Minutes of the 39th meeting of National Committee on Dam Safety (NCDS) held on 12 February 2019 at Bhubaneswar

Thirty-ninth (39th) meeting of National Committee on Dam Safety (NCDS) was held on 12nd February 2019 at 10:00 hrs. in Bhubaneswar, under the Chairmanship of Shri S.Masood Husain, Chairman, Central Water Commission (CWC) and Chairman of the National Committee on Dam Safety (NCDS). List of officers present in the meeting is given at **Annexure-I.**

Engineer in Chief, WRD, Govt. of Odisha, being host State, welcomed all the delegates in the meeting. Shri Gulshan Raj, Chief Engineer, Dam Safety Organisation (DSO), CWC and Member Secretary of the NCDS started the proceedings by welcoming Shri S.Masood Husain, Chairman, Central Water Commission (CWC) and Chairman of the National Committee on Dam Safety (NCDS), Shri N.K.Mathur, Member, (D&R), CWC & Vice-Chairman (NCDS), Smt. T. Rajeshwari, Additional Secretary, MoWR, RD & GR, Govt. of India, Shri P.K. Jena, Principal Secretary, WRD, Govt. of Odisha and other members of the Committee and participants.

Chairman, NCDS formally welcomed all the members of the Committee and other delegates present in the meeting and expressed his happiness on the overwhelming participation. Chairman observed that it is very important to keep our existing water resources infrastructure safe as it is becoming difficult to construct new ones. It becomes all the more important as country has already exhausted almost all the good dam sites. Elaborating on the different dam safety practices, he emphasized on the importance of the pre- & post- monsoon inspections of dams, preparation of operation and maintenance manuals, dam break analysis etc. Besides these dam safety practices he emphasized on the importance of Emergency Action Plan/ Disaster Management Plan (EAPs/DMPs) etc. He further elaborated on the issues plaguing the dam safety aspects and pointed out that NCDS should deliberate upon well-defined protocols.

Smt. T. Rajeshwari, Additional Secretary, MoWR, RD & GR, wished for fruitful discussions in the meeting. She further gave a brief review of DRIP. Praising Odisha for preparation of EAP and O&M Manual of Hirakud dam, she requested all the other States to emulate the same.

Sh. P.K. Jena, Principal Secretary, WRD, Govt. of Odisha, welcomed all the delegates in the temple city of India. He also stressed upon preparation of O&M manual of the all the dams as he felt it is very important for smooth functioning of the dam in long run. Citing lack of capacity in the stakeholders, he pointed that CWC and other such organisations of the world are being looked up to for the same. He was apprehensive about the dwindling manpower as the retiring staff is not being replaced fully with new recruitment. He was thankful to CWC for helping

Odisha in preparation of EAP of Hirakud dam. He also stressed on the need of co-ordination between inter-basin states for effective flow of hydrometric data.

Emphasizing the importance of such meetings, Chief Engineer (DSO) & Member Secretary, NCDS stated that as most of the dam owners were from State governments / PSUs, a unified dam safety procedure may be followed to ensure safety of large dams. Member Secretary, NCDS thereafter took up the agenda items one by one.

39.1 Confirmation of the minutes of 38th meeting

Minutes of the 38th meeting of NCDS circulated vide letter No.3/19/NCDS/DSM/38th meeting/2018/145-183 dated 3rd March, 2018 to all the members of NCDS. As no comments have been received from any member, the same was considered as confirmed by the members.

39.2 Pre- & Post- Monsoon inspection of Dams

Member Secretary, NCDS apprised the status of pre- & post- monsoon inspection reports/ Health Status Reports received from dam owners. He indicated that some States had not carried out the inspections and reports were not submitted. He further informed that most of the inspection reports submitted were not as per CWC guidelines as available on CWC website.

Chairman NCDS requested the dam owners to carryout pre- & post- monsoon inspection of each dam regularly as per CWC revised inspection guidelines and consolidated report of the same should be uploaded on DHARMA. The inspection report normally covers the observations of inspection team and suggested remedial measures. However, it was pointed out that the report is generally silent on actions taken on previous inspections/suggestions.

The Chairman enquired for the reasons for low progress from the members of the state of Andhra Pradesh, Chhattisgarh, Gujarat, Jharkhand, Karnataka, and Telangana, etc. and advised them to expedite the pre- and post- monsoon inspections and further requested them to upload the consolidated reports on DHARMA portal. It was further pointed out that the states/ dam owning agencies have not categorized the dams based on deficiency noticed i.e. Category-I, II and III. Tamil Nadu was congratulated for carrying out inspections and submitting reports for all large dams under their jurisdiction. West Bengal informed the Committee about inspection of 17 large dams. However, it was pointed out that the report is still awaited in CWC. Members of NCDS were urged to carry out pre- and post- monsoon inspection of each large dam under their jurisdiction as per the standard checklist and upload the report on DHARMA and also submit the same to DSO, CWC regularly.

Member D&R reiterated that the inspection report and categories of dam safety issues reported therein are important inputs for taking decision on rehabilitation measures. Such

information available in database of DHARMA shall be the major input for taking decision in including the project in DRIP II & III, which are likely to come in near future.

Director, DSR, CWC informed that 19 dam owning agencies have obtained license ID & password from DSO, CWC and have started using the platform. Other dam owning agencies were requested to obtain license ID & password at the earliest. Representatives of Maharashtra requested more training programs on DHARMA. Vice Chairman, NCDS assured them training program in NWA, Pune, as per their requirements and feasibility. Member Secretary, NCDS informed that training program as requested by Uttar Pradesh and NHPC will be planned in due course of time. Representatives of Punjab State also requested for imparting similar training to their officers. The need for constitution of SDSO to coordinate these pre & post monsoon inspection was emphasised and Chairman directed CDSO to take the matter with State Govts.

(Action: All States/DSOs/ CWC)

39.3 Preparation of Emergency Action Plan (EAP) and Reservoir Operation

Member Secretary, NCDS briefed about the latest status of preparation of Emergency Action Plans (EAPs) for all the large dams by the States/ dam owners. Chairman, NCDS expressed concern over lackadaisical approach in preparation of EAPs as most of these do not include Dam Break Analysis and Inundation Mapping (DBA & IM). He listed out the States/ dam owners such as Chhattisgarh, DVC, Gujarat, Jharkhand, Kerala Irrigation, Kerala Electricity Board, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Tamil Nadu, Telangana, Uttar Pradesh, Uttarakhand, West Bengal and Meghalaya Power Generation who have prepared very few or no EAPs so far.

Vice Chairman, NCDS requested IMD to provide pdf copy of PMP Atlas along with shape files of storm isohyets. IMD has agreed to provide pdf copy of PMP Atlas of Krishna Basin and shape files of the storm isohyets used in PMP Atlas to CWC. The same are required for design flood review studies of the projects in Krishna Basin.

It was decided that the while submitting the design flood review study reports to CWC, State Government should submit the height of dam above river bed level, hydraulic head, gross storage, live storage and exact latitude/longitude of project site in degree, minutes, seconds apart from other salient features.

It was also agreed that inundation map for dam break study and other return period flood occurrence can be prepared using 30 m x 30 m digital elevation models as tier 1 study.

Director, DSM, CWC informed members that CWC, suo-moto, is preparing Inundation Maps (IMs) of some of dams of national importance. He requested the owners of these dams to provide the requisite data to CWC at the earliest and depending upon the states' positive response this exercise can be carried out for all dams of National importance in the interest of states. Moreover, Director, NIH, Roorkee informed the Committee that in the last meeting of NCDS also he had offered his help to dam owners in preparation of EAP and again reiterated his offer in this regard.

Director, DSR, CWC informed that the latest guidelines for preparing EAPs are available on the CWC website as well as the dam safety website i.e. www.damsafety.in. Chairman, NCDS desired timelines from the stakeholders for preparation of EAPs. In this regard, some of the dam owning agencies informed the Committee about their progress, as follows:

- GERI informed that EAP of 23 dams is under preparation and is expected of completions in 6 months.
- Karnataka (47 dams in 2 months), Uttar Pradesh (41 Dams) and Telangana (4 dams) promised to complete EAPs soon.
- Kerala Irrigation & KSEB informed that all the EAPs will be complete by April.
- West Bengal will prepare EAPs of 2 dams with the help of WAPCOS.
- Maharashtra will try to complete EAPs of more than 100 dams in a year, as a PIL is in honourable High Court of Maharashtra and the matter has been taken up in mission mode.

Chairman, NCDS asked the member states to prioritize their dams in order of their vulnerability. He further stressed that completed EAPs need to be uploaded on website, so that all NCDS members may benefit and gain experience.

(Action: All States/DSOs/ CWC)

39.4 Dam Safety Bill

Vice Chairman, NCDS briefed the Committee about various provisions of the Dam Safety Bill, as introduced in Lok Sabha on 12th December, 2018 upon the request of Chairman, NCDS. Member Secretary, NCDS informed the Committee that though the Bill was placed in the Parliament but it could not be taken up for discussion due to objections of some of the honourable Members of Parliament.

39.5 Instrumentation of Dams

39.5.1 Strengthening of seismic instrumentation as per the decision of National Committee on Seismic Design Parameter (NCSDP)

Member Secretary, NCDS introduced the issue and emphasised all member states of NCDS to carry out minimum seismic instrumentation in the dams situated in seismic zone IV and V as the same needs to be strengthened. Vice Chairman, NCDS advised that instrumentation of these dams should be as per revised guidelines of seismic instrumentation available on the dam safety website i.e. damsafety.in. All NCDS member states were requested to take advantage of the guidelines and plan the instrumentation of dams under their jurisdiction accordingly. He further informed that those member states who are yet to submit proposal for DRIP-II may have to mandatorily include the instrumentation plan in their proposals for preparation on preferential basis.

Representative from Uttarakhand informed the Committee that Uttar Pradesh has financial constraints for dam instrumentation located in Uttarakhand & owned by Uttar Pradesh. Hence these dams should be included in DRIP-II proposal of Uttar Pradesh.

(Action: All States/DSOs/ CWC)

39.5.2 Strengthening of other instrumentations of large dams

It was mentioned that all the States/DSO's were requested during earlier NCDS meetings to submit separate detailed report on performance of existing instruments installed in the dam body and foundation including analysis of data with permissible limits of instruments in prescribed format to the Director, Instrumentation Directorate, CWC on yearly basis. The State Governments/DSOs were advised to ensure proper functioning of instruments and make sure that at least the basic instruments, i.e. plumb line, V-notch & survey settlement point etc. are in working condition. Dy. Director General of GSI informed the Committee that GSI can also take up the instrumentation work of dams.

Dam owning agencies were requested to install at least those instruments measuring parameters which are very important for maintenance of the dams such as extra survey points (for deformation), crack meters (cracks), Joint meter (differential settlement), instruments for measuring uplift pressure & pore pressure and plumb line etc.

(Action: All States/DSOs/ CWC)

39.6 Dams of national importance

Dams of height 100 metre and above or gross storage capacity of 1 billion cubic metres and above have been defined as dams of national importance. As per the National Register of Large Dams (NRLD), there are 65 completed large dams in the country classified as dams of national importance. The State Govts./ Project Authorities have pointed out issues of dam safety in respect of only following large dams of national importance:

39.6.1 Bhakra Dam (Punjab)

Member Secretary, NCDS briefed the Committee about the issues concerning the Bhakra dam viz, excessive deflection of the dam body and requested the representative from the BBMB to explain the latest status. Chief Engineer BBMB informed that a MoU had been signed between BBMB and M/s Dassault System on 14.11.2017 for technical assistance in FEM studies of this dam which were to be conducted in CWC. He informed that 3-D FEM analysis is being carried out in CWC in association with M/s Dassault System and report will be submitted by March, 2019.

He informed that PMF studies of Bhakra Dam have already been completed and for Pandoh it is under review with IMD.

Chairman, NCDS requested that PMP studies of Pandoh may be finalized in association with IMD, New Delhi at the earliest..

(Action: BBMB, IMD, CWC)

39.6.2 Srisailam Dam (Andhra Pradesh)

Member Secretary NCDS enquired about the status of design flood review of Srisailam dam to increase the spillway capacity. Chief Engineer, Andhra Pradesh informed that the PMF studies (73852.3 cumecs) of the dam were carried out by the consultant alongwith departmental staff. Also the issues had been referred to a dam safety panel of experts (PoE) under chairmanship of Shri A.B. Pandya, former chairman of CWC. As suggested by PoE regarding the erosion of plunge pool located opposite to 4^{th} to 16^{th} blocks on the natural river course, the bathymetric survey work entrusted to the National Institute of Oceanography (N.I.O.), Vishakhapatnam was completed and the final report is awaited. The underwater videography was entrusted to N.I.O., Goa and survey work is yet to be started.

He further stated that for the eroded portion of the apron, the projection measures at the toe of dam opposite to block nos. 6 & 8 at downstream of spillway bucket is under progress (30 % completed). The Committee was further informed that the work of preparation of emergency

action plan (EAP) and dam break analysis (DBA) alongwith inundation maps was entrusted to NIH, Roorkee. The studies were not done for the PMF. Hence the same alongwith other remarks/suggestions were communicated again to NIH, Roorkee for revised report.

(Action: State of Andhra Pradesh,)

39.6.3 Ranjit Sagar Dam (Punjab)

Representative of Punjab informed the Committee that no issue was involved in the dam and hence may be dropped from this list for future meeting agenda.

39.7 Other Dams

39.7.1 Gararda Dam (Rajasthan)

As per discussion of 38th meeting, representative of State Govt. of Rajasthan informed that works of rehabilitation of the Dam were under progress as per the drawings issued by CWC. The Rehabilitation works would be completed by February, 2020. The Committee advised State Govt. representatives to establish some third party evaluation mechanism for quality control. The state govt. representative informed that work is going on and Quality Assurance has been assigned to third party and a MoU has already been signed in this regard with CSMRS. Third party will check the already completed work alongwith future work.

(Action: State of Rajasthan, Chief Engineer (NW&S), CWC)

39.7.2 Temghar Dam (Maharashtra)

Representative from Maharashtra informed the NCDS that rehabilitation works started in February, 2017 as per the recommendation of the Committee of experts. He informed the Committee that 50% of grouting work had already been completed and 80% leakage was reduced. Polyfibre Reinforced Shotcrete (PFRS) has been proposed for upstream treatment and Dynamic analysis will be done after grouting.

(Action: Chief Engineer (NW&S), CWC, State of Maharashtra)

39.7.3 Maudha Dam (Uttar Pradesh)

Member Secretary, NCDS enquired about the status of the rehabilitation proposal of the dam as directed in the last meeting. Representative from Govt. of UP informed the Committee that the proposal has been submitted to the Govt. of UP. He informed the Committee that the work has got delayed due to financial constraints and assured that matter will be pursued with the Govt. The Chairman expressed that the issue of rehabilitation needs to be taken seriously by the State Govts., giving it its due attention.

(Action: State of Uttar Pradesh and CWC)

39.7.4 Durgawati Dam(Bihar)

The Committee was informed that a team of CWC officers visited the dam site and suggested to fill the dam gradually upto FRL & measure discharge in order to find connection between reservoir level and discharge through relief well. The representative of Bihar informed the Committee that reservoir was filled upto EL 122.0 m during last monsoon and the seepage discharge was found to be stable. However, the report on the same is still awaited from the sate govt. the Committee was further informed by the representative of the Bihar that the construction of two relief wells, as suggested by the CWC team, is under progress.

Chairman, NCDS requested to the Govt. of Bihar representative to submit the report as suggested to Secretariat of NCDS at the earliest.

(Action: State of Bihar/ CWC)

39.8 Comprehensive Dam Safety Review Panel (DSRP)

Member Secretary, NCDS mentioned that as per Dam Safety Procedures, the States/ DSOs shall arrange comprehensive safety review of dams which are more than 15 meters in height or which store 50000 acre feet ($60Mm^3$) or more of water by an independent panel of experts once in 10 years. He informed that some of the States have not even constituted independent panel of experts i.e. DSRP.

Chairman, NCDS enquired about the States which had not constituted DSRP, and the reasons for the same. It was observed that States/Agencies viz. Jharkhand, Uttar Pradesh, Uttarakhand, West Bengal and MePGCL have not yet constituted DSRP. Gujarat has formed 2 DSRPs as per CWC guidelines. Representative from Govt. of UP informed that DSRP will be formed in February, 2019, as soon as a government order is issued. Uttarakhand informed that DSRP was not constituted because the state owned only 4 dams. However, Chairman, NCDS apprised that there should be DSRP for even a lesser number of dams ownership. Vice Chairman, NCDS suggested the state can use the services of the DSRP's of PSU's owning dams in their state. Representative of West Bengal informed the Committee that they will form a DSRP by December, 2019. On the request of Kerala, Chief Engineer (DSO), CWC informed the Committee that being Chairman of Mullaperiyar Supervisory Committee, he will recommend inspection of this dam by DSRP, since the last comprehensive inspection of the dam was done at about 10 years back.

Issue of security of the dam was raised by Chief Engineer (DSO), CWC in lieu of references received in DSO, CWC. Chairman, NCDS also emphasized about security and proper

surveillance of these structures depending on the threat perception. The Committee members were of the view that the security aspect of the dams/water resources structures are taken up by the home department of the concerned State.

(Action: All States/DSOs/CWC)

39.9 National Register of Large Dams – Updation as per new formats

Though till date, the NRLD was being updated by DSM Directorate, CWC as per information provided by State Govts. in a paper based format, now the CWC has developed a web-based portal named Dam Health And Rehabilitation Monitoring Application (DHARMA) in which the data related to NRLD can be filled and updated online.

For updation of data on DHARMA online, member States were requested to take licence for DHARMA. The proforma for DHARMA licence had already been emailed to members. Member States, who had not submitted duly filled proforma, were requested to submit the same as earliest as possible to obtain Login ID and Password. Director, DSR, CWC informed that 19 dam owning agencies have already obtained license ID & password from DSO, CWC and have started using the platform. All state governments were circulated and e-mailed the NRLD data reports as available in DHARMA vide CWC letter 3/19/NCDS/DSM/30thmeeting/2019/33-66 dated 15/01/2019 with a request to validate the information. All state governments were requested again to send their observations after checking the data with their information available in their records.

(Action: All States/DSOs)

39.10 Dam Rehabilitation and Improvement Project (DRIP)

Director (DSR), CWC made a brief presentation highlighting the various activities under ongoing World Bank assisted Dam Rehabilitation and Improvement Project (DRIP). He informed the Committee that the program covers rehabilitation of 198 dam projects located in seven States, with a budget outlay of Rs. 3466 Cr with scheduled closure in June 30, 2020. Major important activities include Design Flood Review, publication of important Guidelines as well as Manuals dealing with Dam Safety Management, preparation of O&M Manuals, Emergency Action Plans, development of web based asset management tool i.e. Dam Health And Rehabilitation Monitoring Application (DHARMA), Seismic Hazard Mapping along with development of Seismic Hazard Assessment Information System (SHAISYS), institutional strengthening of all

partners agencies along with academic institutions, organization of Dam Safety Conferences, national and international training programmes, technical exposure visits etc.

It was also informed that based on the success of on-going DRIP, Phase-II and Phase-III of DRIP has been initiated by Government of India covering 18 States and 2 Central Agencies with provision of rehabilitation of 687 dams at an estimated cost of Rs 10,211 Cr. It was requested to all concerned States to initiate preparatory activities such as constitution of Dam Safety Review Panel (DSRP) as per latest guidelines and Inspection of Dams, Design Flood Review etc.

Also, a presentation was made by CPMU Expert on DHARMA highlighting the basic features of this web based asset management tool for capturing data related to dam salient features, health and safety aspects of the dams. It was informed that basic data pertaining to 5354 dams have already been captured in DHARMA, also data for 848 dams has been entered. Also, need based training have been provided to the concerned States including the Non-DRIP States of Rajasthan, Maharashtra and Gujarat. Licenses for DHARMA have been issued to 25 Agencies covering 12 non-DRIP States. So, as on date all major dam owners in country have the DHARMA license.

Vice Chairman, NCDS advised to all partner States as well as agencies that all dam safety inspections shall be done as per latest Guidelines published by CWC in January 2018 in the Phase-II and Phase-III of DRIP. Also, safety inspections of dams proposed under DRIP Phase-II and Phase-III may be uploaded in DHARMA. It may be one of the pre-condition for all partner agencies to join next Project.

(Action: All States/DSOs)

39.11 Records of Dam Failures and Major Dam Incidents and their Technical Reports

Chairman, NCDS emphasized that dam failure reports being valuable source of information for learning and future reference, should be given due importance and technical issues should be documented. He desired that the States should be more open and forthcoming about the sharing of details/reasons for such failures.

Representative from Rajasthan informed the Committee that a failure (Kumbharam Arya) as reported in March 2018 was not a dam. He also stated that major details of the dam failures occurred in early 50's of last century are not available with them due to loss of record. However,

it was requested to provide the report, whenever available, for future reference and learning. Kerala was requested to provide detailed report of overtopping of Poriangalkuttu dam in Aug 2018. Director, DSM, CWC was instructed to obtain detailed report on Myntendu Dam overtopping.

(Action: All States/Director. DSM/DSOs)

39.12 Upkeep and archival of records - Data Book and O&M Manual etc.

Chairman, NCDS emphasised on the need of Operation & Maintenance (O&M) manuals and encouraged the member states for preparation of O&M manuals of all the large dams. He mentioned that though it was a huge task but needed to be done as it is very important document for keeping the dam safe. He further emphasized that the manual needs to be prepared as per new guidelines for preparation of O&M manuals as available on website www.damsafety.in.

Vice Chairman, NCDS informed that O&M manual is an important instrument to operate the dam. He further elaborated that in case of any emergent situation, it will protect the dam owners legally in court of law.The DRIP states were advised to prepare O&M manuals of the non-DRIP dams in their respective states on similar lines of DRIP dams by themselves and inform the status to CWC.

(Action: DSO (CWC), All States/DSOs)

39.13 Setting up Hydrology units and Design Floods Review

Vice Chairman, CWC explained the importance of design flood review of the large dams and stated that it has to be the beginning step for any dam safety review. Andhra Pradesh & Rajasthan have reviewed the floods of large number of dams to get the priority in DRIP-II. Similarly other states also need to follow.

Chairman, NCDS observed that it was important to setup the Hydrology Units in the States and prioritize the dams for design flood review. He said that a column needed to be inserted in the relevant Annexure of the agenda to know the status for setting up Hydrological Unit in the State. A tab in DHARMA may be created for knowing the hydrological review status of Dam. He advised the States having large number of dams to set up more than one Hydrological Unit headed by a Director/Superintending Engineer. States were further advised to prioritise the dams for revising the Hydrology. He requested the members to regularly inform the status of flood reviews to Director, DSM CWC.

(Action: DSR, CWC, All States/DSOs)

39.14 Monitoring of safety aspects of inter-State Dams by Sub-Committees

(a) Mahanadi River System Sub-Committee (MRSS)

It was informed by the Chief Engineer (DSO), Odisha that the Committee is meeting regularly and functioning satisfactorily. 10th meeting of Interstate Sub-Committee was held in August, 2018.

(Action: Chief Engineer, Dam safety, Odisha (Member Secretary & Convenor), MRSS,
Chief Engineer, Mahanadi Project, Chhattisgarh (Member),
Chief Engineer & Basin Manager, Upper Mahanadi Basin, Odisha (Member)
and Chief Engineer, Minimata Bango Project, Chhattisgarh(Member)

(b) Subarnarekha River System Sub-Committee (SRSS)

It was informed by the Chief Engineer (DSO), Odisha that the Committee has not met in the recent past. Last meeting of Interstate Sub-Committee was held in January, 2016. It was further stated by Chairman, NCDS that Sub-Committee should have its meetings quite regularly so as to resolve the interstate issues, if any.

(Action: Chief Engineer, Design& Research, Odisha
(Member Secretary& Convenor), SRSS,
Chief Engineer Design &Research, West Bengal (Member),
Chief Engineer, Design, Master Planning &Hydrology,Jharkhand(Member)

(c) Parambikulam Aliyar Project (PAP) System

Secretary to Govt. of Tamil Nadu wrote to CWC that Parambikulam-Aliyar Project Sub-Committee had become dysfunctional and there is no need to further allow any Sub-Committee to look into dam safety aspect of the project. Hence the Sub-Committee should be disbanded.

Secretary to Govt. of Kerala wrote to CWC that Parambikulam-Aliyar Project Sub-Committee should be activated, as prescribed by NCDS. Representatives from Tamil Nadu & Kerala reiterated the same on behalf of their govts. Representative of Govt. of Kerala again raised the issue and requested Chairman, NCDS to revive the Sub-Committee. Chairman, NCDS asked the representatives from Tamil Nadu to take up the matter again with their govt. for reconsidering the decision and revive of the Sub-Committee in true spirit and report the same to CWC.

(Action: States of Kerala & Tamil Nadu)

At the end, the members appreciated the efforts of WRD, Bhubaneswar for making all arrangements for organizing the meeting. The meeting ended with a vote of thanks to the Chair.

Annexure-I

List of participants of 39th NCDS Meeting held on 12/02/2019 at 10:00 hrs at Hotel Myfair Convention, Jayadev Vihar, Bhubaneswar

Sl.No.	Name of officers	Designation	Signature
I- CWC and MoWR, RD & GR			
1	Shri S. Masood Husain	Chairman, CWC & NCDS	
2	Shri N.K. Mathur	Member (D&R), CWC	
3	Smt. T. Rajeshwari	Additional Secretary, MoWR, RD & GR	
4	Shri Gulshan Raj	Chief Engineer (DSO) & Member Secretary, NCDS	
5	Shri Satish Kamboj	Senior Joint Commissioner, MoWR, RD & GR	
Members			
II - Andhra Pradesh			
6	Shri K. Srinivas	Chief Engineer, CDO, WRD	
7	Shri M. Subba Rao	Executive Engineer, WRD	
III - Bihar			
8	Shri Rampukar Ranjan	Engineer-in-Chief, WR Department,	
9	Shri Binor Kumar Sinha	Director, Dam Safety Cell, WRD	
IV - Chhattisgarh			
10	Shri A.K. Somawar	Chief Engineer, WRD, Hasdeo Bargo Project	
V - Gujarat			
11	Shri P.B. Chaudhari	Superintending Engineer	
VI - Himachal Pradesh			
12	Shri P.K.S. Rohela	Chief Engineer (Energy), Directorate of Energy	
VII - Jharkhand			
13	Shri Satyabrata Banerjee	Chief Engineer (Civil)	
VIII - Karnataka			
14	Shri T.N. Chikkarayappa	Director, KERS	
15	Shri H.K. Udaya Kumar	Research Officer, Dam Safety Cell-2	
16	Vanithamani	Asstt. Engineer, WRD	
IX- Kerala			
17	Shri Bibin Jjoseph	Chief Engineer (Civil), Dam Safety & DRIP	
18	Shri Joshy K.A.	Chief Engineer (ISW), Irrigation Deptt. (KWRD)	
19	Shri K.H. Shamsudeen	Chief Engineer, I&D, IDRB,	
X - Madhya Pradesh			
20	Shri Ram Singh Kushwah	Superintending Engineer, WRD	
21	Shri A.K. Dehario	Deputy Director (D.S.), WRD	
XI - Maharashtra			
22	Shri Atul A. Kapole	Deputy Secretary, WRD, WRD	
23	Shri Sanjay Doiphode	Superintending Engineer, DSO, WRD	
24	Shri N.K. Tayade	Executive Engineer, DSO	
XII - Odisha			
25	Shri P.K. Jena	Principal Secretary	
26	Shri A.K. Banerjee	Engineer-in-Chief, Deptt. of Water Resources	
27	Shri Sunil K. Naik	Chief Engineer, Dam Safety	

28	Dr. Akshaya Kr. Das	Director, Dam Safety	
XIII - Punjab			
29	Er. Ashwani K. Kansal	Chief Engineer, Water Resources Deptt.	
30	Er. Geeta Singla	Chief Engineer, DSO, WRD	
XIV - Rajasthan			
31	Shri K.D. Sandu	Chief Engineer, WRD, SWRPD	
32	Shri Rajesh Kumar Kaloria	Executive Engineer (DSO&DRIP), WRD	
XV – Tamil Nadu			
33	Shri R. Selvakumar	Chief Engineer, O&M/PWD	
34	Shri B. Sundara Raman	Director & Superintending Engineer, Dam Safety Dte., TNWRD, PWD	
35	Shri S. Kannan	Superintending Engineer, PWD, WRD	
36	Shri S. Natarajan	Project Director, SPMU, DRIP	
37	Shri Kalimvthu. A	Executive Engineer,	
38	Shri K. Karthi ----------	Assistant Engineer, PWD, Irrigation Deptt.	
XVI– Telangana			
39	Shri K.S.S. Chandra Sekhar	Director, SDSO,	
XVII - Uttar Pradesh			
40	Shri Shyam Ji Choubey	Superintending Engineer, Irrigation Deptt.	
41	Shri Surya Prakash Verma	Executive Engineer, Dam Safety Cell, UP Irrigation Deptt.	
XVIII - Uttarakhand			
42	Shri A.K. Dinkar	Engineer-in-Chief, Irrigation Department	
43	Shri D.S. Kachhawaha	Superintending Engineer (Planning), Irrigation Deptt.	
XIX - West Bengal			
44	Shri D. Pal,	Director, DSO, I&W Dte.,	
XX - Bhakra Beas Management Board(BBMB)			
45	Shri A.K. Aggarwal	Chief Engineer, Bhakra Dam,	
46	Shri Arvind Kumar Sharma	Director, Dam Safety	
XXI - CSMRS			
47	Shri S.L. Gupta	Director	
XXII - Damodar Valley Corporation(DVC)			
48	Shri Satyabrata Banerjee	Chief Engineer (Civil)	
XXIII - Geological Survey of India			
49	Dr. K. Jayabalan	Deputy Director General, Kolkata	
XXIV - Kerala State Electricity Board(KSEB)			
50	Shri K. A. Joshy	Chief Engineer	
XXV - National Hydro Power Corporation (NHPC)			
51	Shri Keshav Deshmukh	Chief General Manager, D&E Divn.	
52	Shri Mukesh Kumar	Dy. General Manager	
XXVI - National Institute of Hydrology			
53	Dr. Sharad K. Jain,	Director,	
XXVII - THDC			
54	Shri Atul Jain	A.G.M (D&E)	
XXVIII - India Meteorological Department(IMD)			
55	Shri B.P. Yadav	Deputy DGM	

56	Shri Pradip K. Gupta	IMD	
XXIX - Meghalaya Power Gen. Corpn. Ltd.(MePGCL)			
57	Er. Kheidor Tiewsoh	Chief Engineer (C)	
		XXX - Sri Lanka	
58	Eng. S.R.K. Aruppola	Director, Major Dams	
XXXI - Switzerland			
59	Shri Georges Darbre	Former Commissioner for Dam Safety	
XXXII - CWC Officials			
60	Shri C. Lal	Chief Engineer, HSO	
61	Shri T.K. Sivarajan	Chief Engineer, Design (E&NE)	
62	Shri Munni Lal	Chief Engineer	
63	Dr. Srinivas Chokkakula	MoWR Research Chair, Centre for Policy Research	
64	Shri Pramod Narayan	Director, DSR Dte, DRIP	
65	Shri Anil Jain	Director, Emb (NW&S)	
66	Shri N.N. Rai	Director, Hydrology(S)	
67	Shri Goverdhan Prasad	Director, FE&SA & Hydrology (N)	
68	Shri Ambarish Nayak	Chief Engineer, CWC, Bhubaneswar	
69	Shri Gaurav Singhai	Deputy Director (DSR)	
70	Shri Samir Kumar Shukla	Director, DSM	
71	Shri Kuldeep Kumar Singh	Deputy Director, DSM	
72	Shri Maneesh Jaiswal	Deputy Director, Hyd(DSR)	
73	Shri Sharad Kumar	Deputy Director, DSM	
74	Shri Vivek Kumar Soni	Assistant Director, DSM	
75	Shri Deepak	S/W Developer, CPWD	

Annexure-II

Reported failure of dams in India (Year wise)

(As per information furnished by States/DSOs)

Sl. No	State	Name of Project	Type	Max. Height (M)	Year of Completion	Year of Failure	Cause of failure
Up to 1950							
1#	Madhya Pradesh	Tigra	Masonry	24.03	1914-17	1917	Overtopping followed by slide.
2	Maharashtra	Ashti	Earth	17.70	1883	1933	Slope failure.
3#	Madhya Pradesh	Pagara	Composite	27.03	1911-27	1943	Overtopping followed by breach.
1951-1960							
4#	Madhya Pradesh	Palakmati	Earth	14.60	1942	1953	Sliding failure.
5#	Rajasthan	Dakhya	Earth	N.A	1953	1953	Breaching.
6##	Uttar Pradesh	Ahrura	Earth	22.80	1953	1953	Breaching.
7#	Rajasthan	Girinanda	Earth	12.20	1954	1955	Overtopping followed by breaching.
8#	Rajasthan	Anwar	Earth	12.50	1956	1957	Breaching.
9#	Rajasthan	Gudah	Earth	28.30	1956	1957	Breached due to bad workmanship.
10#	Rajasthan	Sukri	Earth	N.A	N.A	1958	Breached by leakage through foundation.
11#	Madhya Pradesh	Nawagaon	Earth	16.00	1958	1959	Overtopping leading to breach.
12#	Rajasthan	Dervakheda	Earth	N.A	N.A	1959	Breaching.
13#	Gujarat	Kaila	Earth	23.08	1955	1959	Embankment collapsed due to weak foundation.
1961-1970							
14	Maharashtra	Panshet	Earth	53.80	1961	1961	Piping failure leading to breach.
15	Maharashtra	Khadakwasla	Masonry	60.00	1875	1961	Overtopping.
16#	Rajasthan	Galwania	Earth	N.A	1960	1961	Breaching.
17#	Rajasthan	Nawagaza	Earth	N.A	1955	1961	Breaching.
18#	Madhya Pradesh	Sampna	Earth	21.30	1956	1964	Slope failure on account of inappropriate materials.
19#	Madhya Pradesh	Kedarnala	Earth	20.00	1964	1964	Breaching.
20##	Uttarakhand	Nanaksagar	Earth	16.00	1962	1967	Breached due to foundation piping.
1971-1980							
21#	Gujarat	Dantiwada	Earth	60.96	1965	1973	Breach on account of floods.
22	Tamil Nadu	Kodaganar	Earth	12.75	1977	1977	Breached on account of floods.
23#	Gujarat	Machhu-II	Composite	20.00	1972	1979	Overtopping due to floods.
1981-1990							
24#	Gujarat	Mitti	Earth	16.02	1982	1988	Overtopping leading to breach.
1991- 2000							
25#	Madhya Pradesh	Chandora	Earth	27.30	1986	1991	Breach.
26*	Telangana	Kadam	Composite	22.50	1958	1995	Over topping leading to breach.
27#	Rajasthan	Bhimlot	Masonry	17.00	1958	-	Breached due to inadequate spillway capacity.

2001-2010							
28#	Gujarat	Pratappur	Earth	10.67	1891	2001	Breached on account of floods.
29#	Madhya Pradesh	Jamunia	Earth	15.40	1921	2002	Piping leading to breaching.
30	Orissa	Gurilijoremip	Earth	12.19	1954-55	2004	The abutment structure along with wing and return walls got undermined with foundation scouring.
31	Maharashtra	Nandgavan	Earth	22.51	1998	2005	Excessive rain causing water flow over the waste weir to a depth beyond the design flood lift.
32#	Madhya Pradesh	Piplai	Earth	16.73	1998	2005	Breach
33#	Rajasthan	JaswantSagar	Earth	43.39	1889	2007	Piping leading to breaching.
34	Telangana	Palemvagu dam	Earth	13.00	U/C	2008	Flash flood resulting in overtopping of the earth dam
35#	Madhya Pradesh	Chandiya	Earth	22.50	1926	2008	Breach.
36#	Rajasthan	Gararda	Earth	31.76	2010	2010	Examination for cause of failure by state authorities in progress.

Note:

* First time dam failure happened in year 1958 due to inadequate spillway capacity and reconstructed in year 1964 that again failed in 1995.

Detailed technical report pertaining to reported dam failures awaited.
Madhya Pradesh-10 Dams, Rajasthan -11 Dams and Gujarat-5 dams

Uttar Pradesh -2 Dams (1dam in UP& 1dam, namely Nanaksagar in Uttarakhand).