

**APPROVED MINUTES OF THE
50TH MEETING OF WORKING GROUP OF NIH
HELD AT NIH, ROORKEE, DURING 20-21 AUGUST 2020**

The meeting was held in VC mode under the Chairmanship of Dr. J V Tyagi, Director, NIH. The list of participants of the meeting is given in Annexure-I.

ITEM NO. 50.1: OPENING REMARKS BY THE CHAIRMAN

The Chairman, WG, welcomed the WG members and the Scientists of NIH. The Chairman then requested the WG members to give their general observations, suggestions and remarks on the scientific activities of the Institute. These are summarized below:

S N	Member	Suggestion(s)
1.	Dr. Vijay Kumar	▪ Suggested use of newly developed software to verify results of studies earlier conducted by NIH
2.	Dr. S P Aggarwal	▪ Provide a link for data availability
3.	Sh. Man Singh	▪ NIH scientists should think beyond RCPs
4.	Dr. Bhishm Kumar	▪ For Henvall experimental station, suggested extensive characterization using hydromet, chemical and isotopic studies
5.	Prof. A P Dimri	▪ NIH should take up urban flooding studies ▪ NIH scientists should think beyond RCPs ▪ Create databank at NIH

Next, the Chairman asked the Member-Secretary to take up the agenda.

ITEM No. 50.2: CONFIRMATION OF MINUTES OF 49th MEETING OF WORKING GROUP

The 49th meeting of the Working group was held during 2-3 May, 2019. The minutes of the meeting were circulated to all the members and invitees vide letter No. **RMOD/WG/NIH-10 dated 3 Dec., 2019**. The members confirmed the minutes of the 49th Working Group meeting.

ITEM No. 50.3: ACTION TAKEN ON THE DECISIONS/RECOMMENDATIONS OF THE PREVIOUS WORKING GROUP MEETING

Dr V C Goyal gave a brief account of the actions taken on the recommendations/ decisions of the 49th working group meeting.

ITEM Nos. 50.4& 50.5: PRESENTATION AND DISCUSSION ON THE STATUS AND PROGRESS OF THE WORK PROGRAMME FOR YEAR 2019-20 AND FINALIZATION OF THE WORK PROGRAMME FOR YEAR 2020-21

The Member-Secretary requested the respective Divisional Heads to present the progress of studies carried out during 2019-20 and also to present the proposed studies for F.Y. 2020-21. Accordingly, the progress of various studies and sponsored projects, and proposal for new studies and projects during 2020-21, were presented by all Scientific Divisions during the two-day deliberations of the Working Group. The Division wise minutes of each study/project presented during the meeting are given next.

ENVIRONMENTAL HYDROLOGY DIVISION

The overview of the technical activities of Environmental Hydrology Division (EHD) was presented by Dr R.P. Pandey, Scientist 'G' & Head. The Working Group was appraised about the scientific manpower, status of completed and ongoing studies, consultancy projects, publications, and technology transfer activities. Subsequently, the scientists of the Division were invited to present the completed studies, progress of ongoing internal studies and proposed new studies. The Comments/suggestions of Working Group members are summarized below.

Progress of Work Program for 2019-20 and Work Program for 2020-21

S. No.	Study	Recommendations/Comments
Internal Studies		
1.	<p>Title: Development of Habitat Suitability Curves for the Aquatic Species of Western Himalayan Streams and Assessment of Environmental Flows</p> <p>Study Group: Pradeep Kumar (PI), C. K. Jain</p> <p>Duration: 3 Years (04/16-05/19)</p> <p>Status: Completed</p>	Dr. Pradeep Kumar presented the study which is completed and the report has been submitted.
2.	<p>Title: Water quality assessment for Haridwar District</p> <p>Study Group: R.K. Nema (PI), Rajesh Singh, J. V. Tyagi & Pradeep Kumar</p> <p>Duration: 1.5 years (05/19-12/20)</p> <p>Status: Ongoing</p>	Dr. Rajesh Singh presented the progress of the study. The members appreciated and expressed that this type of studies are very useful and should be carried out sincerely. Dr. Bhisim Kumar (Ex. Scientist, NIH & IAEA) indicated that the study is very important and the results would be useful for drinking water supply & water quality management in the district. He suggested that the time duration of the study should not be reduced. Dr. Pawan Labhasetwar (Scientist, NEERI) suggested to carry out the sanitary surveillance.
3.	<p>Title: Simulation of Non-Point Source Pollution Processes in Song River</p> <p>Study Group: Pradeep Kumar (PI), J. V. Tyagi, M. K. Sharma & Rajesh Singh</p> <p>Duration: 4 years (11/19-10/23)</p> <p>Status: Ongoing</p>	The members were informed about the progress of the study and the ongoing activities.
Internal Studies (New Study)		
4.	<p>Title: Identification of Causes for deterioration of River Hindon and suggestive rejuvenation plan</p> <p>Study Group: M. K. Sharma (PI), Dr. Sudhir Kumar (Project Coordinator), R.P. Pandey, Anupma Sharma, Anjali, Vishal Singh, Pradeep Kumar, Nitesh</p>	<p>Dr. M. K. Sharma presented the proposal.</p> <p>Dr. Man Singh suggested to fill the gaps in the studies conducted so far on river Hindon and to bring a holistic perspective for rejuvenating the river.</p> <p>Dr. Arun Kumar Saraf suggested that we should focus on small rivers for rejuvenation or Hindon</p>

	Patidar, Surjeet Singh, Rajesh Singh. Duration: 3 years (07/20 to 06/23)	section wise. Dr. Pawan Labhasetwar suggested that a thorough water quality investigation for pre- and post-monsoon duration should be carried out. An inventory of all the drains need to be prepared. Dr. Varun Joshi recommended to go through Ph.D. thesis of his students.
5.	Title: Influence of Anthropogenic Factors on River Ganga in the stretch from Rishikesh to Haridwar Study Team: Rajesh Singh (PI), J. V. Tyagi, R. P. Pandey, R. K. Nema, Pradeep Kumar, M. K. Sharma Duration: 2 Years (06/20 – 05/22)	Dr. Rajesh Singh presented the proposal. Dr. Pawan Labhasetwar (Scientist, NEERI) suggested analysis of river water quality in the breaded segment. Dr. Deshpande suggested modification in third objective i.e. Statistical Analysis as it is the part of methodology and cannot be a standalone object.

Training Programmes organized during 2019-20

SN	Topic	Duration	Place
1.	Hydrologic Modelling using SWAT (Coordinator: Dr. J. V. Tyagi)	Two weeks 20-31 May 2019	Roorkee
2.	Ground Water Quality Monitoring & Assessment under NHP-PDS (Coordinator: Dr. M. K. Sharma)	5 Days 3-7 June 2019	Roorkee
3.	Water Quality Assessment & Management under NHP-PDS (Coordinator: Dr. Rajesh Singh)	5 Days 17-21 June 2019	Roorkee

RECOMMENDED WORK PROGRAMME FOR THE YEAR 2020-21

SN	Study	Study Team	Duration/Status
Sponsored Projects (Ongoing)			
1.	Environmental Assessment of Aquatic Ecosystem of Upper Ganga Basin	M. K. Sharma(PI) Manohar Arora Pradeep Kumar Rajesh Singh D. S. Malik (GKU)	5 Years (04/16-03/21) Sponsored by: DST (NMSHE) Project Cost: Rs. 2.25 Crore Status: In-progress
2.	Ground Water Quality Assessment with Special Reference to Sulphate Contamination in Bemetara District of Chhattisgarh State and Ameliorative Measures	M. K. Sharma (PI) Surjeet Singh Pradeep Kumar Partner: WRD, Raipur, CGWB, Raipur	3 Years (09/17-08/20) Sponsored by: NHP-PDS Project Cost: Rs. 25.4 Lakh Status: In-progress <i>Request Extension upto 03/21</i>
3.	Water Quality Assessment of Southwest Punjab Emphasizing Carcinogenic Contaminants and their Possible Remedial Measures	Rajesh Singh (PI) Pradeep Kumar M. K. Sharma Sumant Kumar Partner: Irrigation Department, Punjab	3 Years (09/17-08/20) Sponsored by: NHP-PDS Project Cost: Rs. 65.6 Lakh Status: In-progress <i>Request Extension upto 03/21</i>
4.	Leachate Transport Modeling for Gazipur landfill site for suggesting ameliorative measures	Anjali (PI) Sudhir Kumar, J. V. Tyagi, M. K. Sharma,	3 Years (11/19 – 10/22) Project cost: Rs. 76.10 Lakh

		Nitesh Patidar Partner: CGWB (Delhi unit)	Sponsored by: NHP-PDS Status: In-progress
Internal Study (Ongoing)			
5.	Water quality assessment of Haridwar District	R.K. Nema (PI) Rajesh Singh J. V. Tyagi Pradeep Kumar	3 years (05/19-12/20) Project cost: 17.10 lakh Status: In-progress
6.	Simulation of Non-Point Source Pollution Processes in Song River	Pradeep Kumar (PI) J. V. Tyagi M. K. Sharma Rajesh Singh R. K. Nema	4 years (11/19-10/23) Project cost: 43.02 lakh Status: In-progress
Internal Study (New)			
7.	Development of rejuvenation plan for Hindon river system	M. K. Sharma (PI) Sudhir Kumar R. P. Pandey Anupma Sharma Anjali Vishal Singh Pradeep Kumar Nitesh Patidar Surjeet Singh Rajesh Singh	3 Years (07/20-06/23) Project cost: Rs. 20.24 Lakh Sponsored by: Internal Status: New Project
8.	Influence of Anthropogenic Factors on River Ganga in the stretch from Rishikesh to Haridwar	Rajesh Singh (PI) J. V. Tyagi R.K. Nema Pradeep Kumar M. K. Sharma	2 Years (06/20-05/22) Project cost: Rs. 23.71 Lakh Sponsored by: Internal Status: New Project
Consultancy Projects (New Project)			
9.	Estimation of Economic Losses in Real Terms per Hectare Basis due to Forest Fire in Uttarakhand and Madhya Pradesh	J. V. Tyagi (PI) Pradeep Kumar (Co-PI) T. Thomas (Co-PI) L. N. Thakural, P. K. Singh, M. K. Sharma, Rajesh Singh, R. K. Nema	2 Years (03/20-02/22) Sponsored by: ICFRE Project Cost: Rs. 1.1033 Crore Status: New Project

Training Programmes

SN	Topic	Duration	Place
1.	Water Quality Management under NHP-PDS (Coordinator: Dr. M. K. Sharma)	5 Days	Roorkee
2.	Water Quality Assessment & Management under NHP-PDS (Coordinator: Dr. Rajesh Singh)	5 Days	Roorkee
3.	Water Quality: Concepts and Analysis under NHP (Coordinator: Dr. Pradeep Kumar)	5 Days	Roorkee
4.	Contaminant Transport Modeling under NHP-PDS (Coordinator: Ms. Anjali)	5 Days	Roorkee

GROUND WATER HYDROLOGY DIVISION

Dr. Anupma Sharma, Scientist 'F' presented a brief overview, status of studies and activities carried out by the division since the 49th Working Group meeting held in November, 2019. She gave an account of scientific personnel available in the division; internal, sponsored and consultancy projects - ongoing and completed; and also future activities planned by the division. Dr. Sharma informed that two in-house R&D studies and twelve sponsored studies were approved for the year 2019-20. In addition to the above studies, scientists of the division have a major role in activities of the National Hydrology Project (NHP), DSS planning and management in selected states, development of groundwater module for “*Integrated Hydrologic Model*” with IIT Kharagpur, Computer Centre, External Project Management Cell and procurement related activities.

The number of research papers published in various journals, lectures delivered in various training courses and number of M.Tech./Ph.D. students guided/under guidance during the period were also reported. The progress of following studies was presented by respective Principal Investigators:

S. No.	Project	Project Team	Duration & Status	Funding Source
Internal Studies				
1. NIH/GWH/ NIH/19-20	The Regional Hydrological Impact of Farm-Scale Water Saving Measures in the Gangetic Plains	Sumant Kumar (PI), C. P. Kumar, Archana Sarkar, Surjeet Singh, P. K. Mishra	1 year (08/19 – 07/20) <i>Status: In progress</i>	Internal Study (in collaboration with CSIRO, Australia)
2. NIH/GWH/ DoWR/20-20	Impact on Salinity of River Mahadayi due to Proposed Dams on River Mahadayi	Gopal Krishan (PI), B. Venkatesh, Nitesh Patidar	3 months (07/20 – 09/20) <i>Status: New Study</i>	Referred by DoWR (MoJS)
3. NIH/GWH/ NIH/20-22	Integrated GEE-MODFLOW based Groundwater Recharge Assessment System for Hindon River System	Nitesh Patidar (PI), Gopal Krishan, Suman Gurjar	2 years (08/20 – 07/22) <i>Status: New Study</i>	Internal Study
Sponsored Projects				
4. NIH/GWH/ NIH/15-20	Peya Jal Suraksha - Development of Six Pilot Riverbank Filtration Demonstrating Schemes in Different Hydrogeological Settings for Sustainable Drinking Water Supply	Surjeet Singh (Lead), B. Chakravorty, Y. R. S. Rao, Anupma Sharma, Sumant Kumar, Gopal Krishan, Suman Gurjar, Anju Chaudhary, Sanjay Mittal	4.5 years (11/15–03/20) <i>Status: Completed</i>	Sponsored by MoWR, RD & GR under Plan Fund
5. NIH/GWH/ CCRBF/20-23	Expansion of the Indo-German Competence Centre for Riverbank Filtration – CCRBF	Gopal Krishan (PI & Coordinator)	3 years (07/20 – 06/23) <i>Status: New Study</i>	Sponsored by Federal Ministry of Education and Research, Germany

The suggestions emerged during the presentation of progress of these studies are given below:

S.No.	Title of Project/ Study, Study Group, Start/ Completion Dates	Status and Recommendations/Suggestions
Internal Studies		
1	<p>The Regional Hydrological Impact of Farm-Scale Water Saving Measures in the Gangetic Plains (Ongoing) Study Group: Sumant Kumar, C. P. Kumar, Archana Sarkar, Surjeet Singh, P. K. Mishra DOS: Aug. 2019 DOC: Jul. 2020</p>	<p>Dr. Sumant Kumar (PI) presented the objectives, methodology, achievements and expected outcome of the study. The PI requested for the extension of the study for seven months and it was approved by members. PI also informed that a word ‘farm-scale’ has been replaced with ‘agricultural’ in the study title and it was approved by the members. Now, the study title shall be “The regional hydrological impact of agricultural water saving measures in the Gangetic plains”.</p>
2	<p>Impact on Salinity of River Mahadayi due to Proposed Dams on River Mahadayi (New) Study Group: Gopal Krishan, B. Venkatesh, Nitesh Patidar DOS: Jul. 2020 DOC: Sep. 2020</p>	<p>Dr. Gopal Krishan (PI) presented the background, statement of the problem, objectives, methodology and future plans and also requested for extension of time period by two months, which was agreed during the meeting.</p>
3	<p>Integrated GEE-MODFLOW based Groundwater Recharge Assessment System for Hindon River System (New) Study Group: Nitesh Patidar (PI), Gopal Krishan, Suman Gurjar DOS: Aug. 2020 DOC: Jul. 2022</p>	<p>Dr. Nitesh Patidar (PI) presented about the background, objectives, methodology and future plan of the study.</p> <p>Dr. R.D. Deshpande suggested to measure evapotranspiration in the field, if feasible.</p>
Sponsored Projects		
4	<p>Peya Jal Suraksha -Development of Six Pilot Riverbank Filtration Demonstrating Schemes in Different Hydrogeological Settings for Sustainable Drinking Water Supply (Completed) Study Group: Surjeet Singh, B. Chakravorty, Y. R. S. Rao, Anupma Sharma, Sumant Kumar, Gopal Krishan, Suman Gurjar, Anju Chaudhary, Sanjay Mittal DOS: Nov. 2015 DOC: Mar. 2020</p>	<p>Dr. Surjeet Singh (PI) presented the study in detail on the RBF sites developed in various states. He described about the selection of sites, details on drilling of RBF well, construction of pump house, performance on water quality, safety from floods, etc. and future plan.</p> <p>Mr. S. M. Sharma, Working Group member requested to provide the draft final report. Director NIH advised to send the report to Mr. S. M. Sharma for review in addition to the approved list of reviewers.</p>
5	<p>Expansion of the Indo-German Competence Centre for Riverbank Filtration – CCRBF (New) Study Group: Gopal Krishan DOS: Jul. 2020 DOC: Jun. 2023</p>	<p>Dr. Gopal Krishan (PI) presented the background, work packages and future plan of the study.</p>

RECOMMENDED WORK PROGRAM FOR THE YEAR 2020-21

S. No.	Project	Project Team	Duration & Status	Funding Source
Internal Studies				
1. NIH/GWH /NIH/19- 21	Application of Satellite Data Products for Water Resources Assessment	Suman Gurjar (PI), Vishal Singh, Surjeet Singh, C. P. Kumar, P. K. Singh	2 years (05/19 - 04/21) <i>Status: In progress</i>	Internal Study
2. NIH/GWH /NIH/19- 20	The Regional Hydrological Impact of Agricultural Water Saving Measures in the Gangetic Plains	Sumant Kumar (PI), C. P. Kumar, Archana Sarkar, Surjeet Singh, P. K. Mishra	1 year 8 months (08/19 – 03/21) <i>Status: In progress</i>	Internal Study (in collaboration with CSIRO, Australia)
3. NIH/GWH /DoWR/20 -20	Impact on Salinity of River Mahadayi due to Proposed Dams on River Mahadayi	Gopal Krishan (PI), B. Venkatesh, Nitesh Patidar	5 months (07/20 – 11/20) <i>Status: New Study</i>	Referred by DoWR (MoJS)
4. NIH/GWH /NIH/20- 22	Integrated GEE-MODFLOW based Groundwater Recharge Assessment System for Hindon River System	Nitesh Patidar (PI), Gopal Krishan, Suman Gurjar	2 years (08/20 – 07/22) <i>Status: New Study</i>	Internal Study
Sponsored Projects				
5. NIH/GWH /NMSHE/ 16-20	Study of River - Aquifer Interactions and Groundwater Potential at Selected Sites in the Upper Ganga Basin up to Dabrani	Surjeet Singh (PI), C. P. Kumar, R. J. Thayyen, Sudhir Kumar, Manohar Arora, Gopal Krishan, Nitesh Patidar, Anjali	5 years (01/16 - 12/20) <i>Status: In progress</i>	Sponsored by DST under NMSHE SP-8
6. NIH/GWH /BGS/17- 20	Groundwater Fluctuations and Conductivity Monitoring in Punjab - New Evidence of Groundwater Dynamics in Punjab from High Frequency Groundwater Level and Salinity Measurements	Gopal Krishan (PI), Surjeet Singh, C. P. Kumar, M. S. Rao <i>From: BGS, UK</i> Dr. Dan Lapworth (PI) Prof. Alan MacDonald	3.5 years (12/17-06/21) <i>Status: In progress</i>	Sponsored by BGS, UK
7. NIH/GW H/PDS/1 7-20	Hydro-geochemical Evolution and Arsenic Occurrence in Aquifer of Central Ganges Basin	Sumant Kumar (PI), Sudhir Kumar, Rajesh Singh, Gopal Krishan, Anju Chaudhary <i>Partner Organization:</i> MWRD, Bihar <i>Collaborator:</i> Brijesh Yadav, IIT Roorkee and N.S Maurya, NIT Patna	3.5 years (12/17-06/21) <i>Status: In progress</i>	Sponsored by NHP under PDS

8. NIH/GW H/PDS/1 7-21	Assessment of Impacts of Groundwater Salinity on Regional Groundwater Resources, Current and Future Situation in Mewat, Haryana – Possible Remedy and Resilience Building Measures	Gopal Krishan (PI), Surjeet Singh, C. P. Kumar, <i>IIT-Roorkee:</i> M. L. Kansal, Brijesh Yadav (PI) <i>Sehgal Foundation,</i> <i>Gurgaon:</i> Lalit Mohan Sharma	4 years (12/17-11/21) <i>Status: In progress</i>	Sponsored by NHP under PDS
9. NIH/GW H/PDS/1 7-21	Ganges Aquifer Management in the Context of Monsoon Runoff Conservation for Sustainable River Ecosystem Services - A Pilot Study	Surjeet Singh (PI), C. P. Kumar, Sudhir Kumar, Suman Gurjar, Gopal Krishan	4 years (12/17-11/21) <i>Status: In progress</i>	Sponsored by NHP under PDS
10. NIH/GWH /DST/18- 20	Future Secular Changes and Remediation of Groundwater Arsenic in the Ganga River Basin - FAR GANGA	B. Chakravorty (India Lead), Surjeet Singh (Dy. Lead), Sumant Kumar, Gopal Krishan, Suman Gurjar <i>Other India Partners:</i> IITR, IITKg, MCS, Patna <i>UK Partners:</i> Univ. of Manchester, BGS, Salford University, Univ. of Birmingham	3 years (01/18 - 12/20) <i>Status: In progress</i>	DST-Newton Bhabha- NERC- India- UK Water Quality Research Programme
11. NIH/GWH /DST/18- 20	Impact of Rainwater Harvesting on Groundwater Quality in India with Specific Reference to Fluoride and Micro-pollutants	Anupma Sharma (India Lead), Sumant Kumar, Gopal Krishan, Suman Gurjar, M. K. Sharma <i>Other Indian Partners:</i> IIT Ropar, IIT Jodhpur <i>UK Partner:</i> Cranfield University <i>Project Partners:</i> Water Harvest, Excellent Development (UK based NGOs)	3 years (01/18 - 12/20) <i>Status: In progress</i>	DST-Newton Bhabha- NERC- India- UK Water Quality Research Programme
12. NIH/GWH /CEHM/18 -22	Integrated Management of Water Resources for Quantity and Quality in Upper Yamuna Basin upto Delhi	Anupma Sharma (PI), Sanjay K. Jain, Archana Sarkar, M. K. Sharma, L. N. Thakural, Sumant Kumar, Suman Gurjar, Vishal Singh, Nitesh Patidar <i>Partner Organizations:</i> Irrigation & Water Resources Dept. Haryana, Groundwater Dept. UP, Yamuna Basin Organization, CWC, New Delhi	4 years (04/18-03/22) <i>Status: In progress</i>	Special Project under “Centre of Excellence” (NHP)

13. NIH/GWH /DST/19- 23	Enhancing Food and Water Security in Arid Region through Improved Understanding of Quantity, Quality and Management of Blue, Green and Grey Water	Anupma Sharma (Lead NIH), C. P. Kumar, Suman Gurjar, Nitesh Patidar (Lead: CAZRI Jodhpur, Partners: NIH Roorkee, IISWC Dehradun, CSWRI Bikaner, CIAH Bikaner, NIAM Jaipur)	5 years (03/19 - 02/24) <i>Status: In progress</i>	Sponsored by DST
14. NIH/GWH /CCRBF/2 0-23	Expansion of the Indo-German Competence Centre for Riverbank Filtration – CCRBF	Gopal Krishan (PI & Coordinator)	3 years (07/20 – 06/23) <i>Status: New Study</i>	Sponsored by Federal Ministry of Education and Research, Germany
Consultancy Projects				
1.	Assessment of Saline and Freshwater Zone in Faridkot, Fazilka and Muktsar Districts of Malwa Region of Punjab	Gopal Krishan (PI)	1.5 year (03/19-09/20) Cost: 17.70 lakh <i>Status: In progress</i>	Punjab Government
2.	Expansion of Salinization in Aquifers in Punjab	Gopal Krishan (PI)	1.5 year (03/19-09/20) Cost: 1.18 crore <i>Status: In progress</i>	Punjab Government
3.	Water Availability Study based on Hydrological Investigations and Rainfall-Runoff Modeling of Upper Hindon Basin	Anupma Sharma (PI)	1.5 year (04/19-09/20) Cost: 11.80 lakh <i>Status: In progress</i>	Irrigation Deptt., Saharanpur

HYDROLOGICAL INVESTIGATIONS DIVISION

Dr Sudhir Kumar, Scientist-G and Head of the H. I. Division presented the activities of the Division including the scientific staff strength and infrastructure. He briefly introduced about the scientific work of the Division and the various studies being carried by the Division including the new proposals, along with details about the publications by the Division and analytical work carried out at the Nuclear Hydrology Laboratory. He also informed about the technology transfer activities organized/proposed by the Division during November 2019 to August 2020.

Table 1: Status of studies carried out by HI Division during Nov'19 to Aug'20

Type of study/Project	Approved Studies	Completed Studies	New studies	Total
Internal Studies	2	1*	-	1
Sponsored Projects	9	2	-	7
Consultancy Projects	5	1	5	9
Total	16	4	5	17

*Dropped

Table 2: Details of training Courses/Workshops organised by HI Division during Nov'19 to Aug'20

SN	Title of Training Course/Workshop	Duration	Venue	Co-ordinator
1.	Tools and techniques of hydrological investigations	04 - 08 Nov 2019	NIH, Roorkee	S. M. Pingale

Table 3: Details of samples analysed by HI Division Labs during Apr'19 to Mar'20

SN	Parameter analysed	No. of samples
1	$\delta^2\text{H}$ on DI-IRMS	6,707
2	$\delta^{18}\text{O}$ on DI-IRMS & CF-IRMS	6,693
3	Tritium enrichment / measurements	378
4.	WQ samples on IC	1,075

Table 4: Details of Research Publications by HI Division during Nov'19 to Aug'20

	Published	Accepted	Communicated
Books/Book Chapter	-	-	-
International Journals	2	-	6
National Journals	1	-	-
International Conferences	5	3	-
National Conferences	2	-	-

The progress for ongoing studies and proposals for new studies for the year 2020-21 was presented by the respective P.I. of the study. The comments/actions suggested by the working group for various studies are as follows:

INTERNAL STUDIES:

SN	Project	Study Team	Duration	Status	Comments/ Action(s) Suggested
1.	Hydrological investigations of selected springs in Tehri Garhwal District , Uttarakhand <u>Earlier title:</u> Integrated hydrological investigations of natural water springs in lesser Himalaya, Uttarakhand	S M Pingale (PI), Sudhir Kumar Suhas Khobragade S. S. Rawat Rajeev Gupta	3 years (04/19 to 03/22)	Continuing Study	i) Dr. Bhishm Kumar suggested (i) only important springs, i.e., which are being used by local public should be studied, (ii) tritium dating of the spring water should be carried out to understand the recharge zones. ii) Dr. RD Deshpande suggested to reformulate the first three objectives of the study. iii) Dr. Sudhindra Mohan Sharma suggested (i) to also develop the correlation of spring characteristics with geomorphology, and (ii) to suggest the guidelines for spring studies.
2.	Isotope fingerprinting of precipitation over Indian Region	Nidhi Kalyani (PI), Sudhir Kumar MS Rao Scientists from RC's	3 years (04/19 to 03/22)	Continuing Study	To be dropped as no progress is made. May be considered in future.
3.	Groundwater recharge estimation in a part of Sabarmati basin	M. Someshwar Rao (PI) Sudhir Kumar Vipin Aggarwal	2 years (09/20 to 08/22)	New Study	Dr. Bhishm Kumar suggested that (i) tritium tagging technique may be used with high precaution, and (ii) stable isotopes should be used for determination of recharge.
4.	Integrated Hydrological Investigations of Renuka lake, Himachal Pradesh, for its Conservation and Management	SD Khobragade (PI) Sudhir Kumar Hukam Singh Rajiv Gupta Vipin Agarwal Scientist from GoH.P.	3 years (7/20-6/23)	New study	Could not be presented due to shortage of time

RECOMMENDED WORK PROGRAMME FOR THE YEAR 2020-2021

S. N.	Project Title	Study Team	Duration	Status
<u>INTERNAL STUDIES:</u>				
1	Hydrological investigations of selected springs in Tehri Garhwal District , Uttarakhand	S M Pingale (PI), Sudhir Kumar S. D. Khobragade Soban Singh Rawat Er. Padam Singh, (UUHF, Ranichauri), Rajeev Gupta	3 years (04/19-03/22)	Continuing Study
2	Groundwater Recharge estimation in a part of Sabarmati basin	M. Someshwar Rao(PI) Sudhir Kumar Vipin Aggarwal	2 years (9/20 – 8/22)	<i>New Study</i>
3	Integrated Hydrological Investigations of Renuka lake, Himachal Pradesh, for its Conservation and Management	SD Khobragade (PI) Sudhir Kumar, Hukam Singh, Rajiv Gupta, Vipin Agarwal, Scientist from GoH.P.	3 years (9/20-8/23)	<i>New study</i>
<u>SPONSORED PROJECTS:</u>				
1.	Understanding of hydrological processes in Upper Ganga basin by using isotopic techniques	Suhas Khobragade(PI) Sudhir Kumar, Rajesh Singh, M. Arora, R. J. Thayyen	5 Years (04/16-03/21)	Continuing Study under NMSHE Project
2.	Dating very old ground waters of deeper aquifers in Ganga Plains, India	M. Someshwar Rao (PI) Sudhir Kumar	3 Years (06/16 -05/19) Ext. upto 03/21	Continuing Study IAEA under CRP
3.	Chemical & Isotopic Characterization of Deep Aquifer Groundwater of Middle Ganga Basin	Sudhir Kumar (PI) M. Someshwar Rao Vipin Aggarwal	3 ½ year (1/18 – 6/21)	Continuing Study PDS under NHP
4.	Integrated Study on groundwater dynamics in the coastal aquifers of West Bengal for sustainable groundwater management	M. Someshwar Rao (PI), Sudhir Kumar A. R. Senthil Kumar V. S. Jeyakanthan	3 ½year (1/18 – 6/21)	Continuing Study PDS under NHP
5.	Development of a comprehensive plan for conservation and sustainable management of Bhimtal and Naukuchiatal lakes, Uttarakhand	Suhas Khobragade (PI) Sudhir Kumar	3 Years (1/18 – 12/20)	Continuing Study PDS under NHP
6.	Unravelling Submarine Discharge (SGD) zones along the Indian subcontinent and its islands (Mission SGD) – Pilot Study	Sudhir Kumar (PI) SM Pingale, M. Someshwar Rao BK Purandara, YRS Rao	1 year (04/19 – 03/20) Extended till 03/21	Continuing Study under NCESS, MoES
7.	Groundwater Rejuvenation As Climate changeE Resilience for marginalized and gender sensitive GangeS (GRACERS)	Sudhir Kumar (PI) M. Someshwar Rao SM Pingale	2 years (06/19 – 5/21)	IIT Bombay, Mumbai

Table 2: Training Courses/Workshops proposed by HI Division for the year 2020-2021

S. N.	Title of Training Course/Workshop	Duration	Venue	Co-ordinator
1.	Advanced tools and techniques for hydrological investigations	November 2020	NIH, Roorkee	S. M. Pingale
2.	Conservation and management of lakes, wetlands and springs	December 2020	NIH, Roorkee	S. D. Khobragade

SURFACE WATER HYDROLOGY DIVISION

Dr. Rakesh Kumar, Sc G & Head, Surface Water Hydrology Division presented the various activities of the division. The concerned PI of the study presented the progress of his study during the working group meeting. The record of discussions for the respective study is given below:

S.N.	Title of Project/ Study, Study Group, Start/ Completion Dates	Status and Recommendations/Suggestions
SPONSORED STUDIES		
1.	Hydrological modeling in Alaknanda basin and assessment of climate change impact (NMSHE) Study Group: A.K. Lohani Sanjay K. Jain, Archana Sarkar, V.S. Jeyakanthan, L.N. Thakural DOS: April 2016; DOC: March 2021	VIC and WinSRM models have been setup for the study basin. Further, calibration of both VIC and WINSRM models with the available data has been carried out. The study also extended upto entire upper Ganga basin catchment up to Rishikesh and both the above mentioned models were calibrated and validated. Further climate change scenario have been downloaded and applied to generated future runoff series using the selected models. The study will be completed by December 2020.
2.	Rainfall-Runoff Modelling of Selected Basin based on LULC pattern and development of Correlation (NHP) Study Group: A.K. Lohani R.K. Jaiswal, Sushant Jain, WRD Rajasthan, Sanjay Agarwal, Shailendra Kumar DOS: Oct. 2019; DOC: Dec. 2020	Rainfall-runoff models e.g. SWAT and VIC have been setup for the study catchments. Request were made to WRD, Rajasthan for the G&D data for the selected basins. It was informed by the WRD, Rajasthan that the G&D data for the study are not available. Further, G&D data for the other sites available with CWC were provided by WRD, Rajasthan in the month of July 2020. Now with these data the hydrological models are being calibrated for the gauged sites. Further, using the calibrated parameters of the hydrological models runoff time series will be generated for the study basins. The progress of the study was presented in the R&D session of PDS held in Jan 2020 at New Delhi.
INTERNAL STUDIES		
3.	Development of regional methods for design flood estimation in Uttarakhand Study Group: J.P. Patra Rakesh Kumar, Pankaj Mani, Sanjay Kumar	Mr. Jagadish Prasad Patra, presented the objectives, need for such study with brief methodology of the completed internal study entitled "Development of regional methods for design flood estimation in Uttarakhand". The various objectives of study and work carried out were presented. The results of rainfall and flood frequency analysis using L-moments approach are presented with detail explanation. The relationships developed to estimate design flood for various return periods with catchment area are also

	<p>DOS: April 2017; DOC: March 2020</p>	<p>presented. The Nonstationary Extreme Value Analysis considering the aspect of non-stationary in data series is presented in detail for annual maximum peak flood series and 1day annual maximum rainfall series. It is presented that an unjustified assumption of stationarity could lead to an underestimation of extreme floods. However, it is highlighted that effect on such nonstationary approach may not be always very critical in terms of water level in the river viz. water surface in a bridge, over topping of embankments etc. Further, effect of Tehri dam for moderation of flood peaks at Rishikesh is also discussed considering reservoir index as an additional co-variate. However, the results obtained until now are not very conclusive. The experts enquire about any specific recommendation regarding the effect of climate change in flood frequency analysis. It was explained that the considering various uncertainties associated with climate change, is difficult to exactly quantify the increase in design flood value. However, with example it is explained that non-stationary frequency analysis needs to be carried out to check the resilience of various infrastructures with respect to their design life.</p>
<p>4.</p>	<p>Development of regional relationships for water availability analysis and flood estimation for lower Godavari basin (3f)</p> <p>Study Group: Sanjay Kumar Rakesh Kumar, J.P. Patra, Pankaj Mani</p> <p>DOS: April 2017; DOC: March 2021</p>	<p>Dr. Sanjay Kumar presented the progress of the study, he mentioned that the study has five objectives and the work has been completed on three objectives. The work on other two objectives is under progress based on secondary data from various reports and manual as short interval recorded rainfall (hourly) data at CWC gauging sites has not been provided. He mentioned that based on the available secondary data and collection of the additional rainfall data of nearby sites from IMD, the study will be completed in time.</p>
<p>5.</p>	<p>Assessment of Climate Change Impact on Water Availability and Agriculture in part of Banas basin</p> <p>Study Group: Archana Sarkar Surjeet Singh Suman Gurjar Sunil Gurrapu</p> <p>DOS: Nov. 2018 DOC: March 2021</p>	<p>Dr Archana Sarkar presented the background and objectives of the study. She presented the methodology adopted and detailed results of the downscaled and bias corrected climate data (precipitation, maximum temperature, minimum temperature, mean temperature) for historic as well as future time period upto 2100 from 16 GCMs under two future emission scenarios (RCP4.5 & RCP8.5). She also presented the data availability for hydrological modeling in the Banas basin upto the Bisalpur reservoir and future plan of work. She informed the house that due to the present pandemic situation, field visits for some more data collection could not be taken up and the study requires one year extension upto October 2021. The Chairman asked the PI to complete the study by March 2021. Dr Deshpande from SAC, Ahmedabad enquired about the inflow and outflow from the Bisalpur reservoir. Another member from NEERI, Nagpur also enquired about water allocation priorities from the reservoir to which Dr Sarkar presented the Dam operation data given by WRD, Rajasthan. No other specific comments were received from the committee members present.</p>

6.	<p>Study of hydrological changes in selected watersheds in view of climate change in India</p> <p>Study Group: L.N. Thakural D.S. Rathore, Surjeet Singh, Sanjay K. Jain Sharad K. Jain DOS: April 2015; DOC: March 2020</p>	<p>Dr. Laxmi Narayan Thakural presented the objectives, methodology and the status of the above ongoing study. The GIS database created to meet out the objectives of the study using Digital Elevation Model (DEM) and satellite imagery for flow accumulation, stream network, watershed boundary, Land use/Land cover thematic maps in addition to soil map for the four watersheds was presented. Spatio-temporal analysis of hydro-meteorological data using parametric and non-parametric approaches for the Ramganga, Bina, Dhadhar and Chaliyar river basins were also presented in the meeting. The outcomes/results of hydrological models calibrated and validated for the river basins i.e. Ramganga, Bina, Chaliyar and Dhadhar river basins were presented and the future simulations using future rainfall and temperature scenarios for the Dhadhar and Chaliyar basins were also presented.</p> <p>On the request of the PI, the study has been extended up to December 2020 to complete the future simulations under changing climate for the remaining two basins (which is under process).</p>
7.	<p>Evaluation of seasonal extreme rain events across river basins of India in 3D global temperature change scenario.</p> <p>Study Group: Ashwini Ranade Archana Sarkar DOS: April 2018; DOC: March 2021</p>	<p>Dr. Ashwini Ranade, PI of the project presented the objectives, work plan and current status of the project. She has presented important results from global temperature trend analysis (1979-2018). Committee members well appreciated the work on the changes in 3-D global atmospheric thermal structure in recent years and its association with monthly rainfall of seven homogeneous zones of the country.</p>
8.	<p>Evaluation of the influence of low-frequency atmosphere-ocean oscillations on annual floods in the watersheds of the Indian subcontinent.</p> <p>Study Group: Sunil Gurrapu Ashwini Ranade J.P. Patra DOS: Nov 2018; DOC: October 2021</p>	<p>PI of the study presented the objectives and the status of the study, with preliminary results of correlations analysis between low-frequency ocean-atmosphere oscillations and the streamflow at the selected gauging sites. Based on the suggestions from previous working group, an additional objective was added to the study objectives and the study will now be concentrated on 2 watersheds, Godavari and Narmada River Basins. No comments were made by the committee members. Dr. J V Tyagi, Director, NIH inquired if the study is going as per the schedule and suggested that the project be completed as scheduled, i.e. by the end of October 2021.</p>
9.	<p>Evaluation of water quality of Government schools in Roorkee block, District Haridwar</p> <p>Study Group: N.K. Bhatnagar M.K. Sharma, L.N. Thakural, Reena Rathore DOS: Oct. 2018; DOC: Sept. 2020</p>	<p>Head SWHD briefed the progress of the study on Evaluation of water quality of Government schools in Roorkee block, District Haridwar. Pre monsoon and post monsoon water sampling has been done and testing of water quality has been completed. Testing of metal ions for pre monsoon in water samples has been completed, post monsoon is under process. All GIS Maps has been completed. Report writing is under progress. The Chairman desired that the study should be completed and its report may be submitted by October, 2020.</p>
10.	<p>Application of unified-extreme-value (UEV) distribution for flood frequency: (1) Lower Narmada & Tapi subzone-3b, (2)</p>	<p>It was informed by Head SWHD that in this study the methodology developed by the PI will be applied for carrying out flood frequency analysis generalized UEV (unified extreme-value) distribution for</p>

	Lower Godavari subzone-3f Study Group: S.K. Singh DOS: April 2020; DOC: March 2021	Lower Narmada & Tapi subzone-3b; and Lower Godavari subzone-3f. The efficacy of the developed methodology will be demonstrated for flood frequency estimation.
11.	Probabilistic dam break flood wave simulation and flood risk assessment for preparation of EAP for Mahi Bajaj Sagar dam in Rajasthan. Study Group: J.P. Patra Rakesh Kumar, Pankaj Mani, Sunil Gurrapu DOS: July 2020; DOC: August 2022	Mr. Jagadish Prasad Patra, presented the current practice of dam break studies for preparation of EAP and the need for moving towards a Probabilistic dam break studies and importance of Exceedance Probability Inundation (EPI) Maps in future. The various objectives along with brief methodology was presented for the proposed study “Probabilistic dam break flood wave simulation and flood risk assessment for preparation of EAP for Mahi Bajaj Sagar dam in Rajasthan”. It was explained that considering reduction in duration of the study, a truncated model approach will be used for modelling the breach outflow hydrograph rather than cloud computing or parallel processing approach. There was no specific comments on the study.

RECOMMENDED WORK PROGRAM FOR THE YEAR 2020-21

ONGOING STUDIES (SPONSORED)			
S. No. & Ref. Code	Title	Study Team	Duration
1.NIH/SWHD /16-21	Hydrological modeling in Alaknanda basin and assessment of climate change impact (NMSHE)	A.K.Lohani Sanjay K. Jain Archana Sarkar V.S. Jeyakanthan L.N. Thakural	5 years (April 2016 to March 2021)
2.NIH/SWHD /19-20	Rainfall-Runoff Modelling of Selected Basin based on LULC pattern and development of Correlation (NHP)	A.K. Lohani R.K. Jaiswal Sushant Jain WRD Rajasthan Sanjay Agarwal Shailendra Kumar	15 months (Oct. 2019 to Dec. 2020)

ONGOING STUDIES (INTERNAL)			
S. No. & Ref. Code	Title	Study Team	Duration
4.NIH/SWHD/ 17-21	Development of regional relationships for water availability analysis and flood estimation for lower Godavari basin (3f)	Sanjay Kumar Rakesh Kumar J.P. Patra Pankaj Mani	4 years (April 2017 to March 2021)
5.NIH/SWHD/1 8-20	Assessment of Climate Change Impact on Water Availability and Agriculture in part of Banas basin	Archana Sarkar Surjeet Singh Suman Gurjar Sunil Gurrapu	2 years (Nov. 2018 to October 2020) Extended up to March 31, 2021)

6.NIH/SWHD/ 15-19	Study of Hydrological Changes in selected Watersheds in view of Climate Change in India	L.N. Thakural D.S. Rathore Surjeet Singh Sanjay K. Jain Sharad K. Jain	4 years (April 2015 to March 2019) Extended up to Dec., 2020
7.NIH/SWHD/ 18-21	Evaluation of seasonal extreme rain events across river basins of India in 3D global temperature change scenario.	Ashwini Ranade Archana Sarkar	3 years (April 2018 to March 2021)
8.NIH/SWHD/ 18-21	Evaluation of the influence of low-frequency atmosphere-ocean oscillations on annual floods in the watersheds of the Indian subcontinent	Sunil Gurrapu Ashwini Ranade J.P. Patra	3 years (Nov 2018 to October 2021)
9.NIH/SWHD/ 18-20	Evaluation of water quality of Government schools in Roorkee block, District Haridwar	N.K. Bhatnagar M.K. Sharma L.N. thakural Reena Rathore	2 years (Oct 2018 to sept. 2020)

NEW STUDIES (INTERNAL)

S. No. & Ref. Code	Title	Study Team	Duration
10.NIH/SWHD /20-21	Application of unified-extreme-value (UEV) distribution for flood frequency: (1) Lower Narmada & Tapi subzone-3b, (2) Lower Godavari subzone-3f	S.K. Singh	One year (April 2020 to March 2021)
11.NIH/SWHD /20-22	Probabilistic dam break flood wave simulation and flood risk assessment for preparation of EAP for Mahi Bajaj Sagar dam in Rajasthan.	J.P. Patra Rakesh Kumar Pankaj Mani Sunil Gurrapu	2 years (Aug 2020 to Jul 2022)

WATER RESOURCES SYSTEMS DIVISION

During the working group meeting, internal completed/ ongoing studies and proposed new studies were presented. None of the sponsored studies were presented during the WG. Accordingly, two completed studies, three ongoing studies and four new studies were presented by the respective PIs. Dr. Sanjay K Jain, Sc. G and Head, presented an overview of the division – scientific strength, the ongoing studies, sponsored & consultancy studies, technical publications and training courses organized. Thereafter, PIs of the studies as discussed above presented their studies. Following are the comments/suggestions received from working group on the presentations of the various studies.

PI: Dr. M. K. Nema (MKN), Scientist “D”

MKN presented one completed and one proposed study.

1. Hydrological Processes and Characterization of Lesser Himalayan Catchments (Completed)

MKN presented the completed study covering the study background, objective, methodology, instrumentation set up and various results. He informed that all the objectives had been accomplished. It has been explained that the first phase of the Herval study mainly dealt with the establishment of field observatory in the catchment and also time-series analysis of various meteorological, hydrological and lithological variable. The results of the evapotranspiration (ET) estimated by the various methods and their inter-comparison were presented. It was also informed that a detailed project report has been prepared and sent for technical review to external and internal experts. The WG members made no significant comments during the presentation.

2. Monitoring and hydrological modeling of Herval watershed in Lesser Himalaya (Project Herval Phase-II) (New Study)

MKN proposed a new internal research study on the Herval experimental watershed. He expressed that considerable instrumentation has been done in the Herval catchment and in continuation Herval Phase-II is being proposed. He briefed about the study objectives, methodology, budget, and project timeline to the working group members. The working group members appreciated the initiatives and made no specific suggestions or comments about the new proposed study.

PI: Deepa Chalisgaonkar, Scientist “G”

DC presented one completed study and one proposed study.

1. Development of window based software for Flood Estimation (Completed)

Mrs. Deepa presented the study. She informed WINDOWS based software named “NIH_FLWin: A Windows based Software for Flood Estimation” has been developed. The modules in the software are classified in nine different categories dealing with different aspects such as Processing and Analysis of Precipitation Data, Computation of Discharge and Rating Curve Analysis, Computation of Excess Rainfall and Direct Surface Runoff, Unit Hydrograph Derivation, Reproduction of Direct Surface Runoff and Estimation of Flood, Design Flood, Channel Routing, Reservoir Routing Using Modified Pul’s Method and Flood Estimation for Large Catchments. These modules have been further sub-divided into various sub modules.

She further added that the software provides a user-friendly environment. It also includes on-line help to guide the user for each module. Sample data has been included in the package for easy preparation of input files. The results are in the form of tabular and graphical options facilitating efficient analysis and reporting and are subjected to the assumptions and limitations of the respective techniques on which the programmes are based. The package provides useful information regarding the flood estimation which is very much useful to the field engineers.

Dr S P Agrawal enquired about the validation of the software. Dr A K Lohani informed that the software has been tested with sample data and it is working fine.

2. Upgradation of NIH_ReSyP – A Reservoir Systems Package (New Study)

Mrs. Deepa presented the study. She informed that there are two objectives. (i) Upgradation of NIH_ReSyP to VB.Net Platform and (ii) To carry out a number of modifications in various modules of NIH_ReSyP software developed in the institute about a decade back. The modules of NIH_ReSyP software such as capacity computation, storage yield analysis, hydropower simulation, reservoir routing, EAC interpolation, inflow estimation using rate of rise method, initial rule curve derivation, and operation of a system of multiple reservoirs for conservation purposes will be upgraded from VB6 to VB.NET. It was suggested by Dr. Vijay Kumar, MoES that a number of reservoir system studies have been carried out at NIH. It would be worthwhile to demonstrate the applications of NIH_ReSyP software modules with such data. It was clarified that in the previous version of the software, sample input - out files for each module were provided with the software and the same will be provided in this version also. Dr M K Goel added that the development of a user-friendly software for integrated operation of reservoir systems in accordance with the Indian practices.

PI: Dr. P. K. Singh (PKS), Scientist “D”

PKS presented one ongoing study and one proposed study.

1. Developments of Water Accounts for Subarnarekha Basin Using Water Accounting Plus (WA+) Framework (Ongoing)

PKS presented the work on the ongoing study “Developments of Water Accounts for Subarnarekha Basin Using Water Accounting Plus (WA+) Framework”. During presentation, one of the experts asked whether the deep aquifers are considered in this framework. PKS informed that WA+ framework does not consider deep aquifer mechanism in developing water accounts. By the end of December, 2020, the remaining work on overall aspects of water resources availability (Sheet 5 and Sheet 1) will be completed and the final report of this project will be submitted. PKS further informed that the work has been also presented in IGWC-2019 and one research paper is ready for submission to the Current Science Journal. The presentation was appreciated by the experts.

2. Development of Water Accounts for the different sub-basins of Brahmaputra and Barak River Basins in the state of Meghalaya Using Water Accounting Plus (WA+) Framework. (New Study)

PKS also presented a new NHP sponsored study on “Development of Water Accounts for the different sub-basins of Brahmaputra and Barak River Basins in the state of Meghalaya Using Water Accounting Plus (WA+) Framework”. This study was specifically requested by the implementing agency (IA) of National Hydrology Project (NHP), i.e., Water Resources Department (WRD) Meghalaya to NIH Roorkee.

PI: Dr. M. Arora (MA), Scientist “E”

MA presented one ongoing study.

1. Monitoring and Modeling of Gangotri Glacier melt runoff and simulation of stream flow under different climate scenarios (Ongoing study)

MA presented the progress of the study. He informed that the data could not be collected for the ablation period of 2020 because of Covid 19 outbreak. The analysis of meteorological parameters was presented. The capabilities of HBV light model were demonstrated with the help of one case study for a Himalayan

catchment the difference between SNOWMOD and HBV was explained. The CORDEX outputs will be used for studying the climate response. Dr Bhishm Kumar asked about the isotope analysis in the study. It was informed that samples are collected for isotope analysis in another NMSHE study. Dr Man Singh wanted to know how the individual components of streamflow are characterized. MA explained how snowmelt and ice melt can be separated. Director, NIH was interested in knowing the beneficiaries of this study. MA informed that studies carried out were presented in PAMC of DST and project report was submitted to DST. The results of the study were also used for reply of parliament queries. Also the results are communicated to the hydropower companies, State climate departments and GSI etc.

PI: Dr. Vishal Singh (VS), Scientist “C”

VS presented one ongoing study and one proposed study.

1. Real time flood modelling using HEC-RTS modelling framework (Ongoing)

VS presented study on Real time flood modelling using HEC-RTS framework in Periyar river basin. He briefly presented the different components under HEC-RTS. Dr. Dimri suggested a similar new study on urban flood modeling. Dr. Sanjay Jain informed that the study is different than urban flooding study and some studies have been carried out in the Institute on urban flooding also. No specific comments were received from the members.

2. Impacts of glacier and climate change on runoff for selected basins of Himalayan region (New)

VS presented the proposed new study on ‘Impacts of glacier and climate change on runoff for selected basins of Himalayan region’. He explained that the main purpose of the study is to know the impact of glacier change on runoff and also to see the impact of climate change on runoff. No specific comments were received from the members.

The work program of the division for the year 2020-21 is given below.

RECOMMENDED WORK PROGRAMME FOR THE YEAR 2020-2021

SN	Title	Study Team	Duration	Funding (Rs. Lakh)
Ongoing Internal Studies				
1.	Developments of Water Accounts for Subarnarekha Basin Using Water Accounting Plus (WA+) Framework	P. K. Singh P. K. Mishra, M. K. Goel, Suman Gurjar	2 years (12/18-12/20)	
2.	Real time flood modelling using HEC-RTS modelling framework	Vishal Singh A. K. Lohani	2 years (12/18-12/20)	
3.	Seasonal Characterization of Gangotri Glacier melt runoff and simulation of streamflow variation under different climate scenarios	M. Arora Sanjay K. Jain	3 years (04/18-03/21)	
Ongoing Sponsored Studies				
1.	Development of a project website and hydrological database in Upper Ganga Basin (Sub-project – 1)	M. K. Goel; M. Arora; A. K. Lohani; D. S. Rathore; D. Chalisgaonkar; A. R. S. Kumar; S. Singh; P. Mani; A. Sarkar; M. K.	5 years (01/16-12/20)	DST (52.15)

		Nema; P. K. Mishra		
2.	Real-time snow cover information system for Upper Ganga basin (Sub-project – 2)	D. S. Rathore D. Chalisgaonkar, V. S. Jeyakanthan L. N. Thakural	5 years (01/16-12/20)	DST (48.83)
3.	Glacial Lakes & Glacial Lake Outburst Flood (GLOF) in Western Himalayan Region (Sub-project – 3)	Sanjay K. Jain A. K. Lohani Sudhir Kumar Praveen Thakur (IIRS)	5 years (01/16-12/20)	DST (36.79)
4.	Assessment of downstream impact of Gangotri glacier system at Dabrani and future runoff variations under climate change scenarios (Sub-project – 4)	Renoj J. Thayyen; Sanjay K. Jain; Sharad K. Jain (Retd.) P. K. Mishra; M. Arora; AP Dimri (JNU)	5 years (01/16-12/20)	DST 86.1 (NIH) + 73.2 (JNU)
5.	Observation and modelling of various hydrological processes in a small watershed in Upper Ganga basin (Sub-project – 5)	M K Nema; Sharad K. Jain (Retd.); Renoj J. Thayyen; Sanjay K. Jain; P K Singh, P. K. Mishra; P. K. Agarwal AP Dimri (JNU)	5 years (01/16-12/20)	DST (54.07)
6.	Water Census and Hotspot analysis in selected villages in Upper Ganga basin (Sub-project – 11)	P. K. Mishra; M. K. Nema; Renoj J. Thayyen; Pradeep Kumar	5 years (01/16-12/20)	DST (90.99)
7.	Measurements and Modeling of Evapotranspiration and other Hydrological Processes in Lesser Himalayas	M K Nema; Renoj J. Thayyen; Sharad Jain (Retd.); Sanjay Jain; P. K. Mishra; AP Dimri	3 years (2016-19) Extended up to Dec. 2020	MOES (Rs. 98 Lakh)
8.	Investigating Water Stress using Hydro-meteorological and Remote Sensing data	D. S. Rathore; L. N. Thakural; Sanjay Kumar; B. Venkatesh M. K. Jose; T. Chandramohan	3 years 2017-2020	PDS under NHP (50.23 Lakh)
9.	Snow and glacier contribution and impact of climate change in Teesta river basin in Eastern Himalaya	Sanjay K. Jain P. K. Singh; M. Arora Renoj J. Thayyen; A. K. Lohani; Vishal Singh; Suman Gurjar	3 years (11/19-11/22)	NMHS-MoEF (143 Lakh)
10.	Assessment of seasonal variations in Hydrology and Cryosphere of upper Ganga Basin	Renoj J. Thayyen A. P. Dimri (JNU) Sanjay K. Jain	3 years (06/19-11/22)	NRDMS-DST (23.19 Lakh)
11.	Permafrost mapping and characterisation of Ladakh Region	Renoj J. Thayyen; A. P. Dimri (JNU); G. Jeelani (KU); V. Agnihotri (GBPNI)	3 years (11/19-11/22)	NMHS-MoEF (197.48 Lakh)
New Internal/ Sponsored Studies				
1.	Impacts of glacier and climate change on runoff for selected basins of Himalayan region	Vishal Singh Sanjay K. Jain Manohar Arora	2 years (08/20-07/22)	NIH

2.	Henvel Experimental Watershed: Observations and modelling (Phase II)	M K Nema Renoj J. Thayyen P K Mishra	3 years (08/20-07/23)	NIH
3.	Upgradation of NIH_ReSyP to .NET Platform– a Reservoir Operation Package	D. Chalisgaonkar M. K. Goel	1 year (08/20-07/21)	NIH
4.	Development of Water Accounts for the different sub-basins of Brahmaputra and Barak River Basins in the state of Meghalaya Using Water Accounting Plus (WA+) Framework.	P K Singh P K Mishra	2 years (08/20-07/22)	NHP (14.50 Lakh)
5.	Preparation of Guidelines for the “Management of Glacial Hazards and Risks especially GLOFs & LLOFs”	Sanjay K. Jain A K Lohani	1 year (12/19-12/20)	NDMA (14.36 Lakh)

RESEARCH MANAGEMENT AND OUTREACH DIVISION (RMOD)

Dr V C Goyal, Sc G & Head, presented an overview of the Division’s activities and progress of studies during 2019-20. He also presented tables showing the studies and activities proposed for the F.Y. 2020-21. Next, he invited Dr Jyoti Patil, Er Rohit Sambare and Dr Senthil Kumar to present the newly proposed studies.

RECOMMENDED WORK PROGRAM FOR THE YEAR 2020-21

SN	Title of Project/Study	Funding	Study Team	Duration	Status
Internal Study					
1	Conservation of ponds in Ibrahimpur- Masahi Village and performance evaluation of natural treatment system	NIH, CEH-UK	NIH: Omkar Singh (PI) V C Goyal, Rajesh Singh, Digambar Singh, Subhash Kichlu, Rajesh Agrawal, Rakesh Goel, NR Allaka; CEH-UK: Prof. Laurence Carvalho & Team	Apr 2018-Mar 2021	On-going
2	Integrated assessment of water resources for sustainable use in Upper Dhasan basin in Bundelkhand region	NIH	Jyoti Patil (PI) T Thomas (Co-PI), P K Mishra Rohit Sambare	Jul 2020- Dec 2022	New
3	Establishing hydrologic regime and ecohydrological functions of Jhilmil Jheel wetland (Haridwar District, Uttarakhand)	NIH	Rohit Sambare (PI) V C Goyal (Co-PI), Suhas Khobragade; Gajendra Singh-USAC, Dehradun; WI-SA, New Delhi; HESCO, Dehradun	Jul 2020- Jun 2022	New
4	Hydrology-based scenario planning for water productivity and optimization of income from farming practices in Mewat region, Haryana	NIH	A R Senthil Kumar (PI) Omkar Singh (Co-PI) Rajesh Agarwal, N R Allaka Scientist from KVK/Agri Univ.	Jul 2020- Jun 2022	New

Sponsored Projects					
1	Hydrological modelling in Bhagirathi basin up to Tehri dam and assessment of climate change impact	DST-NMSHE	A R Senthil Kumar (PI) J. V. Tyagi, M. K. Goel, S. D. Khobragade, P. C. Nayak, Manohar Arora	Mar 2016-Mar 2021	On-going
2	Rejuvenation of village ponds in identified villages of Baghpat, Ghaziabad and Meerut districts of Uttar Pradesh	MoJS (through Scheme funds)	Omkar Singh (PI), Rajesh Singh, V C Goyal, Digambar Singh, Subhash Kichlu, Rajesh Agrawal, Rakesh Goel, NR Allaka	Jan. 2018-Dec. 2020	On-going
3	Innovation Centre for Eco-Prudent Wastewater Solutions (IC-EcoWS)	DST (GoI)	V.C. Goyal (PI), Omkar Singh, Rajesh Singh, Jyoti P. Patil, Rohit Sambare, Project Team, HQ (IC-EcoWS) Partners: NIH, MNIT-Jaipur, IIT-Bombay, IRMA-Anand	Apr 2019-Mar 2024	On-going

Proposed Training/Workshops during 2020-21

S.N.	Outreach Activity	Tentative Date & Month	Place	Target Participants	Team
1	Training on 'Water security for resilience to deal with disasters and outbreaks', under aegis of INC-IHP (proposal approved by Director, NIH)	Nov. 2020	Virtual training	Youth and YPs associated with WR Assessment & Management	V C Goyal, Jyoti P Patil, Amrendra Bhushan, Victor Shinde (NIUA)
2	Hands-on training on 'Life Cycle Approach for rejuvenation of ponds and lakes using Nature Based Solutions', to be funded by SERB, DST, GoI (proposal approved by Director, NIH)	Dec. 2020	NIH Roorkee	PG and PhD students of Water resources management/ engineering	Jyoti P Patil, V C Goyal, Omkar Singh, T Thomas, Rajesh Singh, Rohit Sambhare
3	Three-day training program on "Hydrology of water bodies and their development under climatic uncertainty"	Jan 2021	NIH Roorkee	Engineers in Irrigation/PHE/ SWC departments	A. R. Senthil kumar, Santosh M Pingale, Rohit Sambare, N R Alakka
4	Awareness program on Ecohydrology for Wetland Conservation	Feb./ Mar. 2021	NIH Roorkee	Research scholars, and PG students	Rohit Sambare, Suhas Khobragade
5	Awareness Program for School Children	Oct/Nov 2020	5 Schools in Roorkee/ Nearby Roorkee	School Children	Digambar Singh, Omkar Singh, Subhash Kichlu, Rajesh Agarwal, N R Allaka
6	Awareness Programme on "Water quality and water budgeting in 5 sub Villages	Feb/Mar, 2021 (5 days)	Vill. Ibrahimpur Masahi,	Progressive Farmers	Omkar Singh, Rajesh Singh, Digambar Singh,

of Ibrahimpur Masahi”, Dist. Haridwar				Subhash Kichlu, Rajesh Agarwal, NR Allaka
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Proposed Outreach Activities during 2020-21

S.N.	Activity
1	Preparation of a guidebook on ‘Role of hydrology in district level planning’ (V C Goyal, Jyoti Patil)
2	Preparation of Short Videos (5-10 min) on i) CW & FW/Nature Based Solutions/ Pond Rejuvenation ii) Wetland Hydrology iii) Crop diversity, water productivity & farmer’s income iv) On studies and projects of NIH Scientists
3	River Walk of Solani River (stretch to be identified)
4	Any other outreach activity on demand/assigned

Dr. V C Goyal thanked the members for their valuable contributions during deliberations in the Working Group meeting. The meeting ended with vote of thanks to the Chair.

ANNEXURE-I

List of Working Group Members who attended the 50th WG meeting

1.	Dr. J V Tyagi, Director, NIH	Chairman
2.	Dr. B P Yadav, IMD, New Delhi	Member
3.	Er. Bhopal Singh, NWDA, New Delhi	Member
4.	Dr. Vijay Kumar, MoES, New Delhi	Member
5.	Dr. P R Ojasvi, ICAR-IISWC, Dehradun	Member
6.	Dr. Sushil Kumar, WIHG, Dehradun	Member
7.	Er. Kireet Kumar, GBPIHE&D, Almora	Member
8.	Dr. R D Deshpande, PRL, Ahmedabad	Member
9.	Dr. R K Goyal, CAZRI, Jodhpur	Member
10.	Dr. Pawan Labhasetwar, NEERI, Nagpur	Member
11.	Dr. S P Aggarwal, IIRS, Dehradun	Member
12.	Dr. Man Singh, WTC, ICAR-IARI, New Delhi	Member
13.	Dr. Varun Joshi, GGSIPU, New Delhi	Member
14.	Prof. K K Singh, Kurukshetra Univ., Kurukshetra	Member
15.	Prof. A K Saraf, IIT Roorkee	Member
16.	Dr. Bhishm Kumar, IAEA (Retd.), Roorkee	Member
17.	Prof. Ramakar Jha, NIT Patna	Member
18.	Prof. A P Dimri, JNU, New Delhi	Member
19.	Dr. Debashish Sen, PSI, Dehradun	Member
20.	Dr. Sadhana Malhotra, Mindspace, Dehradun	Member
21.	Sh. Sudhindra Mohan Sharma, Ex-Nodel Officer, MoDWS, Indore	Member
22.	Dr. Rakesh Kumar, Sc. G & Head SWH Division, NIH	Member
23.	Dr. Sudhir Kumar, Sc. G & Head HI Division, NIH	Member
24.	Dr. Sanjay K. Jain, Sc. G & Head WRS Division, NIH	Member

25.	Dr. R P Pandey, Sc.G & Head EH Division, NIH	Member
26.	Dr. V C Goyal, Sc. G & Head, RMO Division, NIH	Member-Secretary

Scientists from NIH

	EH Division		SWH Division
1	Dr. M.K. Sharma, Sc.E	19	Dr. A.K. Lohani, Sc.G
2	Dr. Rajesh Singh, Sc.D	20	Dr. Sanjay Kumar, Sc.E
3	Dr. Pradeep Kumar, Sc.D	21	Dr. Archana Sarkar, Sc.E
4	Sh. Rajesh K. Nema, Sc.B	22	Dr. L.N. Thakural, Sc.D
5	Ms. Anjali, Sc.B	23	Sh. J.P. Patra, Sc.D
	GWH Division	24	Dr. Ashwini A. Ranade, Sc.C
6	Dr. Anupama Sharma, Sc.F	25	Sh. Sunil Gurrapu, Sc.C
7	Dr. Surjeet Singh, Sc.F	26	Sri N K Bhatnagar, Sc.B
8	Er. Sumant Kumar, Sc.D		WRS Division
9	Dr. Gopal Krishan, Sc.C	27	Dr. M.K. Goel, Sc.G
10	Sh. Nitesh Patidar, Sc.B	28	Smt. Deepa Chalisgaonkar, Sc. G
	HI Division	29	Er. D.S. Rathore, Sc.F
11	Dr. M.S. Rao, Sc.F	30	Dr. Renoj J. Thayyen, Sc.E
12	Dr. Santosh M Pingale, Sc.C	31	Dr. Manohar Arora, Sc.E
13	Ms. Nidhi Kalyani, Sc.B	32	Dr. P K Singh, Sc.D
	RMO Division	33	Er. Manish Nema, Sc.D
14	Er. Omkar Singh, Sc.F	34	Dr. P K Mishra, Sc.C
15	Dr. A R Senthil Kumar, Sc.F	35	Dr. Vishal Singh, Sc.C
16	Dr. (Mrs.) Jyoti P. Patil, Sc.D	36	Sh. P K Agarwal, Sc.B
17	Sh. Digamber Singh, Sc.C		
18	Sh. Rohit S. Sambare, Sc.B		