BANGLADESH: *FLOOD MANAGEMENT*

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Abstract. Information is provided about the approach and long-year experience on flood management in that country, with strategies that have seen continuous change after a number of disastrous floods. Of interest is in particular the introduction of an integrated approach for flood management, which has been reflected in recent plans for flood and water management

1. Location

Bangladesh is situated in the south Asian sub-continent. Because of its unique geographical location and topography, it is one of the most flood-prone countries in the world. Approximately 20 to 25% of Bangladesh's territory is inundated during the monsoon season. Such flooding provides fertile agricultural land and the floodplains in the country are densely populated and intensely utilized. On the other hand, at least 50 to 70% of the country's territory is exposed to intermittent extreme flooding that has far-reaching negative impacts on the national economy. Flood management in Bangladesh is, therefore, perceived as an indispensable component of poverty reduction initiatives.

2. Nature of floods

The country has a unique hydrological regime. It has 230 rivers, of which 57 are international, Bangladesh in most cases being the lower riparian country. Of the three large transboundary river systems (Ganges, Brahmaputra and Meghna), only 7% of their huge catchment areas lies in Bangladesh. The major rivers have a length of 500 to 2500 km and width range from 1 km to 20 km, with very flat slopes.

The seasonal flooding regime has been characterized by means of inundation of the different land types, which have been divided into five categories, ranging from very low to high land. Except high lands (which cover 29% of the country's total area), all other types are subjected to flood inundation to different degrees. Excepting very low lands, human settlements can be found in all other land categories.

Bangladesh generally experiences four types of floods. *Flash floods* occur during mid-April before the on-set of the south-westerly monsoon. *Rain-fed floods* generally happen in the deltas in the south-western part of the country and are increasing in low-lying urban areas. *River floods* are the most common; the areas are inundated during monsoon season along the river and in cases far beyond the riverbanks. *Storm surge floods* occur along the coastal areas of Bangladesh, which has a coastline of about 800 km along the northern part of Bay of Bengal. In case of important cyclones the entire coastal belt is flooded, sometimes causing great loss of lives. Coastal areas are also subjected to *tidal flooding* from June to September.

During the last half-century, at least eight extreme flood events occurred affecting 50% of land area. These extreme events are generated by excessive rainfall in the catchments. When water levels in the three major river systems rises simultaneously and cross the danger marks (usually starting from mid-July and continuing until mid-September), an extreme flood situation usually occurs all over the country. Duration of these extreme events normally extends from 15 days to 45 days. This was observed during those which occurred in 1987, 1988 and 1998, the latter having been the severest one in terms of magnitude and duration.

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3. Flood management and mitigation strategies

Flood management strategies adopted in the country have continuously evolved over the last 50 years, in three distinct phases of their development, and with mixed experiences. Initially, the emphasis was on *structural measures* through the implementation of some large-scale flood control, drainage and irrigation (FCDI) projects. However, it was soon recognized that their implementation involved large investments, as well as longer duration for their completion. It was then opted for the construction of small and medium scale FCD projects so as to provide early benefits. Thereafter, it was realized that water resources development should not be focused only on agriculture but take also into account other sectors related to water resources utilization and development. Environmental protection also came to the fore.

As a result, since the 1960's about 628 large, medium and small-scale FCDI projects have been implemented; they comprise levees and embankments, drainage channel improvements, drainage structures, dams and barrages, pumping systems, etc. They have provided flood protection to about 5.37 million ha of land, which is about 35% of the total area.

Non-structural measures such as flood forecasting and warning were later incorporated, as it was felt that structural measures alone could not mitigate flood problems. The Flood Forecasting and Warning System (FFWS), established in the 1970s, was modernized in 1996 and then again as of 2000. It now covers all the flood-prone areas of the country with 85 flood-monitoring stations, and provides real-time flood information and early warning with lead-times of 24 and 48 hours. The FFWS is currently assisting Government, disaster managers and the communities living in the flood prone areas in matters of flood preparedness, preparation of emergency mitigation plans, agricultural planning and rehabilitation, etc

In addition, more emphasis is now put on other non-structural means for flood mitigation, in particular by adopting a policy of involving communities in flood management, the stopping of encroachments on the flood plains through legislation controlling the developments in the flood plains and wetlands. In addition, a new concept is being introduced of controlled flooding as per desire of the stakeholders, instead of protecting some areas to make them completely flood-free. A pilot project was established in which flooding is allowed in each unit as decided by the stakeholders through consultation among themselves.

4. Flood and water management instruments

Since ancient time legal instruments were used for flood management in the country. During the latter part of 19th Century, many acts and rules for flood management were introduced, e.g. Embankment Act, Drainage Act and Canal Act, etc. From the early sixties Government has introduced some more acts to manage floods. Since there are some inconsistencies found in these laws it has been decided to promulgate a unified law and work is now going on in framing a National Water Code.

Bangladesh has developed a good hydrological data collection system all over the country, as well as an integrated hydrological database with about 40 years of data. There is also a real-time water level and rainfall data collection system from a selected number of stations for FFWS during monsoon months. All these data are used for planning and design of different types of hydraulic structures, construction of different infrastructures, etc.

During the last 40 years Government has invested approximately USD 4 billion in the water sector, mainly for FCDI projects. Annually about USD 200 million are disbursed for water and flood management.

5. Institutions responsible for flood management

About 53 central government organizations and 13 ministries are identified to be involved in water and different stages of flood management, and a *National Water Council* (NWC) was set up to coordinate all the various activities of the Agencies and Departments involved in the water sector. Of those organizations involved in different stages of flood management, the following may be mentioned:

(i) *Water Resources Planning Organization* - macro planning of water resources management;
(ii) *Bangladesh Water Development Board* - feasibility studies, implementation, operation and maintenance of flood management projects, real-time data collection for flood forecasting and warning services, dissemination of flood information at national and regional levels;
(iii) *Joint River Commission* - to conduct negotiations for data and information exchange on trans-boundary rivers;
(iv) *Bangladesh Meteorological Department (BMD)* - long, medium and short range weather forecasting and dissemination;
(v) *Local Government Engineering Departments* – implementation, operation and management of small-scale FCD projects;
(vi) *Disaster Management Bureau (DMB)* - dissemination of all information on natural disaster, including flood information at community level, flood preparedness awareness building, etc.;
(vii) *Directorate of Relief* - conducting relief and rehabilitation operation in flood hit areas; and
(viii) *Local Government Institutions (LGI)* - implementation of small scale flood management projects, flood information dissemination, relief and rehabilitation of flood victims.

The principal national institution concerned with flood management is the BWDB. The JRC and BWDB carry out international and regional data and information exchange. BWDB disseminates all kinds of flood information to all related Government Departments and Organizations.

Flood management relating to water management at national level is co-coordinated by the abovementioned *National Water Council* and the *Ministry of Water Resources*. Flood management relating to disaster management is co-coordinated by the *National Disaster Management Council*, particularly by the *Ministry of Disaster Management and Relief.* Over-all coordination during the flood event is the responsibility of the latter Ministry and the *Inter-Ministerial Disaster Management Committee.*

The Government has made flood management as a participatory activity. Up-dated *Guide Lines For Participatory Water Management* have been prepared to involve all kinds of stakeholders, both at national and local levels. Public consultation has been made compulsory for any flood management project. Some pilot studies have recently been completed to ensure effective peoples' participation in dissemination, as well as in flood preparedness activities at the community level. Methodologies were developed for constituting Community Based Organizations for flood management. Intensive consultation and training were conducted for the local people to develop their capacity for dissemination of flood information and preparedness.

6. Policy

In the early eighties, a *National Water Plan* was formulated to address various aspects of water use and demand and the interests of different stakeholders involved in the water sector. A *Flood Action Plan* was implemented from 1990-1996, on the basis of which a *National Flood and Water Management Strategy* was formulated in 1996. It already included policy guidelines for peoples'

participation, Environmental Impact Assessment (EIA) and multi-criteria analysis during planning process in all future water sector projects.

In 1999 the *National Water Policy* (NWPo) was introduced, which guides all the activities in the water sector. Subsequently, a *National Water Management Plan* (NWMP) was prepared in 2001, cross-cutting different sectors of national economy in the light of Integrated Water Resources Management, to address conflicting water needs and to ensure equitable water use and balanced economic growth, into the next 25 years. The Plan includes also the management of water-induced disasters, e.g. floods, erosion and droughts. A *Comprehensive Disaster Management Plan* (CDMP) and *Disaster Management Guidelines* were also prepared, in which the responsibilities of different agencies involved in disaster mitigation activities are delineated during pre-disaster preparedness, rescue and evacuation operation during disaster and post-disaster relief and rehabilitation.

7. Main lessons learned

Bangladesh has learnt many lessons from its experiences of the last 50 years in flood management, namely:

- Flood management activities should not be a stand-alone approach but rather an integrated approach in line with IWRM.
- Flood management should a combination of both structural and non-structural measures.
- The process of flood management should be a participatory one; especially communities should be pro-actively involved.
- Flood management activities should be sustainable.
- Technical considerations should not preclude socio-economic considerations.
- Flood management should directly contribute to poverty reduction or alleviation in the developing countries.