

Minutes of the nineteenth National Committee on Dam Safety meeting held on 29.6.98 at Central Water Commission, New Delhi.

The nineteenth meeting of National Committee on Dam Safety (NCDS) was held on 29th June 1998 in Central Water Commission (CWC) New Delhi under the Chairmanship of Shri Z.Hasan, Chairman, CWC and Chairman, NCDS.

The list of officers/representatives of various States / Organizations who attended the meeting is given as Annex.I

The meeting started with felicitations to Shri Z.Hasan by the committee members, on his taking over as Secretary, Ministry of Water Resources, Government of India on 29 June 1998. The Chairman welcomed the members and gave his impression about the importance of dam safety and the on-going activities in India. Before the meeting commenced, copies of letter No.3/19/NCDS/NRLD/97/DSM/1423-55 dated 23.6.98 were recirculated among the members with a request to make available latest information about the dams by July 1998 to update National Register of Large Dams published by CWC in 1994.

The Chairman asked the Chief Engineer (DSO) who is Member Secretary to take up the agenda items for deliberations.

After a brief introduction and before taking up the agenda items, Chief Engineer (DSO) gave details of the progress achieved in the on-going dam safety project which was stated as satisfactory by the World Bank and requested the four participating States to achieve the required target in the stipulated time. Many member States, apart from the four participating States, expressed their willingness to participate in the proposed Phase II of DSARP. It was informed that in the proposals received from the State Governments, only the details of fund requirement have been given. However, requirements to be fulfilled on dam safety activities in the States for World Bank funding have not been furnished by member States. Therefore, all the States were requested to give a fresh updated proposal with all such details. After this, with the permission of the chair, Chief Engineer (DSO) took up the agenda items for discussion.

19.1.0 Confirmation of the minutes of 18th meeting of NCDS.

The minutes of 18th meeting were circulated to all the members of NCDS and State Dam Safety Cells vide CWC letter No.3/19/NCDS/97/DSM/47-83 dated 12.1.98. No significant comments / modifications were suggested by the member States / Organizations of NCDS. Comments of minor nature were taken

care of in the Agenda note for the 19th meeting. As such, the minutes of 18th meeting, as circulated were confirmed.

19.2.0 Status of implementation of Dam Safety Assurance and Rehabilitation Project (DSARP) for information.

19.2.1 Director (DSM), CWC was asked to inform the members about the status of the project. He informed that an IDA mission comprising of S/Shri O.Myint, E.V.Jagannathan, M.M.Shah, D.J.Baxi and R.K.Malhotra reviewed the DSAR Project from 11.6.98 to 26.6.98. During this period Gomukhi dam in Tamil Nadu, Hirakud and Darjing dams in Orissa, Pillowa, Tigra, Kotwal and Pagara dams in Madhya Pradesh and Parbati dam in Rajasthan were inspected for the remedial works. The mission carried out detailed discussions and desk review of the project implementation with the senior engineers of the States and held wrap up meetings with Secretaries of Water Resources of the respective States. The mission reviewed Central component of CWC at New Delhi on 20.6.98 and the wrap up meeting with Secretary, MoWR, Government of India at New Delhi was held on 26.6.98. The World Bank Mission reviewed progress of each component of the project, viz. institutional strengthening, basic dam safety facilities and remedial measures. Though overall progress of the project was satisfactory, the mission pointed out deficiencies in one or two components to the respective States for immediate attention, especially for basic dam safety facilities and remedial measures in which the progress could have been speeded up. All the participating States were requested by the Mission to speed up activities to achieve the targets. It was informed that completion of the Phase I project as per revised schedule was essential for approval of the Phase II of the DSARP covering some more States.

19.3.0 Review of National Scenario

19.3.1 The States and representatives of dam-owning agencies were requested to intimate fresh cases of distress in dams, structural and operational deficiencies noted during the monsoon and failure cases, if any, since the last meeting. All the States/dam-owning Organisations were asked to give a report if any such incident had occurred and not reported.

19.3.2 Accordingly the representatives of Madhya Pradesh gave details about the failure of Gate No.25 of Mohini Pickup Weir in Shivpuri District and the remedial measures undertaken for information of other members of the committee. The Chief Engineer, BODHI of

Madhya Pradesh explained about the failure of Gate No.25 when the level of reservoir was 906.25 ft. (276.25 M) due to failure of one of the end arms. It was basically due to failure of welding joints, which resulted in detaching of the arm as well as bracing of the gate support. The Chief Engineer confirmed that the gate has been replaced by the contractor free of cost and now there is no problem with the gate.

No State/Organisation reported any such fresh cases of distress in their dams.

19.4.0 Progress of implementation of the recommendation of "Report on Dam Safety Procedures."

19.4.1 The States had been requested to implement the recommendations contained in the "Report on Dam Safety Procedures" circulated in 1987 and send a consolidated report indicating achievements on various issues and highlight the issues which are difficult to implement.

19.4.2 During the 19th meeting, the States of Bihar, Gujarat, Karnataka, Maharashtra and Tamil Nadu submitted the latest report. The States of Madhya Pradesh, Orissa, Rajasthan, BBMB & NHPC renewed their previous reports.

19.4.3 All other States/Organisations were requested to send consolidated report, highlighting the achievements on the implementation of the recommendations of the "Report on Dam Safety Procedures" by giving the latest information. The representative of West Bengal expressed his difficulty in sending a report as there was no full fledged Dam Safety Cell in West Bengal. Chairman desired that CWC should write to Secretary, Water Resources, West Bengal highlighting the importance of Dam Safety so that a Dam Safety Cell can be formed in the Water Resources Department of West Bengal.

19.5.0 Dam Safety Legislation

19.5.1 During the 17th meeting of the Committee, the Chairman had explained the importance and need to finalise the draft legislation. He desired that the draft legislation be finalised by incorporating the comment received from States/ Organisations.

The following States have already communicated their concurrence at their Government level with comments.

1. Andhra Pradesh
2. Gujarat
3. Maharashtra
4. Orissa
5. Rajasthan
6. Tamil Nadu
7. Kerala
8. Bihar
9. Uttar Pradesh

The Government of Madhya Pradesh have agreed in principle for the Dam Safety Legislation but it is still under examination at the level of Government of Madhya Pradesh. West Bengal also have given their comments on the draft legislation but concurrence by Government of West Bengal has not been received. All other member States have agreed in principle for Dam Safety Legislation barring Karnataka. They were once again requested to reconsider their decision in favour of legislation.

- 19.5.2 Chairman desired to recast the draft legislation in the light of the comments received from the States so far and to obtain the concurrence of Government of India so that the legislation can be adopted.

19.6.0 Preparation of emergency action plans and inundation maps for d/s area

- 19.6.1 A decision for preparation of inundation maps and emergency action plans for d/s areas of dams of National Importance by all the States was taken during the earlier meetings. It was also decided that the four participating States of Dam Safety Assurance and Rehabilitation Project (DSARP) namely, Madhya Pradesh, Orissa, Rajasthan and Tamil Nadu under the World Bank assisted project will give priority for preparation of emergency action plans in respect of the 55 identified dams for rehabilitation. The four participating States of DSARP were requested to inform about the total status on this activity during the meeting.

- 19.6.2 It has been reported that formulation of Emergency action plan has been completed for the following dams:

- | | | |
|----------------|---|--------------------------------------|
| 1. Rajasthan | - | 4 dams, none of them is a dam of NI |
| 2. Maharashtra | - | 72 dams, none of them is a dam of NI |
| 3. NHPC | - | One dam of NI (Salal dam) |

The following States / Organizations have initiated work for taking up Emergency Action Plans for the following dams:

NHPC	-	Bairasul
Gujarat	-	Karjan, Ukai, Kadana
Tamil Nadu	-	Sathanur, Vidur, Gomukhi, Ponnaniar, Uppar, Gunderipallam, Amravathy, Manimukthanadi, Pechiparai, Perunchani, Willingdon, Siddamalli
Rajasthan	-	Ranapratap Sagar, Jawahar Sagar
Madhya Pradesh		Gandhi Sagar, Tawa
Orissa		Godahado, Hirakud

Punjab Irrigation Department has not reported progress in preparation of Emergency Action Plans for the downstream areas of the dams which are controlled by Bhakra Beas Management Board (BBMB). BBMB informed that the matter has been taken up with Irrigation Department, Punjab. NHPC reported that cross-sections of all dams have been completed but they could not make any progress further for want of Mike-II Software. The NHPC was advised for procurement of a dongle, the software key, directly from Danish authorities. Bihar has reported that the two dams of National Importance, i.e. Maithon and Panchet in Bihar are under the control of DVC. Accordingly DVC was advised to take up the work. All the States / Organizations were requested to take up the preparation of Emergency Action Plans and inundation maps for all the dams of National Importance under their control.

19.7.0 Compilation of data book

- 19.7.1 As per decision taken by the NCDS, "Data Book" for dams of National Importance (NI Dams) was to be prepared by the respective States and sent to DSO/ CWC for record/reference.
- 19.7.2 Andhra Pradesh, Bihar, Gujarat, Karnataka, Rajasthan, Tamil Nadu as well as BBMB and NHPC have submitted Data Books for dams of National Importance; Maharashtra has submitted Data Book for Paithan and Ujjaini Dams out of 5 dams of National Importance located in the State. Maharashtra has also prepared additional "Data Books" for 97 large dams. Orissa has submitted Data Book for 4 out of 5 dams of National Importance under the State (Salandi, Rengali, Balinela, Upper Kolab). Madhya Pradesh reported that "Data Books" for 2 dams of National Importance

have been prepared and in addition "Data Books" for 14 nos. of dams of State importance have also been prepared.

- 19.7.3 Till date, data on 32 dams (out of 56 dams - 46 completed and 10 under construction) of National Importance have been completed. "Data Books" are yet to be completed for the remaining 14 completed dams. These are awaited from Kerala (5), Maharashtra (3), Orissa (1), Uttar Pradesh (4) and West Bengal (1). All the States were requested to finalise and send the Data Books to DSO/CWC at the earliest.

19.8.0 Preparation of completion report of large dams

- 19.8.1 Completion report of all large dams (total 3596 dams) are to be prepared by the respective States giving priority in the first phase to dams of National Importance.
- 19.8.2 As per the information received from the States, the following States have prepared completion reports for the following number of dams:

Karnataka	19
Maharashtra	43
Orissa	2
Uttar Pradesh	123
Rajasthan	2
Tamil Nadu	7
BBMB	<u>3</u>
Total	<u>199</u>

The States of Rajasthan, Bihar, Madhya Pradesh, Gujarat, Karnataka and Orissa have decided to engage consultants for this work. Gujarat have initiated the work for National Importance dams. ToR is under preparation in Madhya Pradesh. Rajasthan has submitted the proposal to the Government. The State of Andhra Pradesh has written to the concerned field Chief Engineers will initiate and complete the work. Kerala, West Bengal and NHPC & DVC have not reported the latest progress in this regard. Chairman observed that the progress on preparation of completion report on large dams is very slow and desired that the States / Organizations should identify the large dams under their jurisdiction and list out the dams for which completion reports have yet to be prepared. He desired that an action plan be drawn up by the dam-owning Governments for preparation of completion reports. A copy of the action plan be given to DSO unit of CWC.

19.9.0 Preparation of Operation and Maintenance Manual

19.9.1 During the previous meetings it had been emphasised that O&M Manual is an important document for operation and maintenance of dams and this manual should be available before commissioning of each project. As O&M manuals have not been prepared for several of the dams, this needs to be taken up without any further delay and completed expeditiously by the respective States/Organisations owning the dams. Emphasis was also laid on the need for standardization of O&M Manuals. This will help expedite the matter.

19.9.2 Present status on preparation of O&M manuals is given below:

BBMB	-	All dams
Uttar Pradesh	-	All dams
Tamil Nadu	-	All dams
KSEB	-	All dams
NHPC		Guidelines for operation of each dam under the organisation is prepared.
Rajasthan	-	All dams with ungated spillways & 3 gated dams.
Maharashtra	-	67 dams
Orissa	-	20 dams
Madhya Pradesh	-	7 dams

Andhra Pradesh reported that Gate operation schedules for 3 dams of National Importance have been prepared. Preparation of O&M Manual has been initiated for 9 dams in Gujarat and for 2 dams in Karnataka. Madhya Pradesh has taken up preparation of O&M manuals for 24 gated dams on priority basis.

The States of Bihar and West Bengal have yet to initiate the work. The Irrigation Department of the State of Kerala has not given any information. All the States / Organizations were requested to give the priority to the preparation of O&M Manuals and to complete it at the earliest.

19.9.3 On the basis of information from West Bengal and TNEB, Chairman desired that CWC should address to higher authorities of the States elaborating the importance of O&M Manuals.

19.10.0 Periodical inspection of dams and report on dam safety activities in the States

19.10.1 The States/Organisations were requested to carry out periodical inspection of dams and send a consolidated annual report on the status of dams and dam safety activities under the title "Health Status of Dams and Dam Safety Activities in the States" to DSO/CWC. Copies of the format were circulated by DSO/CWC to all the States/Organisations and State DSOs to bring uniformity in reporting.

19.10.2 The reports received by DSO/CWC are given below:

Bihar	-	upto December 1997
Rajasthan	-	upto December 1997
Maharashtra	-	upto June 1997
Andhra Pradesh	-	upto May 1998
Orissa	-	upto February 1996
Tamil Nadu	-	upto April 1997
Madhya Pradesh	-	upto March 1997
Gujarat	-	upto December 1996
NHPC	-	upto December 1997

Gujarat reported that Annual report for the period 1.1.97 to 31.12.97 will be submitted shortly. The reports from Karnataka, Orissa and Tamil Nadu are under preparation.

DVC has submitted a brief report for the dam under them for 1998 during 19th meeting. NHPC has submitted the inspection report of Chamara HE Project for the inspection conducted in February 1998. All the States were requested to submit consolidated reports on yearly basis for all the large dams under them covering pre- and post-monsoon inspection and other details.

19.11.0 Safety review of large dams (once in ten years)

19.11.1 In accordance with the recommendations contained in the "Report on Dam Safety Procedures (1987)," safety review of large dams which are more than 15m in height or which store 60 million cu.m or more of water are to be carried out by an independent panel of experts once in ten years. For this purpose, experts' committees comprising of only those officers from the States who were not connected at any stage either with construction or maintenance of the structures are to be constituted.

19.11.2 By the year 1997 the ten year term was over. No States / Organizations have completed the safety review of all the dams once in ten years. Andhra Pradesh has constituted 2 Dam Safety Review Panels who have inspected 17 dams and a proposal has been sent to the Government to sanction one more panel so as to complete the remaining dams by 2000 AD. An Expert Committee has been constituted and safety inspection of dams is in progress in Bihar. Gujarat has completed inspection for 250 dams and the State will be able to complete inspection for the remaining dams by 1999. Forming of an Expert Committee is under active consideration in the State. In Karnataka, proposal for expert panel has been sent to the Government for approval. Expert Committee for the large dams has been constituted in Madhya Pradesh. Rajasthan is still to constitute an expert committee. Phase I inspection of large dams has been completed in Tamil Nadu. In West Bengal, inspection of only one dam (Kangsabati) has been completed. Uttar Pradesh has reported that an independent expert panel was still under consideration of the Government and requested for the names of experts from CWC. In Maharashtra, the Government has appointed six regional committees headed by the Regional Chief Engineers for structural review of large dams. A workshop was also organised in the State in November 1997 for this purpose. Orissa reported that large dams were being inspected by the State DSO once in five years and action has been initiated for forming expert committee for structural review of dams once in ten years.

Even though some of the States are conducting the review work through their own officers, it was desired that the safety of dams must be reviewed by an independent panel of experts, once in ten years.

NHPC, DVC and KSEB were asked to give the latest position. No information is available from Kerala Irrigation Department.

Orissa and Maharashtra have yet to intimate the latest position in this regard. Kerala has reported that expert committee is set up exclusively for safety aspects of distressed dams but the State is required to constitute expert committee for safety review of all large dams once in ten years. Although it is understood that some progress in safety review of dams has been achieved, all the States were reminded that the first 10 years period starting from 1987 is already over but the progress on this front has not been encouraging. All the

States/Organisations were requested to complete the work at the earliest.

19.12.0 Safety status of dams of National Importance (NI)

19.12.1 The States have been requested to prepare safety status of 46 completed dams of National Importance in the prescribed proforma circulated by DSO/CWC.

19.12.2 Andhra Pradesh, Bihar, Gujarat, Karnataka, Maharashtra, Madhya Pradesh, Orissa, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal, BBMB and NHPC have submitted reports for the dams of National Importance totalling 40.

Kerala (Irrigation Department) and KSEB have not yet furnished any information for the 5 dams under them.

19.12.3 All the States/Organisations were requested to send details of any further progress with regard to the safety status of dams of National Importance in their States.

19.12.4 Comprehensive Dam Safety Review covering entire hydrological & structural aspects of Tungabhadra dam in Karnataka has been taken up by Tungabhadra Board through CWC. It was stressed that similar comprehensive reviews of dams of National Importance should be undertaken by the States / Organizations.

19.13.0 Monitoring safety report of inter-State dams by sub-committees

19.13.1 Three sub-committees were set up during March 1990 to monitor the safety aspects of inter-State dams in (a) Parambikulam Aliyar Project (PAP), (b) Mahanadi River System and (c) Subarnarekha River System.

19.13.2 Committee for Parambikulam Aliyar Project held 2 meetings in 1991 and 1992; Committee for Mahanadi River System held a meeting in 1992; and Committee for Subarnarekha River System has held only one meeting in 1993. Subsequently no meetings have taken place.

Tamil Nadu had reported follow up action in February 1995. But the latest position is not known. No meeting has taken place since then. Kerala has also not given the latest position. Tamil Nadu was requested to write to Kerala on this matter.

- 19.13.3 The Chief Engineer, Orissa has written some letters to Chief Engineer, Madhya Pradesh to fix a date for the second meeting of Mahanadi Basin and in another letter to Chief Engineers of Bihar and West Bengal, have been requested to attend the third meeting of Subarnarekha System. During the 19th meeting, it was agreed to convene the meeting in July 1998 by the concerned States. CWC has also to monitor this inter-State aspect and may pursue with the concerned States for holding meetings and for follow up actions.

19.14.0 Setting of hydrological units in the States for review of hydrology of existing dams

- 19.14.1 Hydrology of all existing dams is required to be reviewed by setting up/ strengthening the existing Hydrology Units in the States. Some States/Organisations have already initiated actions for strengthening/setting up of Hydrology Units and have also taken up review of hydrology of selected dams.

- 19.14.2 Progress made in setting up of Hydrology Units is given below:

Status of completion of hydrology review

Orissa	-	46 dams
Tamil Nadu	-	17 dams
Rajasthan	-	All large dams
Gujarat	-	156 dams
Madhya Pradesh	-	40 dams

No information is available from other States / Organizations.

Separate Hydrology Unit established

1. BBMB
2. NHPC
3. Orissa
4. Maharashtra

Hydrology review by existing units

1. Gujarat
2. Madhya Pradesh
3. Bihar
4. Rajasthan

Action for strengthening of existing units initiated

1. Andhra Pradesh
2. Karnataka
3. Tamil Nadu
4. West Bengal
5. Uttar Pradesh

No information is available from Kerala in this regard.

It was informed that in case hydrology review of dams is not possible by the States themselves, they can utilise the services of CWC, NHPC or any other consultants of repute for completion of review work of existing dams.

19.15.0 Instrumentation for dams

19.15.1 NCDS had decided that the States may take stock of the status of instrumentation in all large dams to know the performance of instruments, their mortality rate, periodicity for analysis of data, carrying out the analysis and forwarding them to the designers for evaluation, status of structural behaviour reports and adequacy of the staff engaged for this job etc. So far information for the instrumented dams has been received from the following States/Organisations:

1. Andhra Pradesh
2. BBMB
3. Gujarat
4. Karnataka
5. Kerala
6. Madhya Pradesh
7. Maharashtra
8. Orissa
9. Tamil Nadu
10. N.H.P.C.
11. Rajasthan

The information on instrumentation is required to be supplied to CWC by all the States on the following format:

1. Name of dam
2. Name of instruments
3. Date of instrumentation
4. Working condition of instruments
5. Position of data analysis
6. Results

- 19.15.2 All States/ Organisations were requested to give the status of instrumentation (as per the above 6 items) to the committee. It was desired that analysis of instrumentation data must also be done for evaluating safety of the dams.

19.16.0 Installation of standard meteorological instruments.

- 19.16.1 All the States were requested to supply detailed information as per specified list of items on the type of meteorological instruments installed in the catchment areas and reservoirs of large dams for meteorological observations.
- 19.16.2 The States/Organisations were also asked to give details about the availability of standard meteorological instruments with working condition. Actual data is not required to be furnished. Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu, BBMB and NHPC have supplied information in respect of a few dams. Kerala, Orissa, Uttar Pradesh and West Bengal have been requested to expedite submission of information. Bihar has reported that only rain gauges are established at all the dam sites except Chandil dam where other standard instruments are also available. All the States and DVC were requested to furnish individual dam-wise information on the above item for all the dams under their control..
- 19.16.3 The States were requested to prepare a performance report of the meteorological instruments for each project before the onset of monsoon and send them to CWC by the end of May every year. No such reports have been received. All the States were once again requested to send such a report.

19.17.0 Seismic studies of dams

- 19.17.1 DSO/CWC has made available copies of documents "Guidelines for inspection of dams following earthquake" to all the States/Organisations with a request to make use of these guidelines and report to the Committee about safety status of dams immediately after occurrence of earthquakes.

The latest incident that was reported was an earthquake of intensity 6 on the Richter Scale, with its epicentre about 20 kms north-east of Jabalpur city in Madhya Pradesh occurred in the early morning of 22.5.97. The representative from Madhya

Pradesh confirmed that no dam was facing any dam safety problem in the affected area.

All States/Organisations have confirmed non-occurrence of any such damages for dams under their control.

19.18.0 Need for Research and Development in Dam Safety

- 19.18.1 All the members of NCDS were requested to suggest areas requiring research and development of projects in the field of dam safety in particular and Water Resources Sector in general and send their suggestions to DSO/CWC. The Chairman during the last few meetings had desired that the States may examine the areas/fields to undertake research on a subject of their choice. They may also prepare report on the schemes for research and send the same to one of the 5 national Committees set up for taking up research schemes under Water Resources Sector. Three reports were submitted by NHPC. The scheme sent by NHPC has been examined by R&D Directorate, CWC. No other States/Organisations has submitted R&D proposals as per information available with R&D Directorate of CWC.

19.19.0 Proposal for rehabilitation of distressed dams in India during the IX Five Year Plan

- 19.19.1 An estimate for rehabilitation of dams under distress in 12 States, viz. Andhra Pradesh, Bihar, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal has been sent to the Ministry of Water Resources, Government of India for inclusion in the IX Five Year Plan. Total amount provided in the tentative estimate has been revised to Rs.862.5 crore. The States have been requested to submit detailed proposals along with the estimates in respect of the distressed dams in their States that need rehabilitation. Provisions have been made in this scheme, as per the available information for the States in CWC. The States were requested to send details along with the estimates for consideration by the Planning Commission and subsequent external funding, if possible. Latest information available for provision in IX Plan prior to 19th meeting is given below:

Gujarat	-	Rs.32.36 crore
Bihar	-	Rs.70.00 crore
West Bengal	-	Rs.10.28 crore

During the 19th meeting, information received from various States are as under:

Madhya Pradesh	-	Proposal sent to their Government
Orissa	-	Proposal awaited from field formations.
Tamil Nadu	-	Rs.118.50 crore (IX Plan) proposal Submitted
Karnataka	-	Proposals awaited from field units.

A copy of the letter No.3/19/NCDS/98/DSM/ dated 29.6.98 enclosing the details to be supplied for IX Plan proposal which was circulated earlier was again circulated during the meeting with a request to all the States for updating their proposals.

19.20.0 (i) Guidelines and standards on assumptions to be made for potential gate malfunction, pre-flood reservoir level, free board and other relationship for routing the flood through reservoir for the process of computing the inflow, outflow and storage.
(ii) Hazard classification of dams

19.20.1 Copies of these guidelines have been sent to all NCDS members and Dam Safety Cells in the States and other organisations by CWC vide letter No.3/10-A/DSM/Guidelines/ 1590-1625 dated 30.12.96 and No.16/1/95/DSRD dated 23.10.96 respectively. Suggestions for improvement in the content, coverage and presentation have been received from the States of Gujarat, Karnataka, Maharashtra and Tamil Nadu. Information given by other States are as under:

Andhra Pradesh	-	Comments awaited from field units
Orissa	-	Under study
Rajasthan	-	Under study

Comments received from Bihar, Gujarat, Madhya Pradesh, Maharashtra, Orissa and Tamil Nadu on Hazard classification of dams are being analysed by DSR Directorate, CWC to incorporate them in the guidelines.

All the other States / Organizations were requested to give their comments / modifications, if any, at the earliest.

19.21.0 Risk Analysis in Dam Safety Engineering

There is a need to adopt and implement modern risk based approaches to Dam Safety Management in India. A proposal has

been formulated by CWC for training Indian engineers for this work. The training includes organising trainings/workshops on risk analysis in India and abroad. The main objectives of this training are

- a) to create awareness of the potential benefits and limitations of risk based approaches to dam safety management at all levels;
- b) to identify opportunities for beneficial adaptation and use of risk based approaches to dam safety management in India;
- c) to recommend approaches for prioritising or classifying dams for detailed safety investigation and allocation of funds for remedial actions;
- d) to sharpen the focus of further activities for Indian engineers in India and prepare draft guidelines for risk analysis in dam safety engineering.

This training in Risk Analysis is proposed to be funded under DSARP which is under implementation at the Centre and four States, viz. Madhya Pradesh, Orissa, Rajasthan and Tamil Nadu. Terms of Reference for engaging consultants for imparting training on Risk Analysis have been cleared by the World Bank and Letter of Invitation has been sent to some consultancy firms for their offer on consultancy for Risk Analysis.

The members from the States of Madhya Pradesh, Orissa, Rajasthan and Tamil Nadu confirmed that they would participate in the training.

19.23.0 Demonstration of Gate Operation Simulation Model (Version 2.0)

CWC has developed a software package, i.e. Gate Operation Simulation Model for training gate operators for emergency operation of gates during high flood and PMF conditions. This software model has been developed under the World Bank assisted DSAR Project. During 18th meeting, a demonstration of this model was made by Director, Software Management Directorate, CWC and a floppy containing the software model was given to all the respective States/Organisations for their review and comments, if any. The members from BBMB, Rajasthan and Andhra Pradesh informed their difficulty in operation and requested for training in this case. CWC agreed to this. Karnataka has sent the software to field units and comments are awaited.

The meeting ended with a vote of thanks to the Chair.