Mainstreaming Climate Change Adaptation into the World Bank's Operational Work

Lessons learned from ADAPTATION TO CLIMATE CHANGE IN BANGLADESH

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Summary

Bangladesh, with a population nearing 130 million, is one of the poorest countries in the world while also being one of the most vulnerable to the impacts of climate change. Since the early nineties a number of studies have been carried out which have built a body of knowledge and information about the likely adverse impacts of climate change to different sectors of the country's economy. In 2000 the World Bank office in Dhaka initiated an effort involving international and national experts to use the existing body of analysis of climate change impacts and attempt to engage with stakeholders from the different vulnerable sectors of the country in order to try to mainstream adaptation to climate change into national planning. The World Bank published the results of the study in 2000 as *Bangladesh: Climate Change and Sustainable Development (Report no 21104-BD).*

The **overall objective** of the study was to mainstream climate change adaptation issues in the regular development strategies and operations in Bangladesh and serve as an example for other countries of the world.

The **study process** involved two distinct sets of activities namely (i) analysis of existing information on climate change scenarios and their impacts in a manner that would make them intelligible to policy makers and planners, and (ii) identification of possible adaptation measures and engagement with key stakeholders in each of the vulnerable sectors to determine the feasibility of adopting the potential adaptation measures identified for those sectors.

Five **key sectors** of the economy and physical resources of the country were selected (based upon the existing studies) as being amongst the most vulnerable to climate change, namely: *Coastal resources*, *Fresh water resources*, *Agriculture*, *Human health* and *Ecosystems and Biodiversity*.

For each of the selected sectors the major impacts of the climate change scenarios were determined and possible adaptation measures identified and elaborated. The potential adaptation measures identified were then used in discussions with key stakeholders from each sector to determine their relative feasibility based on the criteria of (i) *Effectiveness* of the measure to reduce the key risks, (ii) *Feasibility,* considering the technical aspects as well as costs, social acceptance and manageability, and (iii) *Current state of implementation and requirements of improvements* (referring to how they are being practiced in the country with or without consideration of climate change).

The most important impacts on **coastal resources** were determined to be on d*rainage congestion*, m*orphological processes* and d*isaster mitigation.* The most important impacts on **freshwater flows** were determined to be on *reduced low flows* and *drainage congestion*. The most important impacts on the **agriculture** sector were determined to be on *drought* impacts, f*lood* impacts and *salinization* impacts. The most important impacts on **human health** were determined to be on *water borne diseases* and *vector borne diseases*. The most important impacts on **ecosystems and biodiversity** were determined to be on the *Sundarbans mangrove ecosystem* (the largest mangrove ecosystem in the world), other *coastal ecosystems* and *wetland ecosystems*.

In each of the key sectors the discussions with the sectoral stakeholders (primarily the sectoral planners and managers) were held. Many of the sectoral stakeholders were able to assess the information given to them on the impacts of climate change on their respective sectors and help in the process of both identifying suitable adaptations as well as prioritising them according to the agreed criteria. However engaging with high-level policy makers at the national level was less successful.

The **main lessons** of the exercise were: (i) Information on climate change impacts needs to be translated from the scientific research domain into language and time scales relevant for policy makers, (ii) Research on potential impacts of climate change needs to be supported in-country to enable information to be improved and be passed on to policy makers on a regular basis, (iii) All relevant stakeholders need to be involved-but their needs for information may vary and thus information must be suited to the stakeholder group being engaged with, (iv) Sectoral level policy makers, planners and managers are relatively more likely to mainstream adaptation to climate change into their on-going and planned work (provided the information on impacts is given to them in a suitable form), (v) High level policy makers need to be especially targeted (with suitable material), (vi) National and international experts and researchers need to share their knowledge with people making decisions and plans on the ground more effectively.

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1. Background

The World Bank's environment strategy – *Making Sustainable Commitments* – approved by the Executive Directors in July of last year, highlights the linkages between poverty alleviation and longer-term environmental sustainability. It explicitly recognizes the threats that degradation of the environment pose to poor countries and poor people in the long term and responds to three challenges – improving the quality of life; improving the quality of growth; and improving the quality of the regional and global commons. These three challenges make up the holistic approach the World Bank is pursuing to link environment and development on both the local and global levels. At the global level, the focus is on addressing the threat climate change poses to longer-term development and for the poor to escape from poverty.

In order to manage this diverse and challenging agenda, including the increasing focus on cross-sectoral work, the Strategy gives priority, inter alia, to training of Bank staff. As a part of this broader training agenda, the Climate Change Team, in collaboration with the World Bank Institute is offering a one-day course on Mainstreaming Climate Change Adaptation into the Bank's Operational Work. The purpose of the course is to familiarize Bank staff about evolving climate change agenda, covering the issues of science, impacts, vulnerability and adaptation, and more broadly the policy agenda. The course will draw on, among other things, the work that has been carried within the Bank, including the study on *Bangladesh: Climate Change and Sustainable Development.*

2. Focus of this report

With reference to the study on *Bangladesh: Climate Change and sustainable development* carried out in 2000 as well as previous works on climate change and subsequent developments in Bangladesh, this report provides some lessons learned over the years in mainstreaming adaptation to climate change into development planning in Bangladesh.

3. Context of the study

Bangladesh, with a population nearing 130 million, is one of the poorest countries in the world while also being one of the most vulnerable to the

impacts of climate change. Since the early nineties a number of studies have been carried out under the auspices of various funding agencies and involving international and national experts from different disciplines, which has built a body of knowledge and information about the likely adverse impacts of climate change to different sectors of the country's economy. In 2000 the World Bank office in Dhaka initiated an effort involving international and national experts to use the existing body of analysis of climate change impacts and attempt to engage with stakeholders from the different vulnerable sectors of the country in order to try to mainstream adaptation to climate change into national planning. The World Bank published the results of the study in 2000 as *Bangladesh: Climate Change and Sustainable Development (Report no 21104-BD).*

4. Objectives of the study

The overall objective of the study was to mainstream climate change adaptation issues in the regular development strategies and operations in Bangladesh and serve as an example for other countries of the world.

5. Methodological issues addressed in the study

An important activity of the study was to summarize the existing knowledge on expected impacts of potential climate change, and to develop and apply a methodological framework that allows the classification and assessment of possible adaptation measures. Selected development policies, programmes and projects were analysed, leading to the identification of possible adaptation measures. The study addressed the following questions:

a) What are the expected climate changes?

Through a literature search and using the most recent results of scientific research.

b) What would be the consequences for Bangladesh?

This not only dealt with the sensitivity of ecological and socio-economic systems for climate change induced impacts, but also dealt with non-climate change induced changes because of other developments (such as further reductions of low water flows due to upstream water consumption).

c) What are the specific climate change impacts for which Bangladesh is most vulnerable?

This included an assessment of vulnerabilities in terms of sensitivity and adaptability. It also included an identification of adaptation measures in terms of effectiveness.

d) How can the potential effects of climate change be factored into policymaking, and what adaptation measures for Bangladesh are feasible?

This involved examining the strategic implications of climate change for policy makers and the strategic adaptations that would be needed. Tentative criteria were developed for screening potential adaptation measures, which consider their effectiveness in addition to their implementation feasibility (including costs).

6. The study process

The study process involved two distinct sets of activities namely (i) analysis of existing information on climate change scenarios and their impacts in a manner that would make them intelligible to policy makers and planners; and (ii) identification of possible adaptation measures and engagement with key stakeholders in each of the vulnerable sectors to determine the feasibility of adopting the potential adaptation measures identified for those sectors.

a) Information analysis

This involved the modification of existing climate change scenarios which had been done on a 50 or 100 year time horizon to a 30 year time horizon for the key parameters of temperature and precipitation to enable the time dimension to be more in line with those prevalent in the development planning domain. The climate change scenarios where then used to determine the impacts on some critical biophysical parameters including:

- Drainage congestions of the major river systems of the country
- Reduced fresh water flows in the dry season
- Disturbance to the morphological process of the active delta region
- Increased intensity of extreme climatic events such as floods, cyclones and droughts

b) Identification and evaluation of proposed adaptation measures

Based on previous vulnerability assessments, five key sectors of the economy and physical resources of the country were selected as being amongst the most

vulnerable to climate change. However, no attempt was made to prioritise between the five sectors. The five selected sectors were:

- Coastal resources
- Fresh water resources
- Agriculture
- Human health
- Ecosystems and biodiversity

For each of the selected sectors the major impacts of the climate change scenarios were determined and possible adaptation measures identified and elaborated. The potential adaptation measures identified were then used in discussions with key stakeholders from each sector to determine their relative feasibility based on the following criteria:

- *Effectiveness* (of the measure to reduce the key risks)
- *Feasibility* (considering the technical aspects as well as costs, social acceptance and manageability)
- *Current state of implementation and requirements* of improvements (referring to how they are being practiced in the country with or without consideration of climate change**).**

7. Key findings of the study

For each of the key vulnerable sectors selected the major impacts were determined and potential adaptations were identified with respect to two key parameters, namely:

- physical adaptations
- institutional adaptations

These were then discussed with key (sectoral) stakeholders to arrive at a consensus view on the relative priority for their implementation. The main findings for each sector are shown below.

a) Coastal resources

The most important impacts on coastal resources were determined to be on:
Drainage congestion

- Morphological processes
- Disaster mitigation

The possible adaptation measures (both physical as well as institutional) were identified and assessed with the key stakeholders dealing with coastal resources management and the results are shown in table 1 below.

Table1: Assessment of Adaptation Measures for Coastal Resources

Key impacts and measures	**Effectiveness/ Feasibility**	**Current state of implementation &/or requirements for improvement**	**Priority for incremental future action**
To mitigate drainage congestion			
Physical adaptations			
Increasing infrastructure drainage capacity	Medium/high	Some bridges and culverts are poorly designed. Water and road infrastructure lacks maintenance and proper operation.	High. Needs better implementation.
New regulators	High/medium	To be designed	Medium
Tidal basins	High/high	New concept (some trade off with salinity): early results are promising. Should be pursued especially in southwest Bangladesh.	High (in south-west Bangladesh)
Pumped drainage	Medium/low	Applied in selected places	Low
Institutional adaptations			
Proper O&M arrangements, including establishment and support of local water management	High/medium	Very poor (often non-existing) institutional framework is a major problem. Local government institutions need to be involved.	Medium (needs implementation). WSIP can perhaps play an important role.
Design criteria for drainage capacity infrastructure	Low/medium	Poorly designed and implemented. May not be effective in coastal zones.	Low. However, high priority for new regulators.
To mitigate salinization			
Physical adaptations			
Surface water flow from upstream e.g. by diversion or withdrawal from major rivers	Medium/low	Highly capital intensive, but cross-dams (barriers across tidal flow) could prevent saline water intrusion. This process should include an EIA to assess potential environmental/social consequences.	Medium/high
Resuscitation of river networks	Medium/high	Despite the physical constraints, this could be meaningful in short-term, especially in south-western block (especially Satkhira).	High
Storage of water in the area itself	Low/low	Not yet implemented	Low
Desalinisation plants and equipment	Low/medium	Not yet planned	Low
Institutional adaptations			
Operation of sluices and regulators	Medium/low	Very poor/absent existing management	High (needs implementation)
Groundwater management	Medium/low	Technical aspects not yet evaluated. For example, to prevent salinity intrusion it is important to preserve a prism of surface water.	Low
Land use planning	Medium/low	Management aspect needs to be worked out. For example, salinity is not a problem for shrimp cultivation, but soil salinity can be problematic for agriculture.	Medium
Extension services	High/medium	Need to be improved, especially since coastal areas have lower agricultural growth.	High

Water saving techniques (with consideration of long term climate changes)	High/medium	Not applied at maximum capacity. May pose socio-economic problems to farmers.	High
To improve morphological dynamics			
Physical adaptations			
Mangrove greenbelts	High/high	Started. Needs evaluation and continuation.	High
Cross dams	Medium/low	Needs-assessment is necessary for new dams. Adverse effects elsewhere. Could be expensive.	Low. Can be applied for land accretion purposes.
River training and bank protection	Medium/low	Poorly done. Costly as exposed to the sea.	Low (in coastal areas)
Institutional adaptations			
Protection of mangroves and coastal wetlands	High/high	Evaluation of activities is needed, especially in terms of maximizing social benefits	High
Land tenure laws	Medium/low	Evaluation needed	High
Land use policy	Medium/low	Evaluation needed	High
Adaptation to disasters			
Physical adaptations			
Cyclone shelters for people, livestock, food and assets	High/high	Already proven. High social acceptability.	High
Embankments and landfills	High/medium	Poorly done. Effective up to a certain limit.	Medium
Mangrove greenbelts	High/high	Started. Needs evaluation	High
Modification of infrastructure (including elevation of embankments etc.)	Medium/low	Needs design modification	Low (raising embankment height is a slow affair and the physical aspects are low in the planning phase).
Institutional adaptations			
Forecasting and dissemination	High/medium	Flood and cyclone forecasting could be made location specific	High
Land use development policy	High/medium	Evaluation needed	Medium
Involvement of volunteers and CBOs in pre-and post disaster work	High/high	Should continue	High
Modification of infrastructure	High/high	Institutional aspects need further work. At the planning phase, roads and embankment approach is high priority.	High
Maintenance of coastal embankments	High/medium	Poorly done. Local embankment maintenance groups could be made more effective. Contingency planning and preparedness could be developed, for example in the Coastal Zone Development Program.	High

b) Freshwater resources

The most important impacts on freshwater flows were determined to be on:
- Reduced low flows
- Drainage congestion

The potential adaptations and their relative feasibility and priority were discussed with stakeholders involved in managing water resources and the results are shown in table 2 below.

Table 2: Assessment of Adaptation Measures for Freshwater Resources

Key risks and adaptation measures	**Effectiveness/ feasibility**	**Current state of implementation &/or requirements for improvement**	**Priority for incremental future action**
To mitigate reduced freshwater availability			
Physical adaptations			
Increasing drainage capacity of infrastructure	Medium/high	Some bridges and culverts are poorly designed. Water and road infrastructure lacks maintenance and proper operation.	High
Enhanced surface water flow from upstream	Medium/low	Not very feasible within the country	Low. However, on a basin wide approach it would be high priority, although politically difficult.
Storage in area itself	Low/low	Not evaluated in terms of recharging groundwater aquifers or special operation of regulators, but can be attempted through simple methods such as rainwater harvesting, excavation of ponds etc.	High for freshwater resources
Institutional adaptations			
Guidelines to incorporate CC in long-term planning	High/medium	Not existing	High
Reduction of water demand	High/medium	Need more coherent policies for monitoring groundwater extraction, pricing groundwater, promoting efficient use etc.	High
Participatory management of infrastructure (including water resources infrastructure)	High/medium	Needs appropriate policy guidelines and implementation	High
Adaptation to drainage congestion			
Physical adaptations			
Channel restoration	High/low	Poor maintenance. Not considered feasible for large rivers. May be feasible for medium and minor channels.	Medium
Flushing capacity enhancement	Medium/low	Limited attempts made	Low
Sufficient drainage capacity infrastructures in	High/low	Poorly designed and maintained infrastructure. Construction of any drainage infrastructure should pay	High

roads		special attention to the requirements of drainage capacity.	
Controlled sedimentation and land-fills	High/medium	New concepts. Needs more understanding	Medium
Pumped drainage	High/low	To be considered only for major cities. Generally not a high priority.	Low
Institutional adaptations			
Guidelines to incorporate CC in long-term planning	High/medium	Not existing	High
Improved drainage criteria infrastructure	Medium/medium	Not tried yet	High (needs implementation)

c) Agriculture

The most important impacts on the agriculture sector were determined to be on:
- Drought impacts
- Flood impacts
- Salinization impacts

The possible adaptation measures were identified and discussed with stakeholders involved in agriculture research and extension and the relative priorities shown in table 3 below.

Table 3: Assessment of Adaptation Measures in Agriculture

Adaptation measures	**Effectiveness/ feasibility**	**Current state of implementation &/or requirements for improvement**	**Priority for future incremental action**
Physical adaptations			
Improved irrigation efficiency	Medium/medium	Poor. Needs institutional support.	High
Crop diversification	Medium/medium	Some efforts have met with limited success	High
Conjunctive use of surface and groundwater for irrigation	High/medium	Optimisation of surface and groundwater use needed	Medium
Institutional adaptations			
Guidelines to incorporate CC into long term planning	High/medium	Not existing	High
Training programmes and dissemination	High/high	Dissemination is poor. Activities need enhancing	High
Research and development of new (salinity and drought resistant) crops	High/high	Research needs enhancing	High
Change practices	Medium/low	Needs social persuasion and advocacy	Medium
Expanded access to credit	Medium/low	Institutional support is vital and should be pursued	High

d) Human health

The most important impacts on human health were determined to be on:
- Water borne disease
- Vector borne diseases

These were discussed with stakeholders involved in public health activities and their relative priority shown in table 4 below.

Table 4: Assessment of Adaptation Measures in Human Health

Adaptation measures	**Effectiveness/ feasibility**	**Current state of implementation &/or requirements for improvement**	**Priority for future incremental action**
Physical adaptations			
Water treatment facilities	High/low	Very low coverage. Poor service quality. Needs expanding.	High
Improved sanitation	High/high	Coverage increasing	High
Access to improved healthcare system	High/high	Coverage increasing. Quality needs to be increased.	High
Institutional adaptations			
Surveillance and monitoring of conditions favourable for disease outbreak	High/medium	Not so satisfactory. Needs enhanced activities. Should be co-ordinated with media to issue early warnings and enhanced social response.	High
Improve public education, especially in reproductive health	High/high	Coverage increasing. Quality needs to be increased.	High
Technological/ engineering controls for pests	Medium/low	Needs rational use	Low

e) Ecosystems and biodiversity

The most important impacts on ecosystems and biodiversity were determined to be on:
- Sundarbans mangrove ecosystem (the largest mangrove ecosystem in the world)
- Other coastal ecosystems
- Wetland ecosystems

These were discussed with stakeholders working on ecosystem conservation and prioritised as shown in table 5 below.

Table 5: Assessment of Adaptation Measures to Protect Ecosystems and Biodiversity

Adaptation measures	**Effectiveness/ feasibility**	**Current state of implementation &/or requirements for improvement**	**Priority for future incremental action**
Integrated ecosystem	High/medium	Not yet practiced. Proposed Coastal Zone Development Program could be a	High

planning and management		vehicle for this	
Management of mangrove ecosystems in the Sundarbans	High/low	Proposed Ganges barrage would be very costly. Need to look for an appropriate option.	High
Management of protected areas and 14 ecologically critical areas	High/medium	Improved understanding is needed	High
Reduction of habitat fragmentation and promotion of establishment of migration corridors and buffer zones	Low/low	Trans-boundary co-operation needed	Low
Coastal greenbelt	High/high	Recently started. Promising results.	High
Introduction of alien species or genetically modified organisms	Low/low	More research needed	Low
Agro-forestry development	High/high	Ongoing programs such as FRMP/Coastal greenbelt need further expansion/improvement	High
Studies on, e.g. Risks to endemic species and ecosystems	Medium/medium	Improved understanding is required. E.g. biodiversity action plan to be prepared and implemented.	Medium

8. Impacts on policy makers

In each of the key sectors the discussions with the sectoral stakeholders (primarily the sectoral planners and managers) was very useful and informative. Many of the sectoral stakeholders were able to assess the information given to them on the impacts of climate change on their respective sectors and help in the process of both identifying suitable adaptations as well as prioritising them according to the agreed criteria. The relative success of this exercise at the sectoral levels is given below (as a somewhat subjective judgement):

a) Coastal resource management

The existence of a major project on integrated costal zone management being planned (with support from the World Bank) allowed the project managers involved to readily see the utility of incorporating climate change issues into their programme planning (which they have decided to do). Thus, this was quite a successful mainstreaming into the coastal zone development community. The stakeholders involved with disaster mitigation (specially of

cyclones) were also quite receptive and have decided to incorporate adaptation to climate change into their own ongoing disaster preparedness plans.

b) Fresh water resource management

The planners from the water sector were quickly able to see the importance of climate change impacts on their national water sector plans and have also agreed to incorporate adaptation to climate change into the 25-year water sector plan under development.

c) Agriculture

The stakeholders involved in agriculture research were relatively quick to see the importance incorporating climate change considerations in their research programmes (specially for drought and saline tolerant rice variety development). However those involved in agriculture extension did not see the importance of adaptation measures for their own work.

d) Human health

The success in this sector with the stakeholders was reasonably high with respect to getting their attention but not in any way being able to affect any decision making within the public health community (however they did express the desire to do more work on the issue).

e) Ecosystems and biodiversity

The impacts on the Sundarbans forest were accepted as being of major significance by the stakeholders involved in ecosystem conservation and they have agreed to incorporate the impacts assessment of climate change in a major project being undertaken for the Sundarbans. With respect to the other ecosystems the success in engaging with the relevant stakeholders was not as good.

f) Cross-cutting and research

As climate change and adaptation are relatively long term problems requiring research and advancement of the knowledge base it is important to enhance the research capacities in the country to deal with the issue on an ongoing basis. The stakeholders representing the research community were quite willing to be involved in further work on the issue.

g) High level policy makers

Perhaps the area of least success was in engaging with and getting the interest of high-level policy makers (e.g. those representing the Prime Minister's office,

Finance and Planning ministries as well as legislators). This group seemed least concerned about the impacts of climate change on the overall economy of the country and need to be targeted more effectively in any future efforts to do more on adaptation to climate change in Bangladesh

9. Main lessons

The main lessons from the study and exercise carried out in Bangladesh aimed at mainstreaming adaptation to climate change may be summarized as follows:

(i) Information on climate change impacts needs to be translated from the scientific research domain into language and time scales relevant for policy makers.

(ii) Research on potential impacts of climate change needs to be supported in-country to enable information to be improved and passed on to policy makers.

(iii) All relevant stakeholders need to be involved-but their needs for information may vary and thus information must be suited to the stakeholder group being engaged with.

(iv) Sectoral level policy makers, planners and managers are relatively more likely to mainstream adaptation to climate change into their on-going and planned work (provided the information on impacts is given to them in a suitable form).

(v) High-level policy makers need to be especially targeted (with suitable material).

(vi) National and international experts and researchers need to share their knowledge with people making decisions and plans on the ground more effectively.