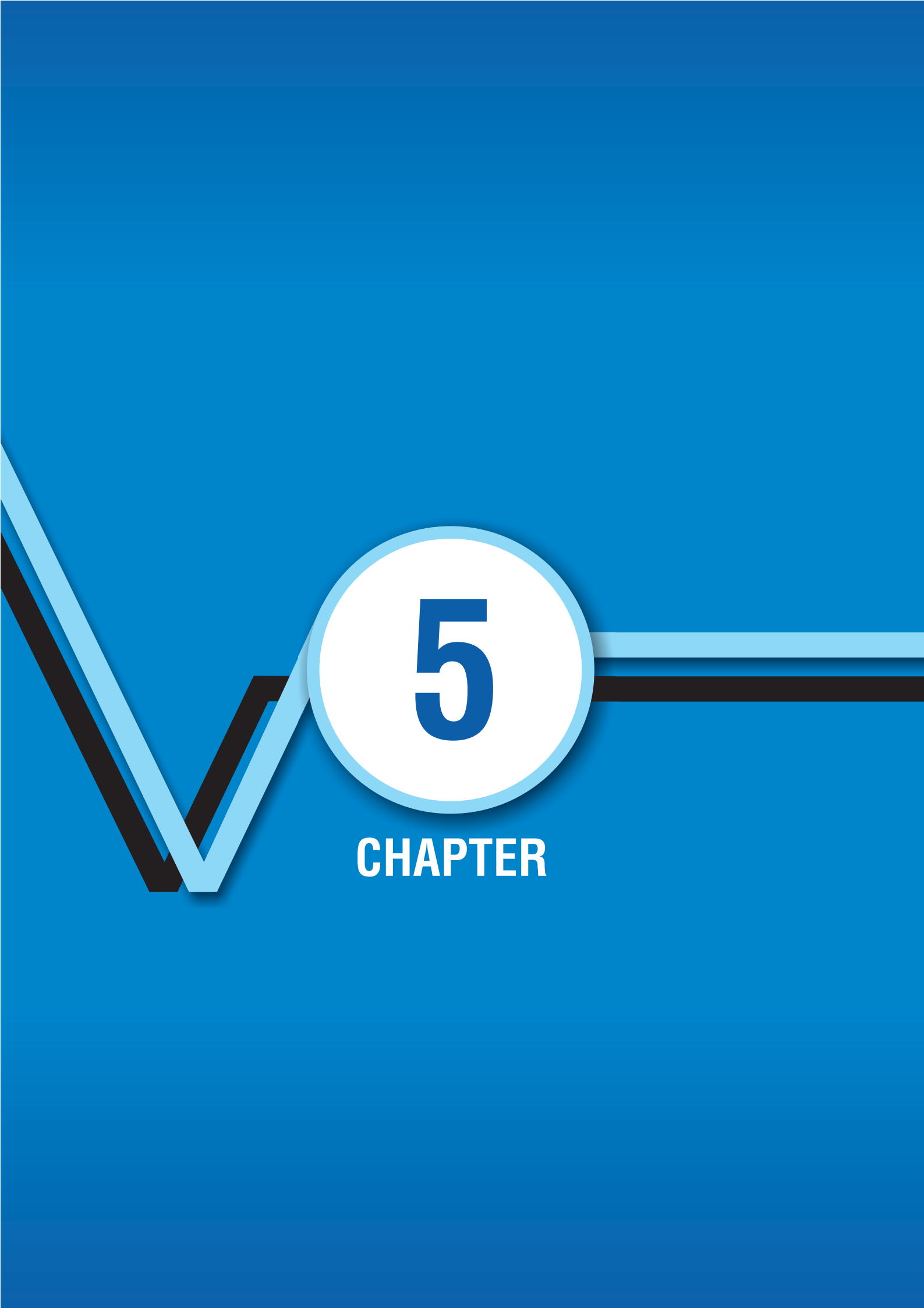
5
CHAPTER

5 Chapter

Other Schemes for Flood Control

5.1 Introduction

Apart from the two main schemes on Flood Management and Flood Forecasting, GoI implemented other smaller schemes towards flood control viz. River Management Activities and Works related to Border Areas (RMABA) and Dam Safety Studies and Planning (DSSP). This chapter contains observations on the extent of work achieved under RMABA and Dam Safety.

5.2 River Management Activities and Works related to Border Areas

RMABA was an on-going Central sector scheme of MoWR, RD&GR which was restructured in XI Five Year Plan on the advice of the erstwhile Planning Commission by integrating smaller schemes operated by the Ministry during X Plan and some new works related to border areas with the neighbouring countries namely, Nepal, Bhutan, Bangladesh, China and Pakistan. The scheme was continued in the XII FYP.

During XII Plan, the component of grant-in-aid to Union Territories (UTs) which was funded under FMP during XI Plan, was also brought into the present scheme in view of requirement of 100 *per cent* funding of flood management/anti-sea erosion works in the UTs. The main activities under RMABA during XI and XII Plan periods were:

a. Field surveys, investigations and preparation of joint DPR in respect of Pancheshwar, Kosi, Saptakosi, Kamla and Naumure project (with/ in Nepal) and construction of high dams on these rivers at an early date.

b. Regular maintenance of flood protection works of Kosi and Gandak Projects (in Nepal), Flood Protection/anti-erosion works in the border areas with Bangladesh and Pakistan by the States.

c. Flood forecasting on rivers common to India and Nepal and flood forecasting in Bhutan, Bangladesh, China and adjoining Indian sites.

The scheme was approved for ₹ 820 crore during XI Plan and ₹ 740 crore during XII Plan. The expenditure was ₹ 721.14 crore and ₹ 339.89 crore respectively during XI and XII Plan (up to March 2016).

5.2.1 Delay in completion of RMABA projects

The RMABA package was approved for XI Plan (December 2008) and for XII Plan (December 2014) for projects like Pancheshwar, Saptakosi, Naumure and Kamla.

Also, as per Task Force constituted in 2004[35], long term solution to the problems of Assam, North Bihar and Eastern Uttar Pradesh from annual floods lay in creating storage reservoirs of adequate capacity with the requisite allocated flood cushions on the rivers Brahmaputra, Barak and Ganga and their tributaries in India or in Nepal. The major recommendations of the Task Force were:

(i) Investigation and preparation of DPR of Sapta Kosi High Dam Multi-purpose and Sun Kosi Storage cum Diversion Scheme; provision of adequate flood storage allocation for management of floods; and negotiation for implementation of the project so that construction could start soon after preparation of DPR.

(ii) Finalisation of DPR of Pancheshwar Multi-Purpose Project and its implementation in a time bound manner.

(iii) Feasibility study of Kamla Multi-Purpose project and preliminary study for Bagmati Multi-Purpose Projects.

We observed that there was huge delay in completion of all the long term RMABA projects as detailed below:

A. Pancheshwar Multipurpose project: India and Nepal signed the Mahakali Treaty in 1996 for integrated development of river Mahakali (Sharda in India) including Pancheshwar project.

For finalisation of DPR, provisions of ₹ 15.00 crore and ₹ 14.90 crore were allocated during X and XI Plans respectively, against which expenditure of ₹ 11.22 crore and ₹ 12.65 crore was incurred.

As per the treaty, pre-construction activities would be started side by side while making final tie-up for project funding by the two Governments. For pre-construction activities, a token provision of ₹ 20 crore was initially provided during XI Plan which was revised to ₹ one crore at the time of revision of funds for XI Plan. However, no expenditure was incurred. In the XII Plan amounts of ₹ 50.13 crore and ₹ 100 crore were provided for investigation and pre- construction works of Pancheshwar multipurpose project respectively. Expenditure incurred along with latest status of the project was, however, not furnished by MoWR, RD&GR.

[35] A Task Force was set up by MoWR, RD&GR to look into the problems of recurring floods in Assam, Bihar, West Bengal and Eastern Uttar Pradesh for suggesting short term and long term measure for management of flood and erosion control.

Ministry stated (February 2017) that Pancheswar Development Authority (PDA) was set up at Kathmandu in September 2014 after the approval of the Cabinet and the draft final DPR was submitted by PDA to both the countries in November 2016.

The fact remained that work under the project was yet to be initiated.

B. Kosi High Dam Multipurpose Project: During December 1991 an understanding was reached between India and Nepal to take up joint studies/investigations of Saptakosi High Dam project and to prepare a DPR. For this joint project-Sapta Kosi Sun Kosi Investigation (JPO-SKSKI) was set up in August 2004, which was to complete the works by February 2007. Due to law and order problem in the project area, the investigation work could not be completed. During the X Plan period, expenditure of ₹ 12.44 crore was incurred against the outlay of ₹ 30 crore. The work was spilled over to XI Plan period for completion by September 2008 with a revised cost of ₹ 70.55 crore in view of increase in scope of work. For survey and investigation of Kosi High Dam ₹ 58.11 crore was initially provided during XI Plan which was later revised to ₹ 33.64 crore, against which an expenditure of ₹ 27.37 crore was incurred. However, due to local agitation against the project, work could not be completed. The cost of the work was further revised to ₹ 74.86 crore (February 2009) and to ₹ 87.63 crore (February 2011) for completion by February 2013. In the XII Plan, a provision of ₹ 40.61 crore was made under the project for carrying out Survey and Investigation activities.

The status of the project along with related records was not furnished by MoWR, RD&GR. Ministry stated (February 2017) that the Joint studies/ investigation and preparation of DPR of Saptakosi High Dam project and Sun Kosi storage cum diversion scheme was under progress through Indo-Nepal joint project office, located at Biratnagar, Nepal. The progress was slow due to resistance by local people.

The fact remained that work under the project was yet to be initiated.

C. Naumure Hydro-electric project: The Naumure project is envisaged on the river Rapti, upstream of the Sikta Irrigation Project which is under construction unilaterally by Nepal. For investigation and pre- construction works of Naumure Hydro-electric project (Nepal) ₹ 21.40 crore was initially provided during XI Plan which was revised to ₹ one crore. No expenditure was incurred for this activity. For investigation of Naumure Hydro-electric project ₹ 25.00 crore was provided during XII Plan.

Ministry stated (February 2017) that pre-feasibility study was completed by CWC in March 2010. During 7th meeting of Joint Committee on Water Resources (January 2013), Nepalese side expressed that pre-feasibility report prepared by CWC was not acceptable in its present form as it did not cater to their demand of irrigation for Kapilvastu region by way of inter basin transfer. No further development was reported thereafter.

The fact remained that work under the project was yet to be initiated.

D. Kamla Project: No provision was allocated for this project under XI and XII Plan.

5.2.2 Discrepancies/shortcomings in execution of RMABA works

We observed the following discrepancies/shortcomings in execution of works in Uttar Pradesh and West Bengal:

a. Irregular award of work on short term tender notices

As per the Government order (December 2000), works below ₹ two lakh only could be awarded on short term tender notices by giving 15 days' time. For works of more than ₹ two lakh, tenders were to be invited by giving 30 days' notice. We noticed the following discrepancies in eight test checked projects in Uttar Pradesh:

i) In five projects, six contracts valuing ₹ 23 crore were awarded on the basis of tenders invited on very short term notice up to seven days.

ii) Four agreements valuing ₹ 20.40 crore were executed on the basis of single tender.

iii) Two agreements of ₹ 2.60 crore were executed after three months of opening tender though the tender notice was issued for short term tender.

iv) In one work of ₹ 1.35 crore, three out of six bids received were rejected without recording any reason thereof.

b. Splitting of tenders

In West Bengal, administrative approval for Scheme-3 'Bank protection work on the Right bank of River Punarbhaba' was granted to Malda Irrigation Division at ₹ 13.30 crore in January 2011. Scrutiny revealed that Malda Irrigation Division split the above work into eight small reaches (ranging each from 100 m to 250 m) and the works were awarded to 10 contractors to expedite the works. Splitting up of the work into smaller works resulted in variations of the contracted rates from 0.03 to 25.77 *per cent*. The work was completed after 14 months of the scheduled date of completion.

The Department stated (December 2016) that this methodology was very commonly adopted with the objective of expedition in execution for economy

and efficiency. The reply is not tenable as there was delay in completion of the work as well as variations in contracted rates though all the tendered items of the work were identical.

c. Allowance of higher rate on disposal of excavated earth

With a view to better drainage and flood management, the work (Scheme-4) of Desilting of River Ichchamati along the common border portion[36] in West Bengal was awarded (March 2010) at a tender cost of ₹ 35.64 crore for completion by January 2011. The work was completed in August 2011 and the agency was paid (December2012) ₹ 37.31 crore. The scope of work *inter alia* included an item of disposal of excavated earth/materials outside the Government land by truck or by any other conveyance beyond 500 m at the rate of ₹ 116 per cubic metre (cu m).

Records revealed that 10.90 lakh cu m of silt was disposed at the rate of ₹ 116 per cu m and the contractor was paid ₹ 12.64 crore. We observed that the analysed rate (land for disposal to be arranged by the contractor) was ₹ 116 per cu m based on the Schedule of Rates (SoR) of Public Works (Roads) Department (2008-09). However, as per the SoR of the Greater Calcutta Drainage Circle (GCDC) during that period the rate of the item was ₹ 49.50 per cu m considering sale proceeds of the excavated earth. Hence, there was an avoidable expenditure of ₹ 7.46[37] crore due to allowance of higher rate.

The Department stated (December 2016) that sale of excavated earth in border areas was a difficult proposition and rate was analysed/adopted for disposal of earth at a land to be arranged by the agency.

The reply is not acceptable as we observed that in two desiltation works on the downstream and upstream of the same river executed by the same division in the year 2004-05 and 2013-14, the SoR of the applicable GCDC was followed in determining the rate of disposal of excavated earth/material beyond 500 m on land to be arranged by the contractor.

d. Non-maintenance of history sheet of RMABA works

Kosi High Level Committee (KHLC) recommended that proper history sheet of the protection works implemented at different sites were to be maintained. The history sheet was to indicate all spurs/protection works particularly works requiring repeated repairs of the restoration work indicating, inter-alia, the

[36] From Barnaberia, P.S.Gaighata at 120 km (Kulkhali, P.S-Sarsa, Distt. Jessore, Bangladesh) to BSF bridge at Kalanchi, P.S,Gaighata at 140.415 km (Chanduria, P.S.Sarsa, Distt. Jessore, Bangladesh) approximate length -20.415 km.

[37] Higher rate ₹ (116-49.50) per cum x 10.90 lakh cum = ₹ 7.25 crore plus 2.90 *per cent* (₹ 0.21 crore) of contractual rate of ₹ 7.25 crore.

work done in the previous years along with the expenditure incurred on repairs from time to time for proper assessment of their performance and for suggesting remedial measures. This was also reiterated by Gandak High Level Committee during its visit in November 2012.

We noticed that history sheets of 119 Anti Erosion (AE) activities carried out in Bihar during 2008-2015 were not maintained and no performance evaluation was done for these works.

5.3 Dam Safety

Building a dam not only ensures a large number of potential benefits but it also creates a structure with potential hazards, which may result from its failure. When a dam fails, due to unprecedented rainfall, earthquake, landslide, poor maintenance and/or sabotage; the huge volume of water stored transforms into a flood wave, which may cause severe damage to the lives and properties situated downstream. The effect of such a disaster can be mitigated to a great extent if the resultant magnitude of flood peak and its time of arrival at different locations downstream of the dam can be estimated, thereby facilitating the planning of emergency action measures.

The various activities for mitigating the effect of Dam failure as per Emergency Action Plan (EAP) were:

a. Determination of the potential inundated area by Dam Break analysis;
b. Preparation of inundation maps;
c. Notification of emergency;
d. Communication, flood management; and
e. Evacuation.

In order to assist State Governments to identify the causes of potential distress and to recommend suitable remedial measures, GoI established the Dam Safety Organization (DSO) in CWC in June 1979. The Standing Committee constituted by Ministry of Irrigation in 1982 recommended (1986) to evolve unified procedure of dam safety for all dams. The National Committee on Dam Safety (NCDS) was constituted by MoWR, RD&GR in October 1987 to oversee Dam Safety Activities in various States and suggest improvements to bring dams safety practices in line with the latest state-of-art consistently with Indian conditions. NCDS, in its 27th meeting (September 2005) finalized the Guidelines for Development and Implementation of EAP for Dams.

In view of above, a Central sector scheme namely 'Dam Safety Studies and Planning' was evolved during XI Plan in CWC having components as preparation and digitization of generalized Probable Maximum Precipitation (PMP) atlases for Indus, Krishna, Ganga and Brahmaputra Basins; upgradation of atlases prepared under Dam Safety Assurance & Rehabilitation Project (DSARP) completed in

September 1999; Environment and Social Assessment Studies; Risk Analysis Studies; and other special studies for identified projects and Training and Development of Special purposes packages on Dam Safety Activities.

The total provision for the scheme during XI Plan was ₹ 10 crore, which was revised to ₹ six crore. Expenditure of ₹ 4.22 crore was incurred by CWC during the XI Plan. However, the activity of preparation and digitization of PMP atlases could not be completed and pursued. The scheme on Dam Safety Studies and Planning was subsumed in the Dam Rehabilitation and Improvement Project (DRIP)[38] during XII Plan.

Also, as per clause 10.7 of National Water Policy 2012, to increase preparedness for sudden and unexpected flood related disasters, dam/embankment break studies, preparation and periodic updating of Emergency Action Plans (EAPs)[39]/Disaster Management Plans (DMPs) should be evolved after involving affected communities. Clause 10.5 also states that operating procedures for reservoirs should be evolved and implemented in such a manner to have flood cushion and to reduce trapping of sediment during flood season.

According to National Register of Large Dams 2002, there were about 4,050 completed large dams in India and another 475 were under construction. The number of completed large dams increased to 4,862 as of March 2016. The National Register, however, brought out that EAPs were not available for most of the completed large dams.

5.3.1 Status of Emergency Action Plans/Disaster Management Plans

Out of 4,862 large dams, EAP/DMPs[40] of only 349 large dams (seven *per cent*) were prepared (March 2016). Preparation of action plans to implement EAPs in respect of these 349 dams was under process. Mock drill in respect of only one dam[41] was conducted as of March 2016. Status of preparation of EAPs/DMPs and Operation and Maintenance (O&M) Manual is given in Table 5.1.

---

[38] A State sector scheme with a Central component being implemented in CWC. DRIP envisaged rehabilitation of 223 existing dams and dam safety institutional strengthening in the States of Kerala, Madhya Pradesh, Orissa and Tamil Nadu. The overall responsibility for project oversight and coordination of DRIP was with the Dam Safety Rehabilitation Directorate of Dam Safety Organisation (DSO) of CWC.

[39] An Emergency Action Plan (EAP) is a formal document that identifies potential emergency conditions at a dam and specifies pre-planned actions to be followed to minimize property damage and loss of life.

[40] Disaster Management Plans.

[41] Ranjit Sagar Dam (Punjab) on 15 May 2014.

Table 5.1: Status of EAPs/DMPs and preparation of O&M manual

States/UTs	Completed Dams	Dams for which O&M manual was prepared	EAPs/DMPs prepared
1. Andaman & Nicobar Island	2	0	0
2. Andhra Pradesh	127	0	3 (EAP for 6 Dams under preparation)
3. Arunachal Pradesh	1	0	0
4. Assam	3	0	0
5. Bihar	24	20	20 (All EAPs need to be updated)
6. Chhattisgarh	248	5	57
7. Goa	5	0	0
8. Gujarat	619	1	1
9. Haryana	1	0	0
10. Himachal Pradesh	19	11	19
11. Jammu & Kashmir	14	0	7
12. Jharkhand	50	1	0
13. Karnataka	230	0	37 (5 prepared as per CWC guidelines and 32 EAPs to be updated as per CWC guidelines)
14. Kerala	61	0	0
15. Madhya Pradesh	898	20	2
16. Maharashtra	1693	110	181
17. Manipur	3	0	1
18. Meghalaya	8	0	0
19. Mizoram	0	0	0
20. Nagaland	1	0	0
21. Odisha	199	7	0
22. Punjab	14	12	12 (updation required for all 12 EAPs)
23. Rajasthan	201	0	0
24. Sikkim	2	0	2
25. Tamil Nadu	116	44	0 (Preparation of EAPs for 106 Dams stated to be in progress under DRIP[42])
26. Telangana (from 02 June, 2014)	162	0	0
27. Tripura	1	0	0
28. Uttar Pradesh	115	0	2
29. Uttarakhand	16	0	4
30. West Bengal	29	0	1
Total	**4,862**	**231**	**349**

Source: as provided by CWC

The Table shows that Operating Manuals were prepared in respect of only 231 large dams (five *per cent*) and EAPs/DMPs were prepared for only 349 dams (seven *per cent*). Thus, preparedness for sudden and unexpected flood related disasters through preparation and periodic updating of EAPs / DMPs was inadequate.

[42] World Bank funded 'Dam Rehabilitation and Improvement Project'.

The Ministry stated (December 2016) that this would be forwarded to CWC/ Dam Rehabilitation and Improvement Project for remedial action.

In Tamil Nadu, the Water Resource Department did not prepare EAP for the reservoirs in Chennai and its suburbs (December 2016). The EAP could have helped better management of flood discharge from all reservoirs, including Chembarambakkam tank, Chennai during 2015 floods.

5.3.2 Hydrology Studies and Inundation Map

An inundation map delineates the areas that would be flooded as a result of a dam failure or unusually large spillway releases. An inundation map is sometimes supplemented by a narrative description of areas that would be flooded.

Conducting hydrology studies and preparing inundation maps for various flood levels for a Dam is a part of EAP. We noticed that the same was still under preparation at State level even in respect of those Dams for which EAPs were prepared. We also observed that despite several discussions in NCDS meetings, State Governments had not specified any time frame for conducting hydrology studies and preparing inundation maps.

Out of 17 States/UT covered under audit, only two States furnished information on status of hydrology studies and preparation of inundation maps.

a. **Himachal Pradesh**: Out of 19 large dams in the State, inundation maps were prepared only for two dams.
b. **Kerala**: No dam-break analysis was conducted in respect of any of the 61 dams in the State.

CWC did not provide any further information in this regard.

5.3.3 Enactment of Dam Safety Legislation

National Water Policy 2002 envisaged enactment of Dam Safety Legislation in order to ensure proper inspection, maintenance and surveillance of existing dams.

GoI sought to enact Dam Safety Legislation seeking all India applicability by exercising power conferred under Article 246[43] of the Constitution. Accordingly, GoI introduced (August 2010) the Dams Safety Bill, 2010 before the Parliament. The Bill was subsequently referred to the Parliamentary Standing Committee (PSC) on Water Resources for examination. Owing to significant changes/ modifications entailed in the Bill while complying with the observation and recommendation of the PSC, MoWR, RD&GR decided to withdraw the Bill and

[43] The Article empowers the Parliament to make laws with respect to any of the matters enumerated in the Concurrent List.

introduce the modified Bill as a new Bill in the Parliament. By this time, the term of the 15th Lok Sabha came to an end and the Dam Safety Bill, 2010 lapsed. In the mean-time, the State of Andhra Pradesh was bifurcated into the States of Telangana and Andhra Pradesh. Accordingly, MoWR, RD&GR requested both the States for fresh approval of the said resolution earlier passed by the House of erstwhile State of Andhra Pradesh. A fresh resolution was, however, still awaited as of August 2016.

Therefore, Central Dam Safety Legislation to ensure proper inspection, maintenance and surveillance of existing dams was pending enactment by the Parliament. Among the States, Bihar was the only State which had enacted the Dam Safety Legislation (May 2006).

5.3.4 Pre and Post monsoon inspection of Dams

As per minutes of 33rd meeting of NCDS, pre and post monsoon inspection of each large dam was required to be carried out by Dam Safety Organization (DSO) of the concerned State. Annual consolidated reports of pre and post monsoon inspection of previous years was to be submitted to DSO (CWC) in April every year for record and further action at their level.

Out of 17 States/UT selected for audit, only Himachal Pradesh and Tamil Nadu had carried out the pre and post monsoon inspection of the dams, three States had carried out the inspections partially. DSO, CWC also did not ensure that these inspections were carried out at regular intervals in order to ensure safety of the dams.

The Ministry stated (December 2016) that this would be forwarded to CWC/ Dam Rehabilitation and Improvement Project for remedial action.

5.3.5 Maintenance of Dams

As per para 24 of National Water Policy 2002, there should be proper organisational arrangements at the National and State levels for ensuring the safety of storage dams and other water-related structures consisting of specialists in investigation, design, construction, hydrology, geology, etc. The policy also stated that guidelines on the subject should be periodically updated and reformulated and there should be a system of continuous surveillance and regular visits by experts. We examined the activities with regard to maintenance of existing dams in the selected States.

We found that in five large dams (two in Bihar, two in Uttar Pradesh and one in West Bengal) certain defects and deficiencies were pointed out during the Safety review by Expert Committee but no remedial measures were taken due to non-availability of funds. The details are given in Table 5.2.

Table 5.2: Issues relating to maintenance of Dams

State	Observations
1. Bihar	An Expert Committee conducted (December 2015) a safety review of two Dams[44] for suggesting remedial measures. Defects and deficiencies observed in the dams during inspection were, however, not rectified as Department had not provided any funds for the same. Due to siltation, water storage capacity of the Badua Dam was found to be reduced.
2. Uttar Pradesh	During scrutiny of 12 test checked dams, it was noticed that neither any programme/norms for maintenance of dams were prepared nor any specific funds for maintenance of these dams were made available. Further, defects and remedial measures[45] pointed out by external agencies on inspection of Rihand Dam (1985) and Maudaha Dam (May 2015) were not rectified due to non-sanction of funds for the purpose.
3. West Bengal	Kangsabati Kumari Dam, constructed in the year 1965, required maintenance and repair of boulder on slope for a slope length of 3,270 m at a cost of ₹ 99 lakh. However, only 1,680 m was taken up in 2015-16 at a cost of ₹ 22 lakh. The Department accepted the fact and stated (June 2016) that the complete work of repair could not be taken up due to paucity of funds.

Thus, although maintenance of dams was an important issue, there were short comings such as non-preparation of programme for maintenance of dams and non-provision of adequate funds to carry out maintenance of dams. Inadequate maintenance of dams in spite of serious defects pointed out by expert committees placed the safety of the dams and the surrounding population at risk.

5.5 Conclusion

There were huge delays in completion of RMABA projects which were long term solutions for the flood problems of Assam, North Bihar and Eastern Uttar Pradesh. There were discrepancies in execution of works like irregular award of work, splitting of tenders and payment at higher rates. Out of 4,862 completed dams in the country, Emergency Action Plans/Disaster Management Plans of only 349 dams were prepared. A time bound initiative for preparation and implementation of Emergency Action Plans including preparation of inundation maps and

[44] Chandan Dam under Irrigation Division, Baunsi and Badua Dam at Irrigation Division, Bijukhorwa.

[45] Rihand Dam - cracking of concrete on the upstream and downstream faces of the dam and power block intake structure, separation of the secondary concrete of power house intake gate grooves from primary concrete and dislodging of the gate guides; and cracking of RCC columns in pen stock gallery of power house and consequent exertion of pressure on turbine mass concrete. Maudaha Dam - seepage in drainage gallery, immediate repair of flood gate and construction of emergency exit upto DSL level, etc.

hydrological studies for all the large dams, was not observed. Dam Safety Legislation initiated in 2010 has not been enacted till August 2016. Pre and post monsoon inspection were not carried out in most of the States/UT. Programme for maintenance of dams were not prepared and adequate funds were not provided to carry out structural/repair works.

5.6 Recommendations

We recommend that

i) MoWR, RD&GR may prepare a time bound action plan to accelerate the completion of all the long term RMABA projects to facilitate the long term solution to the flood problem of Assam, North Bihar and Eastern Uttar Pradesh from annual floods.

ii) MoWR, RD&GR may, in consultation with State Governments, devise a time bound action plan for preparation and implementation of Emergency Action Plans including preparation of inundation maps and hydrological studies for all the large dams in the country.

iii) MoWR, RD&GR may advise the State Governments to prepare Standard Operating Procedures for dams and carry out the prescribed pre and post monsoon inspection of the dams.