SESSION III: GREENING THE DEVELOPMENT PARADIGM
SATURDAY, AUGUST 2, 9:00-11:15 A.M.

INTEGRATING CLIMATE CHANGE INTO DEVELOPMENT: MULTIPLE BENEFITS OF MITIGATION AND ADAPTATION

Atiq Rahman
Bangladesh Centre for Advanced Studies

(A draft version of a chapter forthcoming in the book, *Development in the Balance: How Will the World's Poor Cope with Climate Change?*, to be published by the Brookings Institution Press)

EXECUTIVE SUMMARY:

Climate change poses the greatest threat to human civilization today, causing enormous challenges for sustainable development. This paper focuses on the urgency of integrating climate change issues into future development plans. It also examines the ability of mitigation and adaptation to address the impact of climate change. Rapid economic growth, industrialization, and overconsumption in wealthy countries has degraded the global commons. Now climate variability and extreme climatic events obstruct development, affect natural resources, damage agricultural productivity, cause water shortages, and threaten the health of millions in the developing world. Climate change thus increases not only costs of development but also levels of poverty and inequity across the world. Its effect will be concentrated in tropical countries, and in every nation, the poor will be the most affected. Finally, both the rise in sea levels and the higher occurrence of extreme climatic events will destabilize affected populations and lead to massive migrations, social upheaval, and general human insecurity. Any delay in addressing climate change through reduction of greenhouse gas emissions will increase the cost of both adaptation and protecting development. This paper urges urgent action by both developed and developing nations towards transformation of their economies in the direction of green energy, energy efficiency and sustainable

consumption. It also highlights a few successful cases of adaptation and integration of climate issues into development in South Asia. The paper is based primarily on current literature and qualitative analysis.

Climate change is the greatest threat for human security and civilization. It poses an enormous challenge for sustainable development. Although the problem has largely being created by rich, industrialized countries, the poor are the main victims of climate change impacts. The various negative impacts of climate change are being felt locally in developing countries. Climate change will increase global food insecurity, hunger, poverty, migration, and social conflicts. The enormous, forceful cyclone Sidr that hit the coast of Bangladesh in November 2007 not only killed over 10,000 people but also devastated the lives and livelihoods of over 30 million. The most recent cyclone Nargis generated in the Bay of Bengal spared the Bangladesh coast, but hit the coast of Myanmar on 4 May 2008, killing more than 100,000 people and injuring millions. The occurrence of these two major cyclones in such close proximity is consistent with IPCC projections about extreme climatic events.

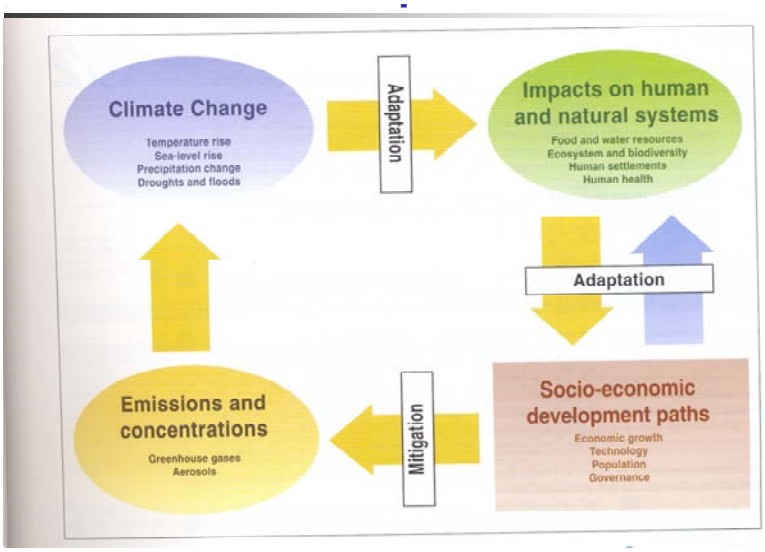
The recent frequent and prolonged floods in Bangladesh, Indonesia, and China have affected millions. Increasing drought in Africa is causing crop failure and reducing yields, creating food insecurity. These issues are closely linked to global warming and climate change. Thus, the extreme climatic events across the world have reconfirmed the IPCC assertion that poor people in developing countries are most vulnerable to the onslaught of climate change and its impacts. The poor live on the frontlines of climate impacts and natural disasters, and have the least capacity to address climate's devastating impacts on their lives, livelihood, and health (Rahman and Mallick, 2005). Climate change is obstructing development and compounding poverty in developing countries. Global food price increases induced by biofuel production and trading have also created huge food crises in developing countries and have led to food riots in several countries. A recent report by World Bank also confirms that 70 percent of the recent food price increases in the global market can be traced to biofuel production and trading.

Al Gore, former vice president of the United States, and the Intergovernmental Panel on Climate Change (IPCC) in 2007 for their contribution to building awareness and generating scientific knowledge about human-induced climate change as well as to lay the foundations for the urgent and long term measures to halt dangerous climate change. The Nobel Committee highlighted the potential risk between accelerating climate change and the risk of violent conflicts over various scarce resources, including fresh water across regions, countries, and communities. This award encourages and gives greater responsibilities to policy and decision makers, development agencies, and other actors at global, regional, national, and local levels to take necessary action led by sound policy and strategy to reduce the threat of dangerous climate change. Actions are required now from various actors and stakeholders before climate change progresses beyond our control. The challenges are multi-dimensional and multi-sectoral, both in the short term and in the long term.

CLIMATE CHANGE AND THE DEVELOPMENT INTERFACE

Development has both positive and negative links with climate change. Industrialization and modernization, the burning of fossil fuels, global trade and business, the destruction of natural resources for industrial production, and overconsumption, particularly by the rich, have all contributed to the problem of global warming. On the one hand, the current level of rapid climate change is the result of many anthropogenic factors and unequal development. On the other hand, climate variability and extreme events again affect natural resource bases, ecosystems, human systems, social systems, and the development process. It has implications for poverty alleviation, food and water security, and the livelihoods of the billions in developing countries, and thus put barriers toward achieving the UN Millennium Development Goals in Asia, Africa, and Latin America. The following diagram shows the complex relation between climate change and development and suggests both mitigation and adaptation measures to protect socio-economic development.

Figure 1. The Complex Relationship between Climate Change and Development



The Human Development Report of 2007-2008 argues that the progress made in recent years in human development is being threatened by climate change. The signs are already observed in the poorest and most vulnerable populations. The report warns of water stress and the loss of agricultural productivity leading to food insecurity raising enormous health concerns. This will certainly increase global poverty if appropriate measures are not taken by all actors (Watkins, 2007). Furthermore, natural calamities and climate-inflicted biofuel issues have affected food production and the food trade, resulting in price hikes of food grain in developing countries. Global wheat production has decreased sharply in the last year because of increasing maize cultivation destined for biofuel production for rich countries. Poor and marginalized people are mainly the victims of this situation. In this context, Amartya Sen observed that the stomachs of poor are competing with the fuel tanks of the rich. Millions of non-poor are also becoming poor in this situation. Cyclone Sidr and the frequent and prolonged floods caused damage to 30 to 40 percent of crops last year in

Bangladesh and a majority of people are now facing food insecurity. Bangladesh is facing a silent famine from climate disasters and economic shocks.

THE LINK BETWEEN CLIMATE AND DEVELOPMENT IS YET WEAK

Until recently, climate change was viewed largely as an environmental concern, of little relevance to development policy makers and practitioners. Likewise, development approaches have been given less attention within the climate change community, who instead favor natural science approaches focusing on reduction of greenhouse gas (GHG) emissions. Understanding the vital links between climate and development, and reinforcing these linkages will significantly affect national and regional development, as well as the formulation of strategies for addressing climate change. Climate change experts can no longer ignore the fact that most climate change impacts will fall predominantly on the world's poorest people. Likewise, without addressing climate change issues, much development policy and practice will be wasted. Alternative development pathways (low carbon and energy efficient economies) will influence the capacity of communities and countries to adapt to climate change (Huq et al, 2006).

Unsustainable development is the underlying cause of climate change, and development pathways will determine the degree to which social systems are vulnerable to climate change. Climate change will have a direct impact on the development of climate-sensitive activities such as agriculture, and indirect consequences on social issues such as poverty and education. Furthermore, climate change is likely to exacerbate inequalities due to the uneven distribution of the burden of damage, necessary adaptation, and mitigation efforts. Climatic changes could lead to environmental insecurity in certain regions, which could harm peoples' livelihoods and lead to migration or, in extreme situations, conflict between social groups. For example, conflict over trans-boundary water sharing between Sudan and Egypt has already been observed.

There are many instances in which specific development projects may be jeopardized by climate change. For example, in 1985 a glacial-like outburst in Nepal destroyed a newly completed World Bank funded hydropower dam. Such incidents clearly demonstrate the need to consider the impacts of climate change and the vulnerabilities of current and planned development programs. This need for "climate proofing" applies to small (such as micro-credit schemes) and large (such as infrastructure construction) development projects alike (*ibid*).

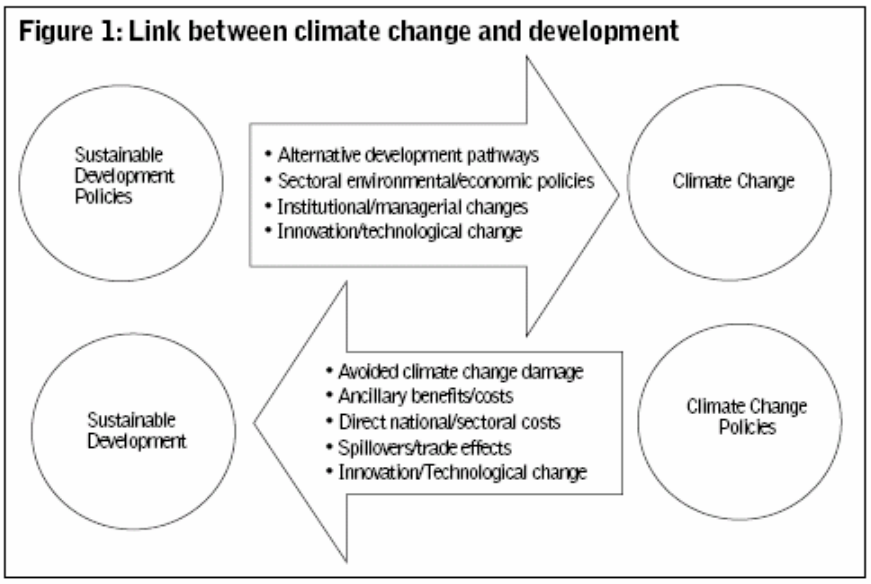
NEED FOR BETTER INTEGRATION OF CLIMATE AND SUSTAINABLE DEVELOPMENT POLICIES AND ACTIONS

Sustainable development policy (UN Agenda-21,) and actions can complement climate change policies and actions, such as the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol, and the Bali Action Plan for mitigation and adaptation. Figure 2 shows the linkages and mutual benefits from both sets of polices and actions. The UNFCCC and Kyoto Protocol require that climate change be tackled within the wider context of sustainable development, but climate change negotiations are still dominated by concerns about reducing emissions in industrialized nations (mitigation), and few attempts have been made to operationalize climate change into the wider development

agenda. Some parties to the negotiations also fear that attention on development linkages will detract from efforts to reduce emissions and divert scarce funds to more general development projects.

The IPCC is the main body responsible for assessing the literature on climate change. This body acknowledges that development may provide the most effective policy framework to address climate change mitigation and that it is critical to the success of adaptation strategies. The Third Assessment Report stressed development linkages by including "discussions about alternative development pathways and global sustainability" (*ibid*). The fourth assessment report of the IPCC also examines the vital linkages between ecosystems and human systems, and also suggests measures for protecting them from the negative impacts of climate change.

Figure 2. Complementarities between climate and sustainable development policies



Source: Swart *et al*, 2003

CLIMATE CHANGE IMPACTS ON DEVELOPMENT AND THE COST OF MALADAPTATION

Climate change variability and climate extremes are obstructing development in tropical and poor countries. The impacts are already evident in various sectors. The following sections describe the impacts of climate change on major sectors including agriculture, food, water, ecosystems, health, and infrastructure, where both adaptation and mitigation measures could be advanced, primarily to protect development, but also to stop climate change.

Agriculture and food

Climate change poses a serious threat to agriculture, particularly in developing countries in Asia and Africa. Both climate variability (rising temperatures and changes in rainfall patterns) and extreme climatic events (drought, flood, cyclone, etc.) are affecting

agricultural productivity and food security in Asian and African countries. Over 60 percent of the population in Asia depends on agriculture for their employment, income, and food. In Africa, drought and climatic events have already decreased food production and degraded the food security situation in recent years. There would be increased pest attacks on tropical crops in a warmer climate, which could lead to crop loss and food crisis. Salinity intrusion and possible sea level rise have already affected coastal agriculture and the livelihoods of millions in India, Bangladesh, Indonesia and coastal countries in Africa. The World Food Programme reports that over 860 million people are suffering from severe food insecurity and chronic malnourishment in the world (WFP, 2008). About 95 percent of them are in developing countries. Inequitable access to food is the major factor behind food insecurity, but global warming and climatic events are also aggravating its effects.

The food price hike in the global market is also closely linked to biofuel production and price hikes in oil. Hunger and food insecurity in Africa and Asia are increasingly threatened by extreme weather, natural disasters, institutional weakness, and market failure. Considering the severity of the problem, the UN secretary-general Mr. Ban Ki-moon urged the global community to take immediate and urgent action to address the food crisis in a high level meeting of the WFP in Rome in May 2008. The technical sessions discussed the vital links between climate change impacts, biofuels, and the global food crisis. The meeting proposed immediate and long term action for various actors including government, development partners, research organizations, and community organizations. The immediate actions would be food assistance for the hungriest and most vulnerable communities while the long term efforts would be to support agricultural development with engineered seeds, local innovation, and input supply to increase the resilience of the agricultural systems in the context of climate variability and its impacts.

Water and ecosystems

The IPCC has already warned about the possible conflicts that may arise over access to degraded water resources. That situation would be aggravated under a warmer climate regime. Over 1.2 billion people in the world lack access to safe water and 2.5 billion do not have access to basic sanitation. The Stockholm Environment Institute has estimated that the proportion of the world's population living in countries of significant water stress will increase from approximately 34 percent in 1995 to 63 percent in 2025—some six billion people, nearly the same number currently living on earth. Worst, that figure is based upon only a moderate projection of climate change (Simms et al 2004).

Global warming is exacerbating water stress by changing rainfall patterns, river flows, lake levels, and groundwater recharge. In some places water sources are becoming more depleted; other areas are being hit by floods. Globally, river basins and wetlands—where most of the world's population lives—are losing their capacity to provide a water supply of adequate quality and quantity to ensure sustainable development and maintain vital ecosystems. Fisheries are becoming depleted and degraded. Food security has eroded as it becomes increasingly difficult to obtain good harvests (*ibid*).

Fresh water resources are highly sensitive to weather and climate variability. The rapid rise of atmospheric temperature and consequent changes in global climate will affect hydrological patterns on local and regional scales, and also affect the availability of fresh

water for agriculture, drinking, and domestic use. Climate model simulations suggest that total flows of fresh water, probabilities of extreme high and low flow conditions, seasonality, surface and ground water interfaces, and water quality could all be significantly affected by climate change over the coming few decades. Access to safe drinking water will be reduced in many regions, resulting in human health problems, particularly in Africa and Asia. South and Central Asia have already experienced a high degree of water stress. Agricultural systems and ecosystems in some areas may be able to cope with some decrease in rainfall, but other semi-arid areas could be amongst the first to show the effects of climate change (Reid H 2007).

Conservation of water resources through equitable and efficient use must be promoted at all levels. An integrated water resources management (IWRM) approach for both flood and drought management should be promoted for efficient and varied use of scarce water. Changing hydrological patters will bring both challenges and opportunities that need to be addressed through regional cooperation and an ecosystem or basin management approach, and also by considering local needs and indigenous knowledge and priorities.

Diseases and health

Global warming will have many impacts on human health because a wide range of diseases (vector-borne, water-borne and respiratory) have demonstrated links to climatic changes. The most vulnerable people will be the elderly and the urban poor. Some regions are already suffering the consequences. For example, Bangladesh is already vulnerable to outbreaks of climate-sensitive diseases. The incidence of malaria has dramatically increased in the last 30 years, and it is now a major public health problem. Other diseases, like diarrhea, skin disease, asthma, hypertension, dengue, and dysentery, are also becoming more prevalent, especially during the summer months. Climatic factors, such as temperature, rainfall, and salinity, are directly connected to incidences of diarrhea, skin disease, malaria, kala-azar, and other illnesses. Climate change is also likely to affect the distribution, lifecycle, and population dynamics of dengue fever. Additional factors, such as dehydration, malnutrition, and heat stress, especially among children and the elderly, are closely linked to water supply, sanitation, and food production. All will be affected by global warming. Climate change will mean that there will be less clean water for a country where waterborne diseases are already responsible for 24 percent of all deaths (*ibid*).

Hurricanes, storms, and heavy rainfall have direct life-threatening impacts. Urban and coastal populations are particularly at risk from storm surges, flooding, and coastal erosion. Increased incidences of disease also follow floods. Access to safe drinking water is compromised by drought and other factors, such as glacial melt. Health is further threatened when nutrition is undermined by the impact of weather extremes on farming (Reid H et al 2007). There has been change in seasonal patterns. Hot, long, and dry summers may increase water scarcity in the region in the coming years.

Frequent and prolonged floods will affect water sources and degrade the quality of fresh water, thus increasing vector borne diseases in Asian countries. The poor in both rural and urban settings will suffer the most due to fresh water scarcity in the South Asia. Over 90,000 diarrheal patients were admitted to hospitals and clinics in Dhaka in a week during the flood in August in 2007. They were infected because they lacked safe drinking water.

Additionally, many thousands of sick people could not travel to the city because of bad communication.

The challenge is to understand new disease patterns and the complex relationship between disease, health, and social affordability. Poor countries need resources and technical supports to address climate related health risks.

Livelihood and poverty

Climate change impacts are affecting the livelihoods of common people and aggravating global poverty. Millions of poor across the Asia and Africa derive their livelihoods from common property and natural resource bases like land, water, fisheries, and forestry. Climate variability and climatic events are likely to affect resource bases and their productivity, limiting the options and potential of the poor in many ways. Their assets and resources, including their employment, income, and access to land, water, and other natural resources will be affected more severely by a warmer climate. Thus, climate change impacts will erect barriers on the path to achieving the Millennium Development Goals (MDGs). Poverty will be permanent on the planet unless we can stop climate change and address its negative impacts.

According to the Stern Review, "the poorest developing countries will be hit earliest and hardest by climate change, though they have contributed little to causing the problem." The recent report of the IPCC has asserted that climate change will deepen poverty. The direct impacts of climate change include loss of life, destruction of resources, infrastructure, and livelihoods. For example: millions of people are suffering from food insecurity, malnutrition, and water insecurity after the super cyclone Sidr and devastating floods in Bangladesh in 2007; over 165,000 people in Honduras fell below the poverty line after Hurricane Mitch in 1998.

Currently, the world has accumulated the largest amount of resources of all kinds (human, financial, physical capital) with the highest number of people living in abject poverty. Over three billion people live in poverty. Of them, about 1.2 billion people are in extreme poverty, and are suffering from hunger, food insecurity, malnutrition, ill-health, lack of resources, lack of education and basic services, powerlessness, and social exclusion across the world. Most of them live in Asia, Africa, and Latin America. In Asia and Africa, the struggle against poverty may deteriorate in the face of an unequal global economy and climate change (Rahman and Mallick, 2005). A recent study in Bangladesh suggests that the number of poor has increased sharply in the country in the last 2 to 3 years from 38 percent to 48 percent due to both natural disasters (frequent and prolonged floods and cyclones) and socio-economic shocks.

The livelihoods of the poor must be protected and improved in the face of climate change. Resource support and alternative livelihoods should be promoted for affected groups, with the most vulnerable groups potentially needing social and economic rehabilitation. Policies and programs in developing countries must be devised in line with current and future risks. The Poverty Reduction Strategy Papers (PRSPs) in poor countries

must take into consideration theses new challenges to ensure the livelihoods of the poor and most vulnerable communities.

Climatic extreme events, human displacement, migration, social conflicts, and human insecurity

The frequency, intensity, and impacts of climatic and natural disasters have increased in recent years. Climatic events such as floods, drought, and cyclones have hit the poorest first since they live in vulnerable, fringe areas. Casualties are high among the poor due to natural and climatic disasters. Furthermore, these events affect agriculture, food supply, water sources, and health. Thus, today's poor will be the extremely poor in the future. The conventional disaster risk reduction (DRR) measures are not effective in the context of frequent and intense climatic disasters. The cost of disaster risk reduction (DRR) has increased globally. Poor countries need further resource and technology support from developed countries in this regard. Otherwise, climatic disasters will increase poverty in Asia and Africa.

Possible sea level rise will affect low lying and coastal countries. Millions of people will be displaced from their homes and lose their occupations and livelihoods. Many will be thrown into poverty by increasing salinity and sea level rise across the world. Bangladesh is already experiencing higher levels of tidal inundation in the coastal districts. The country is highly vulnerable to sea level rise. About 45cm sea level rise will not only affect the vast coastal ecosystems and hamper agriculture and food production, but it may also dislocate about 35 million people from 20 coastal districts by the year 2050. These may pose severe problems for rural livelihoods and sectoral development, as well as for the sharing of scarce resources (land, water, forests, and fisheries). It will thus increase rural to urban migration and generate social conflict in the near future. The emerging climate refugees will put enormous pressure on urban economies and infrastructure (housing and communication) as well as on basic services such as water supply, power, health, and sanitation. The rural poor will be pushed into urban slums. Internal relocation of populations due to coastal erosion and sea level rise is already happening in Pacific regions like Vanuatu, Kribati, and Tuvalu. More and more people will face forced migration in the future, creating social conflict particularly in the resource poor countries of Asia and Africa (Reid, 2007).

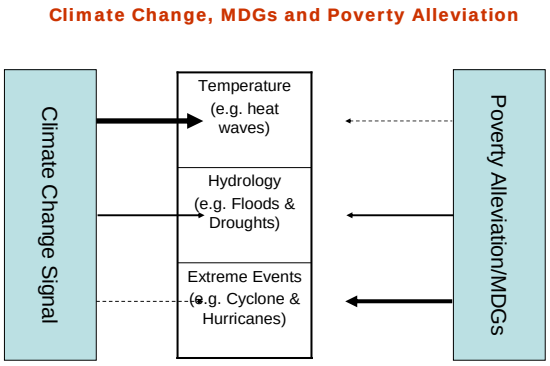
International migration policies and programs will need to be reformulated in light of the rapid increase of climate refugees from developing countries. Assistance should be provided to enable people to stay within their own communities and cultures as a preemptive measure to combat high levels of migration. Regional rehabilitation and resettlement must be advanced to a much greater extent before the onset of sea level rise.

Climate change impacts on MDGs

The Millennium Development Goals (eight goals with 18 targets) were adopted by the United Nations and world leaders in 2000 to meet the development challenges of the planet. It is assumed that climate change will affect local, national, and regional development efforts, and place barriers in the way of achieving these major goals. The activities under goals 1, 4, 5, 6, and 7 would be affected severely. Climate change will hit the poor the hardest, making them extremely vulnerable. Climate variability and climate extremes will increase poverty particularly in the developing countries and hence goal 1 (i.e., reducing

poverty and hunger) will not be achieved by 2015. The outbreak of weather and water diseases will affect goals 4, 5, 6, and 7 (reducing mortality, combating diseases, and improving health). Further, global warming and climate extremes will affect ecosystems and threaten environmental sustainability globally unless urgent action is taken by all actors, including government, development agencies, communities, and the private sector. Figure 3 shows the vital linkages between climate change, the MDGs, and poverty alleviation. But the link between climate variability in terms of temperature rise and changes in hydrological patterns with poverty and the MDGs are not solidly understood, necessitating further studies, awareness, and advocacy at different levels.

Figure 3. Linkages between Climate change and MDGs



Source: Saleem et al., 2006

Stern (2007) examines the economic costs of climate change impacts on the economy and development and suggests urgent action to address climate change through stabilizing greenhouse gas (GHG) emissions, promoting low carbon economies, and building resilience to various impacts. He also feels that climate change threatens the basic elements of life for the people around the world—access to water, food production, health, and use of land and the environment. The impacts of climate change are unevenly distributed across the world: the poorest countries and the poor of every country will suffer the earliest and the most. Cutting carbon emissions will have an initial economic cost, but will aid development in the long run. It will require change in broader models of technology generation and transfer, energy efficiency, competitiveness, equity, and corporate responsibility. Stern promotes adaptation for coping with the unavoidable impacts of climate change. He suggests that strong and early actions on climate change will outweigh costs and provide enormous benefits in the long run for development.

AVOIDING DANGEROUS CLIMATE CHANGE: MULTIPLE BENEFITS OF MITIGATION AND ADAPTATION

The environmental, social, economic, and political implications of global warming are profound. Ecosystems—from mountains to oceans, from poles to tropics—are undergoing rapid change. Mitigating climate change, eradicating poverty, and promoting economic growth and political stability all demand the same solutions: we must kick the carbon habit. We must immediately reduce GHG emissions to save the planet and human civilization. The good news is that technologies already exist or are under development to make the consumption of carbon-based fuel cleaner and more efficient and to harness the renewable power of the sun, wind, and waves. We all are parts of the solution. Conscious individuals, organizations, political authorities, and private sectors across the world must understand both the problem and the current opportunity; they must take urgent and bold action now for saving the earth.

The key challenges for all of us are: a) to stop climate change through urgent mitigation measures now and create an effective framework for a post-2012 commitment with greater participation of both developed and developing countries to halt dangerous climate change; b) to explore how to live in the warmer climate that is now unavoidable; and c) to develop a low-carbon economy and lifestyle for the rich, who do the most harm through luxuries and overconsumption. The UNFCCC, Kyoto Protocol, Agenda 21, World Summit on Sustainable Development (WSSP) Plan of Action, the MDGs, and Bali Action Plan under the Conference of Parties (COP) and Meeting of Parties (MOP) have given us guiding principles towards a transformation and positive shift in our economies and societies toward the right kinds of development and institutions. But we lack action.

There are powerful arguments in favor of making the transition towards a low carbon economy. Greening the global economy might cost as little as a few tenths of global GDP annually over the next 30 years, but it could be a driving force for innovation, new business, industries, and employment opportunities across the developed and developing worlds. Fighting climate change and poverty requires diverse, but well-coordinated and immediate efforts by governments, development agencies, relevant actors, and vulnerable communities. These may include structural measures to raise awareness and build the capacity and security of the resource base in order to improve the livelihoods of the poor and reduce their vulnerability to climate change. Urgent key actions include the following:

- Enhance understanding and awareness about climate change's many impacts in the context of local communities;
- Urgent measures for stopping dangerous climate change Reduce GHG emissions immediately, and formulate a post-Kyoto framework for greater participation with more a substantive commitment by both developed and growing economies;
- Build the capacity of all actors and stakeholders to reduce risk and vulnerability;
- Protect the poor, their assets, and their livelihoods from climate impacts;
- Advance community adaptation to climate change;
- Improve DRR capability to the current and future threat of climate change;
- Sectoral Adapt key sectors and climate-proofing development efforts;
- Utilize resource transfer and technology support to empower the poorest and most vulnerable stakeholders;
- Build greater resilience in natural, human, and social systems; and
- Raise the voices of the poor against climate injustice.

Urgent Actions: Negotiation, mitigation and adaptation

The UN Framework Convention on Climate Change (UNFCCC) assigns common, but differentiated responsibilities to us to address climate change. But we see a lack of sincerity in the actions of the rich and industrialized countries. They must be pressured to take urgent action in GHG emission reduction. The Group of 77 (G77) and Least Developed Countries (LDC) are working collectively in the COP negotiations process to put pressures on Annex 1 countries for both mitigation and resource transfers to climate proof development and facilitate community adaptation. Furthermore, governments, and development agencies must:

- Ensure harmonization between development and environmental agencies such as the ministry of environment and forests and the ministry of foreign affairs;
- Develop a strong national position demanding compensation;
- Develop country negotiating strategies;
- Influence international partner countries to support LDCs and poor countries;
- Organize training and enhance manpower for better negotiation and international climate diplomacy; and
- Internalize and prioritize climate change in all development efforts.

Mitigation and adaptation to climate change

Mitigation is the main response measure to prevent future impacts of climate change. It consists of actions like switching from coal to petroleum to natural gas, or, better still, switching to renewable energy as new technologies emerge, while reducing energy use and increasing energy efficiency. Development processes must be significantly de-carbonized. Mitigation is the best response, and it will also reduce the cost of adaptation. Developing countries will have to collectively raise their voices to force the developed countries to kick their carbon habit.

Further, Adaptation is no substitute for mitigation. Any delay in reducing emissions will only increase the need and cost of adaptation, and increase the risk of runaway global climate change. Though the developing countries currently emit little CO2, they may emit more in the future and they must pursue economic growth in low carbon development pathway through:

- Harnessing solar energy in all areas not likely to be included in the traditional electricity grid in the immediate future;
- Promoting compact fluorescent bulbs across all institutions and infrastructure (if this is done rapidly, Bangladesh will not need to produce additional electricity immediately);
- Improving energy efficiency in industrial sectors, such as sugar mills, brick kilns, thermal power plants etc., and reduce losses in transmission;
- Popularizing improved stoves and biogas plants, which can be bundled into good CDM projects; and
- Utilizing waste to generate organic fertilizers and electricity.

Improving copping of the poor and advancing adaptation to climate change

A complete strategy cannot exclude adaptation to the unavoidable impacts of climate change. In recent years, adaptation has gained prominence as an important response measure, especially for poor and vulnerable countries, as it has become clear that some impacts are now unavoidable in the short to medium term, and countries like Bangladesh will need greater adaptation capacities to reduce climate risks. Adaptation to climate change is taking place across the world in limited scale and adaptive capacity is uneven across communities and societies. A number of barriers to adaptation exist. These include

ecological, financial, institutional, and technological barriers, as well as information and cognitive hurdles. The least developed countries and poor in developing countries in particular need greater support for adaptation. The approach of integrating adaptation to climate change could include but is not limited to the following:

- Mainstreaming adaptation into all development policies and projects;
- Developing tools and methodologies for undertaking adaptation actions in ecosystems and sectors, and demonstrating appropriate adaptation projects. (Bangladesh is emerging as a global leader in this area);
- Conducting adaptive capacity assessments and developing adaptation strategies at the country, regional, local, and ecosystem-wide levels;
- Ensuring the establishment of financial resources for adaptation activities and assessing the sustainability of programs and the adequacy of funding sources, Discussions must be initiated with donors and development partners;
- Establishing partners and networks on adaptation between the scientific community and research institutions, the private sector, and NGOs;
- Linking of adaptation to disaster risk reduction strategies and activities and leveraging the synergies that exit between the two processes; and
- Ensuring the development and transfer of effective and appropriate adaptation technologies for the national, program, sectoral, ecosystem, and community levels.

Emerging successful practices in South Asia

In the field of adaptation, Bangladesh is currently a global leader in community-based adaptation (CBA). The first two international conferences on community-based adaptation to climate change were held in and organized by the Bangladesh Centre for Advanced Studies. The communities assisted by NGOs and local governments are evolving adaptation practices from raising plinth levels in both flood and coastal areas, providing rain-harvested water in the saline belt, and floating garden practices to evolving dry land corps and low water agriculture. Bangladeshi farmers' innovation is legendary: after cyclone Sidr and two consecutive major floods in 2007, farmers still managed to produce bumper rice and potato crops this year. But these farmers must be supported by seeds, water, energy, and fertilizer in vulnerable times, so policy supports across sectors are essential in enabling farmers' productive capacities as well as their adaptive capacity.

In the areas of treaty negotiations and fund mobilization, Bangladesh has shown some leadership. Working through the G77, the People's Republic of China, and particularly the LDC group gives Bangladesh an opportunity to demonstrate leadership and protect its self-interest in reducing the risk of climate threats. Various Bangladeshi ministries and agencies will need to work together in advancing this cause (Rahman, 2007).

The recent production of the National Action Plan on Adaptation (NAPA) has demonstrated that different agencies and sectors working together can obtain good results. But the international response to the NAPA has been very poor. The international community and funding agencies must be made accountable to the processes they initiate; otherwise, the trust in international efforts will diminish greatly, undermining the credibility of the negotiations and the international treaty process.

Few of the southern institutions and networks are very keen to promote adaptation. Bangladesh Centre for Advanced Studies (BCAS), an independent research and policy institute in Dhaka, has great interest in understanding adaptation needs as well as promoting climate change adaptation with various stakeholders and actors including governments, development agencies, and the local community. BCAS, in association with the International Institute for Environment and Development (IIED) and development partners, organized an international CBA workshop in Dhaka in 2007 to enhance understanding among the scientists and practitioners about adaptation approaches, integration into sustainable development, disaster risk reduction, poverty alleviation, and sectoral development, especially in agriculture, water, and biodiversity (*ibid*).

BCAS is also advancing community adaptation with partners under a South-South-North (SSN) initiative to increase the resilience and adaptive capacity of communities in drought and salinity affected areas of Bangladesh. The project has completed vulnerability and needs assessments and is now developing actions for community adaptation with vulnerable groups, partners, and key stakeholders. Project activities may include both adaptation and mitigation measures such as irrigation with solar energy, afforestation, water security, and livelihood promotion. Multilateral development agencies can promote such community and sectoral adaptation activities in developing countries.

CONCLUSION

We live in an increasingly unequal and unjust world. Climate change will increase inequality in the form of extreme poverty, food insecurity, hunger, and social conflict, and obstruct the overall development process in the coming decades if we do not take action now before it is beyond our control. Developing countries have very little capacity (both economically and politically) to influence global decision making and are victims of various injustices, including climate injustice. The COPs under the UNFCCC and the related global decision making process must take into consideration these issues and create scope and structure for effective participation and contribution from the South to reverse the current practices. We have to ensure equity and justice in mitigation, adaptation, technology generation and transfer, as well as in resource allocation to save the planet, people, and ecosystems from the emerging danger of climate change and build a better and more just world.

Al Gore strongly advocates that we have the solutions in our hands and need an equally strong will to act now both individually and collectively. Any delay in taking action will increase the cost of climate mitigation responses and adaptation in the future. There is further need for research and collective action to explore the possibility of blending adaptation and mitigation measures. We must raise our collective voice to stop global climate injustice and stimulate strong commitments and bold action by all.

REFERENCES

1. Rahman A and Mallick D (2005): *Sustainable Development and Climate Change: How can Sustainable Development Policies contribute to Climate Change Mitigation and Adaptation in Developing Countries?* Bangladesh Centre for Advanced Studies (BCAS), Gulsnan-1, Dhaka, Bangladesh

2. Watkins K (2007): *Human Development Report 2007-2008: Fighting Climate Change – Human Solidarity in a Divided World*, United Nations Development Programme (UNDP), New York, USA

3. Watson RT (2001): *Climate Change 2001: Synthesis Report,* WMO and UNEP

4. Huq S., Reid H., and Myrray LA (2006): Climate Change and Development Links, Climate Asia: published by CAN-SA Secretariat, Gulshan, Dhaka

5. World Food Programme (2008): *Declaration of the High level Conference on World Food Security; The Challenges of Climate Change and Bio-energy,* Rome

6. Simms A., et al (2004): *Up in Smoke? Threat from and response to, the Impacts of Global Warming to Human Development,* International Institute for Environment and Development (IIED), London

7. Reid H et al (2007): *Up in Smoke? Asia and the Pacific: The Threat from Climate Change to Human Development and the Environment;* IIED, London

8. Stern N (2007): *The Economics of Climate Change,* DFID UK

9. Rahman A (2007): *Advancing Climate Change Adaptation through Greater Collective Actions,* Environment Matters, Annual Review 2007: The World Bank, Washington DC