Introduction

Moazzem Hossain

Since the awarding of the 2007 Nobel Peace Prize to the former US Vice President Al Gore and the United Nations (UN) Intergovernmental Panel on Climate Change (IPCC) for their work on climate change and global warming, both the developed and developing world have realised the urgency in fighting the menace of climate change. The IPCC prediction of global temperature rising by 4°C by 2100 appears to be credible and is acceptable to climate scientists. The chief cause of the warming is thought to be the burning of fossil fuels such as coal, oil and natural gas, which release carbon dioxide and other substances known as greenhouse gases into the atmosphere (see Chapter 1). What is the ultimate outcome? In simple words, as the atmosphere becomes richer in these gases, it becomes a better insulator, retaining more of the heat provided to the planet by the sun. Climate scientists use elaborate computer models of temperature circulation to study global warming. Based on these models, they have made several predictions about how global warming will affect weather, sea levels, coastlines, agriculture, wildlife and human health (Mia 2008). With this global environmental change on the horizon, several multilateral agencies have been carrying out various studies in recent years. These are summarised below.

RECENT CLIMATE CHANGE STUDIES AT MULTILATERAL LEVEL AND KEY FINDINGS

United Nations Development Program (UNDP)

The UNDP dedicated its 2007/2008 Human Development Report (HDR) to the issues of climate change globally (UNDP 2007). This study had four chapters which examined: first, the challenges of climate change in the twenty-first century; second, risk and vulnerability due to climate shocks in an unequal world; third, the possible strategies for mitigation of climate change dangers; and finally, adapting to climate change through national action and international cooperation.
The study has adequately stressed with proof that there is no ‘if’ or ‘but’ on the subject of climate change and that time has come for collective decision on tackling the challenges emanating from climate change. As climate change is economy neutral, mitigation measures must seriously consider how to bring both the developed and the developing world together in developing strategies that are mutually re-enforcing and environmentally sustainable. Global actions are needed to face the disaster locally.

The study has put forward five transmission ways by which climate change could affect livelihood and human development in the future. These are:

- Agricultural production and food security;
- Water stress and water insecurity;
- Rising sea levels and exposure to climate disasters;
- Ecosystems and biodiversity; and
- Human health.

Increases in global temperature of 3–4°C could result in 330 million people (5 per cent of the world’s population) being permanently or temporarily displaced through flooding.

In order to avoid such a calamity in our lifetimes, unparalleled collective action and international cooperation is needed in the time ahead, since none of the above mechanisms will operate in isolation. Meaningful strategies should be devised for mitigation. Most importantly, carbon markets are a necessary condition for the transition to a low-carbon economy, however, these are not sufficient conditions. Why carbon markets? It is now established, without doubt, that a sustainable global carbon emissions strategy will be the major pathway of mitigation.

**UN Intergovernmental Panel on Climate Change (IPCC)**

The IPCC’s sixth technical paper was released in June 2008 (Bates et al. 2008). This paper deals with the issue of freshwater. Sea-level rise has been dealt with only insofar as it can lead to impacts on freshwater in coastal areas and beyond. Freshwater is not only related to climate and biophysical systems, it is also interconnected with socioeconomic systems encompassing multi-country and multi-origin regional networks. Hence, the study makes clear that the relationship between climate change and freshwater resources is of primary concern to human society and also has implications for all living species.

The study found abundant evidence that freshwater resources are vulnerable and have the potential to be strongly impacted by climate change,
with wide ranging consequences for human societies and ecosystems (p. 3). The following are the major conclusions of the study:

- Observing warming over several decades, it has been found that there is a link between warming and changes in large-scale hydrological cycles;
- By the middle of the twenty-first century, annual average river runoff and water availability are projected to increase as a result of climate change at high latitudes and in some wet tropical areas, and decrease over some dry regions at mid-latitudes and in the dry tropics;
- Increased precipitation intensity and variability are projected to increase the risks of flooding and drought in many areas;
- Water supply stored in glaciers and snow cover are projected to decline in the course of the century;
- Higher water temperatures and changes in extremes, including floods and droughts, are projected to affect water quality and exacerbate many forms of water pollution;
- Globally, the negative impacts of climate change on freshwater systems are expected to outweigh the benefits;
- Changes in water quantity and quality due to climate change are expected to affect food availability, stability, access and utilisation;
- Climate change affects the function and operation of existing water infrastructure – including hydropower, structural flood defences, drainage and irrigation systems – as well as water management practices;
- Current water management practices may not be robust enough to cope with the impacts of climate change;
- Climate change challenges the traditional assumption that past hydrological experience provides a good guide to future conditions;
- Adaptation options designed to ensure water supply during average and drought conditions require integrated demand-side as well as supply-side strategies; and
- Water resources management clearly impacts on many other policy areas.

Asian Development Bank (ADB)

The ADB has put in place several projects relating to climate change issues affecting the Asia–Pacific region. Most important among them are establishing climate change funds and reviewing the economics of climate change. The former concerns collaboration with member nations in Asia and the small island nations of the South Pacific in funding adaptation
Climate change and growth in Asia

and mitigation projects on climate change impacts. The latter concerns the impact of climate change in Southeast Asian nations. The ADB is of the view that this region:

is expected to suffer from many of climate change’s most detrimental impacts. Coupled with recurring food, oil and financial crises, climate change will have very serious implications for the region’s economic potentials and well-beings of its people. Climate change is now clearly recognized as a development issue, with significant impact on all our efforts for poverty alleviation in the Asia-Pacific in general, and Southeast Asia in particular. While climate change is by nature an environmental issue, it is of greatest concern to all of us and has much more far reaching adverse impacts on people’s health, safety and livelihoods – with the poor being disproportionately affected. ADB believes that we can play an important role in this effort. Our recently approved Strategy 2020, ADB’s long term strategic framework, provides a forward looking platform for us to focus on climate change responses as an integral element for sustainable growth and poverty reduction. (Schafer-Preuss 2008, pp. 2–3)

The regional review study of the ADB has three major objectives:

● Contribute to the regional debate on economic costs and benefits of unilateral and regional actions on mitigation and adaptation measures, for example, to promote consensus and cooperation among policy makers in the region on the steps needed to address climate change;

● Raise awareness of the urgency of climate change challenges and their potential socioeconomic impact in the Southeast Asian region to improve understanding of the economics of climate change; and

● Support government and the private sector to mitigate and adapt to climate change and also include other stakeholders such as civil society, academia and the media.

Under ADB’s funding a few national consultations have been conducted in Indonesia, Philippines, Singapore, Thailand and Vietnam. The last consultation was held in Indonesia covering all participant nations in the region in November 2008 and this review is still in progress as of late 2009.

World Bank (WB)

The global financial crisis (GFC) and recessions since 2007, together with fuel and food price increases in 2008, have taken their toll on poverty alleviation in the South Asia region. Exacerbated by natural disasters and global economic turmoil, poverty in South Asia, once again, has taken an
adverse turn. For example, Bangladesh’s poverty in US$1 a day terms has increased from 35 per cent of the total population to 40 per cent in 2008. In India, it is feared that poverty has moved from 30 per cent to 36 per cent. A similar reverse trend can be witnessed in Pakistan and Sri Lanka (Hossain et al. 2010). With such a background the WB demonstrates how the South Asia region is coping with climate change challenges with respect to growth and poverty alleviation. On the impact of climate change on South Asia’s poor, the Bank (World Bank 2008) concludes that there will be the following consequences:

- Decreased water availability and water quality in many arid and semi arid regions;
- An increased risk of floods and droughts in many regions;
- Reduction in water regulation in mountain habitats;
- Decreases in reliability of hydropower and biomass production;
- Increased incidence of waterborne diseases such as malaria, dengue and so on;
- Increased damages and death caused by extreme weather events;
- Decreased agricultural productivity;
- Adverse impacts on fisheries;
- Adverse effects on many ecological systems.

United Nations Framework Convention on Climate Change (UNFCCC) Summit in Copenhagen (COP15)

The 15th UN sponsored summit on climate change was held in Copenhagen between early and mid December 2009, 193 members participated, including hundreds of national and international NGOs. Throughout the conference, it was clear that there was a huge division in this UN sponsored summit. On one side, the wealthy and powerful developed North (US/EU led), and on the other, the weak and divisive South (G77, led by Sudan). In between, there were some least developed nations who played both as a part of the G77 or on some occasions on their own (Maldives and Bangladesh immediately come to mind). However, in the concluding two days, when the heads of governments began arriving in Copenhagen, it was no longer North versus South. It was more about big emitting nations: the mighty United States and emerging China–India backed by Brazil and South Africa. Out of this, it was recognizable that there had been a major difference between the leaders of the United States and China on the issue of transparent international monitoring of emission control and reaching a binding agreement. At the end, a 12 paragraph accord was presented to the summit by President Barak Obama from which both the monitoring...
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and binding clauses had been removed. The full text of the accord is provided below:

[The participating UN member nations] have agreed on this Copenhagen Accord which is operational immediately.

1. We underline that climate change is one of the greatest challenges of our time. We emphasise our strong political will to urgently combat climate change in accordance with the principle of common but differentiated responsibilities and respective capabilities. To achieve the ultimate objective of the Convention to stabilize greenhouse gas concentration in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system, we shall, recognizing the scientific view that the increase in global temperature should be below 2°C, on the basis of equity and in the context of sustainable development, enhance our long-term cooperative action to combat climate change. We recognize the critical impacts of climate change and the potential impacts of response measures on countries particularly vulnerable to its adverse effects and stress the need to establish a comprehensive adaptation programme including international support.

2. We agree that deep cuts in global emissions are required according to science, and as documented by the IPCC Fourth Assessment Report with a view to reduce global emissions so as to hold the increase in global temperature below 2°C, and take action to meet this objective consistent with science and on the basis of equity. We should cooperate in achieving the peaking of global and national emissions as soon as possible, recognizing that the time frame for peaking will be longer in developing countries and bearing in mind that social and economic development and poverty eradication are the first and overriding priorities of developing countries and that a low-emission development strategy is indispensable to sustainable development.

3. Adaptation to the adverse effects of climate change and the potential impacts of response measures is a challenge faced by all countries. Enhanced action and international cooperation on adaptation is urgently required to ensure the implementation of the Convention by enabling and supporting the implementation of adaptation actions aimed at reducing vulnerability and building resilience in developing countries, especially in those that are particularly vulnerable, especially least developed countries, small island developing States and Africa. We agree that developed countries shall provide adequate, predictable and sustainable financial resources, technology and capacity-building to support the implementation of adaptation action in developing countries.

4. Annex I Parties commit to implement individually or jointly the quantified economy wide emissions targets for 2020, to be submitted in the format given in Appendix I by Annex I Parties to the secretariat by 31 January 2010 for compilation in an INF document. Annex I Parties that are Party to the Kyoto Protocol will thereby further strengthen the emissions reductions initiated by the Kyoto Protocol. Delivery of reductions and financing by developed countries will be measured, reported and verified in accordance with existing and any further guidelines adopted by the
Conference of the Parties, and will ensure that accounting of such targets and finance is rigorous, robust and transparent.

5. Non-Annex I Parties to the Convention will implement mitigation actions, including those to be submitted to the secretariat by non-Annex I Parties in the format given in Appendix II by 31 January 2010, for compilation in an INF document, consistent with Article 4.1 and Article 4.7 and in the context of sustainable development. Least developed countries and small island developing States may undertake actions voluntarily and on the basis of support. Mitigation actions subsequently taken and envisaged by Non-Annex I Parties, including national inventory reports, shall be communicated through national communications consistent with Article 12.1(b) every two years on the basis of guidelines to be adopted by the Conference of the Parties. Those mitigation actions in national communications or otherwise communicated to the Secretariat will be added to the list in appendix II. Mitigation actions taken by Non-Annex I Parties will be subject to their domestic measurement, reporting and verification the result of which will be reported through their national communications every two years. Non-Annex I Parties will communicate information on the implementation of their actions through National Communications, with provisions for international consultations and analysis under clearly defined guidelines that will ensure that national sovereignty is respected. Nationally appropriate mitigation actions seeking international support will be recorded in a registry along with relevant technology, finance and capacity building support. Those actions supported will be added to the list in appendix II. These supported nationally appropriate mitigation actions will be subject to international measurement, reporting and verification in accordance with guidelines adopted by the Conference of the Parties.

6. We recognize the crucial role of reducing emission from deforestation and forest degradation and the need to enhance removals of greenhouse gas emission by forests and agree on the need to provide positive incentives to such actions through the immediate establishment of a mechanism including the United Nations Reducing Emissions from Deforestation and Forest Degradation in Developing Countries Programme (UN-REDD)-plus, to enable the mobilization of financial resources from developed countries.

7. We decide to pursue various approaches, including opportunities to use markets, to enhance the cost-effectiveness of, and to promote mitigation actions. Developing countries, especially those with low emitting economies should be provided incentives to continue to develop on a low emission pathway.

8. Scaled up, new and additional, predictable and adequate funding as well as improved access shall be provided to developing countries, in accordance with the relevant provisions of the Convention, to enable and support enhanced action on mitigation, including substantial finance to reduce emissions from deforestation and forest degradation (REDD)-plus, adaptation, technology development and transfer and capacity-building, for enhanced implementation of the Convention. The collective commitment by developed countries is to provide new and additional resources, including forestry and investments through international institutions,
approaching US$30 billion for the period 2010–2012 with balanced allocation between adaptation and mitigation. Funding for adaptation will be prioritized for the most vulnerable developing countries, such as the least developed countries, small island developing States and Africa. In the context of meaningful mitigation actions and transparency on implementation, developed countries commit to a goal of mobilizing jointly US$100 billion dollars a year by 2020 to address the needs of developing countries. This funding will come from a wide variety of sources, public and private, bilateral and multilateral, including alternative sources of finance. New multilateral funding for adaptation will be delivered through effective and efficient fund arrangements, with a governance structure providing for equal representation of developed and developing countries. A significant portion of such funding should flow through the Copenhagen Green Climate Fund.

9. To this end, a High Level Panel will be established under the guidance of and accountable to the Conference of the Parties to study the contribution of the potential sources of revenue, including alternative sources of finance, towards meeting this goal.

10. We decide that the Copenhagen Green Climate Fund shall be established as an operating entity of the financial mechanism of the Convention to support projects, programme, policies and other activities in developing countries related to mitigation including REDD-plus, adaptation, capacity building, technology development and transfer.

11. In order to enhance action on development and transfer of technology we decide to establish a Technology Mechanism to accelerate technology development and transfer in support of action on adaptation and mitigation that will be guided by a country-driven approach and be based on national circumstances and priorities.

12. We call for an assessment of the implementation of this Accord to be completed by 2015, including in light of the Convention’s ultimate objective. This would include consideration of strengthening the long-term goal referencing various matters presented by the science, including in relation to temperature rises of 1.5 degrees Celsius.

The most important achievement of the COP15, however, is in support of the adaptation projects in least developed and vulnerable nations. Some commitments have been reached for the short to medium terms. As suggested by point 8, above, an adaptation fund of US$30 billion until 2012 has been promised by the developed members starting from 2010 with US$10 billion per year. Additionally, President Obama outlined a US$100 billion a year fund after 2020. In other words, the outcome of the summit in establishing an Adaptation Fund for nations vulnerable to climate change certainly generated interest for the long term.

The Accord’s future support modalities have not been finalised yet, however, it emphasised that new funds will prioritise Africa, least developed vulnerable and small island nations. It was also agreed that a ‘Copenhagen Green Fund’ will be established for channelling some
parts of this fund according to wish of the developing nations (*The Economist* 2 January 2010). The WB has been kept out of managing such a fund.

The next full summit (COP16) was held in Cancun in December 2010.

**CLIMATE CHANGE AND GROWTH IN ASIA**

Indeed, it is encouraging to watch the momentum in climate change debate in recent years both at multilateral and national levels. Most importantly, the bilateral assistance funds have started to flow through into the developing nations. For example, the Department for International Development (DFID) the development assistance arm of the British government allocated £250 million over the next five years to Bangladesh for climate change adaptation and the creation of a safety net for vulnerable people. Similar assistance projects have also been developed by the DFID for India.

The Bay of Bengal region (India and Bangladesh) has enjoyed high to moderate growth over the last decade. Table I.1 presents growth rate and Figure I.1 captures per capita income in purchasing power parity dollar (PPPS) terms for selected Asian economies.

While the region made strong progress in the early part of the twenty-first century, there also emerged new challenges. The most important among these is climate change and the devastating impact it has brought to this region in recent years with the occurrence of frequent cyclones, floods and the rise in sea level over the last three decades (see Chapter 4).

**Table I.1 Growth rates for selected Asian nations, 1961–2007**

<table>
<thead>
<tr>
<th>Country</th>
<th>GDP growth</th>
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<tbody>
<tr>
<td>Bangladesh</td>
<td>4.1</td>
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<tr>
<td>India</td>
<td>3.9</td>
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<tr>
<td>Pakistan</td>
<td>7.3</td>
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<tr>
<td>Sri Lanka</td>
<td>4.6</td>
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<tr>
<td>China</td>
<td>3.7</td>
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<tr>
<td>Indonesia</td>
<td>4.2</td>
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<tr>
<td>Philippines</td>
<td>4.9</td>
</tr>
<tr>
<td>Thailand</td>
<td>8.2</td>
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<tr>
<td>Malaysia</td>
<td>6.5</td>
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Climate change and growth in Asia

New Moore/South Talpatti Island on the Bay of Bengal has recently disappeared under a metre of water due to sea-level rise (see Figure I.2 and Appendix I.1).

As mentioned earlier, the present volume includes papers presented at an international workshop held in Brisbane, Australia in September 2009. In addition, three invited chapters on adaptation, climate security and climate justice have been included to cover more comprehensively the emerging issues and debates concerning climate change in Asia, more specifically, in South Asia. The volume is presented in three parts: climate change and growth issues; climate change and adaptation issues; and climate change and challenges. Presented below is a brief summary of all the chapters in each of these parts.

PART I: CLIMATE CHANGE AND GROWTH ISSUES

Part I deals with the core issues concerning climate change and growth in Asia. Four chapters are included in this part.

Hossain and Selvanathan present an account of recent population, poverty and carbon emissions in Asia. In his chapter, Tisdell demonstrates the issue of producing biofuels in Asia and the consequences for agricultural growth. Ahmad discusses the freshwater issues of Bangladesh and claims that freshwater is not only a problem of this nation due to global warming, but has implications all over Asia and, indeed, the world. Hossain, Ali and Selvanathan study livelihood issues in the Bay of Bengal delta.
PART II: CLIMATE CHANGE AND ADAPTATION ISSUES

The second part of this volume addresses the issues surrounding adaptation and mitigation in the era of climate change.

In his chapter, Hunt maintains that China and Indonesia must assume major roles in Asia to reduce greenhouse gas emission alongside developed nations for future prosperity. The chapter by Rahman, Noor and Ahmed presents adaptation and related policies in Bangladesh, a highly vulnerable nation affected by climate change in Asia. Khan takes climate change and social parameters into consideration to demonstrate how Asian societies must seek increased partnerships at the regional level and adopt a more value-based approach to cope with the issues of climate risks. The


Figure I.2 New Moore/South Talpatti, Bay of Bengal Delta
chapter by Howard captures the challenges for China, a major contributor to greenhouse gas emission in Asia, from the viewpoint of future climate governance.

PART III: CLIMATE CHANGE AND CHALLENGES

In the final part of this volume, three chapters are presented with a view to addressing the challenges of climate change for Asia’s big players in terms of security, politics and management in uncertain times. Murthy’s chapter demonstrates a new management model for growth at the time of global uncertainty in the era of climate change and GFC. The chapter by McIntosh and Sarker presents sustainable business enterprise and sustainable business issues in the era of climate change and global warming. The chapter by Rashid argues that climate justice must be taken seriously in vulnerable Asian nations and the global economic powerhouses must take a leading role to bring climate justice to the forefront of the climate change debate in the future.

REFERENCES

*The Age* (2010), 26 March.
*The Economist* (2010), 2 January.
APPENDIX I.1

A tiny island at the centre of a territorial dispute between India and Bangladesh has disappeared beneath the waves due to rising sea levels and erosion, scientists said. The uninhabited outcrop – called New Moore Island by India and South Talpatti by Bangladesh – was 3.5 km (approximately 2 miles) long and 3.0 km wide before it was swallowed up by the Bay of Bengal (see Table IA.1).

‘There’s no trace of the island anymore. After studying satellite images, I confirmed this from fishermen’, said Sugata Hazra, a professor from the School of Oceanographic Studies at Jadavpur University in Kolkata.

Hazra said global warming and erosion were responsible for solving a point of contention in the sometimes fractious relations between India and Bangladesh, which both claimed the island. ‘Climate change has obliterated the source of dispute’, he said.

Hazra said temperatures in the region had been rising at an annual rate of 0.4°C (0.8°F). In 1981, the Indian navy planted its national flag on the island, but no permanent settlement was established.

The island, which is thought to have been created by a cyclone only about 40 years ago, sat in the Sundarbans mangrove delta in the mouth of the Hariabhanga River that divides India and Bangladesh. At its height, it was never more than 2 m (approximately 6 feet) above sea level.

Hazra said a larger island, called Lohachara, disappeared in the Bay of Bengal in 1996 after 4000 inhabitants had fled. At least five other islands in the region are also threatened, he said.

Bangladesh is one of the countries worst affected by climate change with some scientists predicting 20 million people will be displaced by 2050 because of rising sea levels.

Table IA.1 South Talpatti, Bay of Bengal

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<tr>
<th>Geography</th>
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<tr>
<td>Location</td>
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<tr>
<td>Area</td>
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<td>Length</td>
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