

## CHAPTER 15

### ENVIRONMENT AND DEVELOPMENT

*Protection of environment is a crucial challenge for the bio-diversity rich developing countries like Bangladesh. As the economic growth and development of the country largely depends on natural resources, it is important to ensure sustainable environmental development. According to 'Vision 2021', the Government of Bangladesh has been implementing various programmes incorporating the measures of environmental pollution control and impact of global warming. Meanwhile, Bangladesh has achieved the target of ensuring safe drinking water and sanitation for all people as envisaged in the Millennium Development Goal (MDG) set by United Nations. The Government also integrated the Sustainable Development Goals (SDGs) in the Seventh Five Year Plan (2016-2020) and has set 11 targets in it. Bangladesh has introduced the mapping of ministries, data analysis and national monitoring and evaluation framework for SDGs implementation. Bangladesh Climate Change Strategy and Action Plan, 2009 (BCCSAP 2009) is being implemented to address the impact of climate change where both adaptation and mitigation activities have been considered. Bangladesh Climate Change Trust Fund (BCCTF) has been formed from internal resources in implementing BCCSAP 2009 and allocated a total amount of Tk.3,100 core from the FY2009-10 to FY2016-17. Moreover the Government has enacted Climate Change Trust Fund Act 2010 and formulated Climate Change Trust Fund Policy for better management of BCCTF. In addition to that Bangladesh Climate Change Resilience Fund (BCCRF) has also been formed with the assistance of development partners in implementing BCCSAP 2009. Finance Division has undertaken a Technical Assistance Project titled Inclusive Budgeting and Financing for Climate Resilience (IBFCR) funded by UNDP at an estimated cost of Tk.185.20 million. The Ministry of Environment and Forests has also undertaken many awareness programmes and reform activities for environment conservation including Ozone Layer Protection and Pollution Control. Bangladesh is rich in biodiversity which is very important to environment and ecosystem and considering this the Government has prepared National Action Plan 2020 and many projects are being taken under this action plan. National Bio safety Framework and National Biodiversity Strategy and Action Plan are being implemented and has been updated for biodiversity conservation in the country. The Ministry of Disaster Management and Relief is also agile in implementing various programmes in order to tackle eventualities emanating from natural disasters.*

Geographical location makes Bangladesh a bio-diversity rich country. The existence of the planet Earth is threatened due to the climate change and environmental degradation which is again induced by the rapid growth of economy, urbanisation and population. Bangladesh is also facing various environmental crisis like climate change,

water pollution, air pollution, noise pollution and hazardous waste. Bangladesh is one of the most vulnerable and disaster prone countries in the world for the impact of climate change and global warming. Climate change continues to induce risks like cyclones, tidal surges, salinity intrusion and water logging in coastal areas due to sea-level

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rise, irregular rainfall, floods, river erosion, drought, landslides and the adverse impacts on agricultural production has become a major threat to achieving the country's Sustainable Development Goals. The present Government is utterly trying to overcome these environmental problems for achieving a healthy, beautiful, durable and eco-friendly Bangladesh for the benefit of present and future generations. Ministry of Environment and Forests is playing an important role by undertaking necessary steps for environmental pollution control and biodiversity conservation, preparing and implementing timely legislation, institutional strengthening and implementing other relevant activities.

### International Initiatives on Protection of Environment

The concept of environment protection received wider global attention at the Stockholm Conference held in 1972. Significant international initiative on the issue was negotiations on the Kyoto Protocol signed in December 1997 under the United Nations Framework Convention on Climate Change (UNFCCC). With a view to reducing carbon dioxide and greenhouse gas emission the Kyoto Protocol was ratified by 191 states except Andorra, South Sudan, Canada and the United States. As part of the Kyoto Protocol, many developed countries have agreed to legally binding limitations/reductions in their emissions of greenhouse gases within their commitment periods.

Table 15.1 shows the list of highest emitting 10 countries with the level of their Green House Gas (GHG) emissions.

**Table: 15.1 Greenhouse Gas Emissions of Top 10 Countries**

S.L	Country	Annual CO <sub>2</sub> Emissions in 2013 (In millions of metric tons)	% of Global Total in 2013
1	China	11735.01	25.93
2	USA	6279.84	13.87
3	India	2909.06	6.43
4	Russia	2199.12	4.86
5	Japan	1353.35	2.99
6	Brazil	1017.81	2.25
7	Germany	894.06	1.98
8	Indonesia	744.34	1.46
9	Canada	738.38	1.63
10	Mexico	733.01	1.62

Source: CAIT Climate Data Explorer, 2017

### United Nations Climate Change Conference

Bangladesh actively takes part in the discussion of the United Nations Climate Change Conference (UNCCC) in favour of the climate change vulnerable countries. The 21<sup>st</sup> session of the UNCCC, COP21/CMP11 was held in Paris, France from 30 November to 12 December 2015. The Paris Agreement (an agreement to deal with the issues of greenhouse gases emissions, mitigation and adaptation) was negotiated by representatives of 195 countries. Paris Climate Change Agreement has been accepted by all the countries with appreciation. The major achievements of the Paris Agreement are stated in below:

- The Paris Agreement is a legally binding global document;
- A target has been fixed to limit temperature below 2 degree celsius owing to the demand of the climate vulnerable countries like Bangladesh.

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- Special priority supports to the Least Developed Countries (LDCs) on financial, technology transfer, capacity development along with relaxation from legal bindings.
- A Global goal on adaptation has been accepted for the first time in the conference.
- Rights to the displaced people by the climate change and loss and damage.
- Developed countries would extend financial support to the LDCs for climate change adaptation and mitigation. Especially, public funds and grant-based financial support will be provided for adaptation to the vulnerable countries, LDCs and Small Island Developing States (SIDS).

Bangladesh has signed the agreement on 22 April 2016. The Paris Agreement has entered into force on 4 November 2016. As of 21 August 2017, among the 195 signatories of the Paris Agreement, 160 parties, which accounts for 86 percent of the total global greenhouse gas emissions, have submitted their instruments of ratification, acceptance or approval.

The 22<sup>nd</sup> Session of the UNCCC (COP22) was held in Marrakech, Morocco, on 7-18 November 2016. This conference incorporated the 22<sup>nd</sup> Conference of the Parties (COP 22), the twelfth meeting of the parties for the Kyoto Protocol (CMP 12) and first meeting of the parties for the Paris Agreement (CMA1). The purpose of the conference was to discuss and formulate modalities, procedures and guidelines to implement the Paris Agreement. With the entry into force of the Parties serving as the meeting of the Parties to the Paris Agreement

(CMA1). The Conference successfully demonstrated to the world that the implementation of the Paris Agreement is underway and the constructive spirit of multilateral cooperation on climate change continues.

### Climate Change and Bangladesh

The rise in sea-level poses a big threat to the lives and livelihood of the huge population of the coastal areas of Bangladesh. The Government is attaching the highest importance to the issue of tackling climate change induced disasters and the country's preparedness to protect lives and livelihoods of the people. Some policy initiatives concerning these are given below:

- National Adaptation Programme of Action (NAPA), 2005, (revised 2009)
- Bangladesh Climate Change Strategy and Action Plan (BCCSAP), 2009
- Roadmap for Developing a National Adaptation Plan (NAP) for Bangladesh, 2015
- Nationally Determined Contribution (NDC) Implementation Roadmap (draft, 2017)
- Establishment of Climate Change Unit in Ministry of Environment and Forest.

Besides various development projects/programmes, the Government has established three funds to tackle the adverse impact of climate change:

- **Bangladesh Climate Change Trust Fund (BCCTF):** A Climate Change Trust Fund (CCTF) was established by enacting a law in FY2009-10 and a budgetary allocation of Tk.700 crore was made from the Government's own resources. Over the last seven consecutive fiscal years, the

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Government allocated a total of Tk.3,100 crore for this fund. The main objective of this fund is to implement the BCCSAP, 2009. To run this fund, government has established Bangladesh Climate Change Trust Fund Board. Bangladesh Climate Change Trust Fund Policy was constituted in 2009 and Bangladesh Climate Change Trust Fund Act has been passed in 2010. As of June 2017, 487 projects have been undertaken. Among them 424 projects are being implemented by the government, semi-government and autonomous agencies; while 63 projects are being implemented by NGOs which is managed by *Palli Karma Sahayak* Foundation (PKSF). Among these projects 213 have already been completed.

- **Bangladesh Climate Change Resilience Fund (BCCRF):** Bangladesh Climate Change Resilience Fund (BCCRF) is a coordinated financing mechanism by the Government of Bangladesh, development partners and the World Bank to address the impacts of climate change. The fund was established in May, 2010 with financial support from Denmark, European Union, Sweden and United Kingdom. Moreover, Switzerland, Australia and the United States subsequently joined the fund. As of now, an amount of over US\$187 million has been pledged for this fund. On behalf of the development partners, World Bank provided technical and financial management support to Bangladesh Government up to December 2016.
- **Strategic Programme for Climate Resilience Bangladesh:** The Pilot

Programme for Climate Resilience (PPCR) of the Strategic Climate Funds (SCF) established under the Multi-donor Climate Investment Fund (CIF) aims to help countries transform to a climate resilient development path, consistent with poverty reduction and sustainable development goals. US\$110 million in grants (45 percent) and near-zero interest credits (55 percent) from the PPCR will enable Bangladesh to make strategic investments in critical areas of climate resilience planning and implementation in a manner consistent with its poverty reduction and sustainable development objectives. Bangladesh's PPCR investment plan was designed under the leadership of the Government, in coordination with the Asian Development Bank (ADB), members of the World Bank Group (IBRD, IDA, and IFC), key Bangladeshi stakeholders and other development partners.

The Finance Division has taken a Technical Assistance Project titled 'Inclusive Budgeting and Financing for Climate Resilience (IBFCR)'. This project is funded by UNDP at an estimated cost of Tk.1852.00 lakh and the implementation period is five years. The project is built on the Climate Fiscal Framework finalised in June 2014 and will align with existing and future PFM and PIM reform programmes led by Finance Division and Programing Division of Planning Commission. Major project component includes-(1) Climate Fiscal Framework Implementation and Management, (2) Strategic Climate Change Sensitive Planning and Budgeting Management, (3) Climate

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Public Finance Governance Strengthened, (4) Strengthening Finance Divisions Coordination Roles in Climate Public Finance Management and (5) More Effective Planning and Budgeting for Climate Finance at the Local Level. The IBFCR project intends to foster a sustainable basis for identifying, maximising and managing sources and application of funds for financing climate resilient actions.

### Sustainable Development Goals (SDGs)

The Millennium Development Goals (MDGs) were supposed to be achieved by 2015. A new initiative was taken to agree and prepare development goals from 2015-2030. Discussion on the post-2015 framework for international development began well in advance on Post 2015 Development Agenda releasing the first report known as 'Realising the Future We Want'. On 19 July 2014, a proposal was forwarded to the United Nations General Assembly. Following the negotiations, a final document was adopted at the UN Sustainable Development Summit 25–27 September 2015. The Sustainable Development Goals (SDGs), officially known as 'Transforming our world: the 2030 Agenda for Sustainable Development'. The MDGs will be replaced by the SDGs, which will be implemented within 2015-2030.

The Sustainable Development Agenda outlines 17 goals and its associated 169 targets. The 17 goals are: 1. No Poverty, 2. Zero Hunger, 3. Good Health and well-being, 4. Quality Education, 5. Gender Equality, 6. Clean Water and Sanitation, 7. Affordable and Clean Energy, 8. Decent Work and Economic Growth,

9. Industry Innovation and Infrastructure, 10. Reduced Inequality, 11. Sustainable Cities and Communities, 12. Responsible Consumption and Production, 13. Climate Action, 14. Life below Water, 15. Life on Land, 16. Peace, Justice and Strong Institutions and 17. Partnerships for the Goals.

Bangladesh, a part of her commitment to implement the SDGs, decided to take part in the Voluntary National Review at the UN High Level Political Forum. The country has earned many international accolades for our achievements in MDGs. Bangladesh integrated the 2030 Agenda in its 7<sup>th</sup> Five Year Plan (2016-2020) and has set 11 targets in it. This offered a tremendous opportunity to implement the 2030 agenda, while reflecting the priorities of the SDGs in the national plan. The Government has adopted 'Whole Society' approach to ensure wider participation of NGOs, development partners, private sector, media and Civil Society Organisations (CSOs) in the process of formulation of the Action Plan and implementation of the SDGs. To spearhead the process, 'SDGs Implementation and Monitoring Committee' has been formed at the Prime Minister's Office to facilitate and implementation of SDGs Action Plan. Means of implementation of the SDG along with some notable initiatives so far taken in the country are highlighted below:

- **Mapping of Ministries:** Bangladesh has clearly identified the responsibilities of the ministries and agencies to achieve the SDGs. In the process, GED has clearly mapped out 40 lead, 34 co-lead and 51 associate ministries against each target of

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the SDGs. This mapping exercise is expected to reduce duplication of efforts, enhance synergy and help implementing action plans.

- **Data Gap Analysis:** Bangladesh Planning Commission conducted a review of various means of data generation in the country. It reveals that Bangladesh has data for 70 indicators and partially available data for 108 indicators. We need to devise new mechanism for data mining for the remaining 63 indicators.
- **National Monitoring and Evaluation Framework:** Bangladesh is in the process of finalising a Monitoring and Evaluation Framework for SDGs implementation. In this connection, a web based data repository system has already been developed to facilitate data collection, analysis progress tracking and reporting.
- **Action Plan to Achieve SDGs:** The Government is preparing an action plan for implementation of SDGs in alignment with the 7<sup>th</sup> Five Year Plan. Respective ministries are working towards translating the particular targets into actionable projects/ programmes /activities in this regard. The Action Plan will be finalised soon.
- **Needs Assessment and Financing Strategy:** We have done an estimate to determine the financing needs for SDGs implementation with a view to mobilising internal and external resources. The preliminary assessment reveals that we may require around US\$ 1.5 trillion worth of additional resources for full implementation of SDGs.

- **Assimilation of SDGs Targets in Performance Agreement:** Bangladesh has introduced Annual Performance Agreement (APA), a result based performance management system across the whole spectrum of public sector. The APA is expected to play an instrumental role in assessing performance of individuals and ministries/agencies involved in SDGs implementation.

The Ministry of Environment and Forests (MoEF) is the lead Ministry for Environment and Climate Change related SDG targets. On behalf of MoEF the Department of Environment has already drafted an action plan towards implementing of these targets.

### Adaptation and Mitigation

Adaptation and mitigation activities are necessary to face the recent challenges due to climate change. The activities of other ministry and department also have direct and indirect impact on climate change. As a result to ensure a secured and sustainable environment preparation of an integrated investment plan is necessary according to the policies, strategies etc. of Ministry of Environment and Forests as well as other relevant ministries/divisions. Ministry of Environment and Forests implementing a project titled 'Strengthening the Environment, Forestry and Climate Change Capacities of the Ministry of Environment and Forests and its Agencies' with the technical assistance of Food and Agriculture Organisation (FAO). An important output of this project is the preparation of a Country Investment Plan (CIP). By this time five sectors were developed under this programme like;

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environment and climate change; forestry; agriculture, livestock, food security; development of economy and infrastructure and gender to identify the gap, duplication and capacity of existing policies and acts of the relevant sector. In the process of CIP preparations different committees such as Departmental Focal Points Committee, CIP Technical Advisory Groups etc. at different level were formulated for providing necessary suggestion and guidelines.

The MoEF has already drafted the CIP titled 'Bangladesh Environment, Forestry and Climate Change Country Investment Plan' built on four pillars. The pillars are: 1) Sustainable Development and Management of Natural Resources; 2) Environmental Pollution Reproduction; 3) Adaptation, Mitigation and Resilience to Climate Change and 4) Environmental Governance, Gender and Human and Institutional Capacity Development.

### Air Pollution Control Activities

Air pollution is one of the threats to the environment in Bangladesh. Air pollution is increasing with rapid urbanisation and industrialisation. Emissions from brick kiln, construction activities, industrial operation and vehicle are considered the key sources of air pollution causing harmful impact on public health and environment. For controlling air pollution, the Department of Environment (DoE) monitors air quality in important places in different cities of the country.

### Monitoring Air Pollution:

- Aiming to improve the overall air quality of the country, the Department of

Environment is implementing some projects and initiatives with the co-operation of development partners. Among this, Clean Air and Sustainable Environment (CASE) project supported by the World Bank for the period of 2009-2016 has established 11 Continuous Air Monitoring Stations (CAMS) at various places of important cities in the country which include Dhaka, Chittagong, Rajshahi, Khulna, Barisal, Sylhet, *Gazipur* and *Narayanganj*. In addition, there is a Transboundary Air Quality Monitoring Station operating at *Syamnagar* of *Shatkhira* district.

- Through these CAMS several parameters, such as Particulate Matter (PM<sub>10</sub> and PM<sub>25</sub>), SO<sub>2</sub>, NO<sub>2</sub>, CO<sub>3</sub> and other meteorological data are being measured and calculated round the clock. The status of air quality is understood taking into account the data set deriving from these CAMS. Reviewing and examining the data set, it is found that Particulate Matter (PM<sub>10</sub> and PM<sub>25</sub>), remain high in major cities during dry season. In the wet season, the PM is within national standard (Bangladesh National Ambient Air Quality Standard, BNAAQS). On the other hand, other pollutant is more or less within national standard around the year.

### Vehicular Emission Control

- According to Bangladesh Environment Conservation Act, 1995 (Revised 2010) the mobile court can penalty for air pollution due to vehicular emission. Moreover, the activities are also run by police administration according to Motor Vehicle Ordinance Act, 1983. Among the

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polluting vehicles the diesel-run ones are considered to be the worst. Emission tests for diesel vehicles are conducted in different parts of country including Dhaka and Chittagong to ensure that test vehicle constitute representative sample of the vehicle pollution as far as possible.

### **Air Pollution Emission from Brick Kiln**

- The demand of construction materials is increasing with the massive development activities of the country, which increases the demand of brick in manifold. As a result hundreds of bricks kilns have been set up haphazardly across the country. The emissions coming from brick kilns have become the main source of air pollution. In order to manage the brick production sector in an environment friendly manner, 'Brick Manufactures and Kiln Set Up (Control) Act 2013' has been promulgated and enacted on 1 July 2014. This act imposes ban on the use of soil of agricultural land and hills as well as fire wood for brick production. Moreover, low grade coal, consisting high sulphur, ash, mercury or any other material cannot be used as fuel in brick field. Restrictions are also put on setting up brick kilns in specific areas and locations and also brick field cannot be established in municipality or City Corporation within 1 kilometer.
- Approving license to old brick kiln already stopped. All old brick kiln should be converted into new environment friendly technology. Up to June 2017 among the 6,623 brick kilns in the country 4,227 (64 percent) brick kilns are running with environment friendly

technology. Necessary steps have been taken to amend the act with a view to making it more realistic, justified and implementable.

### **Industrial Pollution Control**

In accordance to the Environmental Conservation Act, 1995 (amended at 2010) and Environmental Conservation Rule, 1997 (amended at 2005) pollution level is found within allowable limit, environmental clearance certificate issuance is issued for the particular industry/project. Installation of pollution mitigation measures such as Effluent Treatment Plant (ETP), sound barrier, Air Treatment Plant (ATP), Dust collector and internal monitoring system are prerequisite in getting environmental clearance certificate for the particular industry/project. Moreover, the compliance of others pollution mitigation policies like National 3R(Reduce, Reuse and Recycle) strategy for waste. Installation of rainwater harvesting and sewerage treatment plant for high rise building and Zero Discharge Plan (ZDP) for liquid discharging industry are being imposed in issuing environmental clearance certificate and renewal.

### **Industrial Pollution Control Activities**

- **Establishment of Effluent Treatment Plant (ETP):** To protect water pollution DoE is monitoring frequently and operate enforcement activities to establish ETP for the industry which discharge liquid waste. Attempts have been taken to collaborate with the industrialists and relevant sector associations to develop appropriate Effluent Treatment management system in the industries. As

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a result, ETP have been established in 1,555 industries up to June 2017 throughout the country.

- **Enforcement Activities:** DoE takes legal action including filed case in environment court, operate mobile court and penalty for environment pollution under the Environmental Conservation Act, 1995 (Revised in 2010). Up to June 2017, enforcement activities have taken against 1,049 institutions and penalty for Tk.14.33 crore. 11 industries were sealed and 20 industries gas and electricity lines were disconnected.
- **Operation against Banned Polythene Shopping Bags:** Penalty is taken from the owner of banned polythene shopping bags producing factory. DoE enforcement activities has taken against 1,124 institutions, confiscated 133.17 tonnes banned polythene shopping bags and fined Tk.99.50 lakh.
- **Noise Pollution:** Department of Environment (DoE) has implemented 'Integrated and Participatory Programme to Control Noise Pollution' during July 2015 to June 2017 to create awareness on Noise Pollution (Control) Rules 2006 and to motivate concerned stakeholders to decrease noise pollution in the country. DoE conducted trainings among DoE, Bangladesh Police and Bangladesh Road Transport Authority (BRTA) personnel's, drivers, trainers of drivers and students. Under the programme DoE procured 200 Sound Level Meters and distributed among these organisations. A survey on sound levels in eight divisional cities was also carried out. The result of the survey

shows that all the cities have exceeded the noise limits as per Noise Pollution (Control) Rules 2006.

- **Waste Management:** Waste management is one of the major challenges in the cities and towns of Bangladesh. With the financial support of BCCTF few projects are being implemented as pilot projects for showcasing the implementation of National 3R Strategy for waste in different cities and towns such as Dhaka North, Dhaka South, Chittagong, *Narayangonj* and Rangpur city corporation and Cox's Bazar, Mymensing, *Feni*, *Kishorgonj pourashava*. Two compost plants have been started operation in producing compost and the construction of the rest 6 compost plants are in progress.
- To control industrial pollution and to protect the rivers around Dhaka City from pollution relocation of tanneries from *Hazaribagh* to *Harindhara*, *Savar* through a project under the supervision of BSCIC, Ministry of Industry is completed in April 2017.

### Water and Environment

Rivers are important features of Bangladesh's landscape where hundreds of rivers crisscrossed the landmass. According to the Environment Conservation Rule 1997 the water quality of the main rivers in Bangladesh such as the *Padma*, *Meghna*, *Jamuna*, *Korotoa*, *Dhaleshwari*, and *Surma* was within the limit of Environmental Quality Standard (EQS) in 2016. But the water quality of the rivers flowing around the Dhaka City namely *Buriganga*, *Balu*, *Shitalakhya* and *Turag* deteriorates drastically

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during the dry season (January to May) when the water flow is very low. At these period Dissolved Oxygen (DO) of these rivers become almost zero for which phytoplankton and zooplankton cannot grow and live. The Government has, therefore, declared the rivers like *Buriganga*, *Shitalakshya*, *Turag*, *Balu* and their foreshores Ecologically Critical Area (ECA) to take necessary actions to improve the ecosystem of these rivers.

The Department of Environment (DoE) has been monitoring surface and ground water quality since 1973. The surface water quality monitoring programme of DoE includes 63 stations of 27 rivers in Bangladesh. Six divisional offices of DoE measure about 12 parameters (physical and chemical) of collected samples. These are pH, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Suspended Solid (SS), Total Dissolved Solid (TDS), Electrical Conductivity (EC), Chloride, Turbidity and Total Alkalinity.

Based on the parameters mentioned above high level of BOD 40 mg/l (acceptable range 6 mg/l or less according to Environmental Conservation Rules 1997) and COD 126 mg/l (acceptable range up to 35 mg/l or less according to UNECE standard), TDS 641 mg/l (acceptable range up to 500 mg/l according to USEPA standard) were found in *Buriganga* river from January to December in 2016.

High level of Chloride 12,697 mg/l (acceptable range 250 mg/l USEPA standard) and TDS 16,370 mg/l were found in *Pashur* River. Generally high turbidity of water was found in the rivers flowing in the southern

coastal part Bangladesh, part of central zone. High turbidity reduced transparency of water that ultimately caused reduction in phytoplankton production in one hand and up lift river channel bed through silt deposition on the other hand. Maximum level of Turbidity 136.3 NTU (acceptable range 10 NTU) was found in *Khekshiali* River.

### Bio-diversity Conservation

**Updating National Biodiversity Strategy and Action Plan:** Bangladesh is a signatory to the United Nations Convention on Biological Diversity (UNCBD). Being a party of the UNCBD, Bangladesh is working for international commitment. The National Biodiversity Strategy and Action Plan (NBSAP) 2016-2021 has been prepared. Biodiversity National Assessment and Programme of Action 2015 have been prepared as 5<sup>th</sup> National Report to CBD. Bangladesh Clearing House Mechanism (CHM) or web based platform to provide update on the biodiversity related information of the country has been prepared. Bangladesh Biodiversity Act 2017 has been promulgated.

DoE has implemented various development initiatives towards conservation of biological diversity under the National Action Plan, 2020. Remarkable achievements of this action plans are as follows:

- **Conservation of Ecologically Critical Areas (ECA):** Ecologically Critical Area (ECA) Rules, 2016 has been promulgated. Already 13 Ecologically Critical Area (ECA) has been declared all over the country.

- **Formation of Village Conservation Groups (VCG):** 74 Village Conservation Groups (VCG) have been formed by the Department of Environment engaging dedicated organized people in *Hakaluki Haor*, *Cox's Bazar-Teknaf Peninsula* and *Sonadia Island* ECA. The VCGs are registered with the Department of Cooperatives. Environmental, Ecological, Biodiversity conservation and livelihood diversification activities are systematized by this VCGs. Ten Village Conservation Centers(VCC) have been constructed in *Hakaluki Haor* and *Cox's Bazar*. One day in every week will be dedicated for women of the area, they will gather, discuss issues of their interest as they like. This may also be a resource center where government and other service provider as required may be invited by the community. A biodiversity museum has been established in each VCC.
- **Creation and Conservation of Mangrove Forest:** Mangrove forests were created as well as conserved in different areas in *Cox's Bazar*. The sand dune has been conserved.
- **Creation and Conservation of Swamp Forest:** The Department of Environment has improved the *Hakaluki Haor* ecosystems by creation and conservation of Swamp Forest. The department has conserved 500 hector Swamp Forest and created 10 hector Swamp Forest in different areas in *Hakaluki Haor*. Swamp contributes in carbon sequestration and habitat creation. Swamp Forest is important habitat for fish, aquatic plants and animals, wildlife and local and migratory birds.
- **Establishment of Wetland Sanctuary:** Established 9 wetland sanctuaries after re-excavation envisioned for ecosystems management and fisheries conservation, which is very important for conservation of wetland biodiversity and fisheries resources of *Hakaluki Haor*.
- **Construction of Submersible Greenbelts:** 10 submersible greenbelts have been constructed in *Hakaluki Haor* to protect *Haor* fringe villages from powerful wave action locally called *afal* during flooding time. 10 submergible embankments were constructed and at the same time many saplings were planted aimed at formation of green belt alongside the ridge.
- **Installation of Solar Based Irrigation Plants:** Installed 5 solar based irrigation plants with the objectives of reducing fossil fuel burning; at the same time helping farmers to get a good harvest with proper watering. The irrigation pumps will also play a central role in diversifying agriculture crops which has multifarious benefit for farmers and for land including reduces the risk of farming. This is an effective intervention for climate change mitigation.
- **Installation of Solar Based Desalinisation Plants:** Using renewable energy 2 solar based desalinisation plants were installed to supply pure drinking water to the most vulnerable coastal communities in *Cox's Bazar* where there is no source of pure drinking water close by and people are mostly compelled to

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drink saline water due to intrusion of salinity. This is a great intervention for climate change mitigation.

Bangladesh is a party to the *Cartagena Protocol on Biosafety to UNCBD*. Department of Environment has developed guidelines, framework and rules-regulations towards addressing the potential risks of Genetically Modified Organisms (GMO) to biodiversity and human health. In line with the obligations of the Cartagena Protocol to UNCBD, the government has enacted Bangladesh Biosafety Rules 2012. Development of National Biosafety Framework (INBF) is in place to enhance the capacity building on biosafety at the institutional and individual levels.

Two Safari Parks named *Bangabandhu Sheikh Mujib* Safari Park in *Gazipur* and *Cox's Bazar* and *Sheikh Russell* Aviary and Eco-Park in *Rangunia*, 17 National Parks and 21 Wildlife Sanctuaries have been established as a part of conservation of bio-diversity and natural environment of forests. Another two safe zones have been declared for conservation of vulture. Harvesting of old plantation along with natural reserved forest has been stopped for conservation of bio-diversity. Harvesting of natural forests of the Government *khas* land is being controlled. A crime control unit involving Police, Customs, Coast Guard and Forest Department has been working for curbing the killing and trafficking of wildlife through making necessary co-ordination.

According to the Article 20(1) mentioned in the Wildlife (Protection and Security) Act

2012, '*Swatch of No Ground*' with 1,738.00 sq. km situated in the Bay of Bengal has been declared as marine protected area of the country.

In order to promote sustainable tourism in *Sundarbans*, some restrictions must be imposed on random travels to maintain long term sustainability of *Sundarbans* Reserved Forest. Eventually, *Sundarbans* Travel Rule has been proposed where the number of tourist should never exceed the carrying capacity. For first time in Bangladesh Tiger Survey in *Sundarbans* have been done through Camera Trapping method. Crocodile and Elephant Surveys were also completed. Forest conservation has been more accelerated at 21 protected areas to protect forests for future generation and conserve existing biodiversity involving local communities in co-management approach. Co-management activity has been strengthened and expanded along with the expansion of social forestry area as a part of this process. Half of the income from entry fee of protected areas is being allocated for livelihood improvement of local communities and landscape development.

### Ozone Layer Protection

Bangladesh had signed the Montreal Protocol on 2 August, 1990 and ratified its London, Copenhagen, Montreal and Beijing amendments in 1994, 2000, 2001 and 2010 respectively. Bangladesh is enlisted in Article 5 (1) of the Protocol. Guided by the condition of the protocol, use of CFC control started gradually from 1 July 1999 and in 2010 it became zero level. In addition, an Ozone Cell was formed in DoE in 1996 and several other

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projects are on board under the financial support of the Multilateral Fund (MLF).

Some important activities carried out by the Department of Environment (DoE) to protect the Ozone Layer are as follows:

- Enacted ‘Ozone Depleting Substances (Control) Rules, 2004’ in 2004 and amended in September 2014.
- Phased-out about 50 percent CFCs in the aerosol sector in 2002 by Public Private Partnership conversion project.
- 653 law enforcing officials have been trained under the programme ‘Promotion of Ozone Layer Protection in Bangladesh and Implementation of Montreal Protocol in Bangladesh’.
- 5,000 refrigeration technicians have been trained through ‘Good Service Practices in Refrigeration and Air-conditioning’. Again, 300 customs officers and other law enforcing officials have been trained through ‘Green Trade for the Protection of Ozone Layer’. Besides, to prevent illegal trade of ODSs at customs entry point, customs department have been provided with the ODS identifiers.
- CFCs have been phased-out from the pharmaceutical sector in the manufacturing of Metered Dose Inhalers (MDIs) in 2012.
- HCFC-141b has been phased-out completely from the refrigerator insulation foam production as a blowing agent in 2012.
- 2,000 technicians have been trained in Refrigerator Retrofit training programme.

- 800 service shops owners have been provided with retrofitting tools and other servicing equipment.
- Organising training programme on capacity building of ODS users.
- Phase out CFC-11 (chlorofluorocarbons) and CFC-12 in manufacturing of Metered Dose Inhalers (MDIs) in pharmaceutical industry in Bangladesh. Transition Strategy and Conversion projects are being implemented with the assistance of UNEP and UNDP respectively funded by Multilateral Fund (MLF).
- Formulation of the ‘HCFC Phase-out Management Plan (Stage-I)’ to phase out hydro-chlorofluorocarbon (HCFC).
- Start implementation of project financed by Multilateral Fund assisted by UNDP with a view to phasing out HCFC-14 B from Foam Sector.
- Reduction of Chlorofluorocarbon (CFC) use at zero level in all sectors except pharmaceutical industry by 1 January 2010 and full phasing out of the use of CFC in pharmaceutical industry by 2012.
- Phased-out HCFC-141b from the manufacturing of refrigerator foam as foam blowing agent on 1 January 2013. Bangladesh is the first Article 5 country to phase-out HCFC-141b from foam sector.

Bangladesh has achieved successfully CFC phase-out from its baseline consumption of 581.4 ODP tonnes to zero ODP tonnes in the year 2012 from all sector application including essential use in metered dose

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inhalers production in the pharmaceutical sector. Again Bangladesh is now phasing out HCFCs from different sector uses from its 2009-10 baseline consumption of 72.6 ODP tons and Bangladesh meet 2013 freeze target and 10 percent reduction target in 2015 by implementing investment project of phasing out HCFC-141b from foam sector and non-investment project. Bangladesh is compliant with Montreal Protocol.

### Green Banking

Green banking initiatives of Bangladesh Bank (BB) are broadly categorised into the following aspects: policy initiatives, monitoring of green banking activities of banks and Financial Institutions (FIs), refinance support from BB in diverse green products/sectors and Bangladesh Bank's own initiatives in environmental management. Bangladesh Bank issued a comprehensive Policy Guidelines for Green Banking to banks and financial institutions in January 2011

with a view to develop a sustainable financial system. In FY2016-17 (Up to December 2016), banks and FIs have disbursed Tk.17,88.00 crore for green finance. In the same period, out of 38,127 rated projects banks and FIs have disbursed Tk.1,066,09.00 crore against 33,045 environmental risk rated projects.

### Conservation of Forest

Forest Department has been managing forests of the country for conservation of biodiversity and to ensure sustainability of the forest resources. The total forests of Bangladesh are 1.60 million hectares at present. About 1.40 million hectares are natural forests and the rest of 0.20 million hectares are coastal forest which has been created by Forest Department artificially through coastal forestation on newly accreted areas. Moreover, there are about 0.77 million hectares homestead forests growing on around villages and marginal land of the country.

**Table 15.2: The Comparative Scenario/Statistics of Forest Land in SAARC Countries (2015)**

Solano	Name of the Country	Total Land (Sq.Km.)	Total Forest Land (Sq.Km)	Forest Coverage(%)
1.	Afghanistan	652860	13500.00	2.10
2.	Bangladesh	147570	1950.97	13.22
3.	Bhutan	38117	27550.00	72.30
4.	India	2973190	706820.00	23.80
5.	Maldives	300	10.00	3.30
6.	Nepal	143350	36360.00	25.40
7.	Pakistan	770880	16010.00	2.08
8.	Srilanka	62710	20700.00	33.00

Source:<http://data.worldbank.org/indicator/AG.LND.FRST.ZS>

Meanwhile, Forest Department has taken initiative to implement different types of development projects and programmes, providing training and creating suitable

environment for agriculture production, to enrich depleted forest resources, to ensure supply of raw materials to wood-based industries, to conserve and develop bio-

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diversity, environment as well as wildlife and to expand eco-tourism.

During FY2016-17, Forest Department implemented 16 development projects (11 investment projects and 5 technical assistance project) with an ADP allocation of Tk.25,506.00 lakh. Out of this allocation, the amount of Tk.24,424.81 lakh has been spent, which was 96 percent of the total allocation.

### **Social Forestry and Poverty Reduction Activities**

Social forestry activities are milestone achievement of Forest Department which is playing a vital role to reduce poverty. During FY2016-17 Forest Department established 4,192 hectares Block/Woodlot plantation, 1200 km. Strip plantation and 30.30 lakh seedlings has been raised under different projects, climate change trust fund projects and revenue budget.

In the FY2014-15, Tk.2,038.35 lakh was distributed among 20,000 beneficiaries as their share. To date about 6,05,566 beneficiaries involved with social forestry activities. In the meantime, about 1,20,413 beneficiaries have received about TK.23,700.00 lakh as benefit sharing of the social forestry. Social Forestry Rule-2004 has been updated in which rate of benefit has been enhanced in particular cases. This activity is playing a vital role in the social safety net programme of the Government. Social forestry is largely contributing towards economic development and women empowerment as well as reducing poverty.

### **National Herbarium**

Bangladesh National Herbarium (BNH) plays an important role in research and development of plant resources like medicinal resources, botanical and economically important plant of the country and also takes other measures to preserve environment and conserve bio-diversity. The collection of the herbarium is a national property that goes down to the posterity through generations and work as reference materials on the flora of the country. The Herbarium published a booklet series called 'Flora of Bangladesh' which includes information about plant species of the country.

The Herbarium carried out a range of activities during FY2015-16 which include among others Botanical Survey Activities, Plant Identification, Plant Specimen Preservation and Developing Database of the Identified Samples, Plant Preservation, Publication of Flora of Bangladesh, Floristic Publication and Recording of Plant Species as new records get available in Bangladesh. In addition, a programme titled Red Data Book of Vascular Plants of Bangladesh, Vol-2, during the period from FY2009-10 to FY2012-13 and 'Red Data Book of Vascular Plants of Bangladesh, Vol-3' during FY2013-14.

### **Natural Disaster Management**

Bangladesh is one of the most disaster-prone countries in the world. Every year, lives and property are affected due to various disasters. Among these disasters, the cyclone of 1970, 1991, cyclone *SIDR* in 2007, cyclone *AILA* in 2009 and flood of 1988, 1998, 2004 and 2007 were most devastating. Ministry of Disaster

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Management and Relief has been playing a vital role in disaster risk reduction and preparedness and post disaster rehabilitation management. To combat the disaster, the primary 'vision' of the Government is to establish an emergency response system by enhancing the total management capacity of the institutions and by its empowerment to cope with a big scale disaster. For this, the poor and vulnerable peoples risk reduction will be ensured.

### **Actions/Initiatives Taken in Disaster Management**

#### **(A) Preparatory Activities**

- To ensure sustainable development through undertaking risk reduction and preparedness programmes under a timely and combined disaster management instead of a relief and rehabilitation based system for managing natural and man made disaster risks.
- ICT based micro zonation mapping helps in planning of urbanisation to reduce risk of earthquake. Micro zonation map has been developed for 3 major cities e.g. Dhaka, Chittagong and Sylhet, considering the earthquake vulnerability and risk of these cities. Preparation of micro zonation maps of six more cities e.g. Mymensingh, Tangail, Bogra, Dinajpur, Rajshahi and Rangpur completed. A database of vulnerable buildings has been developed after surveying all the buildings of Dhaka, Chittagong and Sylhet.

#### **(B) Activities Related to Act, Policies, Rules and Contracts**

- To ensure effective disaster management and disaster risk mitigation administering the institutional recognition, making and planning of national and local planning, to protect disaster risk people's life, property and fundamental rights for providing appropriate legal framework, Disaster Management Act was approved in September, 2012. Disaster Management Rules was published in 2015.
- All ministries, departments, organisations and individuals related to disaster management in order to fulfill their duties and responsibilities and to make its own action plan, Standing Orders on Disaster (SOD) has been prepared in 1997. SODs are amended by including hazards like earthquake, tsunami and fire in disaster management at the National Disaster Management Council, 2010. Recently, SoD is being modified by adding lightning and other disasters.
- The Cyclone Shelter Construction, Maintenance and Management Guidelines, 2011 were prepared for better maintenance, management and construction of shelters by different authorities.
- Cyclone Shelter Construction, Maintenance and Management Policy 2011 has been formulated for efficient use, management, maintenance and development of cyclone shelters constructed by DDM and different departments/ organisations/ authorities in coastal area.

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- Bangladesh has paid subscription in Asian Disaster Reduction Centre (ADRC), Regional Integrated Multi-Hazard Early Warning System (RIMES), Asian Ministerial Conference on Disaster Risk Reduction (AMCDRR) and International Search and Rescue Advisory Group (INSARAG).

### (C) Actions Related to Preparation of Plans

- At World Conference on Disaster Risk Reduction held in March 2015 at *Sendai* city, Japan, 187 countries adopted 'Sendai Framework for Disaster Risk Reduction 2015-30'. Bangladesh is preparing the action plan based on the framework.
- Bangladesh has contributed in the preparation of SAARC Plan of Action for Disaster Management including the SAARC Member Countries policies and plans.
- Midterm evaluation on 'National Disaster Management Plan (2010-2015)' is completed. Based on this evaluation the development of the next National Plan for Disaster Management(2016-2020) has been published.
- National Contingency Plans have been prepared for early recovery from any disastrous event including earthquake. National contingency plans are prepared for different organisations responsible for emergency response such as Department of Disaster Management, Bangladesh Fire Service and Civil Defense, Armed Forces Division, Cyclone Preparedness Programme, City Corporation of Dhaka,

Chittagong and Sylhet and for various service providers like electricity, gas, T&T, WASA and health. Spatial contingency plan and risk profile has been completed at 50 wards of Dhaka, Chittagong and Sylhet city.

- The inundation maps/risk maps for flood (for flood prone areas) and storm surge (coastal area) have been developed (up to *upazila* level) and uploaded in the DMIC website ([www.dmic.org.bd/inmap](http://www.dmic.org.bd/inmap)). The map could be used to determine the safe plinth level for construction of houses, shelter, *killas*, road, embankment and any other infrastructure.
- For effective mega disaster management, preparation of Bangladesh Incident Management System (BIMS) guidelines is at the final stage. Besides, draft of Debris Management Plan, Debris Management Guidelines have already been developed. The Guideline of Dead Body Management has been finalised and published.

### (D) Awareness Building and Lesson Learning Programmes

- A chapter on disaster management has been included in the text books of Grade 3 to Grade 12 to increase disaster management awareness of the students.
- With the target of developing disaster management and climate change related skilled human resources the issues of disaster management and climate change have been incorporated in the curriculum of 41 educational and training institutions. By this time, 13 universities including University of *Dhaka*, *Rangpur Begum*

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*Rokeya* University, *Potuakhali* University of Science and Technology and Bangladesh University of Professionals have introduced Graduation and Post-Graduation courses on disaster management and climate change. Diploma/postgraduate courses have been introduced in 29 universities.

- To maintain equity and coordination in training activities of the government and non-government organisations (NGO) harmonised training modules and manuals for the trainers and trainees have been developed.
- Internship programme for the student of Institute of Disaster Management and Vulnerability of Dhaka University has been introduced from 2016. This year 43 students are taking part of this Internship Programme.

### (E) Training Initiatives

- Foundation training for the DRRO's and PIO's of a period of two months are going on to enhance skills, especially the current strategies to combat disasters. In FY2016-17, 115 DDM officers from field level (district and *upazila*) in 5 batches have participated in this course.
- Members of Bangladesh police, *Ansar*, VDP, and BNCC have been supported with in-country and foreign training on disaster management, preparation, response and recovery.
- Trainings have been imparted on GIS to 60 officers of *Titas* Gas, Armed Force Division, Fire Service and Civil Defense etc. who are the focal point for emergency response.

- To build the capacity at field level, the Disaster Management training has been organised for the local level Disaster Management Committee members (at union, *upazila* and district levels) of *Barguna* district. 1,757 disaster management committee members participated in that training.
- Disaster management training on capacity building and risk reduction was organised for 90 female public representatives and female government officials in the districts of Cox's Bazar, Barisal and Rangpur.
- DDM has introduced a web-based online portal for damage and need assessment under the ECRRP project. The training has been provided to all the field-level officials during FY2015-16. In FY2016-17 two batches of this refresher course was organised by DDM with the support of ERF/UNDP. 64 government officials from DDM, districts and *upazilas* participated on the course.
- A number of the training module on disaster management is used by the Government, NGOs and other organisations. To provide the same information to all a day-long workshop on Harmonised Module on Disaster Management has been organised. 35 participants from DDM and NGOs participated in the workshop.
- To build the skills and capacity of the staff on debris management for Dhaka in case of an earthquake or building collapse a Table Top Exercise (TTX) was organised with the support from USAID. The TTX was planned on the basis of the

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Debris Management Plan of Dhaka developed by MoDMR. 20 participants from MoDMR, DDM, Armed Forces Division, Fire Service and Civil Defense, Dhaka North and South City Corporations have participated in the TTX.

- Two-day training has been organised for the DDM staff to build the capacity on facilitating techniques for training on risk reduction and damage and need assessment. 27 DDM staff participated on the training.
- The day-long trainings on Emergency Response on Earthquake for 160 Primary/*Ebtadai* teachers and the trainers of PTI have been organised at Mymensingh, Chittagong, Sylhet and Comilla districts.
- Two-day long disaster management training has been organised for the media personnel. 28 media personnel participated in the course.
- A day-long Dead body Management training has been organised in *Gazipur* district. 30 participants from different departments and NGOs of the district participated in the workshop.
- To enhance the capacity for management of natural disaster caused by earthquake in Dhaka and Sylhet urban areas a project has been undertaken at the expense of Tk.125 crore. Under this project about Tk.80.68 crore will be spend for the training of people related to enhancing public awareness, rescue and search operations. Rest of the money will be spend to establish and strengthen NDMRTI and ERCC. Establishment of the National Disaster Management

Research and Training Institute (NDMRTI) is under process and its activities are now in function.

### **(F) Actions Related to Disaster Reduction, Procuring Equipment and Structural Intervention**

- ‘Procurement of Equipment for Search and Rescue Operation for Earthquake and Other Disasters (2nd phase)’ project is going on to complete the procurement of items including rescue vehicles, pick-up vans, rechargeble search light, foldable strecher, body bag, face/gas mask, rescue equipments for volunteers and search cameras at the expense of Tk.153.52 crore.
- Under the project ‘Emergency Cyclone Recovery and Restoration Project (DDM part)’ a cell named Multi Hazard Risk and Vulnerability Assessment (MRVA) has been established. This cell provided vulnerably and risk map for 8 major hazards (flood, cyclone, earthquake, tsunami, land slide, drought, technical and health hazards) and this data has been uploaded to website. Besides, under this project 13 satelite phones, 12 pick-up vans for emergency response, 35 megaphone syrens have been distributed among 12 coastal cyclone-prone districts. Apart from these, procurement of 6 water ambulance, 12 small mareine rescue boats and 4 rough sqcuatic sea search and rescue boats is completed and these items are provided to 12 coastal district administrations, Coast Guard and Rapid Action Batelian (RAB).

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- Construction of small bridge/culvert (not more than 15m length) project on earthen rural road is implemented by the Ministry of Disaster Management and Relief. The main objective of this project is to prevent water logging and to create better communication facilities in the rural area. In FY2016-17, construction 57,686 m bridges/culverts is under process. This project has started from January 2016 and will end in June 2019. It targets to construct 12,993 bridges/culverts at the completion of the project
- In the last five years about 726 (up to 12m long) bridges/culverts have been constructed to improve rural peoples' wealth by reducing water logging and enhancing communication facilities in Chittagong Hill Tracts region. By December 2016, 196 bridges/culverts have been constructed in 25 *upazilas* of 3 Hill Districts.
- Under the project 'Multipurpose Cyclone shelters in Coastal and Cyclone Shelters Construction Project (2<sup>nd</sup> phase)' initiatives have been undertaken to construct 220 shelters in 86 *upazilas* of 16 districts at the cost of Tk.533.16 crore with the targets to provide safe shelters to the poor and asset-less people in coastal and cyclone prone areas, protect their cattle and household properties and other items from the damage of disasters and continue educational and other community-service oriented activities during periods other than disasters.
- Under the project 'Construction of Flood Shelter in the Flood Prone and River Erosion Areas (2<sup>nd</sup> Phase)' 156 flood

shelters are being constructed in 154 *upazilas* of 43 districts of the country in order to provide safe shelters to the poor and helpless peoples of the flood prone and river erosion area during disasters. Provision of shelters for approximately 400 peoples and 200 animals has been made in each flood shelter. Every flood shelter is being constructed in the premise of some educational institution or in their own land so that these can be used for academic purpose of the respective educational institution during normal time. According to the Memorandum of Understanding (MoU) signed between GoB and the respective educational institution, these flood shelters will be opened up for the affected peoples during disaster. Construction work of the flood shelters has been completed among which 53 flood shelters has been inaugurated.

### Early Warning Signals and Emergency Response Activities

Bangladesh is a natural disaster prone country. Cyclone and flood occur frequently. Early warning signals are helpful for disaster risk reduction/damage. Development of early warning signals reduces the loss and damages in natural disaster. Following three systems are newly included to send disaster warnings:

- **Website and email:** Through website and email, early disaster warnings are being disseminated. For this purpose the website of Department of Disaster Management has been linked to the websites of Bangladesh Meteorological Department and Water Development Board.

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- **Interactive Voice Response (IVR):** To ensure that cyclone and flood related early warnings reach the mass people via mobile phones Interactive Voice Response (IVR) system has been introduced through all the mobile phone operators. In this system different weather related information can be obtained through dialing a toll free code 1090 (get weather forecast and warnings for sea-bound fishermen by pressing 1; warnings for river ports by pressing 2; everyday weather forecast by pressing 3; cyclone warnings by pressing 4 and information on water levels rise/fall in the rivers by pressing 5).
- **Short Message Service (SMS):** SMS helps in maintaining coordination among the officers responsible for discharging all kinds of duties related to disaster management. It is possible to send information in a very short time to create mass awareness or to coordinate activities of different stakeholders working in the field of disaster management. To achieve this target the Department of Disaster Management sends SMS alerts to the chairpersons and secretaries of district/*upazila* Disaster Management Committees, as required, during pre/post disaster periods.
- **Disaster Management Information Center (DMIC):** To establish an internet based information communication technology and infrastructure DMIC is build up to the office of DDM at 64 district and 485 *upazilas*. In this Centre information services related to disaster and disaster management can be obtained through web-based applications. For example: information services related to cyclone shelters, disaster risk maps, maps of possible flooded areas of cyclone and surges, database of Cyclone Preparedness Programme (CPP) volunteers and e-library, etc. are accessible online.