regulatory measures, and not overly rely on flexible mechanisms that have not proven particularly effective thus far. Furthermore, the post-Kyoto arrangements need to bring development and climate change together and accord a more central place to the twin challenges of a faster and decarbonized growth faced by developing countries. Developed countries therefore also have a role to play in supporting (technologically and financially) developing countries in engaging in mitigative activities beyond those that would have immediate relevance for development.

At the same time, developing countries need to realize that it is also in their interest to engage in mitigation on developmental grounds, and—in the case of new and emerging large-scale emitters among them—for reasons directly related to climate change. They can do so by decarbonizing their growth as much as possible. In recent years, GHG emissions by some developing countries have increased at a faster rate than the world average, as shown by the figures for Asia and the Pacific in table 1. Developing countries aspire to improve the welfare of their populations and reach those standards currently prevailing

in developed countries; however, the danger is that attempts by developing countries to achieve such parity will accelerate the growth of GHG emissions, unless the current development trajectory is significantly decarbonized.

In this regard, it is encouraging that many developing countries are drawing up plans that involve measures directed not only at adaptation but also at mitigation. Examples of such action at the regional and national level are given below:

India: India's Conservation Strategy highlights the need for coping mechanisms, especially in coastal areas. Some CDM projects have been initiated, and substantial research is under way on emissions reduction through the development of energy from sea waves and biomass, or through sustainable transport. India has recently established an Integrated Energy Policy providing the poor with access to clean energy and also increasing energy efficiency. The policy is to lead to an estimated reduction in GHG-intensity by one third.

Indonesia has developed a national climate strategy. The Government has prioritized adaptation measures over mitigation and is working to enhance coping capabilities, for instance, for sea-level rise.

Kenya has an emerging climate policy with associated institutions such as a National Committee on Climate Change.

Brazil has established interministerial coordination for sustainable development and actively follows (and contributes to) international climate negotiations. Brazil plans for its share of renewable energy to be 10 per cent in 2030.

China aims at reducing its energy intensity (energy/GDP) by 20 per cent between 2005 and 2010 and at meeting 15 per cent of its energy needs from renewable sources within 10 years.

Africa: Almost all African countries have ratified the UNFCCC and many support the Kyoto Protocol. They are potential beneficiaries of its mechanisms. Detailed inventories of emissions and sinks have been provided by many countries. Options for exploitation of alternative energy sources (e.g., solar, wind, biomass and hydro) are being explored. Mitigation and adaptation options must be found to cope with the impacts of changes in weather regimes, droughts and floods.

Asia: The Asia Least Cost Greenhouse Gas Abatement Strategies (ALGAS) project has identified a range of options to reduce GHG emissions.

Latin America and the Caribbean: Mitigation and adoption activities include energy saving methods in such sectors as transportation, agriculture and waste management. The region is actively involved in developing renewable energy and carbon sinks (forests), as well as wind energy.

The efforts of developing countries often also include afforestation, an area in which grass-roots organizations often play an important role. Overall, however, the adaptation measures taken by developing countries are still inadequate.

The challenge for developing countries is to achieve fast economic growth while adding the least possible amount of GHGs to the atmosphere. At the same time, the most vulnerable countries are faced with the costs of adaptation to the inevitable adverse consequences of climate change. Their multi-pronged effort—pursuing adaptive and mitigative efforts at the same time as achieving faster economic growth—will require the full support of the international community.

Meeting these challenges calls for a vast endeavour that includes:

- More in-depth research to formulate the appropriate development strategy.
- Formation of national consensus on the strategy adopted.
- Mobilization of necessary domestic and external resources.
- Actual implementation of the strategy.

Such a development strategy has to focus on the interlinkages between growth, poverty and climate change, and will have to give an important role to the poor as actors and not treat them just as a target group recipient of action by others. The policy instruments to be used by the strategy may include direct investment (in research and extension), large-scale public works, conventional regulation, subsidy and taxation, redistribution mechanisms, differential taxation, subsidy schemes favouring the poor, non-trading market mechanisms, community development, credit and microcredit programmes, development of climate-friendly institutions and legal action, ideally all backed and monitored by citizens and evaluated against short- and long-term targets. The desired development strategy will need to consider policies that pertain to population and reproductive health, land use and energy (including deployment of renewable energy, energy security, energy conservation and energy efficiency).

Further analysis of the linkage between poverty and climate change may have implications for concepts and indicators of vulnerability, especially those pertaining to least developed countries.

New partnerships towards sustainable development

Efforts by developing and developed countries at the national and regional levels to reduce GHGs and to adapt to the inevitable future changes in climate are essential and should be prosecuted with ever-increased vigour. However, confronting climate change and sustain-

ing development requires not only national and regional actions, but something much broader: a new partnership between developed and developing countries. The developed countries cannot avoid disruptions caused by climate change that will result if the developing countries run full steam towards industrialized country levels of per capita carbon emissions. The developing countries, on the other hand, cannot engage in a decarbonized or less carbonized growth process without adequate technological and financial support from the developed countries.

In devising climate-friendly technologies, the developed countries have to be attentive to their applicability in developing countries as well. In addition to contributing to mitigation worldwide, taking developing countries' needs into account also makes sense business wise, since the potential that developing countries offer in terms of markets will also improve the commercial viability of such technologies. However, short-run profitability should not stand in the way of the development and deployment of climate-friendly technologies. Similarly, intellectual property rights (IPRs) should not act as a hindrance to the dissemination, transfer, adaptation and actual deployment of climate-friendly technologies in developing countries.

Developed countries also need to provide the necessary technical support to enable developing countries to adapt and put these technologies into use. Developing countries themselves also need to upgrade their national technological capability both to adapt the climate-friendly technologies available in the developed countries and to develop their own climate-friendly technologies suitable to their unique conditions.

Given that developing countries often lack resources to address their urgent investment needs, they require additional resources to implement the less-carbonized or decarbonized development measures. Thus, mechanisms need to be identified enabling developing countries to follow more climate-friendly development trajectories. These may include financial assistance in addition to ODA and innovative international financing schemes such as carbon (or GHG) taxation.

The partnership between developed and developing countries in confronting climate change must be viewed neither as a matter of just "giving and receiving aid" nor as a matter of intergovernmental transactions. The scope of necessary action is so vast that many different dimensions and channels may be envisaged that involve a role for Governments, private companies, individual entrepreneurs, civic and non-governmental organizations, professional bodies, etc.

What is clear is that major changes—likely involving institutional changes—in the relationship between developed and developing countries are required and that the world is only at the beginning of a process which is essential to safeguard life on the planet and the continued growth of, in particular, the poorest countries.

Conclusions and recommendations

The above analysis has led the CDP to make the following conclusions and recommendations for action at the international level by the appropriate United Nations bodies:

- The response to the climate change threat so far has been inadequate, and there is an urgent need for raising the mitigation and adaptation efforts to an entirely different level. Any post-Kyoto arrangement has to go far beyond the present Protocol, in order to reflect properly the enormity and the urgency of the problem. This includes the articulation of an adequate approach towards the development and implementation (including measures ensuring the facilitation thereof) of options for adaptation, especially in LDCs and SIDS.
- While the Kyoto Protocol followed a one-track approach focusing on (marginal) reduction of emissions by developed countries and treating developing countries largely as onlookers, post-Kyoto arrangements have to adopt a simultaneous two-track approach. The first track would aim at very deep cuts in emissions by developed countries; the second would provide a more central role to developing countries by enabling them to both grow faster and make their growth as less-carbonized and decarbonized as possible through the successful adoption and implementation of appropriate climate-friendly development strategies with the necessary technological and financial cooperation from developed countries.
- The United Nations should further contribute to the post-Kyoto process, and the Economic and Social Council could provide a platform for an overarching and sustained policy dialogue about the relationship between climate and development. This policy dialogue should also lead to a process of future revision of the Millennium Development Goals so that the danger of climate change and its overshadowing impact on all other development issues find appropriate reflection. In this regard, there is need to consider the links and feedbacks between climate change (and also the policies adopted to address it) and development in a thorough and integrated way. On the one hand, development paths vary in the ways in which they have an impact on the climate; on the other, different climate policies will have different impacts on development trajectories and rates of economic growth. Even though these feedbacks within the climate-development nexus are not, as yet, fully understood, they should be explored in order to arrive at an appropriate strategy involving all parties concerned. The strategy would comprise those mitigation and ad-

aptation measures (as well as the actions needed to facilitate their implementation) required to address effectively the challenge climate change poses to development. Further work by the CSD will be of invaluable importance. The CDP, building on IPCC results, is also ready to assist in achieving a deeper understanding of the linkages between development and climate change and to contribute to the formulation of a conceptual framework in which the goals of advancing development, while arresting climate change, are integrated.

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