



Proceedings of the International Planning Workshop¹
on
Conceptualizing Effective and Efficient Adaptation Policies to
Climate Change in Bangladesh
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Bangladesh Centre for Advanced Studies (BCAS)
Bangladesh Development Research Center (BDRDC)
International Institute for Environment and Development (IIED)
Millennium Institute (MI)

¹ These proceedings are based on notes taken by Jessica M. Ayers, Bernhard G. Gunter, and John D. Shilling. While these proceedings attempt to reflect the statements made and agreements reached at the workshop, they should not be understood as formal agreements by workshop participants, nor should they be stated as reflecting the views of any of the organizations the participants are affiliated with. The participants' affiliations are provided solely for identification purposes.

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List of Acronyms

ADB	Asian Development Bank
BCAS	Bangladesh Centre for Advanced Studies
BDRC	Bangladesh Development Research Center
BRAC	formerly: Bangladesh Rural Advancement Committee
BRRI	Bangladesh Rice Research Institute
BUET	Bangladesh University of Engineering and Technology
CC	climate change
CCC	Climate Change Cell (of the GoB)
CEGIS	Center for Environmental and Geographic Information Services
CIF	Construction Innovation Forum
DoE	Department of Environment (of the GoB's MoEF)
FAO	Food and Agriculture Organization (of the United Nations)
GIS	Geographic Information Systems
GoB	Government of Bangladesh
IIED	International Institute for Environment and Development
IPCC	Intergovernmental Panel on Climate Change
IPVM	Integrated Pest Vector Management
IUCN	International Union for Conservation of Nature
IWM	Institute of Water Modeling
LDC	Least Developed Country
LSE	London School of Economics
MoEF	Ministry of Environment and Forest (of the GoB)
NAPA	National Adaptation Programme of Action
NGO	non-governmental organization
NSU	North South University
RDA	Rural Development Academy (in Bogra, Bangladesh)
SEMP	Sustainable Environment Management Programme
SLR	sea level rise
T21	Threshold 21 model
UN	United Nations
UNDP	United Nations Development Programme
WHO	World Health Organization
WTO	World Trade Organization

I. Introduction/Background

Bangladesh is recognized as one of the countries that are most vulnerable to the impacts of climate change (CC) and climate variability. Despite an impressive amount of research on the implications of CC on Bangladesh, the actions taken so far are insufficient for a variety of reasons. First, there is a lack of consistency, even among recent impact assessments. Second, there is a lack of studies analyzing the cross-sectoral, cross-spatial, and longer term inter-temporal implications of CC. And third, there is a lack of integrating CC adaptation policies into the broader development strategy.

Fortunately, it is feasible to overcome these lacks as there already exists a generic model, the Millennium Institute's Threshold 21 model (T21), that, after the customization for Bangladesh and a few extensions for CC, would provide an ideal platform upon which current and future scientific knowledge about CC and the broader development agenda can be integrated into a single multi-disciplinary framework for policy design and decision making in Bangladesh. However, given the complex ways CC will impact Bangladesh physiologically, economically, and socially, the needed extensions of the T21 would need to be designed by a combination of scientists, development economists, policy-makers, and civil society representatives.

Hence, it was agreed to organize a three-day planning workshop to bring various stakeholders together to brainstorm on the complex CC issues and to draft a research program and policy framework on conceptualizing effective and efficient adaptation policies in Bangladesh. The three-day workshop was structured into three parts. The first day was allocated to providing a common background in terms of workshop objectives, the current CC research, the lessons and gaps in the Bangladesh CC literature, and a presentation of the T21. The second day was allocated to brainstorm on addressing the main physiological impacts of CC in Bangladesh (sea level rise, floods, cyclones, and droughts). The third day was allocated to brainstorming the sectoral implications of CC on health, education, and agriculture/fisheries, as well as one concluding session on next steps. Please see Appendix 1 for the detailed workshop agenda.

The workshop was attended by 13 participants (please see Appendix 2 for the complete list). Various other persons were very interested to attend the workshop but could not make it either due to other commitments/emergencies (like Dr. Saleemul Huq from the IIEE) or due to financial constraints (like Dr. Ashraf Dewan, a Bangladeshi post-doctoral researcher at Nagoya University in Japan). A list of these persons was provided to the actual participants and is available upon request from Dr. Gunter (president@bangladeshstudies.org).

II. Proceedings of Day 1

II.1. Welcome Session

Atiq Rahman from the Bangladesh Centre for Advanced Studies (BCAS) introduced the workshop by describing the climate change – development – adaptation nexus. He explained the relationship between the three, and focused on adaptation to CC, noting that adaptation has two sides; one based on community needs and realities, the other based in the international CC arena, conceived as a result of failed mitigation. In particular, he stated the central questions for the workshop:

- How can we integrate CC into development?
- How can we do what we are doing better and in a more integrative way?

John Shilling from the Millennium Institute (MI) gave a brief introduction to T21, a tool that integrates economic, social, and environmental concepts into a single framework that generates coherent scenarios. Intellectually, various groups have recognized that CC is a problem for both environment and development, but they usually approach these two key issues separately. T21 can provide a way of moving beyond this divide to provide integrative solutions for adaptation.

Bernhard Gunter from the Bangladesh Development Research Center (BDRC) described three key areas which must be improved to adapt more efficiently and more effectively to CC in Bangladesh:

- There is a lack of consistent and reliable information – for example with regard to sea level rise, a recent World Bank study estimates that 1m sea level rise will affect 1% of Bangladesh; another study says 30% - how can policy makers make decisions without good data?
- There are many good studies but little linking between sectors – what are the intesectional implications, for example, of changes in agriculture on health, on population?
- There is no tool applied in Bangladesh or elsewhere that really integrates these different aspects of society, population, and economics with environmental concerns – there is potential here for T21.

Each workshop participant introduced her/himself and stated her/his interest and expectations from the workshop. Some of the statements made and information shared was:

- comprehensive disaster management must include adaptation to CC;
- the ADB has recently created a \$34 million CC Fund, though details are still to be worked out on how to access these funds;
- the World Health Organization (WHO) Bangladesh office has a new 2008-2013 programme; the workshop will be useful to provide some practical guidelines;

- problems posed by climate change today could contribute to profitable business tomorrow;
- there is a new forum in Bangladesh that concentrates on CC and development, which is responsive at the grassroots level;
- the DFID-funded donor conference on CC in Bangladesh is likely to be held on September 8, 2008 in London; and
- the 3rd International Conference on Community Based Adaptation to Climate Change will be held from February 22-26, 2009 in Dhaka.

II.2. CC in the Context of Global and Local Policies and Governance

II.2.a. Presentation by Shireen Kamal Sayeed, Assistant Country Director, UNDP

(Complete presentation available at: <http://www.bangladeshstudies.org/Climate.html>)

Ms. Sayeed described the emergence of the CC concept in Bangladesh, and noted that CC has traditionally been seen as an environmental issue but now it is increasingly recognized as a development issue. She discussed the relevance of both mitigation and adaptation in Bangladesh. In terms of mitigation, the UNDP is particularly interested in meeting energy needs through a mitigation strategy. She also mentioned that CC requires special considerations for the least developed countries (LDCs), like for example debt relief.

Ms. Sayeed discussed the link between global and local policies for CC, through such cross-cutting issues as food insecurity, energy needs, health, biodiversity loss, and population growth. She also discussed the costs of adaptation across various sectors including education, industry, infrastructure, communication, and transportation; and she called for a more integrated approach to vulnerability analysis.

The issue of CC governance at both the local and global level was addressed, and it was stressed that CC must now be seen as a development issue and not just an environmental issue. The UN now recognizes CC as a human rights issue. At the country level in Bangladesh, policy and institutional building is needed in order to effectively mainstream adaptation into the national, sub-national, and local level activities. At this moment, activity is too concentrated in the Department of Environment (DoE). Defining the way forward across all 40 sectors is a major need.

Ms. Sayeed raised the issue of funding for CC, which must be condition free; the potential for comprehensive disaster management in the least developed countries must be improved. Private financing and public/private partnership building should be encouraged. Donor support for creation of a special CC Trust Fund exclusively for Bangladesh is being developed.

Ms. Sayeed proposed several ways forward:

- Government: Does not want a national CC policy, so there is a need to develop individual sectoral plans for CC adaptation. Sectoral coordination, and cross-sector monitoring and evaluation are needed, possible coordinated by the Ministry of Environment and Forest (MoEF). The MoEF also plans to provide CC inputs into the Poverty Reduction Strategy Paper (PRSP).
- Financial institutions should develop mechanisms to support adaptation, including the provision of easy credit for technologies.
- Non-governmental organizations (NGOs) need to build capacity at the community level, for which they need support from donors.
- Donors must help the government and civil society in formulating new projects, for example, by providing easy credit for technologies
- Donors also need to pool funds, yet to know how this will operate/be accessed, how they will access, and on what conditions.

II.2.b. Group Discussion (chaired by Hua Du, Country Director, ADB)

It was clarified that the government does not want one comprehensive CC plan. The government has developed an adaptation plan through five thematic areas, but this has not progressed very far. This must be a national level initiative, unlike the National Adaptation Programme of Action (NAPA), which was stimulated by external incentives through the LDC Fund. The adaptation plan for the country is a very different issue because closely tied in with ultimate development needs. A type of regional planning approach/sectoral approach was proposed as one way forward. Also, with the NAPA being revisited, the potential for cross-sector inter-linkages should be explored in the NAPA process.

The potential for linking mitigation and adaptation was raised and possibilities were noted in the waste-to-energy sector and through decentralized renewable technology.

The issue of monitoring and evaluation was raised for cross-sector initiatives. It was noted that the MoEF does not have the capacity to monitor all activities in the whole country – civil society could play a role but this process would have to be coordinated.

The activities of the government's Climate Change Cell (CCC) in this area were highlighted. The Cell has developed a framework for climate resilient development, and an institutional road map resource for modeling relevant to each sector, etc. This could help integrate CC into different sectors. UNDP also has a draft inter-sectoral program for adapting to CC.

The issue was raised about how CC can be integrated into the current government system, societal system, and community system. In many ways, Bangladesh is ahead of many other countries in this debate. But in the absence of a framework, Bangladesh is facing the challenge of being the first.

The potential for mitigation in Bangladesh was discussed. It was noted that the global argument is that adaptation is too expensive so the focus should be on mitigation (for example the World Bank Climate Investment Funds see mitigation as the key goal in Asia). However, in Bangladesh adaptation is the priority whilst there is little scope for effective action on mitigation.

The funding constraints on adaptation to CC are serious. A suggestion was made for an awareness raising program for donors in Bangladesh to improve flow of information and coordination.

Finally, it was stressed that a guiding document at the national level will be needed to avoid sectoral conflicts when adapting to CC.

II.3. Current CC Adaptation Research in Bangladesh

II.3.a. Presentation by Mozaharul Alam, Research Fellow, BCAS

(Complete presentation available at: <http://www.bangladeshstudies.org/Climate.html>)

This presentation introduced the concept of adaptation and noted the variation of CC impacts and vulnerability by region and socio-economic livelihood groups. Issues related to CC included: Food security/availability/affordability/access; water availability/quantity/quality; human health; biodiversity; and migration within/beyond national boundaries.

Major adaptation strategies were reviewed, including NAPA. Questions were raised on how we can identify and strengthen existing coping strategies; how do we create enabling environments for policies and institutions; and what strategies and development plans are feasible as a means of implementing national plans. It was noted that sectors must be working towards the same goals and must be based on the same data and scenarios to avoid disjoint and possibly conflicting approaches.

Examples of adaptation strategies were given from the agricultural and water sectors, and previous action research projects on adaptation were described, in which livelihoods and disaster risk reduction were taken as the starting point. Knowledge generation was highlighted as a priority, along with awareness raising, capacity building, and mainstreaming.

The next steps identified included:

- The need to understand better how autonomous adaptation strategies can cope versus the need for planned strategies, as well as the relationship between the two.
- The need for cost-benefit analyses for various adaptations strategies.
- Address challenges to implementation of adaptation strategies and ensuring their adoption by local communities – in particular how to avoid mal-adaptation.
- The uncertainties and risks associated with effective implementation.
- Assessing the effectiveness of each adaptation option against scale.

- Identification of knowledge gaps that need to be filled to ensure effective implementation.

II.3.b. Group Discussion (chaired by Atiq Rahman, Executive Director, BCAS)

The difference between climate variability and CC was clarified – CC is a shift in trends over time that is irreversible.

The need to invest in research to update and improve datasets on vulnerability was noted. The Center for Environmental and Geographic Information Services (CEGIS) has a tool that identifies areas vulnerable to inundation – but further work is needed to update and incorporate CC science.

The issue of migration was raised, and incentives for relocation were discussed. In Bangladesh no research has been done on this area, but relocation is taking place internally and externally, for example to India, but the Ministry of Foreign Affairs will not acknowledge this. The political implications of migration will be significant and need to be explored.

The role of civil society was discussed, and it was stressed that advocates of CC have a strong responsibility to bring information forward that is accurate, reliable, and properly researched. Much of the evidence for CC is anecdotal – while this is valuable there is a need for scientific rigor to underpin it. There is a clear need to use Bangladesh-specific examples and data. It will not work to bring non-specific examples to Bangladesh, as the message would not be brought home.

The issue of information communication was raised, and it was noted that there is a tendency for new research to stay within small circles. There is a need for better avenues of information sharing.

On market-based adaptation issues: There is a lot of discussion at international level, but it is difficult to price an adaptation ‘product’ - one way is to deal with these things as public goods – some of which can be quasi privatized, some can be quantified. Many institutions, including BCAS and IIED, are working on costing adaptation.

Atiq Rahman summarized some of the points from the discussion as follows:

- a) CC research remains to be at an early stage; much is based on isolated information; the research is not yet systematic;
- b) some implications of CC are well-known at the community level, especially among village elders; and
- c) new technologies will be crucial, some of which will be local, others international.

II.4. The Bangladesh CC Literature: Lessons & Gaps

II.4.a. Presentation by Bernhard G. Gunter, President, BDRC

(Complete presentation available at: <http://www.bangladeshstudies.org/Climate.html>)

The presentation began by pointing out that effective and efficient adaptation policies to climate change require:

- knowledge about the impacts of climate change,
- knowledge about the vulnerabilities to climate change,
- knowledge about the adaptation options, and
- an integration of adaptation policies with policies for sustainable economic development and disaster management.

Hence, the presentation of lessons and gaps was structured along these four areas.

With regards to CC impacts, the main points were based on the Bangladesh CC literature: we have relatively good knowledge about various types of physiological impacts (sea level rise, increased storm surges/cyclones, increased temperatures, increased evaporation, too much water during monsoon leading to floods, too little water during the dry season leading to droughts, changes in cross boundary river flows, and increased landslides) as well as good knowledge about indirect impacts of climate change (reduced fresh water availability, surface drainage congestion, plant diseases, and insect pests), but there remain various gaps (e.g., financial resources and capacity), as well as that some assumptions for the impacts need to be revisited.

With regards to CC vulnerability, the knowledge gaps are far larger than for the physiological impacts. It is necessary to move, for example, from hazard maps to vulnerability maps. There also are serious gaps with regards to sectoral interactions (e.g. between irrigation and water resources). It will be necessary to adopt a more holistic concept of vulnerability to CC.

With regards to adaptation options, various lessons and gaps were presented with regards to:

- Identifying adaptation options
- Conducting analysis
- Selecting and implementing the most effective and most efficient adaptation options
- Monitoring and evaluating adaptation policies

With regards to mainstreaming CC, the new emerging paradigm is the integration of CC adaptation policies with policies for sustainable economic development and disaster management in order to achieve a “triple dividend” from scarce resources.

Various lessons and gaps were presented in this regard, and then the presentation made ten suggestions for next steps:

- create conditions to enable adaptation;
- strengthen the academic and research institutions to conduct innovative research;
- further improve climatic disaster management;
- learn from the actual difficulties faced by individuals to cope with current risks/vulnerabilities;
- promote economic diversification;
- enhance skills through technical training, like soil and water conservation;
- act before the situation becomes critical in order to take advantage of windows of opportunity;
- anticipate conflicts and start to defuse them now by focusing on needs rather than on rights;
- take gender issues seriously; and
- adapt now!

II.4.b. Group Discussion (chaired by Abu M. K. Uddin, Program Manager, CCC, GoB)

The need to think about assumptions of climate scenarios used in all these different studies was noted.

The challenge of cross-border issues was raised, for example regional cooperation in water resource management. ADB are making some progress in the Mekong area, lessons from this could be transferred. More data is needed on upstream water.

The question of how to convert peoples' knowledge to scientific knowledge was raised. There is an evolving methodology that has been presented at the world conference on water, where each anecdote is seen as a data point, but such methods are generally rejected by the scientific community. More work is needed on how to validate local knowledge.

There is a gap between addressing CC and disaster management – it was debated whether reactive disaster management will always be preferred to disaster avoidance because no one notices disaster avoidance.

The issue of funding and time constraints on action was raised, for example in relation to maintenance of existing work on disaster risk reduction, such as polders.

The gap in resources versus needs was noted as a major problem, and there is a need for significant external resources to fill this gap.

II.5. Bangladesh, Climate Change, and T21

II.5.a. Presentation by John D. Shilling, Chairman, Board of Trustees, MI

(First part of presentation available at: <http://www.bangladeshstudies.org/Climate.html>)

Building on the comments made in the introductory session, Mr. Shilling provided further details about how T21 can be used as an effective tool for developing an integrative approach for managing CC in Bangladesh. In the first part of the presentation, he presented T21 analytic and operational strengths, illustrated some of T21's application, and the dynamic approach of T21. He then provided specific examples about how the T21 works and how it could be applied to analyze the impact of, as well as policy responses to, climate change in Bangladesh. Some of the main applications were then detailed as follows:

- expand basic structure of T21 to include CC factors at appropriate levels of detail over a reasonable time horizon;
- produce scenarios showing the effects of different characteristics of climate change to illustrate their broader impacts;
- generate sensitivity analysis of parameters and assumptions that are uncertain and of different timing of impacts;
- show causal relations and track changes to better understand causes and effects of various impacts and outcomes;
- test alternative ways to mitigate and adapt, and estimate the costs and benefits of the alternatives; and
- establish effective monitoring and evaluation processes based on model, which can help find solutions where goals are missed.

The second part of the presentation provided a detailed look at how T21 works by presenting specific country applications of the T21, the T21 menu, the baseline simulation and its match with historical data, specific simulations of policy interventions, and how results can be viewed and the reasons for the results can be analyzed. This demonstrated the ease of use of T21 and its transparency. These attributes help T21 facilitate dialogues among stakeholders and promote cooperation and deciding on and applying CC policies.

II.5.b. Group Discussion (chaired by Leo Christensen, Project Manager, Baltic Sea Solutions)

The discussion was positive about the potential for T21 in Bangladesh. It was suggested that the model could be housed in the Bangladesh University of Engineering and Technology (BUET) or CEGIS, where much of the existing modeling work on CC is taking place.

Particular issues and concerns that were raised regarding T21 included:

- In Bangladesh there is very little hard data – much of the CC data that exists is either outdated or based on qualitative observation. It was noted that T21 had been applied in a number of countries with limited data. T21 makes best use of the available data, indicates where improvements are most needed, estimates some data, and may be able to incorporate such qualitative indicators by working with data ranges rather than absolute figures.
- The issue of internalizing political variables was raised. It was noted that T21 is capable of doing this to the extent that such relations can be adequately described and some quantitative values indicated.
- There was concern over the assumptions underlying social dynamics, and whether these could be brought into the model. It was noted that this is possible, and has been done in a number of cases, depending on the information that is available.
- It was noted that T21 is non-partisan in nature –because it’s transparent it can incorporate different views to describe different outputs.
- The viability of the model in terms of costs and training needed was raised; it takes time and effort to train a local team who will maintain, extent, and further adapt the model; and to build a basic model, since there is no existing basic Bangladesh model. Depending on the detail requested in the initial stages, it would take \$250,000-\$350,000 to train staff, travel, get the model up and running. Once adopted, follow up costs would be minimal.
- The range of intellectual inputs and engagement require people from across sectors and disciplines; how do you engage different groups to provide inputs? Local inputs are very necessary as adaptation is so context specific. Then, how do you engage the government in the outputs? Their involvement in the development of the model is important. And its ability to graphically demonstrate the results of policies and help build support.
- Building a model forces evaluation of available data, and contributes to identifying critical additional data that may be needed.
- Ms. Hua Du noted that she will bring the T21 to the attention of the economic and research unit of the ADB Bangladesh office.

III. Proceedings of Day 2

III.1. Brainstorming 1: Adaptation to CC-induced Sea Level Rise (Chaired by Giasuddin Ahmed Choudhury, Executive Director, CEGIS)

The session was introduced with some figures relating to CC induced sea level rise (SLR) in Bangladesh:

- Even in normal flood during high tide, 38% of the land in Bangladesh is inundated.
- If there is SLR of 88 cm by end of the century, then 4,000 additional sq km will be inundated.
- By end of century, 50% of the coastal land may be inundated - around 14% due to CC induced SLR.
- The degree of inundation depends on the rate of SLR – earlier assumptions by the Intergovernmental Panel on Climate Change (IPCC) have been significantly exceeded because of the rate of ice melt.

It was highlighted that there is uncertainty embedded within these assumptions, but we must act with the available data that we have. For this reason, it is imperative that we are aware of the assumptions on which predictions are based so that we may improve predictions as the data emerges and becomes available. The T21 model provides an opportunity to do this.

It was noted that there are a number of organisations in Bangladesh working on SLR. Bangladesh's Institute of Water Modeling (IWM) is one key organisation that is doing much of the work in this area – any actions on adaptation and SLR should take account of the work being done by IWM. BCAS is also working in this area – for example they have been commissioned for IWM to do a base period run for the last 50 years to develop revised 'depth duration maps'. However, the number of studies that are going on often exclude the coastal area because of the complex number of factors involved – for example rising sea levels combines with the 'backwater' effect to create particularly problems for the areas behind polders; or the lack of understanding of sedimentary behaviour, which has in the past resulted in huge mis-investment in poldering areas. Such complexities are one reason why a straight technology transfer from countries such as the Netherlands is not realistic.

It was noted that for policy makers, more general information is needed, so there is a need for a better understanding of the process. Perhaps a post IPCC Fourth Assessment Report review of the situation in Bangladesh would be helpful to pull together all the studies and assumptions. Technical discussions can only go so far without technical expertise; perhaps until this expertise is brought together policy makers are better off focusing more on community (rather than infrastructure) priorities in vulnerable areas. The importance of community participation was highlighted for the success of technological interventions, particularly in ensuring effective implementation and maintenance of technical solutions. Community aspirations must be taken into account in the planning of any adaptation strategies.

It was noted that Geographic Information Systems (GIS) are being used for mapping impacts, and such maps are valuable for informing decision makers about what kind of impacts would be suitable and where, combined with community consultation, such tools can help avoid mal-adaptations.

Impacts by sector were discussed. It was noted that education will be affected if schools are inundated. One innovative adaptation has been schools on boats, which is happening in the North-west of Bangladesh. These schools are solar powered and are proving a popular and productive way of maintaining education when areas of land are flooded. Students arrive on the school by boats in the morning and spend the day there taking lessons, leaving by boats in the afternoon.

Some areas that are not directly affected by inundation will be indirectly affected by salinity intrusion. This will have an impact across sectors, including health, agriculture, and industry. This has implications for migration. The potential for saline tolerant species was discussed, and it was noted that the saline tolerant BR47 rice is currently being piloted by the Bangladesh Rice Research Institute (BRRI).

The issue of migration was discussed. Migration and relocation are difficult strategies but technologies can help, for example early warning systems and evacuation strategies. Lifestyle changes and the broadening of livelihood options can help mitigate against the need for relocation. However there will be some degree of human displacement, and it is important that the information available is used to help us understand where this will be and to what extent. The possibility of training ‘climate refugees’ in professions such as nursing was raised. There is a need for greater research at the small scale to understand migration – how do people make decisions about what they are going to do and where to go and when to go? For example, whether they go to the main cities or whether they go inland – this affects everything from the basic services to the infrastructures people will need.

The particular problems for the fishing communities were noted. Fishermen are losing days on the water and they are already among the poorest and most vulnerable communities. The International Union for Conservation of Nature (IUCN) and the BUET are currently piloting new boat structures to help make fishing boats more resilient.

II.2. Brainstorming 2: Adaptation to CC-induced Floods (Chaired by Tahera Yasmin, Development and Management Consultant)

The session was introduced by stating that CC floods in Bangladesh are likely to increase for two reasons: higher glacial melt and sea-level rise. Changes in precipitation may also have an impact.

The geo-politics behind freshwater provision in Bangladesh was discussed, and it was highlighted that many of the water problems in Bangladesh cannot be attributed to CC. Given that adaptations to CC cannot address these factors, it is necessary to develop practical solutions to make communities more resilient to floods caused by an array of factors including, or exacerbated by, CC. As concluded by a recent report by development, NGO, and technical agencies, called ‘Damage and Technical Assistance’, we cannot avoid floods in Bangladesh, so we need to better understand how to live with CC and mainstream the implications of CC into current flood resilient activities.

Flood responses are common at the community level, for example even after the two recent major floods, farmers produced bumper crops. We need to look at the autonomous adaptations that are taking place at the community level and consider how to scale them up.

There is potential for market strategies, for example 3 major strategies for farmers to adapt are extensification, intensification, and diversification, all of which are linked to the market. However, this is simply good agricultural practise – to what extent these can be called adaptation is debatable.

The difference between adaptation and development was discussed. It was stated that the difference lies not in the activity but the reason behind it – not what you are doing but why and with what knowledge. On the ground, this difference is seemingly theoretical, but it matters at the level of negotiations and also financing adaptation.

Early warning systems for floods exist but need to be improved, and CC data should be incorporated. It was suggested that the lack of response to flood early warning systems as compared with those for cyclones was the more gradual nature of floods. Awareness raising of the urgency of floods as well as methods to increase home security when people leave is needed, as is greater community consultation on possible solutions to this. One solution put forward was practice drills for managers and community leaders, as part of a wider flood preparedness programme.

A key gap that was discussed was that between the way in which the community would like to get information and understand it, versus the way in which such information is generated. Information must be well understood on the ground in order for people to respond to it. It was noted that DANIDA has a community-information center through which they disseminate information. This idea could be built upon. Mr. Giasuddin Ahmed Choudhury stated that CEGIS worked on a project where information about floods was communicated through mobile-to-mobile text (SMS) messages, and that this has been very well received by the local communities. Another avenue is through school children.

One of the lessons that came out of the 2004 floods was the concept of the ‘most vulnerable’ – it was shown that contrary to previous understanding, the worst affected were not the poorest but one level above that because amongst this class, social conventions prevented people from begging or using public sanitation areas – so institutional and cultural adaptation is also important. People must be kept above the critical ‘tipping point’, for which institutional support is needed. This is related to awareness raising among people who do the service delivery. Strategies must be inclusive of those people just above the poverty line.

Infrastructural interventions were discussed. The control of the directions of floods in the Netherlands was raised as an example from which lessons could be learnt – yet it was pointed out that technologies are not strictly transferable, for example, in Bangladesh due to the of flatness of land, floods do not ‘flow,’ and there is also no space to divert floods.

Land zoning was raised as one potential intervention. It was also suggested that a comprehensive review of existing flood preparations and responses is needed by an independent body.

III.3. Brainstorming 3: Adaption to CC-induced Cyclones (Chaired by Abu M. K. Uddin, Programme Manager, CCC)

Cyclone shelters were discussed as the primary infrastructural adaptation, and it was pointed out that existing shelters are inadequate to deal with current cyclone risks. While the design of individual shelters is good, the management of shelters and their distribution is inadequate – the social design of shelters should be much better. For example, people are often reluctant to move to shelters if they have to leave behind their assets. Given that livestock are among the most valuable assets, cyclone shelters should be able to accommodate livestock. Insurance systems should also be looked at to encourage responses to early warnings, although it was noted that BRAC lost significant amounts of money through micro-insurance systems due to CC-induced disasters.

One suggestion for meeting the shortfall in shelters is to reinforce the houses of the wealthier people in the village to be used as shelters when a cyclone hits. While investment is needed for reinforcement, the maintenance would be the responsibility of the home owner. Such schemes would ensure that everyone lives within a reasonable distance from a shelter and would also encourage social cohesion. The success of early warning systems is also heavily dependent on community trust. Awareness raising also needs to occur with the media to help communicate early warnings.

Shelters and early warning systems should be part of a wider integrated cyclone management strategy. For example, the earlier that warning systems can alert people, the more time they have to make it to a shelter. Such strategies must incorporate the priorities of the local communities so that users understand and have ownership over the system.

Fishing communities are particularly vulnerable. Fishermen, in particular, often borrow money to obtain their equipment, and they need to secure their catches in order to repay the loans and meet subsistence needs. The investment issue makes them very sensitive to changes in the risk of cyclones.

The most important aspect of rehabilitation after a cyclone is the provision of safe drinking water. There is currently no plan of action for this. One idea proposed was the removal of heads on tube wells in anticipation of the cyclone. Then after the cyclone, at least one tube well will remain operational. Such schemes are used in flood management and should be transferred to cyclone management.

Housing in the coastal zones needs to be made more durable, or more easily resurrectable. Temporary mobile structures were noted as one possibility, but perhaps they are more suited to flood zones.

The question of financing adaptations to cyclones was raised. This is the main reason for the shortfall in adequate shelters – properly designed effective shelters are extremely expensive. In the context of limited resources in the rural areas, this is a major issue. Hua Du spoke about the ADB investments in cyclone areas. In 1991, the ADB assisted the Government of Bangladesh in building schools that could also act as shelters. This had the co-benefit of minimising disruption to education in the cyclone aftermath. Those schools have played a key role in accommodating people. It was suggested that all schools built in cyclone areas must also be built strong enough to withstand cyclones. However, the difference in cost between resilient and non-resilient school buildings is significant - \$4000 up to \$10,000 – which requires significant external financing. The role of Construction Innovation Forums (CIFs) could be significant in this regard.

Communication was again raised as a key issue. The role of the media was noted, particularly the role of community radio. The potential for SMS was again raised.

III.4. Brainstorming 4: Adaption to CC-induced Droughts (Chaired by Jessica M. Ayers, CC Researcher, IIED/LSE)

The impacts of drought on Bangladesh were briefly described. Bangladesh has major droughts ever 5 years, although intermittent droughts occur more frequently. The link between increased temperatures and increased drought is very direct. CC is likely to increase the occurrence, extent, and severity of droughts. Bangladesh will experience higher winter temperatures, and greater temperature extremes. The main area of concern is the North-West of Bangladesh, the existing drought-prone area, although with CC, drought is spreading to the South-West region of the country. Rising temperatures will affect soil moisture through more intermittent rainfall patterns and increased evapotranspiration. More extreme rainfall events coupled with dryer soils will result in more flash flooding and a decline in the water-holding capacity of soils. The impacts will be context specific and will vary according to ecological, socio-economic and cultural differences.

It was noted that the FAO has already produced a handbook and developed training courses on adaptation to drought in Bangladesh in conjunction with the Asian Disaster Preparedness Centre.

The main impacts of drought will be felt on the agricultural sector. Existing adaptation strategies include supplementary irrigation; community soil conservation through ploughing when it rains and stopping tillage agriculture after it rains; and developing new varieties of crops that can withstand higher temperatures.

Water management is a key problem for which water storage options need to be further explored. One programme noted by UNDP was the Sustainable Environment Management Programme (SEMP) in which one dryland area was targeted and water conservation was carried out over a period of seven years. Water was retained by SEMP through irrigation canals and water storage tanks. Plantation forests have maintained the soil, and the programme has been very successful – the government has now adopted the programme and co-invested. This is a good example of an adaptation strategy to create a micro-climate in the area through water storage and tree planting. Cooperatives in the area have introduced a water metering system for farmers and water pumping mechanisms have been installed for household use. Income has gone up, health and education levels have increased.

The challenge for the future in light of rising temperatures is the need for more efficient irrigation systems and the maintenance of these. Further analysis of climatic scenarios to gauge the extent of this challenge is needed. CEGIS has developed a drought assessment model.

CC is not the only issue: deforestation and the geopolitics of river flows have a greater impact on drought than CC.

Post harvest losses are also significant and should be minimised; hence, post-harvest technologies should also be looked at.

Other adaptation strategies discussed include: In the Barind area deep tubewells are being used– this has proved a good system but is not common in the rest of Bangladesh. The Rural Development Academy (RDA) in Bogra is promoting underground irrigation to provide piped water to households and for agriculture. This is also a reaction to arsenic in the ground water – an integrated ‘win-win’ approach. Integrated Pest Vector Management (IPVM) is another integrated approach for minimising crop losses and working on water management – reducing standing water reduces water bodies for pests and also stems evapotranspiration. As CC is also associated with an increase in vector borne diseases, this is a good integrated adaptations strategy.

Drought tolerant crops were discussed. So far, the focus of research and applications has been on rice.

Insurance was again raised as a potential mechanism for encouraging the uptake of new cropping systems. Index based insurance allows you to avoid hazards based on historical trends. However, any switch to new crops must be in line with market demands otherwise it will not be sustainable. There is a need to explore the market for drought resistant crops further and to link with international trade groups, such as World Trade Organization (WTO), because the domestic market is not big or diverse enough. There should be special conditions for the most CC vulnerable countries through WTO.

Health impacts of drought were discussed. Most notable were lack of drinking water and the impact of diarrhoeal diseases. Particular impacts on women, who are the main water carriers and health and nutrition providers, were considered to be critical to adapt to CC. Arsenic is a related issue because it has an impact on drinking water supplies.

Improved cooking stoves were also mentioned as a very good response to adaptation and mitigation, reducing indoor pollution, and reducing biomass load.

It was noted that behavioural change requires education at the school level.

IV. Proceedings of Day 3

IV.1. Brainstorming 5: CC Adaptation and Health Sector Issues (Chaired by Andrew Trevett, WHO Scientist, WHO Bangladesh)

The session was introduced with a brief presentation of CC and health impacts. It was noted that with the exceptions of heat waves and extreme weather events, most of the impacts of CC on health will be indirect, which is challenging for the involvement of health professionals. Some areas that health professionals can engage with include advocacy, important for the attention of policy makers and more general awareness raising; conducting vulnerability assessments; how/where will forecasts affect communities; and building the evidence base. A workshop on “Climate Change and Health” held in Dhaka in November 2007 highlighted three objectives for the health sector: increasing awareness within health sector; work on both mitigation and adaptation plans; and participation of the health sector in the CC dialogue, which had proved difficult.

The discussion began by highlighting that both the Ministry of Health and the Ministry of Education’s Department of Vocational and Higher Education (DVHE) are working with the CCC, and a workshop is planned for August to facilitate CC into a number of sectors including health.

In relation to mitigation, it was noted that while the health sector cannot drive this agenda, there are many linkages between mitigation and health, such as the impact of pollution on respiratory diseases, bringing about the possibility of ‘win-win’ integrated approaches. Health can be a supporting factor in advocating mitigation strategies.

There have been some preliminary studies on peoples’ perceptions of health associated with CC – patterns are emerging at the anecdotal level, there are opportunities for linkages of understanding, and there is a sensitisation going on.

Many impacts will be at the regional level, diseases will not stop at borders – a South Asia approach is needed.

Health is a key factor because adaptation depends on the resilience of society and of the individual, so if the individual is not healthy, stresses cannot be resisted.

Nutrition is a major factor in Bangladesh – the link between malnutrition and health is more serious than HIV/AIDS because malnutrition has an impact on immune system. Therefore the impact of CC on the agricultural sector is of great concern to the health sector. The importance of preventative measures and the role of modelling in assessing such trends were highlighted.

At this moment, WHO is in the early days of engaging the health sector in the CC agenda. Currently we are trying to get a framework endorsed by the government, with the target of producing a booklet by the end of June. After this, divisional level seminars will be organised to work on advocacy and awareness raising.

The window of opportunity for engaging the health sector is now. However awareness is easy; the difficulty is relating awareness to particular working domains – what can each person *do*.

Communication within and across sectors is a key concern - networks and forums for discussion are really important – the potential for a central repository for announcements, questions, documents, and information was discussed, possibly housed within the CCC.

Health surveillance systems should be sensitised to CC – while CC will rarely introduce new diseases, it will have an impact on the ranges of diseases, so we need to ensure resources in areas where there is expected to be a change

For the health sector, a holistic approach is particularly important because of the multi-factoral nature of health. Attention must be paid to the linkages.

Baseline studies are important as there is a need for a point of comparison. There is baseline data for certain diseases, but the health sector must make sure it engages with other sectors, such as water logging associated with vector borne diseases

The critical issue is what will the health sector do *differently* Do we take a preventative way of looking at things; or a clinical response that is more common in Bangladesh?

Modelling and data issues were discussed. BCAS has tried to link malaria with temperature, rainfall and humidity; however a major limitation is the administrative boundary. It is important for the engagement of health professionals that we are able to draw on data and case studies where health professionals are working and link to CC in these areas. Another study discussed was exploring the link between salinity intrusion and hypertension. The London School of Tropical Medicine is currently developing a proposal in conjunction with BCAS to do a baseline study on the existing situation and a three to five years continuous monitoring programme on salinity and blood pressure, particularly among pregnant women – the proposal has been submitted.

IV.2. Brainstorming 6: CC Adaptation and Education Sector Issues (Chaired by Mizan R. Khan, Chairman and Professor, Department of Environmental Science & Management, NSU)

Prof. Khan introduced the session by noting that the solution to CC requires tradeoffs. He highlighted three key issues for CC and education:

1. Software: what kind of knowledge, skills, and awareness do we have to impart and how can we internalise education about CC into education sectors?
2. Hardware: how will educational infrastructure be affected by CC?
3. Financial resources: how can we mobilise financial resources for both the soft and hard side of the education sector?

A short presentation by Ms. Hua Du described the work of the ADB on the education sector. She began by outlining the ADB Country Strategy for Bangladesh – working with other partners and donors on

mitigation and adaptation. The emphasis was on disaster resistant design. A case study of the second primary education sector wide programme (PEDP-II) was discussed, focusing on ‘hardware’. Part of the programme involved making schools into cyclone shelters, and it was noted that the cost of such interventions is huge. Schools built under ADB have proved a great facility, but we are lacking in resources to do more. The role of students in communicating disasters and CC was discussed. Miking (the use of microphones) was one strategy used to give announcements. Students could be trained to undertake these activities. The presentation concluded with the point that under the primary education project, a huge amount of money is spent to cope with natural disasters and that kind of expenditure requires external assistance.

Other points raised included the need to protect other infrastructure, such as roads, which has huge costs implications. Also there is a need to educate people about CC – to mainstream these ideas into the country. The CCC is holding workshops and producing educational materials for schools. Tertiary education must also be targeted in courses such as geography, soil science etc. The CCC is working on developing courses on this. UNDP ran courses on environment – so this has already been done. However it took seven years – four years just to build linkages with the Ministry of Education. The programme has trained 400 master teachers who will continue to give training to other teachers in primary and secondary schools. It was suggested that it would be necessary to link with the Department of Education and ask them to revise their programme to include CC.

BCAS stated that they had reviewed the ADB programme under the ORCHID framework, a framework designed to mainstream CC into development interventions. The recommendations were to incorporate present and future climate circumstances because the design was based on past climate patterns. Also design of school building for drought prone area whether ventilation is a factor to reduce increasing heat stress

On primary education – it was suggested that education providers should tailor the CC syllabus to be context specific to make it relevant and applicable in the local area.

Teaching resources – the WHO regional office has developed a teacher’s manual on CC and health as well as an accompanying student manual

The issue of ‘clever architecture’ or ‘climate-smart architecture’ was raised. New innovative designs are needed that are less costly, and some of them already exist. This is an area for major government investment in Bangladesh.

It is worth thinking through the added value of these approaches. There are lots of documented case studies for us to learn from, for example, it would be possible to team up with BRAC to incorporate climate-smart architecture into other kind of lower cost structures

On the issue of construction material, it was noted that in coastal areas that are suffering from salinity intrusion, this is affecting the durability of cement from the sand. Building regulations must be modified, particularly because most construction happens in the dry season when salinity is higher.

The need for integrated education approaches was again highlighted. There should be a wider programme where people learn the value of shelters, combined with education about early warning systems and other response mechanisms.

Pilot projects are needed to demonstrate value to governments of such schemes.

The issue of school buildings in dryland areas was discussed. Designs should incorporate good ventilation–. Here we can learn from ‘wind catcher’ technology from the Middle East.

The Chair’s Summary noted that the discussion had focused on the ‘hardware’ side of educational adaptation, which is the concern of engineering departments. We also need to think about how to introduce climate into the ‘software’. A suggestion was put forward to incorporate CC into the next round of environment text books. It is still not fully integrated at graduate level – no comprehensive courses on CC. It is worth introducing a general environmental and CC awareness course across disciplines.

IV.3. Brainstorming 7: CC Adaptation and Agriculture/Fisheries (Chaired by Abu Mostafa Kamal Uddin, Programme Manager, CCC, GoB)

Following introductory notes by the chair, the session was introduced with a brief presentation by Ms. Jessica M. Ayers on the key impacts of CC on agriculture (based on a recent note by Saleemul Huq and Jessica M. Ayers that had been prepared for the European Parliament; available at: <http://www.europarl.europa.eu/activities/committees/studies/download.do?file=19195>).

Adaptations discussed included new rice varieties that are saline resistant, for example, BR47 is being introduced in the Satkira area and giving good results. For drought resilient varieties, work is going on but new varieties are not yet launched. Flood tolerant varieties have been developed, but have proved low yielding. BRRI is working on this.

‘Hanging gardens’ are being piloted – farming land on raised platforms, or the rooftops of houses, which can be scaled up. However, it should be noted that it is not the staple crops that are grown through such methods. Careful market analysis is needed for the potential for such systems. Floating gardens is another good adaptation strategy which has been adopted throughout much of South Asia.

It is important to look across developing countries for innovative solutions and to look beyond borders, which the World Bank is doing.

Fiscal policy interventions are needed to support adaptive strategies, for example, by supporting the purchase of new seeds for farmers. Subsidies are needed to mitigate the costs.

The role of insurance was again raised.

Another way of encouraging uptake is to demonstrate the benefits of adaptive strategies through pilot schemes. For example, ADB is introducing new varieties in a demonstration field. Then farmers volunteer to adopt new variety when they see how successful new varieties are compared with old ones.

Also new low tech farming technologies need to be demonstrated to the farmers to give them the courage and incentives to proceed.

Decisions about crop changes need seasonal forecasting, and more research is needed on how to do this. Any forecasting at the local level needs to be very carefully communicated and needs to be realistic to avoid mal-adaptation and break in trust between forecasters and communities.

Adaptation strategies must take into account other factors, such as population growth. If there is population growth and the land is not extending or increasing, it must become more productive; yet people are migrating into urban areas and we need to look beyond agricultural sector to see what will be the impact of CC on the overall economy? As long as there is growth and increases in income, there will be a shift away from agriculture to services, which is happening in Bangladesh and needs to be taken into account.

Reclamation of land was discussed as a possible option. It was acknowledged that a proposal has gone forward to The Netherlands, however the cost is very high for not a lot of land reclamation. Could money be better spent on existing land?

Fisheries were also discussed. Fisheries face serious consequences with CC because they are extremely sensitive and complex systems—. Much more research is needed on this. Overfishing will be a major contributing factor, especially given the implications of CC on other agricultural sectors. Adaptation strategies will include protection areas.

IV.4. Concluding Brainstorming Session: Next Steps (Chaired by John D. Shilling, Chairman, Board of Trustees, MI)

All participants described what they found most useful about the workshop. Responses included:

- Getting fresh inputs from different perspectives and coming together with people from a range of different backgrounds.
- The benefit of a small group – a lot of opportunity for intense discussion and exchange of ideas reveals large degree of consensus on what needs to be done.
- The discussions resulted in a greater motivation to take integrate CC into one's own agenda and get more engaged in the CC arena.
- Provided an opportunity to work on integrative approaches.
- Has highlighted and clarified the difference between the challenges of dealing with climatic extremes versus CC trends.
- Modelling is an area that has been lacking in Bangladesh, particularly accessible, transparent models – therefore interesting to learn about the role T21 may play in providing a new avenue for this work.
- Value of not limiting ourselves to a single sector in discussions and research presented, but looking at cross-sector policy, advocacy, interventions, and research.

- Revealed the knowledge gap between sectors and across scales – highlighted the need to improve information and communication at all levels.
- Many examples of innovative adaptations were encouraging – e.g. climate-smart architecture; schools on boats; schools to shelters.
- Agreement we need an integrated modelling tool to really go forward to provide a common basis across sectors.
- Highlighted amount of work that is already going on.

Areas participants would like to see taken forward/action to be taken include:

- Communication and knowledge management.
- Region-specific planning (whereby regions refer here to specific areas within Bangladesh).
- Keep network going.
- A summary of findings should be shared with the secretary of planning – also need to discuss with government the efforts to respond – need to think about Annual Development Programme to get this to move beyond small or research based activities.
- Address resource implications – without external support, the government alone cannot carry this forward without donations and compensatory payments where possible – external assistance must be channelled through the development process.
- Look into an ecosystem based approach where livelihood and CC implications will be different between ecosystems in order to address cross cutting issues.
- The T21 should be taken forward.
- Improve knowledge management - options include a list serve and data repository perhaps under the website of the CCC.
- It would be good to see if we can devise a set of researchable ideas.
- Have the conclusions brought to technical team who will have the knowledge to implement it - technical expertise needs this level of knowledge, which should move to close the gap between intellectual and practical level.
- Integrate all the issues discussed into a common framework, which may be possible under T21 - a proposal will be put together to build capacity in Bangladesh to use this.

All participants agreed that the workshop had been productive and enjoyable, and acknowledged the work of the organisers in making the workshop a success. All participants also thanked the Frati Team of the Bellagio Center and the Rockefeller Foundation for financing most of the costs of the Workshop. Various participants agreed to work out more concrete next steps and/or suggestions for further research.

Appendix 1: Agenda

Tuesday, May 20, 2008

09:00-09:20 Welcome Session

09:00-09:20 Welcome and Objectives of the Workshop

Atiq Rahman, Executive Director, BCAS;
John D. Shilling, Chairman, Board of Trustees, MI; and
Bernhard G. Gunter, President, BDRC

09:20-11:00 Presentation 1: CC in the Context of Global and Local Policies and Governance

09:20-09:50 Presentation by Shireen Kamal Sayeed, Asst. Country Director, UNDP Bangladesh

09:50-10:55 Group Discussion (chaired by Hua Du, Country Director, ADB)

10:55-11:00 Chair's Summary

Coffee Break

11:20-13:00 Presentation 2: Current CC Adaptation Research in Bangladesh

11:20-11:50 Presentation by Mozaharul Alam, Research Fellow, BCAS

11:50-12:55 Group Discussion (chaired by Atiq Rahman, Executive Director, BCAS)

12:55-13:00 Chair's Summary

Lunch

14:00-15:40 Presentation 3: The Bangladesh CC Literature: Lessons & Gaps

14:00-14:30 Presentation by Bernhard G. Gunter, President, BDRC

14:30-15:35 Group Discussion (chaired by Abu M. K. Uddin, Program Manager, CCC, GoB)

15:35-15:40 Chair's Summary

Coffee Break

16:00-17:40 Presentation 4: Bangladesh, Climate Change, and T21

16:00-16:30 Presentation by John D. Shilling, Chairman, Board of Trustees, MI

16:30-17:35 Group Discussion (chaired by Leo Christensen, Project Manager, Baltic Sea Solutions)

17:35-17:40 Chair's Summary

Wednesday, May 21, 2008

09:00-10:15 Brainstorming 1: Adaptation to CC-induced Sea Level Rise

Chair: Giasuddin Ahmed Choudhury, Executive Director, CEGIS

Coffee Break

10:30-11:45 Brainstorming 2: Adaptation to CC-induced Floods

Chair: Tahera Yasmin, Development and Management Consultant

11:45-13:00 Brainstorming 3: Adaption to CC-induced Cyclones

Chair: Abu M. K. Uddin, Programme Manager, CCC, GoB

Lunch

14:00-15:30 Brainstorming 4: Adaption to CC-induced Droughts

Chair: Jessica M. Ayers, CC Researcher, IIED/LSE

Thursday, May 22, 2008

09:00-10:15 Brainstorming 5: CC Adaptation and Health Sector Issues

Chair: Andrew Trevett, WHO Scientist, WHO Bangladesh

Coffee Break

10:30-11:45 Brainstorming 6: CC Adaptation and Education Sector Issues

Chair: Mizan R. Khan, Chairman and Professor, Dept. of Env. Science & Management, NSU

11:45-13:00 Brainstorming 7: CC Adaptation and Agriculture/Fisheries

Chair: Abu M. K. Uddin, Programme Manager, CCC, GoB

Lunch

14:00-16:00 Concluding Brainstorming Session: Next Steps

Chair: John D. Shilling, Chairman, Board of Trustees, MI

Appendix 2: List of Participants

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