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POVERTY AND CLIMATE CHANGE: ASSESSING IMPACTS IN DEVELOPING COUNTRIES AND THE INITIATIVES OF THE INTERNATIONAL COMMUNITY

Claire McGuigan
Rebecca Reynolds
Daniel Wiedmer

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ACRONYMS

AIJ	Activities Implemented Jointly
AUSAID	Australian Agency for International Development
CCDF	Climate Change Defence Fund
CCI	Climate Change Initiative
CDM	Clean Development Mechanism
CER	Certified Emissions Reduction
CIDA	Canadian International Development Agency
CO2	Carbon Dioxide
COP7	Conference of Parties (7^{th} Session)
DFID	Department for International Development
EEZ	Exclusive Economic Zones
EIT	Economies In Transition
EU	European Union
EWS	Early Warning System
FAO	Food and Agriculture Organisation
FDI	Foreign Direct Investment
FIELD	Foundation for International Environmental Law and Development
GCM	Global Climate Models
GEF	Global Environmental Facility
GHG	Greenhouse Gases
GTZ	Deutsche Gesellschaft fur Technische Zusammenarbeit
IFRC	International Federation of Red Cross and Red Crescent Societies
IIED	International Institute for Environment and Development
IPCC	Intergovernmental Panel on Climate Change
JICA	Japanese International Cooperation Agency
FSU	Foreign Soviet Union
NAFTA	North American Free Trade Agreement
ODA	Overseas Development Assistance
OECD	Organisation for Economic Cooperation and Development
PV	Photovoltaic
SLR	Sea Level Rise
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development

Introduction

There is wide academic consensus that global warming is occurring due to the emission of greenhouse gases (GHGs) and the Intergovernmental Panel on Climate Change (IPCC) Working Group's Fifth Report; *Climate change 2001 : impacts, adaptation, and vulnerability*, predicts an average global temperature increase of 1-3.5ºC over the next 100 years. Taken by itself this small aggregate temperature change has little meaning, however there is general concern over how climate change will affect the frequency of extreme weather events and how particular regions will be drastically affected by even small temperature increases. It is known that both temperature increases and precipitation changes will vary from region to region, affecting higher and lower latitudes differently. Due to these differential effects, developing countries are likely to suffer more from the economic impacts of climate change, as well as being the least able to adapt to new climatic conditions. Changes will be brought about with regard to the incidence of natural disasters such as droughts and floods, agricultural production, fisheries and marine life, water resource availability, industry and human health. These are all expected to increase the disparity in wealth between the developed and developing world and redistributive impacts are one of the major reasons for concern about the climate change phenomena as expressed by the IPCC in its 2001 report. Although there is still a lot of uncertainty in scientific predictions, levels of vulnerability and the ability to adapt, these are all clearly urgent issues for developing countries, particularly because it will be the already poor and marginalized populations who will be most affected by climate change.

This report forms part of an ODI project to assist developing countries participate effectively in international climate change negotiations. It presents the overall likely effects of climate change, as well as mitigation and adaptation efforts in developing countries, highlighting the particular vulnerability of the poor. The first section examines the increased hazards for developing countries due to sea level rise and increased frequency and intensity of natural disasters. To investigate the impacts on poor communities it draws parallels from the body of research on vulnerability and natural disasters. General conclusions highlight the devastating impacts which coastal communities will be exposed to, as well as pointing to specific developing countries and regions, which will be disadvantaged.

The next section presents the overall impact of climate change on the livelihoods of the poor in developing countries. It looks at global food security trends as well as presenting current research on country specific and regional effects. The most pressing concerns relate to the distributional impacts of increased temperatures and water shortages on crop production, and the likely decrease in food security in the developing world. The analysis expands the discussion of agriculture beyond food security, to include looking at the overall economy wide effects of decreasing crop yields, declining fish stocks and water shortages. Finally this section includes a summary of the effects of climate change on health in developing nations, presenting the major areas of concern.

Given the lack of national research on climate change, which has been identified by developing country negotiators as an obstacle to their task[1], this report also offers a framework to help developing countries conduct their own research on climate change impacts and vulnerability and presents recommendations for analysis and negotiation in this respect. This includes looking at national level exposure to sea level rise, natural disasters, declining production and the likely changes that will result in the economy. The framework also suggests indicators and a framework for research into the vulnerability of the poor.

The following section reviews the clean development mechanism (CDM), the main implementing mechanism under the Kyoto Protocol which will lead to investment in developing countries. The CDM has both environmental and sustainable development goals and will be analysed particularly with regard to its effects on poverty alleviation. This section includes an overveiw of the mechanism itself, criteria for project investment through the CDM, current debates on the possible trade-offs between environmental and poverty reduction goals and the risks that, in line with the observed trends of foreign direct investment (FDI), smaller, less industrialized countries will be marginalized from the investment process. However, this section will also identify some opportunities for the poorest countries which arise from the specific nature of CDM projects which can include small scale, pro-poor clean energy options. A review of case studies will show the effects of different CDM project types on poverty alleviation and on improving the quality of life of the poor. This section concludes by identifying some "win-win" projects in the energy sector and by suggesting means to increase the number of these projects.

The final section examines the role of Official Development Assistance in addressing climate change and poverty. It outlines the climate change policies of six bilateral donors, as well as the activities of of the European Union and the Global Environmental Facility in partnership with the UNDP, UNEP and the World Bank. The section then discusses whether ODA programmes, particularly mitigation and capacity building measures, effectively address the vulnerability of the poor. It finishes by offering several points for future discussion and consideration for policy makers, including mainstreaming, ODA's relationship with the CDM and pro-poor projects.

Section 1: Natural Disasters and Sea Level Rise — Rebecca Reynolds

Rising temperatures will bring enormous and varied changes in weather patterns, ocean currents, regularity of natural habitats and thus biodiversity. One the first changes that this paper will look at is the impact of rising temperatures on sea levels and the occurrence of natural disasters like floods and cyclones. It will show that sea level rises and associated weather events will have diverse and widespread impact but that the knock-on effects will be felt disproportionately by poor countries and by poorer communities in these countries.

[1] Page (2002)

Many studies predict the extent and the expected effects of sea level rise (SLR), however fewer exist on the increased severity of natural disasters. The most recent and extensive study on global warming and expected changes is the IPCC Report (2001) which summarises most studies and provides a survey of the expected impacts in each region along with their vulnerability. Whilst there little research about effects of SLR on the poor, it is possible to draw parallels from the extensive literature on the impact of disasters.

(a) Impacts

- Impact of Rising Temperatures

The IPCC Report predicts that global warming resulting from carbon emissions will cause a rise in sea levels and may lead to an increase in the frequency and severity of natural disasters. Although no definite predictions exist as to the exact magnitude, timing and distribution of sea level rise, most estimates foresee that an increase of 1.5-4.5 C will lead to an increase of 15 – 95cm, with 50cm being the best estimate (IPCC 2001). Increased temperatures contribute to SLR in three ways:

- heating leads to the thermal expansion of oceans and thus an increase in volume;
- higher temperatures cause mountain caps and polar glaciers to melt and add to oceans' volume;
- warmer seas cause coral bleaching, which stagnates coral growth, preventing it from fulfilling it natural protector role accommodate rising seas. (IPCC 2001, OECD 2000, IFRC 1999).

There is less certainty about the relationship between climate change and the occurrence of natural disasters. Any change in the mean climate will affect the frequency of extreme events, however it is impossible to predict exactly what the frequency, and distribution of these events will be. In spite of this uncertainty, there is consensus that global warming may precipitate an increase in cyclonic wind and rain intensities, intensified droughts and floods associated with El Niño, increased Asian monsoon rain variability, and intensity of mid-latitude storms (IPCC 2001). The changes anticipated with SLR will contribute to the increasing severity of natural hazards, storm surges and flooding.

- Impacts of Sea Level Rise and Natural Disasters

Coastal areas are most at risk to the changes outlined above. Increased sea-levels will bring salinisation and an intrusion of seawater into freshwater sources, flooding and loss of land, erosion, loss of wetlands and mangroves and loss of soil fertility. Changes in temperature will alter ocean circulation patterns, vertical mixing of water and wave patterns which will impact on marine productivity, availability of nutrients and disturb the structure of marine and coastal ecosystems (IPCC 2001). Whilst there is no data on the frequency of disasters due to climate change, Jepma *et al* (1998) estimate that with a 70cm SLR the number of people at risk of annual flooding could increase from 46 million to 90 million. Furthermore greater wind intensities in cyclones will damage buildings, crops, forestry, natural habitat and thus ecosystems, housing and vital physical infrastructure.

Over half the world's population as well as most of the fertile lands and urban dwellings are located in coastal and delta regions where the changes outlined above

will occur (GEF 2000, IFRC 1999, IFRC 2000). The impact on physical infrastructure and human livelihoods will therefore be numerous and widespread. Firstly these changes will bring loss of life, as floods, storms and cyclones cause drowning and the spread of disease (cholera, dysentery, malaria and yellow fever) and increase the chances of famine in areas with inadequate coping systems (Blaikie 1994). Loss of livelihood is a further and more widespread impact of weather changes. The salinisation, flooding or complete innondation of agricultural lands or urban industry will destroy vital assets and resources for survival (OECD 2000). For example a SLR of 30 cm could flood parts of the Yangzte Delta where 30 million people live and work in agriculture (IFRC 1999). Finally, SLR and increased natural disasters will destroy infrastructure vital for economic development like ports, quays and sewer systems, as well as shelter. For example it is estimated that with sea level rises of 1 metre, Bangladesh and Egypt could lose 46 million houses (DFID 2000).

Global warming will therefore bring significant global changes due to increased sea levels and disaster occurrences. Annex 1 provides a regional summary for Africa, Asia, Pacific Islands and Latin America and the following sections will look specifically at the impact on developing countries and poor communities.

(b) Vulnerability

Before outlining how and why poorer countries and communities are more vulnerable to climate change, it is useful to provide a definition of this concept[2]. Blaikie (1994) describes vulnerability as the characteristics of a person or a group to anticipate, cope resist and recover from the impact of a natural hazard. For Chambers (1989), vulnerability represents the ability or not to modify the impacts of disaster and the means to cushion risks. On a national level, vulnerability manifests itself in poorer countries due to a lack of resources and capacity to respond. At the community level class, caste, gender, ethnicity, age, level of education and access to resources all determine vulnerability (Blaike1994, IPCC 2001, Warrick and Rahman 1992, Adger and Kelly 2001).

Poorer nations are disproportionately vulnerable to disasters and hence to the effects of climate change for a number of reasons. Firstly, the ability to adapt and cope with weather hazards depends on economic resources, infrastructure, technology, and social safety nets. (IPCC 1995). Developing countries often do not have the resources for these and thus are ill-prepared in terms of coastal protection, early warning and disaster response systems, and victim relief and recovery assistance. (GEF 2001). Secondly, for many countries, climate change is only one of the many environment problems they confront. Many are already under pressure from population growth, rapid urbanization and resource depletion, making them vulnerable to the further challenges thrown up by climate change. (IPCC 2001, Jepma et al 1996)

Specific examples highlight how developing countries will suffer disproportionately to the impacts of climate change. Developed countries experience a larger proportion of property damage (75%), but recovery costs are higher for developing countries. Whilst developed countries pay 0.1% of GDP in losses, developing countries pay 2-

[2] Other sources which provide definitions and frameworks for vunerability include: Adger and Kelly 2001, Chowdury 1996, Bankhoff 1999, Morris et al 2002, Barnett 2001.

3%, or sometimes as much as 15% as seen with hurricanes in the Caribbean. Developing countries also experience a greater loss of life; 90% of all deaths. (Bankhoff 1999). For example, the risk of drowing in Fiji due to dyke failure is 1 in 100 000 whereas in the Netherlands it is 1 in 10 mill. (Olsthoorn et al 1999).

- The Vulnerability of the Poorest – Disaster Preparedness

Poor communities are also more vulnerable to extreme weather events, like those associated with climate change. Location, lack of services and infrastructure and poor building structures all increase the vulnerability to flooding, storm surges and cyclonic wind and rain. In LDC cities in developing countries the poorest live in unplanned squatter dwellings, often located in flood plains which represent the only available place or a source of fertile agricultural land. For example, in Tonga, people moving from outer islands to the main one were forced to settle on low-lying areas; more vulnerable to floods (IPCC 2001, Barnett 2001). In Bangladesh, 15% of total land is subject to flooding and is disproportionately occupied by people living in a marginal existence (IPCC 2001). Poorer settlements often lack the infrastructure of fire services, dykes, Early Warning Systems (EWS), drains, etc which help cope with a disaster (IFRC 1999, Morris et al 2002, Bankoff 1999, Chowdhury 1996, Olsthoorn et al 1999). Finally, the poor do not have the resources to invest in disaster proof buildings which increases the risk of them losing their shelter.

- The Vulnerability of the Poorest - Recovery

Poorer communities also have limited means to cope with the losses and damage inflicted by natural disasters. Lack of insurance, savings or credit make it almost impossible to replace or compensate for the numerous things lost or destroyed, including houses, livestock, food reserves, household items and tools (IPCC 2001, Blaikie 1994). Poor farmers also risk losing crops as the flood season occurs as crops ripen for harvest. In the longer term, poor households also risk losing wage opportunities as the sick and injured cannot work or as the disaster destroys the need for labour. Recovery strategies, like selling assets, can leave the poor without income and thus more vulnerable. Finally, many of these effects contribute to long-term vulnerability leaving people more at risk to the next disaster. (i.e. a flood may reduce wage earning opportunities which prevents people from paying inflated prices for food when another flood strikes).

Specific examples from developing countries further highlight the disproportionate risk and danger faced by the poor. In the 1977 floods in Andhra Pradesh, India the deaths were 23-27% for small farmers and fisherman, and there was a 3% death rate for large farmers and local level officials (Winchester 1986). Morris' study on the impact of Hurricane Mitch shows that the lowest income quintile lost 40% of crop value and 18% of asset value whilst those in the higher quintiles lost 25% and 3% respectively. (Morris et al 2002).

Developing countries face significant challenges to adapt to and cope with climate change. Not only are they likely to disproportionately feel the effects, but a large proportion of their population are highly vulnerable to SLR and natural disasters. In view of this, developing countries must have specific information on their vulnerability to present at climate change negotiations. Suggested areas for research are presented in the final framework for negotiators.

Section 2: Livelihoods — Claire McGuigan

The majority of studies simulating the effects of climate change on agriculture, fisheries and health have been carried out for industrialised countries, largely ignoring specific impacts in the developing world. However more recent studies have begun to highlight particular regional and sub-regional effects and some developing countries have also presented their own analysis of the impacts of climate change in their national communications to the UNFCCC (2001). In particular developing countries have signalled agriculture, food security and water resources as issues of foremost importance.

However it is important to note that only 52 out of 146 non-Annex 1 countries have formulated national communications and many only provide patchy information on impacts and vulnerability. In general developing countries have felt constrained, both with regard to technical capacity and resources, in carrying out detailed impact and vulnerability assessments. This has led to more recent commitments made by the Conference of Parties to the Kyoto Protocol in its seventh session in Marrakesh (UNFCCC, Report of COP7, 2002), where a specific framework for capacity building was adopted. This includes a focus on formulating national communications, scientific research, vulnerability and adaptation assessments and the implementation of adaptation measures.

A general summary of climate change impacts is presented below, along with an analysis of how it could affect the livelihoods of the most vulnerable populations within developing countries.

(a) Impacts

(i) Food Security

Climate change may affect agriculture through:

- Changes in temperature and precipitation,
- Changes in soil moisture and soil fertility,
- Changes in the length of growing season and
- An increased probability of extreme climatic conditions (as dealt with above)

Global climate models (GCMs) predict that aggregate changes in world food production are likely to be small.[3] However there is general agreement that climate change may lead to significant reductions in agricultural productivity in developing countries. There are many uncertainties when constructing models of crop yield changes, with static models often presenting a negative outlook with decreases in crop productivity of around 20-30%. However these assumptions disregard both the positive effects that increased carbon dioxide (CO2) can have on crop yields and the adjustment of the economic system to changes in agricultural production, given interaction in the global economy. In particular the issue of CO2 fertilisation has

[3] The IPCC (2001) predicts global impact will range from slightly negative to moderately positive.

given rise to much debate. Some argue that increasing CO2 fertilisation could make a major contribution to solving the problems created by climate change for agriculture[4], however others feel this contribution may be overestimated. It is worth noting the differential impacts of CO2 fertilisation, with crops such as wheat, rice and soybeans [known as C3 crops] responding positively to increased CO2,[5] whilst other major staples, such as maize, sorghum, sugarcane and millet [C4 crops] do not benefit. As C4 crops are those grown in the tropics, this factor alone shows the possibility of differential climate change effects and points to the fact that only agricultural production in more temperate zones, will be partially compensated by the beneficial effects of CO2 enrichment.

Influential studies, such as that by Rosenzweig & Parry (1994) have examined world food supply, food prices and the number of people at risk from hunger in developing countries. These studies have found that whilst developed countries are likely to experience some increase in agricultural output, developing countries suffer a decrease in the scenarios which were constructed. There have of course been criticisms of the Rosenzweig and Parry study, from those who feel the predicted yield losses are too large, to others who have suggested that not enough attention was paid to the likelihood of adaptation by farmers (Reilly 1994). The IPCC, however, has accepted the likelihood that agricultural productivity will decrease in the tropics, even as a result of small temperature increases and has suggested that a mean global temperature increase of 2.5ºC would lead to an increase in food prices.

It is also important to note that the analytical framework for assessing agricultural impacts is undergoing an evolution, with large scale, global modelling losing importance, as more local level studies are underway. There is a general consensus among developing countries that individual analysis is necessary and 45 developing countries, in their national communications to the UNFCCC (2001) have focused particularly on the agricultural sector, examining the vulnerability of more than 10 specific crops and cultivars under a variety of climate change scenarios.

- Food Security and Water Resources

Water availability is a key component of food security, given the reliability of water supplies is perhaps the single most important factor in food production. In general climate change is expected to lead to more precipitation, but much of this increased wetness may not end up where it is most needed. Arid and semi-arid regions are likely to suffer even more reduced rainfall and increased evaporation. In this respect, climate change is an added risk to these regions which have already been undergoing a process of increased desertification and land degradation, caused both by over-exploitation and inappropriate land-use as well as general climatic variations. This is already the subject of great international concern, beginning with the first UN conference on desertification held in 1977 and culminating in the adoption of the UN Convention to Combat Desertification (UNCCD) in 1996.[6] Currently it is estimated

[4] Budyko (1992), cited in "Integrated Assessments of Mitigation, Impacts and Adaptation to Climate change" 1995.
[5] Some experiments predict a mean yield increase of 30% (UNEP Climate Change Information Sheet, 10)
[6] As of March 2002, 179 governments have signed up to the convention.

that 250 million people are directly affected by desertification and that 1 billion people in over 100 countries are at risk.[7]

Some specific work has been done with regard to water resources in developing countries and the effect of reduced water availability on agriculture. Research in Brazil (Magalhaes, 1994) points to the dramatic effects of likely production loss and food shortages in the semi-arid zone and Liverman and O'Brien (1991) have also looked at the effects water shortages could have on Mexican agriculture. Bolivia (Bojanic 2001) has also identified its vulnerability to drought and the serious implications this could have on rain-fed agriculture which predominates in the country. A key point to note is that water resource availability is not always included in global simulations of agricultural productivity and was not included in the original Rosenzweig and Parry studies, as irrigation adaptation was taken as given. This clearly points to the need to include water resources explicitly in developing countries vulnerability assessments.

- Maize: An Illustrative Example

Although many global food security scenarios use a variety of staple crops in their analysis, it is extremely important to bear in mind the special importance for developing countries of particular crops. Maize provides a good example and is analysed below. Other staple crops such as millet and cassava which are particularly important in Africa have not been subject to much research to date.

Maize

Maize accounts for around 14% of all agricultural production and about ¾ of all traded grain. It is a major staple crop and often forms the basis of food security in developing countries, being grown by the poorest farmers and generally without irrigation. This is clearly illustrated by the example of Mexico where 70% of maize is grown on rain-fed land, by farmers who occupy less than 5 hectares. It is largely regarded as the "peasant crop" and has been repeatedly negatively affected by recent droughts. Small farmers involved in maize production in Mexico have also been negatively affected by cheaper imports from the USA under NAFTA. This clearly illustrates the concept of "double exposure" to both climate change and trade liberalisation presented by O'Brien and Leichenko (2000). Similarly in Tanzania, large effects are expected, given recent scientific simulations predict an average yield decrease of 33% (Mwandosya, Nyenzi and Luhanga 1998). Also important to note is that maize forms the basis of imports by food insecure countries to famine-prone regions.

(ii) Fisheries

Marine fisheries supply an important proportion of the world food supply and may represent a much greater importance for local or regional food security in developing countries where fish provides an important source of protein.[8] Several major ocean fisheries have already been subject to collapse and almost all of the 200 main fisheries monitored by the Food and Agriculture Organisation (FAO) are fully exploited (UNEP 1994). The establishment of Exclusive Economic Zones (EEZ) in the mid-

[7] Cited on the UNCCD website

[8] Hilary French (2000) estimates that nearly 1 billion people, most of them in Asia, are dependent on fish as their primary source of protein.

1970s has not been enough to avert the tremendous pressure on fisheries and climate change needs to be considered as an additional threat to this fragile situation.

Scientific assessments have predicted changes in the oceans' makeup, given increased atmospheric temperatures. Clearly it is more difficult to monitor the marine environment in the same way as crop yields can be investigated, a task further complicated by the fact that fish populations are affected by many natural factors (including wind speed, currents, temperature and salinity). However weather events such as El Niño have shown us how fish populations can be reduced by changing water temperature in upwelling regions. The IPCC (2001) predicts changes in the abundance, distribution and species composition of some fish populations, as well as the collapse of some fisheries, although the expansion of others is also a possibility.

(iii) Overall Economic Impacts

It is necessary to look at the general structure of developing countries economies to understand overall economic impacts. The majority of studies have focused on the issue of food security, generally predicting overall negative impacts for developing countries. Reilly, Hohmann and Kane (1994) in analysing the net economic impacts of climate change with regard to staple food crops, have reminded us that economic effect depends on a whether the country is a net importer or exporter of a particular crop and whether its yield change is positive or negative. This requires a specific analysis of yield changes interacted with commodity price changes to understand how consumer and producer gains and losses will be spread throughout the economy. In this respect it is important to investigate the distributional aspects of climate change within each country.

Overall exposure to risk depends on a detailed analysis of sectors such as agricultural production, fisheries and industry, all of which are sensitive to climate change. Agricultural commodities often make up a large part of developing countries economies, and more recent developing country analysis have paid particular attention to the effects of climate change on the following:

- cash crops (such as coffee, tea and cotton)
- livestock[9]
- wildlife and tourism
- horticultural crops

With regard to fisheries it is worth noting that around 200 million people worldwide are economically dependent on fisheries (French 2000) and that although fishing activities generally make up a small part of national economies there are some developing countries, such as Peru and Chile which depend more heavily on fisheries.

Another fundamental part of any analysis on the economic impact of climate change needs to include an investigation of water resource availability. This is not only to understand the impact on rain-fed agriculture, but also with regard to processes of industrialisation and urbanisation. Water is fundamental to many industrial activities (food processing, heavy industry, cooling) and could slow down industrialisation processes.

[9] In the case of Tanzania, for example, 65% of the country is rangeland with a potential for a large impact on livestock through increased heat stress and an increase in animal vector borne diseases.

(iv) Health

The IPCC (2001) has stated that "overall negative health impacts are anticipated to outweigh positive health impacts from climate change". Of particular relevance to developing countries are health impacts from the spread of vector borne diseases, particularly malaria and dengue, health problems related to water shortages and those related to under-nutrition, given the expected rise in food insecurity outlined above. It is difficult to predict impacts with any certainty given the importance of public health services in determining the health of the population. Added to this are the health impacts of unpredictable natural disasters, including cholera, dysentery, malaria and yellow fever, as outlined above.

- Infectious diseases

Vector borne diseases such as malaria, dengue, mosquito borne (and tick borne) encephalitis and Lyme disease are all affected by changes in climate. Although mosquitos cannot survive past certain temperature thresholds (and therefore some regions may benefit from temperature increases), it is also clear that warmer temperatures and increased humidity are general factors which will encourage their transmission. Malaria is currently one of the most important public health problems of the developing world with around 2.5 million deaths occurring a year mostly in children (DFID, 2002). In general vector borne diseases are expected to expand to cover new areas in the subtropics, including higher elevations and urban areas (such as Nairobi and Harare, DFID 2002). The spread of cholera may also increase due to ocean warming.

Although the IPCC (2001) states that "to date there is little evidence that climate change has played a significant role in the recent resurgence of infectious diseases", Epstein et al (1998) cite some cases where temperature rises have been linked locally to the rise of mosquito borne diseases. This includes cases in the highlands of Tanzania and Kenya, in Mexico (where dengue fever has been reported) and in Colombia where dengue and yellow fever have been reported at an elevation of 2200m.

- Water related health impacts

Currently 1 billion people live without access to safe water and sanitation. Increasing water shortages caused by global warming could lead to further declining hygiene and sanitation, a spread of water borne diseases such as cholera and typhoid and a rise in diarrheal and skin diseases and other water related conditions.

- Under-nutrition

The effects of food insecurity have been well documented in the developing world. It is commonly accepted that a lack of nutrition at a very early age affects children's height and intellectual development as well as resulting in low productivity in adults. Malnutrition also increases the susceptibility to infection.

(b) Vulnerability

Any analysis of vulnerability of developing countries to climate change needs to look at the impact across regions and within countries. Two broad sets of regions appear to be particularly vulnerable to climate change:

- semi-arid tropical and sub-tropical regions (such as north-eastern Brazil and much of Africa), and
- more humid, tropical and equatorial regions (such as South East Asia and Central America).

Africa is expected to be the most vulnerable continent, suffering dramatic losses in agricultural productivity and increases in hunger as a result. Detailed vulnerability studies require regional and local assessments, however such assessments are only beginning to be undertaken by developing countries. Of the countries which have provided the UNFCCC with information on specific vulnerability it is notable that the particular impact on the livelihoods of the poor is not yet being highlighted.

Apart from the frequently highlighted physical vulnerabilities of particular regions and sub-regions, it is clear that the poor are particularly vulnerable to climate change and will suffer disproportionately from its impacts. Writers such as Bohle et al (1994) and Adger (1999) have advocated for an approach which includes both a physical analysis of climate change and a recognition both of how different groups in society will be affected by climate change impacts and how they will respond to its risk. Bohle el al (1994) have proposed a framework of vulnerable groups within developing countries which includes the following:

- rural smallholder agriculturalists
- pastoralists
- wage labourers, particularly in remote agricultural lands[10]
- urban poor
- refugees and displaced

Using this type of definition, it is possible to construct vulnerability assessments based on geographical features which predict agricultural sensitivity and complement this analysis with a map of social vulnerability to hunger and famine. This would allow countries to predict more accurately expected decreases in income and food availability.

Adger (1999) talks of a differentiated social vulnerability and argues that this results in environmental changes "gaining significance when they have an impact on the relative and absolute well-being of individuals and groups". This recognition is extremely important for developing countries participating in climate change negotiations, given the tendency for aggregate scientific predictions to mask what could be a dramatic increase in vulnerability for certain populations in certain regions. In particular the prevalence of subsistence farmers means many poor households are vulnerable not just to economy wide effects, but also to specific impacts on their survival strategies. Adger (1999) therefore suggests a framework with which developing countries can analyse the social vulnerability of particular groups to climate change. This includes:

- separating vulnerability assessments into the vulnerability of the nation and individual vulnerability

[10] In general, it is important to note that agricultural productivity serves as the engine for growth in the rural sector as a whole and even rural non-farm sectors are likely to be affected by losses to agriculture. (Skees, Varangis and Larson 2001)

- developing indicators which represent the diversification of income of poor households, allowing the identification of climate sensitive income sources
- developing indicators which represent the dependency of the poor on natural resources[11]

Some insight can be gained on possible welfare impacts by looking at the microeconomics literature on the risk-coping strategies of the poor. Firstly, it is important to note that harvest failure is generally identified as the primary hardship for poor households, clearly of concern given the likely effects of climate change on agricultural productivity. Welfare impacts on poor households include increased female and child labour participation, worsening child health, particularly that of girls and falling child attendance in school. Given the covariate nature of the risk of climate change which will produce similar impacts in regions or sub-regions, poor households will find it difficult to rely on both formal and informal credit and insurance mechanisms, therefore vulnerability assessments need to take into account this added aspect of vulnerability when analysing predicted livelihood effects.

- Adaptation

Building on the Chambers' approach, the IPCC (1996) defines vulnerability not only as the sensitivity to climate change impacts, but also the ability of systems to adapt to new climatic conditions.[12] Adaptation has the potential to reduce the negative impacts of climate change, however the ability to adapt is particularly related to socio-economic characteristics and the likelihood of adaptation needs to be carefully analysed given developing countries are at a clear technological, financial and institutional disadvantage.

With regard to agricultural production, adaptation techniques could include changes in crop types, crop location, irrigation, fertiliser use and infrastructure. With regard to the water resources sector, integrated water resource management techniques can be applied. Strengthening public health infrastructure is also the major adaptation technique being suggested to respond to the predicted rise in health problems described above. Apart from the obvious challenges and costs of such adaptation to a developing country, Reilly, Hohmann and Kane (1994) point out that in the case of agriculture, adaptation itself may not be the most suitable strategy, given the country's worsening *relative* position in the global agricultural economy. Subsistence farmers in particular do not have the same adaptation options and are likely to be the most heavily affected by changes in crop yields. It is also important to recognize that no single adaptation strategy can be encouraged, given the uniqueness of each country's situation. This is clearly recognized in the COP7 report (UNFCCC, 2002) which emphasizes the lack of a "one size fits all formula".

Section 3: Recommendations for Developing Country Negotiators on Climate Change — Claire McGuigan and Rebecca Reynolds

[11] Similarly, a recent DFID study (2002) highlights the importance of natural resources for both the subsistence and commercial activities of the poor, calling attention to the high proportion of poor in developing countries, living in ecologically vulnerable areas.

Although advances have been made there is still a lack of research within developing countries on their specific exposure to climate change. The following framework provides some indications for calculating overall exposure. It also provides specific indicators to portray the more detrimental effects on the poorest sectors of the population. It relies on both a quantitative and qualitative approach and allows countries to calculate both national and individual level vulnerability, following the framework suggested by Adger (1999).

(a) National Vulnerability

This section focuses on the analysis of overall economic impacts, particularly highlighting the agricultural sector, given its importance for developing countries. It also includes health as an issue of national concern.

Natural Disaster and Sea Level Rise Impact

- No. of extreme weather hazards per year
- Amount of coastline vulnerable to SLR, flooding and storm surges
- Amount of property, crops and infrastructure at risk of flooding or complete loss
- Existing EWS and disaster response
- Exisitng institutional framework for disaster preparedness and planning
- Existing flood management infrastructure
- Costs to cover vulnerable communities

Overall economic impacts

- Climate sensitive sectors and their importance to national economy (agriculture, fisheries, etc.)
- Assessment of double exposure (climate change and international trade interaction)
- % of population working in climate sensitive sectors
- Export earnings from climate sensitive sectors
- % geographically sensitive land areas
- Water requirements for industry (predicted impacts)

Agricultural vulnerability

- Predicted changes in major crop yields
- Predicted changes in crop yields and crop prices - resulting status as a net importer / exporter
- % food production in semi-arid zones
- % increase in irrigation demand
- % of population working in agriculture
- Qualitative assessment of the responsiveness of the agricultural sector to adaptation (technological capabilities, credit market access, infrastructure)

[12] For a discussion on the vulnerability and adaptation literature, see the Olmos paper (2001) produced by the Climate Change Knowledge Network.

Health

- Current incidence of key infectious diseases and predicted spread
- Predicted increase in food insecurity
- Current water and sanitation coverage and predicted decrease in availability of water resources

(b) Individual Vulnerability

This section may be more difficult to gather information on, given such micro-level data is less accessible than the macro statistics mentioned above. General poverty statistics, however, are useful given the general correlation between poverty, vulnerability and marginalization.

- % living below the poverty line
- No. of poor households vulnerable to flooding
- Land available for resettlement, as well as shelter, services and livelihood replacement
- Costs of resettlement
- No. of poor households with shelter which is not disaster proof
- No. of households under the poverty line without savings or access to pensions or credit schemes
- % without access to water and sanitation
- % living in marginal areas
- Predicted producer / consumers status for poorest households
- % of subsistence farmers / small farmers / pastoralists etc.
- % of income of poor dependent on access to environmental resources
- Classification of income sources of poor and relation to climate sensitive sectors
- % poor without access to formal credit and insurance mechanisms

Section 4: Kyoto Protocol: The CDM and Poverty Alleviation
Daniel Wiedmer

The Clean Development Mechanism (CDM) was established in the 1997 Kyoto Protocol to the UNFCCC. It represents the only part of the Protocol which aims both to reduce GHG and support sustainable development (Article 12.2). It is designed to cut the overall costs of reducing GHG emissions by allowing developed countries to invest in low-cost abatement opportunities in developing countries. Investors are able to sell the Certified Emissions Reductions (CER), which are accounted towards the emission targets of developed countries for 2008-2012. In this way, the CDM addresses the externalities of GHG emissions by giving an incentive to the private sector to invest in GHG-reducing projects (Zhang and Maruyama, 2001).

Most literature in relation to the CDM focuses on its effectiveness in reducing GHG emissions, while its implications for sustainable development have received much less attention. The objective of this section is to evaluate possible outcomes on poverty reduction of the CDM in general and of different projects.

After a brief review of the CDM's process and criteria for the selection of projects, the second part will address the likely scale and patterns of financial flows from developed to developing countries. The following part explores case studies in order to determine aspects of investment projects with the most beneficial effects on poverty reduction. Following on from these findings, we will suggest improvements in order to maximise the CDM's impact on poverty reduction.

(a) Selection of Projects

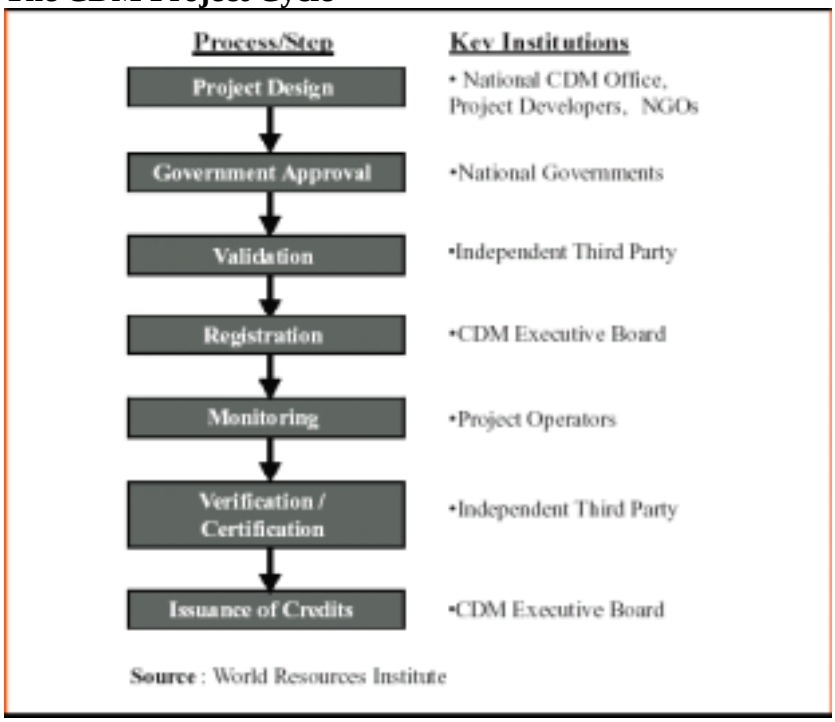
In order to understand the potential conflicts with regard to the design of the CDM and the selection of projects, it is essential to distinguish the underlying objectives of developing and industrialised countries. Developing countries view the CDM as a tool to receive finance and sustainable development, while industrialised countries consider the CDM as a tool to meet their GHG reductions more cost-effectively (Richards, 2001).

So, what are the requirements for qualifying as a CDM project? They must be additional to ODA and provide emission reductions that are additional to a baseline that defines what would have occurred without this project. The CDM Executive Board is responsible for the validity of projects with regard to emission reduction. Baseline calculation and the CDM Executive Board's accountability are unresolved issues that are not discussed here in detail as they mainly concern the environmental objective of the CDM (see for example Shrestha and Timilsina (2002) for a discussion of additionality, and Kete et al (2001) on the accountability of the CDM Executive Board). However, projects with the most potential for GHG reductions are not always those that are most likely to reduce poverty (Austin et al, 1999).

As far as sustainable development is concerned, the Bonn Agreement states that the sole agent deciding whether a CDM project furthers sustainable development is the hosting country (Kammen et al, 2001). What factors will ensure that host countries increase the number of projects that alleviate poverty? First, host countries must have the capacity to assess projects with regard to sustainable development criteria[13] and to participate in project design. During the experimental phase of Activities Implemented Jointly (AIJ), the example of Costa Rica showed that a clear setting of national development criteria, the establishment of a knowledge base and effective administration of the national CDM office could achieve to attract several investments from industrialised countries (for a discussion of the case of Costa Rica, c.f. Dutschke and Michaelowa, 2000). On the other hand, the lack of capacity to propose projects might be the reason why only 2 of around 100 AIJ projects were implemented in Africa (Hurtado, 2000).

[13] Sustainable development criteria applied under the pilot phase include: local environmental benefits, employment, transfer of technology, protection of biological diversity, training and capacity building, buying of local products (Werksman et al., 2001) and food and energy security (Hurtado, 2000).

The CDM Project Cycle



Source: Werksman et al., 2001, p. 4

Second, host countries should identify the specific aspects of projects that have the most beneficial impact on poverty reduction and poor communities should be consulted in the design phase of the project. The review of case studies below will address this issue. However, the host countries' priorities vary and it is far from clear whether poverty alleviation will actually be the main criterion of sustainable development.

Third, the intensity of competition for CDM projects between developing countries will largely influence their ability to remain firm on poverty alleviation criteria. This problem of collective action was not resolved at the international level since a common definition of development goals has been ruled out on grounds of sovereignty. The following factors are likely to influence competition among developing countries and thus the risk of a cutback in development criteria in order to attract investments:

- participation of the US, enhancing demand for CDM projects
- lower/higher emission growth in Annex B countries, decreasing/increasing demand
- degree of stringency of second commitment period targets
- supply from surplus emissions quota (hot air) of Economies In Transition (EIT) and Former Soviet Union (FSU) countries, providing alternative supply to CDM projects
- quality of domestic institutions and political stability making investments more attractive, all else being equal
- ability to market CDM projects to investors
- degree of cooperation between the major suppliers: China, FSU, India, Brazil

The CDM Watch project, which will be set up in the future by Greenpeace, may partly resolve this problem of collective action by monitoring the projects on a worldwide scale. In this role, it is essential that the body acts in a transparent manner and integrates the specific needs and priorities of developing countries, rather than purely the views of Greenpeace's donor community.

(b) Financial Flows

In order to assess the effect of the CDM on poverty, it is necessary to analyse the likely overall scale and pattern of the financial flows from developed to developing countries.

The fact that only developed countries are bound to emission targets will have macro-economic effects in developing countries, even outside the CDM. Zhang and Maruyama (2001) point out that in the short term, the emission controls will reduce demand for fossil fuels and therefore their price. Since most poor developing countries are net importers of fossil fuels, lower prices will enhance their terms of trade. Second, GHG emitting industries in developed countries might relocate to developing countries in the long run in order to avoid emission controls at home (Zhang and Maruyama, 2001). Although these effects are likely to contribute to economic growth of developing countries, but they carry the risk of locking developing countries in polluting industries, which require more costly and painful production transformations later.

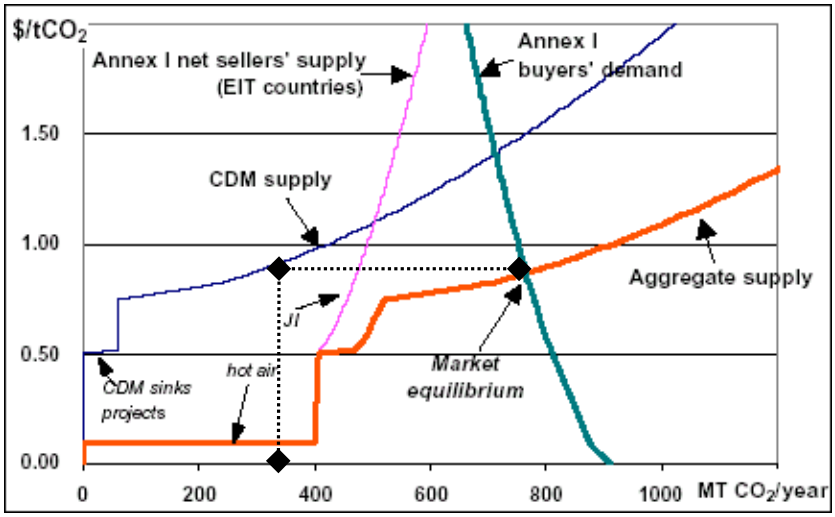
The overall financial flows are extremely difficult to predict because the prices that investors will receive per reduced ton of carbon will not be known until developed countries seriously engage in reduction activities, which might not happen before 2008 (Austin et al, 1999). Additional uncertainties include transaction costs of CDM projects and the costs of alternative abatement options in developed countries.

Total investments flows from CDM projects depend on the price of carbon since the sales of carbon represent the incremental return that makes investment projects profitable. A few studies have attempted to predict the price of carbon, however it is impossible to forecast the amount of investments triggered by this incremental return.

Günter (2001) predicts a price per ton of carbon in the range of USD 17 to 171 and export revenues for non-annex I countries in the range of USD 2.3 to 11 billion. The highest value assumes a cartel in the supply of emission reductions. Similarly, Halsnaes (2002) suggests that a trade coalition between the major suppliers, i.e. China, India, Brazil and Russia, could substantially increase the price and therefore the volume of investments.

A study by Jotzo and Michaelowa's (2001) which includes the fall in demand resulting from the opting-out of the United States, predicts a significantly lower price (USD 0.90) and therefore much less investments. The graph below, from that study, also suggests that "hot air" sales increase supply substantially and crowd out many CDM projects. Therefore, these new developments, i.e. the opting-out of the United States and the Russian intransigence on hot air sales in The Hague, have substantially reduced the volume of future investments under the CDM.

Supply and Demand of Carbon



Source: Jotzo and Michaelowa's, 2001, p. 26

Will the poorest countries benefit from these investments? Most economic models predict that almost all projects will go to China, India and Brazil (Kete et al, 2001).

Zhang and Maruyama (2001) review the risks associated with CDM projects. These risks include those of conventional investment projects, such as market, regulatory, political and economic risks. Hence, if the risks of CDM projects are the same as those of conventional foreign direct investments (FDI), CDM investments might follow the same pattern as FDI and leave out the poorest countries. Further, economies of scale in establishing the contacts with the governments and in dealing with the approval process might favour large countries over small ones (Page, 2001).

On the other hand, the fact that CDM projects also involve specific returns and risks, e.g. the amount and price of CERs, institutional CDM arrangements or non-conventional technology (Zhang, 2001), could provide an opportunity for the governments of poor countries since these risks are not as much associated with the general state of the economy as those of FDI in general. For example, Costa Rica has provided a guarantee for the price of CERs and hence attracted investors by resolving a CDM-specific risk. A further option would be to specialise in one particular technology of renewable energy and hence reduce the risk of non-conventional technology by establishing a distinctive base of experience.

The impact of the CDM on poverty alleviation not only depends on the amount and distribution of investments at country level, but also on the potential of the projects to reach the poorest people within countries. Therefore, it is necessary to evaluate different project types with regard to their likely effects on poverty.

(c) CDM Project Types

In this part, we review case studies of different CDM project types with a particular focus on their impact on poverty alleviation. The range of possible projects under the CDM includes opportunities in conventional power generation, fuel switching, industrial applications, use of renewables and forestry. As argued above, a proactive approach by developing countries can greatly improve their ability to attract investments, and in order to be able to propose projects, developing countries need to build the capacity to evaluate them.

The following criteria could be used as a guide to evaluate CDM projects' effect on poverty alleviation (from Austin et al, 1999, Begg et al, 2000 and Kammen et al, 2001):

- employment opportunities for unskilled labour
- education
- empowerment of low income groups and women
- transfer of technology to rural areas, low income groups
- accessibility for the poor
- health and safety
- freed time from drudgery tasks

A review of case studies in Brazil, China and India by the World Resource Institute (Austin et al 1999) finds that improved coal technologies have a positive impact on efficiency in industry and might affect the poor by improving air quality. The enhanced competitiveness of industries using power supplies might have long-term impacts on poverty alleviation through economic growth. However, in the short term, projects that increase the efficiency of coal power could lead to less employment opportunities for the poor in the coal supply activities. (Shrestha and Timilsina, 2002).

The use of sink forestry has been restricted to afforestation and reforestation projects. A comparison of different forestry projects in Brazil (Austin and Faeth, 1999) shows that sustainable forest management might yield benefits for the poor, whereas afforestation through plantations does not contribute significantly to poverty alleviation. On the contrary, the major adverse effect for the poor might be eviction from common land use because their property rights are often ill defined. For example, in a forestry project in Uganda, 8000 people are evicted from 13 villages and will have to pay rent for using the plantation area if they want to cultivate food among the trees (Hurtado, 2000). Bojanic (2001) points to the need for a policy framework and specific actions focusing on indigenous communities that have forest lands if they are to benefit from the CDM projects.

In general, case studies find that the strongest and most direct impacts on poverty alleviation stem from decentralised energy projects, which are discussed below in more detail.

Begg et al (2000) thoroughly investigated small-scale projects in the energy sector, including solar home systems (SHS), improved cooking stoves (ICS) and micro-hydro power (MHP) projects in Kenya, Nepal, Sri Lanka and Zimbabwe.

Solar home systems proved to be the least beneficial with regard to technology transfer because the main component is not locally produced. Further, their relatively high price restricts access to middle and high-income groups and a local micro-credit scheme was not able to extend the reach to the poor substantially. The manufacturing, installing and servicing of SHS has provided jobs in the local area, but there is no evidence of job opportunities specifically for the poor. SHS have not provided the poor with more time, but improved lighting had a beneficial effect on education because students have the opportunity to study longer hours and teachers have more time to prepare.

Improved cooking stoves are entirely locally made and the low complexity of the technology ensures sustainability. With regard to affordability, half of the stoves were bought by people earning less than $1 per day, "although it is not clear how they afford them." (Begg et al, 2000, p. 15, Annex 4). The ICS project has provided jobs for the poor, in particular for women, who work as potters or installers. Further, the ICS saved significant amounts of time due to a reduced need for firewood collection and shorter cooking times. In some cases, this led to increased income generation for women through craft, as well as increasing the opportunity for children to go to school. ICS were also found to have positive effects on health in poor households by reducing indoor pollution.

The technology for micro-hydro power generation was introduced and then sourced locally. In general, most poor communities could afford the technology. The project's reach of the very poor families was superior when the project was community managed. In some areas, the project provided power for a rice mill, which freed time as manual dehusking was replaced and gave the women who performed this task the opportunity to engage in additional economic activities. Improved lighting and the freed extra time also had a positive effect on education. The effects on health are less important because open fires for cooking still cause indoor pollution.

The case studies reviewed above suggest that decentralised projects in the energy sector are more likely to have positive impacts on poverty alleviation than forestry projects or large-scale coal technology improvements. Of those decentralised projects, solar home systems have the least impact on poverty alleviation.

A major, often neglected factor of poverty alleviation is freed time of drudgeries. This can have a substantial impact on the earnings of women by allowing them to engage in income earning activities. In this regard, improved cooking stoves can provide substantial benefits.

(d) Win-Win projects?

In general, Paul Soffe of Eco Securities suggests that "win-win solutions", i.e. simultaneously alleviating poverty and reducing greenhouse gas emissions, mostly arise in off-grid decentralised power projects. They enable the creation small enterprises in rural communities and reach very poor families, which often lack adequate housing for grid connection. Of the case studies reviewed above, micro-hydro power generation seems to be the most promising type of project in this regard. Further, this type of project had a relatively low cost per reduced ton of carbon or

were even cost saving (Begg et al 2000). Taken together, these findings suggest that micro-hydro power has most potential to be a win-win solution.

Pilot projects of biomass energy production using coconut shells in the Philippines also indicated similar results with regard to poverty alleviation (Kammen et al, 2001). The cost-effectiveness in reducing GHG emissions varies widely among countries, but among the renewable energy options considered by Halsnaes (2002), biomass projects were often the least expensive, in particular in the Philippines.

The main obstacle to the implementation of these small scale win-win projects is the generation of high transaction costs per CER (Black-Arbelaez, 2001). This problem has been partly addressed by the latest decision by the Conference of Parties in Marrakesh (COP7, UNFCCC Report 2002) to provide fast track procedures for smaller projects[14].

However, as pointed out in the section on financial flows, the opting-out of the United States and the large "hot air" sales are likely to lead to a low price of CERs. This will exacerbate the problems of small-scale projects to cover their transaction costs. Further, small-scale community projects often lack a sufficient credit history or assets that could serve as collaterals, which increases the foreign investors' reluctance. Therefore, small-scale "win-win" projects might only prove competitive with ODA.

As discussed in the next section, one of the roles of ODA might be to targeted aid on small-scale CDM projects. Although a subsidy might prove necessary in some cases, a clearly focused aid on transaction costs is more likely to encourage commercial sustainability of the projects. Thus, ODA could assist the poorest countries in capacity building for evaluating CDM projects, for building mechanisms to increase the participation of the poorest communities in the design of projects, for marketing those projects to potential investors and for providing credit guarantees to overcome the reluctance of investors to finance small community projects.

For example, the decision by the Netherlands government to allocate separate funds for smaller, more pro-poor projects, is a step in this direction. The World Bank is also in the process of creating a special fund within its Prototype Carbon Fund for small projects in small countries.[15] Although these efforts are worthwhile in order to pursue win-win projects, the overall forces predict that the poorest countries are most likely to be left out by the financial flows, that the price of CERs is likely to be too low for overcoming the high transaction costs of win-win projects and that competition among developing countries will lead to a scaling-down of the development criteria.

Section 4: Bilateral and Multilateral Climate Change Projects
Rebecca Reynolds

In addition to the Clean Development Mechanism it is necessary to look at Official Development Assistance targeted at climate change and its effects on the poor. This

[14] Although this decision has the potential to lead to the promotion of small scale pro-poor renewable energy projects, it is also unclear how this fast track procedure will evolve given decisions will ultimately depend on the CDM board.
[15] This is estimated to be around $100 million.

section will investigate the climate change policies of 6 bilateral donors[16], and then the initiatives of the European Union (EU) and the Global Environmental Facility (GEF) and the World Bank, as well as UNDP and UNEP. After looking at these policies it will discuss how well ODA programs targeting climate change address the vulnerability of the poor. It will finish by offering several points for future discussion and consideration by policy makers.

Very little literature examines the effectiveness of ODA in addressing the impacts of climate change or in assisting the most vulnerable to adapt. This report has therefore drawn from primary sources from bilateral and multilateral agencies, which outline climate change policies and projects. Some agencies, like USAID and CIDA, have formal mechanisms whose sole purpose is to allocate funds to climate change projects. Others like DFID are still investigating their options by sponsoring research projects like the one studying the impact of climate change on the Millenium Goals. All donors demomstrate a strong preference for mitigation projects reducing carbon emmissions, and capacity building in national level planning, monitoring and reporting. As will be discussed below, these types of project have minimal benefit for the poor.

(a) Bilateral and Multilateral Donor Programmes

USAID

The centrepiece of USAID's climate change policy is the Climate Change Initiative (CCI) to which President Clinton pledged $1 billion for release between 1997 and 2001. CCI projects will target three key focus areas:

- Reducing GHGs (reducing outputs in industrial and transport sectors, increasing storage of carbon in ecosystems, improving industry efficiency and use of clean energy);
- Increasing developing countries' participation in UNFCCC (preparing inventories, monitoring changes and vulnerabilities, increasing acceptance of greater UNFCCC commitments);
- Decreasing vulnerability (disaster preparedness, adaptation, and efficiency in agricultural systems, water resource management, public health and healthy eco-systems).

USAID has identified the following countries as key recipients for CCI funding:

- Brazil, Cameroon, Central African Republic, Democratic Republic of Congo, Gabon, Equatorial Guinea, Belize, Costa Rice, El Salvador, Guatemala, Honduras, Nicaragua, Central Asia, India, Indonesia, Mexico, Philippines, Poland, Russia, South Africa and Ukraine.

[16] US Agency International Development (USAID), Canadian International Development Agency (CIDA), Department for International Development (DFID), Deutsche Gesellschaft fur Technische Zusammenarbeit (GTZ), Australian Agency for International Development (AusAID) and Japanese International Cooperation Agency (JICA). These have been chosen due to their geographical spread, so as to provide two donors from each region.

It must be noted however, that USAID gives priority to countries with higher carbon emissions and to governments who are 'receptive to taking concrete action' against climate change.

CIDA

The Canadian Government established the Climate Change Development Fund (CCDF) in 2000, which allocates $100 million to assisting developing countries combat the causes and effects of climate change. CCDF projects must uphold CIDA's objectives to reduce poverty and to promote sustainable economic development. The CCDF has four priority areas, each with set funding limits and priority recipients:

- Emissions reduction: clean energy and energy efficiency). Key recipients: Brazil, China, Egypt, India, Kazakhstan, Nigeria and South Africa.
  37-42% of funds
- Carbon sequestration: reverse deforestation, land degradation and desertification. Key recipients: Indonesia, Honduras and Central Africa.
  18-23% of funds.
- Adaptation: planning, information gathering, implementing adaptation measures, and technology transfer in Early Warning Systems, drought mitigation and coastal management. Key recipients: Bangladesh, Sub Saharan Africa, and Small Island States.
  10-15% of funds.
- Capacity building: support for inventory preparation, integration of climate change into national strategies for sustainable development, and for attracting investment. Key recipients: Argentina, Chile, Uruguay and Paraguay as well as Francophone recipients.
  20-25% of funding.

CIDA also undertakes policy research into integrating climate change concerns into ODA, and improving developing country participation in negotiations. The Climate Change Partnership Fund allocates grants of up to $250 000 to NGOs, firms, and professional associations to assist in the transfer of environmental expertise and technologies to developing countries.

DFID

DFID's identified priorities for climate change are: to influence the implementation of the CDM with a view to encourage projects in Africa, to encourage small scale projects particularly for the poor, to improve disaster preparedness, and to mainstream climate change into development policy. (DFID 2000).

DFID's current activities in relation to climate change are research and project based, with a strong emphasis on studying the future role of ODA in addressing climate change. The Department has recently launched a 2-year study into the impact of climate change on the Millennium Goals[17], with the aim that this will direct future policy and programming decisions. The Environmental Policy Department is currently investigating options for DFID in addressing climate change; whether to

[17] Principles enshrined in the Resolution adopted at the Millenium Summit 2000: half poverty and suffering from hunger by 2015.

subsidise CDM projects; or to implement projects solely addressing climate change or to concentrate on broader development goals.

Finally, the initial findings of the report *Linking Poverty Reduction and Environmental Management* (2002), which was produced by DFID, UNDP, the World Bank and the European Commission, will influence climate change policy. The report identifies improved governance and quality of growth in terms of the poor and the environment, and the reform of international policies on trade, FDI and aid as priority areas.

In terms of project assistance, DFID has numerous forestry and energy projects which contribute indirectly to climate change. For example, between 1992 and 2000, DFID supported energy efficiency projects worth $670 million.

GTZ

GTZ offers support to developing countries in researching and planning for climate change, as well as mitigation in the energy sector. Its research and policy based assistance has three phases.

- assist countries in the preparation of their national inventories;
- elaborate country studies on climate change, to focus on national win-win mitigation options;
- research special topics surrounding the CDM like baselines, additionality and the experience.

GTZ's energy sector projects, valued at € 7,6 million between 1993 and 2001, aim to:

- meet the energy requirements for improving economic development;
- strengthen the efficiency of the energy sector;
- reduce dependency on external energy sources;
- enhance natural resource efficiency.

AUSAID

AusAID's climate change programme has a total value of $237 million. Although a relatively small donor, AusAID is important in terms of its contribution to Pacific Island nations. AusAID aims to implement projects which reduce poverty whilst also producing positive climate change outcomes. AusAID idenitifies four key areas of development assistance:

- Energy: achieving fossil fuel efficiency, introducing clean energy sources via technology transfer and capacity building;
- Forestry and land management: focusing on carbon sinks in the fields of agroforestry, reforestation and sustainable forestry;
- Adaptation: capacity building and technology transfer in monitoring and planning with a focus on conducting vulnerability and impact assessments, and identifying adaptation options.
- Focus on Pacific Island States: capacity building and technology transfer in monitoring climate change and in disaster preparedness, forestry and renewable energy.

JICA

The “Kyoto Initiative" is JICA’s main vehicle for development cooperation in climate change. Its policy comprises of three themes:

- human resources development in air pollution, waste disposal, energy-saving technologies, and forest conservation;
- favourable terms on ODA loans for projects aimed at countering global warming;
- transfer of Japanese technology and know-how via training, dispatching specialists and providing equipment.

GEF
The strategic thrust of GEF’s climate change activities is to support sustainable measures that reduce the risk, or the adverse effects, of climate change. GEF will provide finance to three broad policy areas:

- enabling activities which facilitate the implementation of effective response measures;
- mitigation measures;
- adaptation

More specifically, the first round of GEF-financed projects will include:

- Long-term measures such as removing barriers to energy conservation and energy efficiency; promoting renewable energy by removing barriers and reducing implementation costs; reducing of the long-term costs of low greenhouse gas-emitting energy technologies.
- Enabling activities such as preparing national communications, strengthening the planning and institutional framework, as well as providing training and research to assist effective policy measures;
- To a lesser extent, short-term mitigation projects which reduce GHG in the short-term.

World Bank, UNDP and UNEP Collaboration in GEF
The World Bank, UNDP and UNEP support GEF as implementing agencies. This involves providing technical assistance and capacity building to developing countries assisting in project implementation, raising awareness, and initiating dialogue on climate change.

Outside its GEF activities, the World Bank also mainstreams climate change into its operations by producing good practice publications and GHG analytical tools for staff, as well as by researching how to insert climate change into Country Assistance Strategies and World Bank projects. (Shih 2000 and Burton et al 1999). Outside the context of GEF, UNDP assists developing countries with disaster reduction and preparedness. It also created the Poverty and Environment Initiative a forum to identify solutions and action to eradicate poverty whilst managing the environment.

EU
The European Commission (EC) identifies the following areas for action:

- supporting the preparation of national communications;

- integrating climate change into EC Environmental Impact Assessment Procedures;
- supporting the new initiatives of developing countries that specifically impact climate change;
- ensuring that new energy projects consider climate change impacts and train personnel in energy management, planning and policy making;
- ensuring that transport projects raise awareness of climate change problems and raise capacity in how to manage and plan for the problem;
- creating an enabling environment for FDI in clean energy.

(b) Development Assistance, Climate Change and Poverty

Mitigation

Most donors have given priority to mitigation projects, with the majority of projects focusing on energy issues in large scale industrial sectors. It is therefore disturbing to see that donors place a heavy emphasis on mitigation projects. The CCDF will allocate 42% of its funds to emissions reductions, primarily in countries which are not that poor. USAID states that priority will go to countries which have large carbon emissions which demonstrate an emphasis on mitigation. Finally, GTZ's primary focus is in the energy sector and its projects are all large scale and industry focused. By focusing on the reduction of greenhouse gases, donors limit the benefits for poorer countries and individuals which produce little or no C02. Although some mitigation projects do address poverty reduction (see Table), however these represent a small proportion of donor funding. To address the needs of the most vulnerable, donors could either implement projects of this type or transfer mitigation funds elsewhere.

Capacity Building

ODA projects also concentrate on building the capacity of governments in strategic planning, disaster preparation, vulnerability assessments and the preparation of national communications. JICA's programme consists nearly entirely of training and the transfer of Japanese expertise. Many of AusAID's projects concentrate on improving the skills and institutional framework of public institutions, and providing training in monitoring the effects of climate change. It is important to note that there is a large focus on capacity building in the Marrakesh Declaration. Multilateral donors, particularly GEF and bilateral donors are also called upon to implement framework for capacity building in developing countries (UNFCCC Report, COP7, 2002)

This type of project is important as governments need the skills and institutional framework to respond to the threat of climate change. However, these initiatives do not directly assist or protect the poor. Furthermore, for adaptation to be effective, capacity building and training is required at the community level, as well as at the national levels of government.

In general, however adaptation measures have received less attention than mitigation and capacity building by multilateral and bilateral donors.

(c) Issues for Consideration by Donors and Developing Countries

How to mainstream climate change
A World Bank study (Burton et al 1999) found that climate change was poorly integrated into its country strategies and project preparation. Donors have recognised the importance of 'mainstreaming' climate change into their policy framework and many have subsequently launched studies on how best to achieve this. It is vital that any form of mainstreaming incorporates a poverty focus rather than viewing it as a purely environmental problem. This will ensure that aid initiatives address the vulnerability of the poor to climate changes.

Balance between pro-poor and environment projects
Many projects focus on climate change activities which have little impact on the poor. Whilst some mitigation and adaptation projects do assist poor communities (see Table), the majority focus on largescale industry and national government initiatives. Donors need to find a balance between the two types of projects, as both address the problems associated with climate change.

Expand Pro-Poor Project Options
Linked with this is the need to research pro-poor climate change projects with the aim of devising a wide range of intitiatives. At this the stage, the most common pro-poor climate projects are community forestry and rural electrification. Whilst these projects may prove effective a broader range is required.

Donor Coordination
At this stage, many donors appear to be investing in projects that assist countries to prepare national communications, research impacts and prepare national strategies. Whilst these play an important role in preparing developing countries for the impending problems of climate change, there is a risk of overlap. Donor coordination is needed to avoid an over-emphasis in this area and a corresponding neglect of other project types. Also, donors could facilitate the incorporation in national communications of specific vulnerability assessments which highlight the situation of the poor. Coordination between ODA and CDM projects would also prevent any over-emphasis in one country or region, as well as avoid projects with contradicting goals.

Relationship between ODA and CDM
The future relationships between ODA and the CDM remains unresolved. ODA subsidies could ensure that CDM projects reach all countries, rather than just the most financially attractive. ODA could also encourage businesses to undertake small scale, pro-poor projects by covering the transaction costs involved. Subsidies could also assist renewable energy technology to compete with cheaper, less environmentally-friendly technologies. However, it is important that any involvement with the CDM does not transfer money away from other areas. Working with the CDM should only be considered as part of a multi-faceted strategy. ODA will also need to address the broader vulnerability of poor communities.

Conclusion

This report provides evidence that the impacts of climate change in developing countries could be dramatic, particularly with regard to marginal regions and highly vulnerable poor communities. While GHG emission and global warming is largely a

result of the activities of the industrialized countries, it is now a well documented fact that the ramifications will be largely felt in developing countries, where the livelihoods of the poor are severely at risk. Whilst the international community, and industrialized countries have recognized the need to act, both to reduce GHG emissions and help developing countries adapt, the actual mechanisms and assistance offered by the international community to date have not come close to matching up to the needs and risks involved. In particular issues such reducing vulnerability and helping the poorest and most marginalized communities to adapt have been almost absent from the climate change agenda. Instead mechanisms have been largely directed at addressing the issue of the mitigation of GHG emissions. Whilst this is obviously a necessary environmental solution, it does not address the pressing issue of climate change and poverty.

It is, however, important to note that the Kyoto Protocol *does* have a commitment to sustainable development and could hence address the issue of poverty alleviation. But is the Kyoto Protocol's implementing arm on sustainable development, the CDM, really capable of tackling this objective? This report suggests that this is not the case for several reasons. Firstly, host countries will individually define their investments' development criteria, thus, competition for investments by down-scaling development criteria is likely. Secondly, since CDM projects involve partially the same risks as other FDI, they are likely to follow the same pattern and leave the poorest countries out. Thirdly, this report shows that the opting-out of the United States and the inclusion of large "hot air" sales lead to higher competition among developing countries and to less CDM investments, in particular in small scale projects.

The highest potential of the CDM to address simultaneously poverty alleviation and GHG abatement - the win-win projects - are precisely small-scale, off-gird projects in micro-hydro and biomass energy generation. The capacity of developing countries to evaluate projects, the inclusion of the poor in the design of CDM projects and streamlined approval procedures for small projects could all contribute to increasing the CDM's effect on poverty. We suggest that ODA might be used to reduce these transaction costs of otherwise commercially sustainable win-win projects. However, the overall assessment of the CDM's effects shows that these win-win projects are likely to be isolated successes, while the general scale and nature of the investments are very far from what would be required to redress the inequity that the differential effects of climate change have caused.

Whilst recognizing that bilateral and multilateral donors could subsidize the CDM, covering transaction costs to encourage investment in smaller projects in poorer countries, the CDM does not have the capacity or the finances to fully address poverty and any pro-poor projects would only have isolated impacts. In contrast, the scale of funding and operations involved in ODA is substantial, enabling it to tackle poverty on a global scale. Any ODA subsidies to the CDM should therefore not be perceived as its contribution to the climate change agenda, but rather a small element of a larger multi-faceted effort to address the vulnerability of the poor in developing countries.

To effectively address the enormous problems of climate change and poverty, bilateral and multilateral donors need to broaden their view of both the problem and suitable solutions. Rather than perceiving it as solely an environmental problem that requires national level planning and the reduction of GHGs, donors must address

vulnerability and the importance of adaptation, resilience and protection. This will involve programmes that reduce overall vulnerability to any shock; be that resulting from climate change or another type of hazard. Donors and development organisations have a well-developed framework of projects and policies, which focus on poverty and vulnerability. Extending their national and regional aid policies to cover climate change would therefore not require large scale change, but rather points to the importance of mainstreaming environmental issues into the broader agenda.

Given the current limitations of mechanisms under the Kyoto Protocol, the international community should use ODA, as a vehicle to redress the imbalance and narrow the gap between the rich and poor, between the vulnerable and the well-prepared. If this does not happen, the effects of climate change will be disastrous, only worsening the inequality between developed and developing countries.

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Interviews:

Saleemul Huq, International Institute for Environment and Development (IIED)

Farhana Yamin, Foundation for International Environmental Law and Development (FIELD)

Helen O’Connor, Department for International Development (DFID)

Paul Soffe, Associate Director, Eco Securities

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