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CLIMATE CHANGE ECONOMICS IN BANGLADESH – A POLICY NOTE

Background

Climate change presents significant challenges to the future development of Bangladesh. Consequently, the Government of Bangladesh is in the process of integrating climate change adaptation into its development agenda, including the Second Poverty Reduction Strategy and the Sixth Five-Year National Plan. This process stands to benefit from a greater understanding of the economics of climate change.

The Planning Commission of Bangladesh, UNDP, UNEP and SANDEE organized a joint workshop on 13-14 October 2009 to discuss emerging issues related to the economics of climate change in Bangladesh. The workshop, titled “Economic Approaches to Climate Change and Poverty: a workshop for economic policy makers and researchers in Bangladesh”, aimed to inform the government’s integration of climate change adaptation into Bangladesh’s development agenda and to support on-going dialogue between the research and policy communities.

This policy note is based on discussions held at the workshop¹, whilst also incorporating other relevant information. It was prepared by Priya Shyamsundar (SANDEE) and Nikolai Beresnev (UNDP).

Why does the economics of climate change and adaptation matter?

There is a need for a stronger dialogue and analysis in Bangladesh on economic issues in adapting to climate change. There are three clear reasons for this:

- The impacts of climate change will weigh heavily on the poor, especially in coastal areas. The policy reforms that can enable the poor to adapt in the least costly fashion need to be identified. Part of this challenge will be ensuring that climate change adaptation is reflected in the Second Poverty Reduction Strategy and the Sixth Five-

¹ Participants at the workshop included representatives of the Planning Commission and various other Bangladesh government departments, international donor agencies such as the Asian Development Bank and UNDP, universities and think tanks. Presentations were made by A.K.E. Haque (United International University), Muhammad G. Sarwar (Planning Commission), Kavi Kumar (Madras School of Economics), Atiq Rahman (Bangladesh Centre for Advanced Studies), Aminul Islam (UNDP Bangladesh), Zahurul Karim (Centre for Agri-research and Sustainable Environment and Entrepreneurship Development), S.M. Mahbubur Rahman (Institute of Water Modelling), Nabiul Islam and M. Asaduzzaman (Bangladesh Institute of Development Studies), Minhaj Mahmud (BRAC University), Saudamini Das (Swami Shradanand College, Delhi) and Priya Shyamsundar (South Asian Network for Development and Environmental Economics).

Year National Plan (both currently under development). The poor are already vulnerable to the increasing number of natural disasters that strike Bangladesh. It is important to understand their current adaptation strategies in the context of the large-scale spontaneous adaptation to climate change that will occur.

- The challenge of financing and implementing adaptation strategies needs to be tackled urgently. While there appears to be significant funding, the question of how this money will be managed is not settled. Furthermore, investments will need to be planned within the context of uncertainty over the impacts of climate change. Economic analyses will be critical in examining and prioritizing different investment options.
- Bangladesh has options for getting on a low-carbon economy track that may also help with adaptation. Mangrove planting is an example of an economic activity which contributes to adaptation and mitigation, whilst also sustaining the livelihoods of the poor. Identifying such options and examining the economic incentives that would make such strategies successful is important.

What are the implications of climate change for Bangladesh?

Bangladesh's geography makes it one of the most vulnerable countries to climate change. It is dominated by flood plains, with most of the land less than 12 metres above the sea level². Bangladesh is also affected by two very different eco-systems (the Himalayas to the north and the Bay of Bengal to the south). The overall result is that it has too much water during the monsoon season and too little in the winter. In an average year, approximately one quarter of the country is inundated.

The climate change vulnerability of Bangladesh's poor is well recognised, with 70 million people likely to be affected by floods annually by 2050³. While there is still considerable uncertainty about the timing and severity of climate change impacts, existing research suggests the following:

- Sea-level rise leading to inundation of up to 7 percent of Bangladesh's land area by 2050⁴;
- Increased frequency and intensity of cyclones;
- Increased salinity in inland areas;
- Increased severity of river floods;
- Heavier and more erratic rainfall during the monsoon season, and lower and more erratic rainfall in drier northern and western regions of the country (resulting in increasing droughts);
- Higher inundation risks because of the melting of ice caps in the Himalayas.

A one-metre rise in the sea-level (expected to take place by the end of the century) will inundate the whole of the Sundarbans⁵. If the sea level rise is higher than currently expected

² Ali, A. 1996. "Vulnerability of Bangladesh to climate change and sea-level rise through tropical cyclones and storm surges". *Water, Air, and Soil Pollution*, Vol. 91, No. 1-2, pp. 171-179.

³ Sarwar, G. Planning Commission, Bangladesh. *Probable Impacts of Climate Change on Poverty Reduction, MDGs Attainment and Economic Growth in Bangladesh*. Presentation delivered at "Economic Approaches to Climate Change and Poverty: a workshop for economic policy makers and researchers in Bangladesh", 13-14 October 2009, Dhaka, Bangladesh.

⁴ S.M. Mahbubur Rahman, Institute for Water Modeling, Bangladesh. *Water infrastructure responses to climate change*. Presentation delivered at "Economic Approaches to Climate Change and Poverty: a workshop for economic policy makers and researchers in Bangladesh", 13-14 October 2009, Dhaka, Bangladesh.

and coastal polders are not strengthened or new ones built, 6 to 8 million people could be displaced by 2050. Increased salinity is likely to result in the decline in rice and wheat production, and a more pronounced shortage of drinking water.

Current embankments in Bangladesh are not designed to deal with 50- and 100-year storms. Embankment failure is therefore a serious possibility. Increased salinity will also lead to migration into cities from rural areas, making the management of employment and services for large numbers of migrants another challenge. The latter problem may be compounded in coastal cities, where ground water is likely to become more saline.

Financing climate change and integrating it with policy reforms

Bangladesh's National Adaptation Programme of Action (NAPA) highlights the main adverse effects of climate change and identifies adaptation needs. It contains US\$77.4 million worth of climate-change adaptation projects; however, this is a "wish-list", and it remains to be seen which of the projects will come to fruition.

While climate and poverty reduction issues are integrated, there is separate financing available for climate change. The Bangladesh government has recently established a National Climate Change Fund (which will focus mainly on adaptation) with an initial capitalisation of \$45 million, and a Multi-Donor Trust Fund of \$150 million with the support of the United Kingdom⁶. These funds will be used for climate change purposes only, and should result in better analyses of climate impacts on traditional (agriculture) and non-traditional sectors (such as telecommunications). The current stumbling block is that it has not yet been decided which institution or ministry will be in charge of the funds; once the decision is made, it will be communicated to other ministries.

The government's mode of planning in five-year brackets is perhaps unsuitable in dealing with climate change due to the long-term nature of the problem. Thus, climate will need to be integrated in Planning Commission's Perspective Plan (currently under preparation).

Climate change and economics of agriculture

What are some no-regret adaptation strategies that offer win-win possibilities to farmers of Bangladesh? If there are measures that result in economic benefits to farmers whilst also preparing them for future climate change, they should be identified, costed and implemented.

A recent study in India finds that farmers would experience around a 9 percent loss in annual farm-level revenue as a result of climate change⁷. However, these losses are smaller (3 percent) once spatial effects of adaptation are taken into account. This suggests that information flows (i.e. "learning from your neighbour") may be an important mechanism in facilitating climate change adaptation. Such issues need to be further examined in the context of Bangladesh.

⁵ Z. Karim, CASEED. *Climate Change Impacts on Bangladesh Agriculture and Food Security*. Presentation delivered at "Economic Approaches to Climate Change and Poverty: a workshop for economic policy makers and researchers in Bangladesh", 13-14 October 2009, Dhaka, Bangladesh.

⁶ "PM calls for realistic fund to tackle climate change". *The Financial Express*, 24 October 2009. <http://www.thefinancialexpress-bd.com/2009/10/25/82517.html>.

⁷ Kumar, K. 2009. *Climate Sensitivity of Indian Agriculture – Do Spatial Effects Matter?* SANDEE Working Paper.

Agronomists consider the change of climate structure as the biggest threat to agriculture. For example, temperature increases will drastically affect wheat area and productivity – for every 10°C increase in temperature, an output decrease of 400 kg per hectare is predicted⁸. Increases in fog and relative humidity raise the incidence of pests and diseases and may cause crop failure (potato, pulses, etc). However, climate change also presents a strong potential for increasing productivity of crops, fisheries and livestock. Therefore, it is important to use correct and accurate scientific assumptions when modelling economic impacts of climate change on agriculture.

Increasing water salinity looms as a major problem for agricultural production in Bangladesh. Currently, more than 170,000 hectares of agricultural land is affected by salt and this problem will only grow bigger. Development of flood- and salinity-resistant rice species is an effective measure in reducing flood- and salinity-induced relocation; however, the research has been quite slow to date.

Climate change and disaster management

Bangladesh is extremely vulnerable to natural disasters. For example, Hurricane Aila (May 2009) damaged 26 districts in the south of the country, affecting 9 million people and causing production loss of around \$99 million; Cyclone Sidr (November 2007) washed away 380 kilometres of embankments⁹. The Government of Bangladesh has undertaken significant work in terms of disaster management by investing in flood protection and drainage schemes, coastal embankment projects, cyclone shelters and coastal “greenbelt” projects. However, climate change is likely to increase the frequency and intensity of natural disasters in Bangladesh.

Embankments are seen as a solution to floods. However, they also reflect a trade-off between economic (agricultural) growth and environmental considerations. In addition, while environmental regulations aimed at reducing the environmental impact of embankments do exist, they are not well implemented. Embankments can also give people a false sense of security, as they are often not high enough to stop storm surges; this can lead to higher death tolls in areas with embankments. Other measures such as afforestation could be more effective in reducing vulnerability to floods (whilst also being more environmentally friendly).

Cyclone shelters have proven to be very important for disaster management. These are multi-purpose buildings, and are often used as schools and community halls. However, maintenance is a major issue.

Despite the fact that non-agricultural sector accounted for 74 percent of total economic loss of the latest (2004) flood, Bangladesh lacks damage data and methodology for urban flood loss assessment¹⁰. Thus there is a need to look more seriously at climate impacts on urban flooding.

There is also a need to understand the role of eco-systems in managing disasters. There is strong evidence that mangroves played a role in mitigating the impact of the Orissa Super-Cyclone in 1999. A recent study shows, among other things, that the presence of mangroves

⁸ Z. Karim, CASEED, op. cit.

⁹ Z. Karim, CASEED, op. cit.

¹⁰ Islam, N. Bangladesh Institute for Development Studies. *Urban and Non-agricultural Impacts of Flooding – Methods of Assessments and Vulnerability Analysis*. Presentation delivered at “Economic Approaches to Climate Change and Poverty: a workshop for economic policy makers and researchers in Bangladesh”, 13-14 October 2009, Dhaka, Bangladesh.

reduced human deaths by over 50 percent, and that no deaths would have occurred if the mangrove cover was at the 1950s level¹¹. Overall, the cost-benefit analysis of human casualties, damages to houses and livestock losses shows that there is an economic case for preservation of mangroves, at least in terms of reducing the cost of dealing with cyclones. It is possible to cultivate mangroves in Bangladesh, and large-scale mangrove plantations are currently being developed.

Climate change and the economics of health

In Bangladesh, climate change is expected to cause an increased frequency and altered distribution of existing diseases (such as malaria, dengue fever and diarrhoea), rather than introduction of new ones. Many factors come into play when examining the impact of climate change on prevailing diseases. A 2009 study, for example, found that the average annual cost of child diarrhoea per household in Dhaka slums is around 1 percent of household income¹². Whether or not these costs will increase with climate change will depend on a number of factors, including human responses. Some measures that may reduce diarrhoea related health risks are maternal education, improved home water storage and better hygiene behaviour.

Climate change and air pollution are linked in complex ways. A recent OECD study found that the global reduction of green house gases to 50 percent of 2005 levels can lead to 20-40 percent reduction in pre-mature mortality from chronic exposure to air pollution¹³. The costs of illness from vehicular air pollution in Dhaka are estimated to be at least 2 billion taka per year¹⁴. Thus integrating climate and air pollution policies has potential win-win local and global possibilities¹⁵. Whether Bangladesh can move in this direction remains to be seen.

A climate change survey

A brief survey titled “Climate Change and Bangladesh – A Survey on Perceptions, Knowledge and Beliefs” was completed by the majority of the workshop’s participants. A number of interesting results emerged.

On knowledge and perceptions towards climate change:

- 100 percent of participants agreed that climate change was occurring;
- Over 70 percent believed that people were already being harmed;
- A majority rated themselves as only “fairly well informed” about the causes, consequences, and ways to adapt to global warming;
- Over 70 percent of participants thought that addressing global warming was the responsibility of all countries (not just the West);
- Nearly 50 percent of the participants did not believe that people would alter their behaviour enough to address global warming; and

¹¹ Das, S. 2007. *Storm Protection by Mangroves in Orissa – An Analysis of the 1999 Super Cyclone*. SANDEE Working Paper No. 25-07

¹² Alam, J.A. 2009. *The prevalence and costs of child diarrhoea in the slums of Dhaka*. SANDEE Working Paper.

¹³ Bollen J., B. Guay, S. Jamet and J. Corfee-Morlot. 2009. *Co-benefits of climate change mitigation policy – Literature review and new results*. Economics Department Working Paper 693, OECD.

¹⁴ Chowdhury T and M. Imran (forthcoming). *What are the health costs of vehicular air pollution in Dhaka?* SANDEE Working Paper.

¹⁵ However, the relationship between air pollution and global warming is complicated by the “cooling effects” of air pollutants that reflect sunlight back and mask global warming.

- Scientific publications, NGOs and IGOs were the most important sources of information on climate change for the participants (interestingly, radio rated the lowest).

On climate change threats and adaptation options in Bangladesh:

- Participants considered Bangladesh's coastal zones, lowlands and agricultural areas as most vulnerable to climate change;
- The most popular climate change adaptation measures among the participants were early warning systems for floods and cyclones (e.g. mobile-to-mobile messaging); conducting health baseline and vulnerability assessments, awareness-raising and information campaigns, and development of saline- and drought-resilient agricultural species.

Recommendations:

- There is a need for integration of climate change into all aspects of national, sectoral and spatial development in the country. Improved capacity of relevant ministries and agencies is essential in achieving this.
- Climate change adaptation in Bangladesh will result in added costs for governments, communities and private individuals. The challenge is ensuring that the benefits of investment in climate change adaptation (by reducing risk and lowering cost) outweigh the costs. Therefore, economic studies should focus on developing strategies for the most efficient level of intervention.
- Climate change will decelerate poverty reduction in Bangladesh, or even increase poverty; we need quantitative studies on the costs for the poor.
- There is a need for a better understanding of costs and benefits of "soft infrastructure" (such as early meteorological warnings to farmers).
- Several flood protection measures need careful evaluation, design and implementation:
 - flood zones may have to re-defined;
 - protecting nearly 21,000 km of Bangladesh's roads and highways;
 - flood-proofing individual homesteads by means of constructing raised platforms;
 - improved spatial planning; and
 - enforcement of land development regulations.
- Ecosystem based adaptation is another useful tool. Coastal afforestation (with mangroves or other tree species) can reduce the height of storm surges.
- Urban planning for floods, migration and salinisation needs to be improved.
- There is a need for more accurate estimates of future cost of transporting drinking water to areas affected by salinity intrusion.