# **Chapter 1**

# Introduction

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#### **1.1** Floods - A national perspective

Floods<sup>7</sup> have been a recurrent phenomenon in many parts of India, causing loss of lives, public property and bringing untold misery to the people, especially those in rural areas. There is also a larger economic impact, as they derail economic activities, thus affecting growth. Indian sub-continent has peculiar climatic conditions, which cause floods in some parts whereas drought in other parts. The main causes of floods are as under:

- (i) High intensity rainfall in short duration,
- (ii) Poor or inadequate drainage/channel capacity,
- (iii) Unplanned reservoir regulation,
- (iv) Failure of flood management structures.

The flood damage data is collected by the State Governments in terms of affected area, crops, cattle, properties, population *etc*. Based upon the statistics provided by the States and compiled by Central Water Commission for the period 1953-2017, it has been reported that damages by floods in the country are more than ₹ 5800 crore per annum besides the loss of precious human lives and cattle.

The flood damages in India during the aforesaid period are given in Table 1.1.

SI	Itom	Average Annual	Maximum Damage	
No	Item	Damage	Extent	Year
1	Area affected	7.17 M ha	17.50	1978
2	Population affected	32.12 Million	70.45	1978
3	Human lives lost	1654	11316	1977
4	Cattle lost	93067	618248	1979
5	Cropped area affected	3.46 M ha	10.15	1988
6	Damage to crops	₹1711.16 Cr.*	17043.95	2015
7	Houses damaged	1241815	3959191	2015
8	Damage to houses	₹827.30 Cr.*	10809.80	2009
9	Damage to public utilities	₹3262.46 Cr.*	38937.84	2013
	Total	₹5800.92 Cr.*		, 

 Table 1.1 : Flood Damages in India during 1953-2017

(Source : Information disseminated by CWC vide No.3/38/2012-FFM/1067-1164 Dt 17 May 2019)

For the study of flood problem, the rivers in India can be broadly divided into the following four regions.

- (1) Brahmaputra Region;
- (2) Ganga Region;
- (3) North West Region; and
- (4) Central India and Deccan region.

<sup>&</sup>lt;sup>7</sup> Flooding occurs when the capacity of the river channel to carry the discharge is exceeded.

# **1.1.1 Statutory Provisions for Flood Management**

The subject of flood control, unlike irrigation, does not figure as such in any of the three legislative lists included in the Constitution (State list, Union list and Concurrent list) of India. Drainage and Embankments, however, are two of the flood control measures specifically mentioned in entry 17 of List II (State List), reproduced below:

*"Water, that is to say, water supplies, irrigation and canals, drainage and embankments, water storage and water power subject to the provision of entry 56 of List I (Union List)."* 

Entry 56 of List I (Union List) reads as follows:-

"Regulation and development of inter-State rivers and river valleys to the extent to which such regulation and development under the control of the Union is declared by Parliament by law to be expedient in the public interest."

For implementation of any flood control programme, it is necessary to acquire private land for execution of engineering measures such as Reservoirs, Detention basins, Embankments, Channelization of rivers, Channel improvement, Drainage improvement, Diversion of flood waters and Watershed Management. Since there is provision for "acquisition and requisitioning of property" in the Concurrent List under entry 42, both Centre and the States can enact laws for this purpose. The Land Acquisition Act of 1894 under which land could be acquired both by the Centre and the States is the basic Act in this regard. Further, if legislation for reducing flood damages is to be resorted to by Flood Plain Zoning, it involves restriction of land use and this power though not included under entry 17 of List II (State List) mentioned above, is covered under entry 18 of List II (State List) which provides "land that is to say, rights in and over land". Besides, Flood Plain Zoning being essentially a local problem and since local conditions differ from area to area, it needs, therefore, to be dealt with by the State Government. The subject of "Flood Management" including erosion control therefore falls within the purview of the States.

The schemes for flood control are planned, investigated and implemented by the States as per priorities within the State with their own resources and the role of Central Government is technical, advisory, catalytic and promotional in nature. A number of States have already enacted laws with provisions to deal with matters connected with flood control works. West Bengal has not enacted any law in this regard, so far.

# 1.1.2 Existing Flood Management Mechanisms in India

In India, a two tier system of flood management exists, as described below:

**State Level Mechanism** - The State Level Mechanism includes the Water Resources Departments, State Technical Advisory Committee and Flood Control Board. In some States, the Irrigation Departments and Public Works Departments look after flood matters.

**Central Government Level Mechanism** – The Union Government has set up following organizations and various expert committees to provide guidance and assist the State Governments in addressing flood problems in a comprehensive manner:

**Central Water Commission (CWC)** – The Government of India set up Central Water Commission, as presently named, in 1945 for achieving the goal of furthering and promoting measures of flood control, conservation and utilization of water resources throughout the country in the areas of beneficial uses, irrigation and hydropower generation, flood management and river conservation.

**Ganga Flood Control Commission (GFCC)** – The Ganga Flood Control Commission (GFCC) was set up by Government of India in 1972 for preparation of comprehensive plan of flood control for Ganga Basin and to draw out a phased coordinated programme for implementation of works and monitoring & appraisal of flood management schemes of Ganga Basin States. The GFCC has prepared comprehensive plans of flood management of the 23 sub-basins in the Ganga Basin besides drawing up a phased programme for implementation of these works to proper standards as well as examination and monitoring of various flood management schemes implemented in the Ganga Basin States.

**Brahmaputra Board (BB)** – The Government of India set up Brahmaputra Board under Brahmaputra Board Act, 1980 (46 of 1980) under the then Ministry of Irrigation (now Ministry of Water Resources). The jurisdiction of Brahmaputra Board includes all NE States (including Sikkim) and North Bengal in Brahmaputra and Barak Basin.

**National Disaster Management Authority (NDMA)** – For prevention and mitigation effects of disasters including flood disasters and for undertaking a holistic, coordinated and prompt response to any disaster situation, the Government of India has set up a National Disaster Management Authority (NDMA) in 2005, an Apex body under the Chairmanship of the Prime Minister of India as per the provision contained in the NDM Act, 2005.

As per the Act, NDMA was to lay down guidelines to be followed by the State Authorities in drawing up the State Plan (Clause No 6(2) (d)). Accordingly, NDMA has issued guidelines in January 2008 for management of floods and the roles of various Central and State agencies have been specified for preparation of flood mitigation plans and taking relief measures during flood disasters.

# **1.2 Flood Scenario of the State**

West Bengal falls mainly in the Ganga Region as the southern and central parts of the State are covered by the river Ganga and its tributaries. Some of the northern parts are covered under the Brahmaputra Region through its tributaries like Teesta, Raidak, Torsa *etc.* The State has three distinct drainage basins namely Brahmaputra, Ganga and Subarnarekha.

West Bengal is one of the prime flood prone States in the country with 42 *per cent* (37660 sq. km.) of its total geographical area (88752 sq. km.) being susceptible to floods. West Bengal, being located at the tail-end of the Ganga Basin, is a hydrologically subsidised State, which receives huge volume of transboundary water. However, the supply of this water is so skewed that West Bengal bears the brunt of flood during monsoon and faces shortage of water during the lean months. The floods of West Bengal have special characteristics. Heavy rainfall at origin or catchment areas of main flooding rivers of this State cause flood, but

these catchment areas are mainly lying outside the State. West Bengal is flooded by water from adjoining states or countries.

	Kinds of damage	Flood damages occurred in West Bengal					All India		
SI No.		During the years				Maximum during (1953-2017)		Average Damage	
		2013	2014	2015	2016	2017	Year	Damage	(1953-2017)
1	Area affected (M ha)	0.182	0.051	1.300	Not reported	1.033	1978	3.080	7.17
2	Population affected (Million)	3.112	0.448	10.840	1.94	8.723	2000	21.800	32.12
3	Human lives lost (nos.)	41	169	338	247	217	1968	2730	1654
4	Cattle lost (nos.)	28311	145	22774	2020	2857	1978	221826	93067
5	Cropped area affected (M ha.)	0.182	0.051	1.300	0.11	1.033	2007	2.490	3.46
6	Damage to crops (₹ crore)	533.95	6.13	11433.68	83.92	6914.50	2015	11433.68	1711.16
7	Houses damaged (nos.)	233336	33621	830245	87704	826982	2000	2194858	1241815
8	Damage to houses (₹ crore)	178.97	17.275	7895.63	47.00	9158.28	2017	9158.28	827.30
9	Damage to public utilities (₹ crore)	13.58	2.67	6023.96	32.56	1655.16	2015	6023.96	3262.46
	Total value of	726.50	26.075	25353.27	163.48	17727.94			₹5800.02
	Damages (6+8+9) (₹ crore)	A	werage Damages : ₹8799.45 crore					crore	

 Table 1.2 : Flood damages in West Bengal

(Source : Information as disseminated by CWC vide No.3/38/2012-FFM/1067-1164 Dated 17 May 2019 and as provided by WB Disaster Management and Civil Defence Department)

From the **Table 1.2**, it is observed that during the period 2013-17, flood damages to crops, houses and public utilities in West Bengal was ₹43997.27 crore. As such the average annual damages during these five years was ₹ 8799.45 crore, which was much higher than the all India average of last 60 years (₹ 5800.92 crore).

Along with flooding, various allied problems like bank erosion, drainage congestion and cyclonic disaster exacerbate the flood situation. Major contributing factors to floods in North Bengal region are heavy local rainfall, discharge from upper basin areas and also outfall condition<sup>8</sup> in the neighbouring countries. In South Bengal, floods become voluminous because of the shape of the catchment area<sup>9</sup>, its steep slope starting from a high plateau area and sloping sharply down to a flood terrain<sup>10</sup> near the outfall of limited capacity.

Flood in deltaic region is a disaster, which can destroy the total environmental set up of the area. It causes river bank erosion, depression of land, shifting of river course, river channel widening *etc.*, due to its high discharge, elevation,

<sup>&</sup>lt;sup>8</sup> Narrowed and silted end of river where it falls into the sea.

<sup>&</sup>lt;sup>9</sup> Surrounding area of a river from where accumulated rain water falls into the river.

<sup>&</sup>lt;sup>10</sup> *Flood affected area.* 

volume and duration. When flood water recedes, affected areas are often blanketed in silt and mud. The water and landscape can be contaminated with hazardous materials, such as sharp debris, pesticides, fuel and untreated sewage. Residents of flooded areas can be left without power and clean drinking water, leading to outbreaks of deadly waterborne diseases like typhoid, hepatitis A and cholera.

~	Flood	North Bengal	South Bengal
WEST Dajiling Jalpaigur BENGAL Uttar Dinalpur FLOOD PROME Dolskalio Dinalpur DISTRICTS Maldai	Districts Affected by Flood	Cooch Behar, Jalpaiguri, Uttar Dinajpur, Dakshin Dinajpur, Malda	Nadia, Howrah, Murshidabad, North 24 Parganas, South 24 Parganas, Hooghly, Burdwan, Birbhum, Paschim Midnapore, Purba
Puruliya Bandmaman Puruliya Bankura Haora North 24 Parganas Sovith 24 Parganas East Medinipur 42 Parganas	Relatively scarce Districts affected by Flood	Darjeeling	Midnapore Purulia & Bankura

Figure 1.1: Blue area depicts the flood prone districts of West Bengal

Flood damage reports for the years 2015 and 2017 prepared by the Disaster Management and Civil Defence Department, GoWB, as included in the CWC data, reflect loss of human lives of 338 and 217 along with damages of crops, houses and public utilities valuing ₹ 25353.27 crore and ₹ 17727.94 crore, respectively.

The major river basins and sub-basins of West Bengal are depicted in **Figure 1.2** below:



Figure 1.2: River Basins in West Bengal

River Basins and Sub-Basins						
BRAHMAPUTRA						
1. Sankosh	3. Torsa	5. Teesta				
2. Raidak	4. Jaldhaka					
GANGA-PADMA						
6. Mahananda	7. Punarbhaba	8. Atrai				
GANGA-BHAGIRATHI						
9. Pagla-Bansloi	13. Damodar	17. Kaliaghai				
10. Dwarka-Brahamani	14. Darakeswar	18. Jalangi				
11. Mayurakshi	15. Shilabati	19. Churni				
12. Ajay	16. Kangsabati	20. Bhagirathi-Hooghly				
		21. Rupnarayan				
SUBARNAREKHA DRAINAGE						
22. Subarnarekha	24. Pichabani	26. Haldi				
23. 24-Parganas & Calcutta Port Area	25. Rasulpur					

Flood control programme/schemes are planned, funded and implemented by the West Bengal Government through the Irrigation and Waterways Department (I&WD).

Besides, Government of India (GoI) also renders technical, advisory and financial assistance to the State Government. Central Assistance is provided to flood prone States to take up flood control and river management works in critical areas under Flood Management Programme (FMP).

The Government of India had decided to provide financial assistance through various Plan schemes because flood damages had increased due to non-completion of flood control works and their poor maintenance on account of funds constraints. A plan scheme "Flood Management Programme" for providing Central Assistance to the State Governments was taken up at an estimated cost of ₹8000.00 crore during 11<sup>th</sup> Five Year Plan for river management, flood control, anti-erosion, drainage development, flood proofing, restoration of damaged flood management works and anti-sea erosion works; which were considered critical in nature. This programme was continued in the 12<sup>th</sup> Five Year Plan period also. Some of the salient features of FMP include:

- To avail the Central Assistance, the States have been advised to prepare the schemes of flood management works in an integrated manner covering the entire river/tributary or a major segment. However, in case of emergent situation arising due to high floods, the works in critical reaches are taken up immediately after flood season.
- While submitting a proposal, the State Governments have to ensure acquisition of land required under the scheme and submit a certificate to this effect.
- The State Governments have to ensure inclusion of the scheme in the State Plan and make requisite budget provision towards Central as well as State share on annual basis.

GoI set up Central Water Commission (CWC), Ganga Flood Control Commission (GFCC), Brahmaputra Board (BB) and National Disaster Management Authority (NDMA) to enable State Governments to address flood problems in a comprehensive manner. Apart from these, the Working Group for 12<sup>th</sup> Five Year Plan of the Planning Commission (PC) of India made (October 2011) various recommendations and suggestions for the management of flood.

These included following strategies to be effectively implemented:

- Scientific assessment of flood prone area.
- Integrated basin management approach.
- Construction of dams and reservoirs with adequate flood cushion.
- Development of detention basins.
- Drainage improvement.
- Strengthening of organizations.
- Public-Private Partnership concept.
- Inventory of works completed by State.
- Provision for adequate funds for maintenance of existing works.
- Procedural reforms.
- Application of new technologies.
- Emergency action plans.

CWC plays a direct role in collection of flood data, flood forecasting and dissemination of flood forecasts to the local administration for planning suitable administrative measures. Apart from approving the projects (particularly those receiving Central Assistance) forwarded by the Departmental Screening Committee<sup>11</sup> of the State, GFCC monitors the progress of the schemes/projects, prepares comprehensive plans for the river system for management of flood in a focussed manner. As part of its mandate, the GFCC has prepared a number of guidelines from time to time on various flood related subjects in consultation with the States for formulation and execution of flood management schemes for ensuring quality in construction and meeting material specifications as per standards. These guidelines were also approved in meetings of the GFCC in which representatives of Ganga river basin States are members.

In order to assess the implementation and effectiveness of flood control measures a **"Performance Audit of Implementation of Flood Control Measures in West Bengal"** was conducted during February to December 2018 covering the period from 2013-14 to 2017-18.

## **1.3 Organisational structure**

Additional Chief Secretary (ACS), I&WD has the overall responsibility for implementation of flood control projects. The organisational set up is depicted in **Chart 1.1**.

<sup>&</sup>lt;sup>11</sup> A committee comprising the Secretary, I&WD as Chairman, Financial Adviser, Joint Secretary (Works), all Chief Engineers and Deputy Secretary – II (Works).





#### **1.4 Audit Objectives**

The Performance Audit was undertaken to get a reasonable assurance that:

- (i) The Department had prepared a comprehensive long-term plan, prioritising flood control measures necessary to combat recurrent floods in the State.
- (ii) Schemes/projects related to flood control measures were implemented as planned and were effective in minimising damage of life and property.
- (iii) Necessary funds were made available and were utilised judiciously.
- (iv) An effective system for ensuring quality control in construction and monitoring was in place.
- (v) Flood forecasting was used as a tool to predict, warn and minimise damage from floods.

#### 1.5 Audit Criteria

Performance was assessed against the following criteria:

- (i) National Disaster Management Guidelines (January 2008),
- (ii) Handbook for Flood Protection, Anti Erosion and River Training Works of Central Water Commission (CWC Guidelines 2012),
- (iii) Report of Working Group on Flood Management and Region Specific Issues for 12<sup>th</sup> Five Year Plan of Planning Commission, Government of India,
- (iv) Revised guidelines for providing Central Assistance to State Governments for the schemes/proposals of flood control and river management works under Flood Management Programme (2007-12), Ministry of Water Resources, Government of India,
- (v) Technical Memoranda on General Flood Management Structures, Ganga Flood Control Commission, Government of India,
- (vi) Indian Standards Codes,

- (vii) West Bengal Financial Rules (Volume-I & II),
- (viii)Irrigation & Waterways Department Code, GoWB (Volume-I),
- (ix) Schedule of Rates of I &WD, GoWB,
- (x) GoWB orders, including departmental policies.

#### **1.6 Scope and Methodology**

The Performance Audit covered the period from 2013-14 to 2017-18 and commenced with an Entry Conference on 23 February 2018 where the audit objectives of this Performance Audit were discussed in detail with the Department.

The methodology adopted for achieving audit objectives with reference to audit criteria consisted of scrutiny of records, analysis of data, issue of audit queries, joint site visits *etc*.

Selection for detailed examination was done as follows: Out of 45 Divisions *(Appendix 1.1)* engaged in flood control measures during the years 2013-18, six Divisions<sup>12</sup> executing two ongoing projects under Flood Management Programme (FMP)<sup>13</sup> and eight other Divisions<sup>14</sup> were selected on the basis of volume of expenditure and ensuring that these were located in different flood prone zones of the State. The Exit Conference was held on 13 December 2018 to discuss the audit observations. Department's replies have been considered, while finalising the report and suitably incorporated.

## 1.7 Acknowledgement

The co-operation extended by the Department of Irrigation and Waterways, Government of West Bengal in providing the necessary records and information in connection with the conduct of this Performance Audit is acknowledged.

<sup>&</sup>lt;sup>12</sup> Berhampore Irrigation Division, Mayurakshi North Canal Division, Mayurakshi South Canal Division, East Midnapore Division, KKB Project Division and Contai Irrigation Division.

<sup>&</sup>lt;sup>13</sup> Kandi Master Plan and Kaliaghai-Kapaleswari-Baghai Drainage Basin Project (in which 124 out of 142 tenders were test checked).

<sup>&</sup>lt;sup>14</sup> Howrah Irrigation Division, Malda Irrigation Division, Mahananda Embankment Division, Coochbehar Irrigation Division, Canals Division, Hooghly Irrigation Division, Jalpaiguri Irrigation Division and Alipurduar Irrigation Division (in which 145 out of 357 tenders were test checked).