

# **Lessons learned from** ADAPTATION TO CLIMATE CHANGE IN BANGLADESH

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# **Climate Change Discussion Paper**

Environment Department The World Bank 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 potent ial 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 drainage congestion, morphological processes and disaster 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, flood 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.

# **Table of contents**

| Summary  | 1  |
|--|----|
| Table of contents  | 3  |
| 1. Background  | 4  |
| 2. Focus of this report  | 4  |
| 3. Context of the study  | 4  |
| 4. Objectives of the study   | 5  |
| 5. Methodological issues addressed in the study                          | 5  |
| a) What are the expected climate changes?                                | 5  |
| b) What would be the consequences for Bangladesh?                        | 5  |
| c) What are the specific climate change impacts for which Bangladesh is  |    |
| most vulnerable?   | 6  |
| d) How can the potential effects of climate change be factored into      |    |
| policymaking, and what adaptation measures for Bangladesh are feasible?. | 6  |
| 6. The study process   | 6  |
| a) Information analysis  | 6  |
| b) Identification and evaluation of proposed adaptation measures         | 6  |
| 7. Key findings of the study   | 7  |
| a) Coastal resources   | 7  |
| b) Freshwater resources  | 9  |
| c) Agriculture   | 11 |
| d) Human health  | 11 |
| e) Ecosystems and biodiversity   | 12 |
| 8. Impacts on policy makers  | 13 |
| a) Coastal resource management   | 13 |
| b) Fresh water resource management                                       | 14 |
| c) Agriculture   | 14 |
| d) Human health  | 14 |
| e) Ecosystems and biodiversity   | 14 |
| f) Cross-cutting and research  | 14 |
| g) High level policy makers  | 14 |
| 9. Main lessons  | 15 |
| Annex 1: Terms of Reference for Saleemul Huq                             | 16 |

# Lessons learned from Adaptation to Climate Change in Bangladesh By Saleemul Huq

# 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 <u>Mainstreaming Climate Change Adaptation into the Bank's</u> <u>Operational Work</u>. 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.

The terms of reference for this report are given in Annex 1.

# 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   | Effectiveness/ | Current state of implementation   | Priority for incremental |  |
| measures  | Feasibility    | &/or requirements for improvement | future action            |  |

#### To mitigate drainage congestion

| Physical adaptation. | s – –            |  |                       |
|----------------------|------------------|--|-----------------------|
| Increasing           | Medium/high      | Some bridges and culverts are poorly     | High. Needs better    |
| infrastructure       |                  | designed. Water and road infrastructure  | implementation.       |
| drainage capacity    |                  | lacks maintenance and proper             |                       |
|                      |                  | operation.                               |                       |
| New regulators       | High/medium      | To be designed                           | Medium                |
| Tidal basins         | High/high        | New concept (some trade off with         | High (in south-west   |
|                      |                  | salinity): early results are promising.  | Bangladesh)           |
|                      |                  | Should be pursued especially in          |                       |
|                      |                  | southwest Bangladesh.                    | -                     |
| Pumped drainage      | Medium/low       | Applied in selected places               | Low                   |
| Institutional adapte | thons            |  |                       |
| Proper O&M           | High/medium      | Very poor (often non-existing)           | Medium (needs         |
| arrangements,        |                  | institutional framework is a major       | implementation). wSIP |
| including            |                  | problem. Local government institutions   | can pernaps play an   |
| support of local     |                  | need to be involved.                     | important role.       |
| water                |                  |  |                       |
| management           |                  |  |                       |
| Design criteria for  | Low/medium       | Poorly designed and implemented          | Low However high      |
| drainage capacity    | Low/ mearum      | May not be effective in coastal zones.   | priority for new      |
| infrastructure       |                  |  | regulators.           |
| To mitigate saliniza | ation            |  | regalación            |
| Physical adaptation  | ıs               |  |                       |
| Surface water        | Medium/low       | Highly capital intensive, but cross-     | Medium/high           |
| flow from            |                  | dams (barriers across tidal flow) could  | e e                   |
| upstream e.g. by     |                  | prevent saline water intrusion. This     |                       |
| diversion or         |                  | process should include an EIA to         |                       |
| withdrawal from      |                  | assess potential environmental/social    |                       |
| major rivers         |                  | consequences.                            |                       |
| Resuscitation of     | Medium/high      | Despite the physical constraints, this   | High                  |
| river networks       |                  | could be meaningful in short-term,       |                       |
|                      |                  | especially in south-western block        |                       |
|                      |                  | (especially Satkhira).                   | -                     |
| Storage of water     | Low/low          | Not yet implemented                      | Low                   |
| in the area itself   |                  |  | _                     |
| Desalinisation       | Low/medium       | Not yet planned                          | Low                   |
| plants and           |                  |  |                       |
| equipment            | 4                |  |                       |
| Institutional adapta | tions            | <b>X</b> (1 , · · · ·                    | TT' 1 / 1             |
| Operation of         | Medium/low       | Very poor/absent existing management     | High (needs           |
| siuices and          |                  |  | implementation)       |
| Groundwater          | Medium/low       | Technical aspects not yet evaluated      | Low                   |
| management           | Wiedrum/10w      | For example, to prevent salinity         | Low                   |
| management           |                  | intrusion it is important to preserve a  |                       |
|                      |                  | prism of surface water.                  |                       |
| Land use planning    | Medium/low       | Management aspect needs to be            | Medium                |
| Zuile use praiming   | 11100101011/1011 | worked out. For example, salinity is     |                       |
|                      |                  | not a problem for shrimp cultivation.    |                       |
|                      |                  | but soil salinity can be problematic for |                       |
|                      |                  | agriculture.                             |                       |
| Extension services   | High/medium      | Need to be improved, especially since    | High                  |
|                      |                  | coastal areas have lower agricultural    |                       |
|                      |                  | growth.                                  |                       |
| Water saving         | High/medium      | Not applied at maximum capacity. May     | High                  |
| techniques (with     |                  | pose socio-economic problems to          |                       |
| consideration of     |                  | farmers.                                 |                       |

I

| long term climate                  |                      |  |   |
|------------------------------------|----------------------|--|---|
| changes)                           | alagiaal demamia     | 2  |   |
| Physical adaptation                |                      | 8  |   |
| Mangrove                           | High/high            | Started Needs evaluation and   | High  |
| greenbelts                         | Ingn/mgn             | continuation.  | Tiigii  |
| Cross dams                         | Medium/low           | Needs-assessment is necessary for new<br>dams. Adverse effects elsewhere.<br>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 adaptat              | tions                | •  |   |
| Protection of                      | High/high            | Evaluation of activities is needed,  | High  |
| mangroves and                      | 0 0                  | especially in terms of maximizing  | 0   |
| coastal wetlands                   |                      | social benefits  |   |
| Land tenure laws                   | Medium/low           | Evaluation needed  | High  |
| Land use policy                    | Medium/low           | Evaluation needed  | High  |
| Adaptation to disas                | sters                |  |   |
| Physical adaptations               | 5                    |  |   |
| Cyclone shelters                   | High/high            | Already proven. High social  | High  |
| for people,                        |                      | acceptability.   |   |
| livestock, food                    |                      |  |   |
| and assets                         |                      |  |   |
| Embankments and                    | High/medium          | Poorly done. Effective up to a certain   | Medium  |
| landfills                          |                      | limit.   |   |
| Mangrove                           | High/high            | Started. Needs evaluation  | High  |
| greenbelts                         |                      |  |   |
| infrastructure<br>(including       | Medium/low           | Needs design modification  | Low (raising<br>embankment height is a<br>slow affair and the |
| elevation of                       |                      |  | physical aspects are low                                      |
| embankments                        |                      |  | in the planning phas e).                                      |
| etc.)                              |                      |  |   |
| Institutional adaptat              | tions                |  |   |
| Forecasting and                    | High/medium          | Flood and cyclone forecasting could be   | High  |
| dissemination                      | II: ala /an a diaran | Evaluation specific  | Madiana   |
| Land use                           | High/medium          | Evaluation needed  | Medium  |
| noliov                             |                      |  |   |
| Involvement of                     | High/high            | Should continue  | High  |
| volunteers and                     | 111gh/mgh            | Should continue  | Tiigii  |
| CBOs in pre-and                    |                      |  |   |
| nost disaster work                 |                      |  |   |
| Modification of                    | High/high            | Institutional aspects need further work  | High  |
| infrastructure                     | ingn/mgn             | At the planning phase, roads and   | ingn  |
|                                    |                      | embankment approach is high priority   |   |
| Maintenance of                     | High/medium          | Poorly done. Local embankment  | High  |
| coastal                            |                      | maintenance groups could be made   | 0   |
| embankments                        |                      | more effective. Contingency planning   |   |
|                                    |                      | and preparedness could be developed,   |   |
|                                    |                      | for example in the Coastal Zone  |   |
|                                    |                      | Development Program.   |   |

# 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.

| Key risks and            | Effectiveness/       | Current state of implementation          | Priority for incremental |
|--------------------------|----------------------|--|--------------------------|
| adaptation               | feasibility          | &/or requirements for improvement        | future action            |
| measures                 |                      |  |                          |
| To mitigate reduce       | d freshwater ava     | ilability                                |                          |
| Physical adaptation.     | 5                    | 1  |                          |
| Increasing               | Medium/high          | Some bridges and culverts are poorly     | High                     |
| drainage capacity        |                      | designed. Water and road infrastructure  |                          |
| of infrastructure        |                      | lacks maintenance and proper             |                          |
|                          | 2.5.11.11            | operation.                               |                          |
| Enhanced surface         | Medium/low           | Not very feasible within the country     | Low. However, on a       |
| water flow from          |                      |  | basin wide approach it   |
| upstream                 |                      |  | although politically     |
|                          |                      |  | difficult                |
| Storage in area          | Low/low              | Not evaluated in terms of recharging     | High for freshwater      |
| itself                   | 2011/1011            | groundwater aquifers or special          | resources                |
|                          |                      | operation of regulators, but can be      |                          |
|                          |                      | attempted through simple methods         |                          |
|                          |                      | such as rainwater harvesting,            |                          |
|                          | _                    | excavation of ponds etc.                 |                          |
| Institutional adapt      | ations               | [  |                          |
| Guidelines to            | High/medium          | Notexisting                              | High                     |
| incorporate CC in        |                      |  |                          |
| long-term                |                      |  |                          |
| planning<br>Deduction of | II: ala /an a diaran | Need mens asherent reliaise for          | III ah                   |
| Reduction of             | High/medium          | monitoring groundwater autroation        | High                     |
| water demand             |                      | pricing groundwater, promoting           |                          |
|                          |                      | efficient use etc.                       |                          |
| Participatory            | High/medium          | Needs appropriate policy guidelines      | High                     |
| management of            | 6                    | and implementation                       | 5                        |
| infrastructure           |                      | L L                                      |                          |
| (including water         |                      |  |                          |
| resources                |                      |  |                          |
| infrastructure)          |                      |  |                          |
| Adaptation to drai       | nage congestion      |  |                          |
| Physical adaptation.     | 5                    | D  |                          |
| Channel                  | High/low             | Poor maintenance. Not considered         | wiedium                  |
| restoration              |                      | feasible for madium and minor            |                          |
|                          |                      | channels                                 |                          |
| Flushing capacity        | Medium/low           | Limited attempts made                    | Low                      |
| enhancement              | incurum io w         | Emitted attempts made                    | 2011                     |
| Sufficient               | High/low             | Poorly designed and maintained           | High                     |
| drainage capacity        | Ũ                    | infrastructure. Construction of any      | Ŭ                        |
| infrastructures in       |                      | drainage infrastructure should pay       |                          |
| roads                    |                      | special attention to the requirements of |                          |
|                          |                      | drainage capacity.                       |                          |
| Controlled               | High/medium          | New concepts. Needs more                 | Medium                   |
| sedimentation and        |                      | understanding                            |                          |
| land-fills               |                      |  |                          |

 Table 2: Assessment of Adaptation Measures for Freshwater Resources

| Pumped drainage   | High/low          | To be considered only for major cities.<br>Generally not a high priority. | Low                         |
|---|-------------------|---|-----------------------------|
| Institutional adapta  | tions             |   |                             |
| Guidelines to<br>incorporate CC in<br>long-term<br>planning | High/medium       | Not existing  | High                        |
| Improved<br>drainage criteria<br>infrastructure             | Medium/medi<br>um | 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.

| Adaptation          | Effectiveness/    | Current state of implementation           | Priority for future |
|---------------------|-------------------|---|---------------------|
| measures            | feasibility       | &/or requirements for improvement         | incremental action  |
| Physical adaptation | 16usibility<br>18 |   | incremental action  |
| Improved            | Medium/medi       | Poor. Needs institutional support.        | High                |
| irrigation          | um                |   | 6                   |
| efficiency          |                   |   |                     |
| Crop                | Medium/medi       | Some efforts have met with limited        | High                |
| diversification     | um                | success                                   | _                   |
| Conjunctive use     | High/medium       | Optimisation of surface and               | Medium              |
| of surface and      |                   | groundwater use needed                    |                     |
| groundwater for     |                   |   |                     |
| irrigation          |                   |   |                     |
| Institutional adapt | ations            | 1   |                     |
| Guidelines to       | High/medium       | Not existing                              | High                |
| incorporate CC      |                   |   |                     |
| into long term      |                   |   |                     |
| planning            |                   |   |                     |
| Training            | High/high         | Dissemination is poor. Activities need    | High                |
| programmes and      |                   | enhancing                                 |                     |
| dissemination       |                   |   |                     |
| Research and        | High/high         | Research needs enhancing                  | High                |
| development of      |                   |   |                     |
| new (salinity and   |                   |   |                     |
| drought resistant)  |                   |   |                     |
| crops               |                   |   |                     |
| Change practices    | Medium/low        | Needs social persuasion and advocacy      | Medium              |
| Expanded access     | Medium/low        | Institutional support is vital and should | High                |
| to credit           |                   | be pursued                                |                     |

Table 3: Assessment of Adaptation Measures in Agriculture

# *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.

| Adaptation  | Effectiveness/ | Current state of implementation  | Priority for future |
|---|----------------|--|---------------------|
| measures  | feasibility    | &/or requirements for improvement  | incremental action  |
| Physical adaptation   | 15             |  |                     |
| Water treatment facilities  | High/low       | Very low coverage. Poor service quality. Needs expanding.  | High                |
| Improved sanitation   | High/high      | Coverage increasing  | High                |
| Access to<br>improved<br>healthcare system  | High/high      | Coverage increasing. Quality needs to be increased.  | High                |
| Institutional adapt   | ations         |  |                     |
| Surveillance and<br>monitoring of<br>conditions<br>favourable for<br>disease outbreak | High/medium    | Not so satisfactory. Needs enhanced<br>activities. Should be co-ordinated with<br>media to issue early warnings and<br>enhanced social response. | High                |
| Improve public<br>education,<br>especially in<br>reproductive<br>health               | High/high      | Coverage increasing. Quality needs to be increased.  | High                |
| Technological/<br>engineering<br>controls for pests                                   | Medium/low     | Needs rational use   | Low                 |

Table 4: Assessment of Adaptation Measures in Human Health

# 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 | Ĺ |
|--|---|
| Biodiversity   |   |

| Adaptation    | Effectiveness/ | Current state of implementation     | Priority for future |
|---------------|----------------|-------------------------------------|---------------------|
| measures      | feasibility    | &/or requirements for improvement   | incremental action  |
| Integrated    | High/medium    | Not yet practiced. Proposed Coastal | High                |
| ecosystem     |                | Zone Development Program could be a |                     |
| planning and  |                | vehicle for this                    |                     |
| management    |                |                                     |                     |
| Management of | High/low       | Proposed Ganges barrage would be    | High                |
| mangrove      |                | very costly. Need to look for an    |                     |

| ecosystems in the<br>Sundarbans  |                   | appropriate option.   |        |
|--|-------------------|---|--------|
| Management of<br>protected areas<br>and 14<br>ecologically<br>critical areas   | High/medium       | Improved understanding is needed  | High   |
| Reduction of<br>habitat<br>fragmentation and<br>promotion of<br>establishment of<br>migration<br>corridors and<br>buffer zones | Low/low           | Trans-boundary co-operation needed  | Low    |
| Coastal greenbelt  | High/high         | Recently started. Promising results.  | High   |
| Introduction of<br>alien species or<br>genetically<br>modified<br>organisms  | Low/low           | More research needed  | Low    |
| Agro-forestry<br>development   | High/high         | Ongoing programs such as<br>FRMP/Coastal greenbelt need further<br>expansion/improvement                | High   |
| Studies on, e.g.<br>Risks to endemic<br>species and<br>ecosystems  | Medium/medi<br>um | Improved understanding is required.<br>E.g. biodiversity action plan to be<br>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 ongoing 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

# Annex 1: Terms of Reference for Saleemul Huq

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**Background**: The 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 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 <u>Mainstreaming Climate Change Adaptation into the Bank's Operational Work</u>. 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*, in the preparation of which you had participated.

**Scope of Work**: Your scope of work is to prepare a 10 to 15-page document based on the *Bangladesh: Climate Change and Sustainable Development Study.* The document should cover, but not be limited to the following:

- Context of the Study, with the view to highlighting the importance of climate concerns for the country in general and specific sectors in particular.
- The objectives of the study
- Methodological issues addressed in the context of the study.
- The process of the study, particularly the approach adopted for establishing the cross-sectoral linkages.
- Key findings of the study and their implications for the Country's broader development agenda. In particular, do the findings of the study call for a

fundamental change in the policy agenda or a simple realignment of policies. Illustrative examples would be helpful.
Impact, if any, on policy makers.
Lesson of experience.