

**MINUTES OF THE
45TH MEETING OF WORKING GROUP OF NIH
HELD AT NIH, ROORKEE, DURING MAY 11-12, 2017**

The 44th meeting of the Working Group of NIH was held at NIH, Roorkee, during May 11-12, 2017 under the Chairmanship of Director, NIH. The list of the participants of the meeting is given in Annexure-I.

ITEM NO. 45.1: OPENING REMARKS BY THE CHAIRMAN

Er R D Singh, Director, NIH & Chairman, WG welcomed the Working Group members and the Scientists of the Institute. The Chairman informed the house about the completion of the 12th Plan on 31-03-2017, and merging of the Plan and Non-Plan funds. Also, he mentioned that the formation of Achievement Review Committee, to review the performance of NIH during the 12th Plan period, is under process. He informed the house that the ongoing studies with NIH's internal funding can be extended upto September 2017, and only studies with no financial requirement can continue beyond September 2017. He also informed the house that some new projects have been sanctioned and commenced in the Institute, namely- NMSHE Project (DST funded), National Hydrology Project (World Bank funded), and the Neeranchal Watershed Project (World Bank funded through DoLR, GoI).

The Chairman then requested the Member-Secretary to take up the agenda of the meeting.

ITEM No. 45.2: CONFIRMATION OF THE MINUTES OF 44th MEETING OF THE WORKING GROUP

The 44th meeting of the Working group was held during April 18-19, 2016. The minutes of the meeting were circulated to all the members and invitees vide letter No. RMOD/WG/NIH-10 dated 01 June 2016. No Comments were received. The members confirmed the Working Group minutes.

ITEM No. 45.3: 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 44th working group meeting.

ITEM Nos. 45.4 & 45.5: PRESENTATION AND DISCUSSION ON THE STATUS AND PROGRESS OF THE WORK PROGRAMME FOR YEAR 2016-17 AND FINALIZATION OF THE WORK PROGRAMME FOR YEAR 2017-18.

The Member-Secretary requested the respective Divisional Heads to present the progress of studies carried out during 2016-17 and work programme for the year 2017-18. Accordingly, the progress of various studies and sponsored projects was 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 below:

ENVIRONMENTAL HYDROLOGY DIVISION

Progress of Work Programme 2016-17

S.No.	Study	Recommendations / Comments
Internal Studies		
1.	<p>Development of Habitat Suitability Curves for the Aquatic Species of Western Himalayan Streams Study Group: Pradeep Kumar & C. K. Jain</p> <p>Duration: 2 Years (04/16-03/18) Status: In-progress</p>	No comments
Sponsored Projects		
1.	<p>Low Cost Technology for Purification of Arsenic and Microbes Contaminated Water using Nanotechnology Study Group: Vijaya Aggarwala & Rama Mehta</p> <p>Duration: 2 Years (04/14-03/16); Extended for 6 months. Sponsored by: DST Status: Completed</p>	No comments
2.	<p>Ionic Enrichment Dynamics of Glacial Sediment and Melt water of Gangotri Glacier Study Group: M. K. Sharma (PI); C. K. Jain; Renoj Thayyan, Manohar Arora, Naresh Saini, Jatin Malhotra, Rakesh Goyal & Shyam Lal</p> <p>Duration: 3 Years (05/14-05/17) Sponsored by: DST Project Cost: 32.8 lacs Status: In progress</p>	No comments
3.	<p>Environmental Assessment of Aquatic Ecosystem of Upper Ganga Basin Study Group: C. K. Jain (PI), Manohar Arora, M. K. Sharma, Pradeep Kumar & D. S. Malik (GKU)</p> <p>Duration: 5 Years (04/16-03/21) Sponsored by: DST Project Cost: 2.25 Crore Status: In-progress</p>	No comments
Consultancy Projects		
1.	<p>Petroleum Product Contamination at Akolner Village, District Ahmednagar, Maharashtra and Suggesting Remedial Measures</p>	No comments

	Study Group: C. K. Jain (PI), Sudhir Kumar, B. Purendra, Anupma Sharma & M. K. Sharma Duration: 1 Years (10/15-09/16) Sponsored by: MPCB, Mumbai Project Cost: 54.72 Lakh Status: Completed	
2.	Study on Ash Disposal from Telangana STPP into Mine Void of Medapalli Open Cast Mines Study Group: C. K. Jain (PI), Sudhir Kumar, Y. R. S. Rao, Anupma Sharma, S. D. Khobragade, M. K. Sharma and Pradeep Kumar Duration: 15 Months (04/16-06/17) Sponsored by: NTPC, Ramagundam Project Cost: 54.96 Lakh Status: In-progress	No comments

Training Courses Organized

S.No.	Topic	Sponsored by	Venue	Period
1.	Advanced Instrumentation Techniques: Hands-on-Training	CPCB, Delhi	NIH Roorkee	19-21 Dec. 2016
2.	Hands on Advanced Instruments of Water Quality Monitoring and Testing	MoWR, RD & GR, New Delhi	NIH Roorkee	16-20 Jan. 2017
3.	Water Quality and its Management	MoWR, RD & GR, New Delhi	NIH Roorkee	20-24 Mar. 2017

Proposed Work Programme 2017-18

S.No.	Study	Study Team	Duration
Internal Studies (Contd.)			
1.	Development of Habitat Suitability Curves for the Aquatic Species of Western Himalayan Streams	Pradeep Kumar C. K. Jain	2 Years (04/16-03/18) Status: In-progress
Sponsored Projects (Contd.)			
1.	Ionic Enrichment Dynamics of Glacial Sediment and Melt water of Gangotri Glacier	M. K. Sharma (PI) C. K. Jain Renoj Thayyan Manohar Arora Naresh Saini Jatin Malhotra Rakesh Goyal Shyam Lal	3 Years (05/14-05/17) Sponsored by DST Status: In progress Project Cost: 32.8 lacs Progress: In-progress
2.	Environmental Assessment of Aquatic Ecosystem of Upper Ganga Basin (Under NMSHE)	C. K. Jain (PI) Manohar Arora M. K. Sharma Pradeep Kumar D. S. Malik (GKU)	5 Years (04/16-03/21) Sponsored by DST Project Cost: 2.25 Crore Status: In-progress
Consultancy Projects (Contd.)			
1.	Study on Ash Disposal from Telangana	C. K. Jain (PI)	15 Months

	STPP into Mine Void of Medapalli Open Cast Mines	Sudhir Kumar Y. R. S. Rao Anupma Sharma S. D. Khobragade M. K. Sharma Pradeep Kumar	(04/16 – 06/17) Sponsored by: NTPC Amount Rs. 54.96 Lacs Status: In-progress
Proposed PDS (New)			
1.	Ground Water Quality Assessment with Special Reference to Sulphate Contamination in Bemetara District of Chhattisgarh State and Ameliorative Measures	M. K. Sharma (PI) C. K. Jain Surjeet Singh Pradeep Kumar Partner: WRD, Raipur A. K. Shukla Ashok Verma P. C. Das	2 Years

GROUND WATER HYDROLOGY DIVISION

Sh. C. P. Kumar, Scientist 'G' presented an overview, progress of studies and activities carried out by the division during the period April 2016 to March 2017. While presenting the technical activities carried out by the division and progress made on different studies during last one year, he gave an account of scientific personnel available at the division, sponsored and consultancy projects carried out, trainings organized and also future activities planned by the Division. Out of five in-house R&D studies and five sponsored studies approved for the year 2016-17, three in-house R&D studies and one sponsored study have been completed and two in-house R&D studies and 4 sponsored studies shall be continued in the next year. Two new studies, the one sponsored and the other one in-house, have been proposed for the year 2017-18 (Annexure 1).

Sh. C. P. Kumar informed that scientists of the division have published a number of research papers in various journals/conferences, delivered lectures in various training courses, and also guided/guiding M.Tech/Ph.D students during the period.

The study-wise progress reported and suggestions emerged are given below.

1. **Project Ref. Code: NIH/GWD/NIH/15-18: Peya Jal Suraksha - Development of Six Pilot Riverbank Filtration Demonstrating Schemes in Different Hydrogeological Settings for Sustainable Drinking Water Supply**

Dr. N. C. Ghosh (PI) briefed about the background of the study and progress made on the six demonstration sites to be developed at Laksar (Uttarakhand), Agra and Mathura (Uttar Pradesh), Sahebganj (Jharkhand), Bhojpur (Bihar) and Visakhapatnam (Andhra Pradesh). He also presented the objectives and methodology of the study. Dr. Ghosh informed that out of six demonstration schemes, the site at Laksar has been abandoned because of water quality issue and erosion of riverbank, the scheme at Sahebganj (Jharkhand) is yet to be decided and the activities of all other four sites are in progress. The construction activities are being taken up through respective State government organizations as deposit work.

2. **Project Ref. Code: NIH/GWD/NIH/14-17: Management of Water Resources for Quantity and Quality in Yamuna-Hindon Inter-basin**

Dr. Anupma Sharma (PI) presented the progress of the study. She informed about the declining groundwater levels in Baghpat, Shamli and Muzaffarnagar districts of the Yamuna-Hindon inter-basin and the increasing pollution levels in the Hindon river and its tributaries. The numerical model developed for the inter-basin using Visual Modflow was described along with the recharge computations and model boundary conditions. The comparison of computed and observed values of water table at steady state was explained. The water quality analysis of samples taken from Hindon river and groundwater within a zone of 500 m was also described. It was informed that variations in the water quality would be correlated with the existing field conditions.

3. **Project Ref. Code: NIH/GWD/NIH/15-16: Alternate Water Supply Management Strategies in Arsenic Affected/ Vulnerable Areas: Mapping of Arsenic Affected Zones/ Regions in Eastern U.P.**

Mr. Sumant Kumar (PI) presented the objectives, achievements and results of the completed study. PI informed that this study is about arsenic(As) risk zone mapping and preparation of As distribution map based on chemical analyses results of 148 distributed GW samples monitored in the district covering all the seventeen blocks. PI mentioned that a detailed hydro-geochemical study would be carried out to understand cause, occurrence and mobilization of As in GW as a Purpose Driven study under the National Hydrology Project (NHP) subject to award of the project.

4. **Project Ref. Code: NIH/GWD/NIH/15-16: Web Enabled “Groundwater Recharge Estimation Model (WE-GREM)”**

Ms. Suman Gurjar (PI) stated that the study has been completed and the Web Enabled “Groundwater Recharge Estimation Model (WE-GREM)” model together with user manual has been uploaded in the NIH’s website : www.nihr@gov.in. She mentioned that about 1000 persons visited the site.

5. **Project Ref. Code: NIH/GWD/NIH/16-17: Groundwater fluctuations and conductivity monitoring in Punjab**

Dr. Gopal Krishan (PI) presented the progress made in the study and presented the future work plans. He also clarified the action taken on the comments of experts made during the 44th WG meeting. Sh. R.D. Singh, Director, NIH advised to give the background of the study and the same has been clarified by Dr. N.C. Ghosh, Head, GWHD. Dr. D.V. Reddy suggested to modify the title of the study and to carry out the water sampling of piezometers for analysis of water chemistry.

6. **Project Ref. Code: NIH/GWD/NIH/16-17: Baseline data collection and analysis of Mewat district, Haryana**

Dr. Gopal Krishan (PI) presented the background, statement of the problem, objectives, methodology and future plans of the study. Sh. R.D. Singh, Director, NIH advised to share the results with the Sehgal Foundation, Gurgaon.

7. Project Ref. Code: NIH/GWD/NMSHE/16-21: **Study of river - aquifer interactions and groundwater potential in the upper Ganga basin up to Dabrani**

Dr. Surjeet Singh (PI) presented the progress of the study. He described about various GIS layers prepared, selection of sites for piezometer, lithology, water sampling analysis and the piezometer development work. He also elaborated the future plans of the study.

8. Project Ref. Code: NIH/GWD/NIH/16-16: **Web Enabled “Conjunctive Use Model for Management of Surface and Ground Water using concept of MAR and ASR”**

Ms. Suman Gurjar (PI) presented the objectives, methodology and progress made so far in the study. She informed that this study considers both recharge and groundwater extraction component including water quality modeling of recharge water. Ms. Gurjar mentioned that unlike WE-GREM, the present study also includes rainfall-runoff modeling of the recharge basin catchment using SCS-CN model and water surface evaporation modeling using Priestley-taylor and modified Penman method. She requested for four month extension to complete the source code development in JavaScript and to make web enabled interface and hosting to NIH's website. Dr. D.V. Reddy suggested for using different datasets to validate the performance of the model.

9. Project Ref. Code: NIH/GWD/NIH/16-16: **Evaluation of Saryu Nahar Pariyojna (SNP) National Project in Uttar Pradesh**

Dr. N. C. Ghosh (PI) presented the background, objectives and results of the study. He informed the members that the study was sponsored by the MoWR, RD & GR and the final report of the study had been submitted in the Ministry in the month of October, 2016.

10. Project Ref. Code: NIH/GWD/NIH/16-17: **Country-wide Capacity Building Program on “Bank Filtration for Sustainable Drinking Water Supply”**

Dr. N. C. Ghosh (Project Coordinator) presented the objectives, and progress made so far on the project. He informed that the project comprising to organize four training courses on “Bank Filtration for Sustainable Drinking Water Supply” was sponsored by DST. Out of four, two training courses was organized; the one at NIH-Roorkee during 12th -16th September, 2016 for the States of all eight north-eastern states, West Bengal, Bihar, Jharkhand, Uttar Pradesh, Uttarkhand, Himachal Pradesh, and Delhi, and the other one at Goa during 6th - 10th February, 2017 for the States of Tamil Nadu, Karnataka, Kerala, Pudicherry, Andhra Pradesh, Telengana, Odisha, Maharastra, Goa, Gujarat, Madha Pradesh, Chhatisgarh, Punjab, Haryana, Rajasthan, Jammu & Kashmir and UTs of Andaman & Nicobar. Dr. Ghosh further informed that the third training course shall be organized at Shillong during September, 2017 for the States all eight north-eastern states, West Bengal, Bihar, Jharkhand, Uttar Pradesh, Uttarkhand, Himachal Pradesh, and Delhi.

The work program of the division for the year 2017-18 as recommended by the Working Group is as follows:

PROPOSED WORK PROGRAM 2017-18

S. No.	Project	Project Team	Duration & Status	Funding Source
1. NIH/GWD/NIH/ 15-18	Peya Jal Suraksha - Development of Six Pilot Riverbank Filtration Demonstrating Schemes in Different Hydrogeological Settings for Sustainable Drinking Water Supply.	N.C. Ghosh (Project Coord. & Leader) C.P. Kumar, B. Chakraborty, Y.R.S. Rao, Anupma Sharma, Surjeet Singh, Sumant Kumar, Suman Gurjar, S.P. Indwar, R.P. Singh, Anju Choudhury, Sanjay Mittal, Ram Chandar, Staff SW Lab	21/2 year (11/15 – 4/18) Status: In progress. Project cost : Rs. 375 lakh	Sponsored by MoWR, RD & GR under Plan Fund.
2. NIH/GWD/NIH/ 14-17	Management of Water Resources for Quantity and Quality in Yamuna-Hindon Inter-basin	Anupma Sharma (PI), N.C. Ghosh (Coordinator), Deepak Kashyap, IITR (Technical Consultant) M K Sharma R.P. Singh Sumant Kumar Shashi P. Indwar	3 years (12/14 – 11/17) Status: In progress.	Internal Funding.
3. NIH/GWD/NIH/ 16-17	Groundwater fluctuations and conductivity monitoring in Punjab.	Gopal Krishan (PI), N.C. Ghosh, Surjeet Singh, C.P. Kumar Dan Lapworth (PI from UK) Alan MacDonald (Project Coordinator)	1 year (01/16 – 12/17) Status: In progress. Project cost : £. 11,800	NIH in association with BGS, UK
4. NIH/GWD/NMS HE/16-21	Study of river - aquifer interactions and groundwater potential in the upper Ganga basin up to Dabrani.	Surjeet Singh (PI), N.C. Ghosh, R. J. Thayyen, S. P. Rai, Manohar Arora, Gopal Krishan,	1 year (03/16 – 02/21) Status: New. Project cost : Rs. 125 lakh	Sponsored by DST under NMSHE.
5. NIH/GWD/NIH/ 16-16	Web Enabled “Conjunctive Use Model for Management of Surface and Ground Water using concept of MAR and ASR”.	Suman Gurjar (PI), N.C. Ghosh, Sumant Kumar, Surjeet Singh, Anupma Sharma	08 Months (04/16 – 11/16) Status: New.	Internal Funding.
6./NIH/GWD/16 -17	<i>Country-wide Capacity Building Program on “Bank Filtration for Sustainable Drinking Water Supply”</i>	N. C. Ghosh, Lead Other Scientists of the division	2 years(02/16 – 03/18) 4 training courses in two years. (2-completed) Project cost : Rs. 38.4 lakh	Sponsored by DST
New Studies				
7. NIH/GWD/NIH/ 16-19	Grey Water to Blue Water – Natural Treatment Techniques for Transforming Wastewater into	N.C. Ghosh (Project Leader), Anupma Sharma, Surjeet Singh, Sumant Kumar, Suman Gurjar, Anju Choudhury, Sanjy Mittal,	3 years (11/16-10/19) Status: New Study. Project	Sponsored by NWM, MoWR, RD & GR

	Sustainable Water	Useable	Ram Chandar, Staff SW Lab - IIT Bombay (Partner) -UJS (Partner)	partners: IIT Bombay UJS, Dehradun Project cost : Rs. 160. 785 lakh + service tax.	
8.NIH/GWD/NIH/17-17	Feasibility of Managed Aquifer Recharge in NCT, Delhi		NIH-Roorkee (Lead) CGWB, New Delhi	6 months (2/17-7/17) Status : New study	Desired by Secretary, WR, RD & GR

HYDROLOGICAL INVESTIGATIONS DIVISION

Dr Sudhir Kumar, Scientist-G and Head of the H. I. Division presented the brief details of various studies being carried out under the H. I. Division along with number of research papers published/accepted for publication/communicated and analytical work carried out at the Nuclear Hydrology Laboratory. He also informed about the proposed training course of the Division.

Table 1: Status of studies of HI Division

Type of study/Project	Completed during 2016-17	Continued in 2017-18	New Proposed for 2017-18	Total studies for 2017-18
R & D Studies	1	4	0	4
Sponsored Projects	3	3	6	9
Consultancy Projects	2	6	1	7
Total	6	13	7	20

Table 2: Publications of HI Division during 2016-17

Reports Completed		
(a) Internal R & D Projects	1	
(b) Sponsored Projects	3	
(c) Consultancy Projects	4 (including 2 projects received and completed after the 44 th WG meeting)	
Research Papers		
	Published	Accepted
Int. Journals	4	1
Nat. Journals	8	--

Int. Conferences	2	--
Nat. Conferences	7	--
TOTAL	21	1

The progress of studies was presented by the respective P.I. of the study. The actions suggested by the working group for various studies are as follows:

INTERNAL STUDIES:

S. N.	Project	Duration	Status	Suggestions/ Recommendations
1.	Interaction between groundwater and sea water along the northern part of east coast of India	2 years (01/15-12/16)	Continuing Study	No specific suggestion. Recommended for extension upto March 2018
2.	Status Report on Rewalsar Lake, Himachal Pradesh	1 years (04/15-07/16)	Completed	No specific suggestion.
3.	Lake-Groundwater Interaction Studies for Sukhna Lake, Chandigarh	3 years (04/15-03/18)	Continuing Study	No specific suggestion.
4.	Radiocarbon dating of deeper groundwater of Indo-Gangetic Basin	3 years (04/16 – 03/19)	Continuing Study	No specific suggestion.
5.	Isotopic Investigations in parts of Upper Yamuna River Basin	2 years (04/16 – 03/18)	Continuing Study	No specific suggestion.

SPONSORED PROJECTS:

SN	Project	Duration	Funding	Status	Action(s) Suggested
1.	The Structure and Dynamics of Groundwater Systems in Northwestern India under Past, Present and Future Climates	06/12-07/16	MOES	Completed	No specific suggestion.
2.	Assessment of Base-flow and its Impact on Water Quality in the Part of Satluj River in India using Environmental Isotopes and Age Dating Techniques	3 years (10/12-07/16)	IAEA, Vienna	Completed	No specific suggestion.

3.	Integration of Isotope Hydrology in Aquifer Mapping Efforts in India: A Pilot Study of Upper Yamuna Plains	2 years (05/13-06/16)	IAEA, Vienna	Completed	No specific suggestion.
4.	Understanding of hydrological processes in Upper Ganga basin by using isotopic techniques	5 Years (04/16-03/21)	NMSHE Project	Continuing Study	No specific suggestion.
5.	Rejuvenation of Springs and Spring-fed Streams in Mid-Himalayan Basin using Spring Sanctuary concept	3 Years (06/16 - 05/19)	Project with GBPIHE	Continuing Study	No specific suggestion.

CONSULTANCY PROJECTS:

SN	Project	Duration	Funding	Status
1.	Hydro-geological Study for Dewatering of Jhamarkotra Mines, Distt. Udaipur	3 years (05/13-04/16)	RSMML, Udaipur	Completed and Final Report submitted
2.	Estimation of canal seepage and groundwater recharge using isotopic techniques in the Chajlet block, Moradabad district, UP	1 year (3/15-06/16)	UPGWD, Lucknow	Completed and Final Report submitted
3.	Hydro-geological study for Gadawara super thermal power project, MP	12 months (07/15-06/16)	NTPC	Draft Report submitted
4.	Hydro-geological study for Katwa super thermal power project, WB	9 months (07/15-04/16)	NTPC	Completed and Final Report submitted
5.	Hydro-geological study for Darlipali STPP, Odisha	9 months (09/15-07/16)	NTPC	Draft Report submitted
6.	Hydro-geological study for Khargone STPP, Madhya Pradesh	9 months (07/15-04/16)	NTPC	Draft Report submitted
7.	Hydro-geological study for Kudgi STPP, Karnataka	12 months (12/15-11/16)	NTPC	Completed and Final Report submitted
8.	Hydro-geological and isotopic study for 1x660 MW Harduaganj PTS, UP	12 months (11/15-10/16)	UPRVUNL	Draft Report submitted

9.	Hydro-geological and isotopic study for 1x660 MW Panki PTS, UP	12 months (12/15-11/16)	UPRVUNL	Draft Report submitted
10.	Hydro-geological and isotopic study for 1x660 MW Panki PTS, UP	12 months (12/15-11/16)	UPRVUNL	Draft Report submitted
11.	Detail Hydro-geological study of ash pond area, Talcher STPS, Angul, Orissa	12 months (7/16 to 6/17)	NTPC	Continuing project

PROPOSED WORK PROGRAMME 2017-2018

SN.	Project Title	Duration	Remarks
<u>INTERNAL STUDIES:</u>			
1.	Interaction between groundwater and sea water along the northern part of east coast of India	2 years (01/15-03/18)	Continuing Study
2.	Lake-Groundwater Interaction Studies for Sukhna Lake, Chandigarh	3 years (04/15-03/18)	Continuing Study
3.	Radiocarbon dating of deeper groundwater of Indo-Gangetic Basin	3 years (04/16 - 03/19)	Continuing Study
4.	Isotopic Investigations in parts of Upper Yamuna River Basin	2 years (04/16-03/18)	Continuing Study
<u>SPONSORED PROJECTS:</u>			
5.	Understanding of hydrological processes in Upper Ganga basin by using isotopic techniques (Under NMSHE Project)	5 Years (04/16-03/21)	Continuing Study
6.	Rejuvenation of Springs and Spring-fed Streams in Mid-Himalayan Basin using Spring Sanctuary concept (GBPNIHESD)	3 Years (06/16 -05/19)	Continuing Study
7.	Stable isotope analysis of groundwaters of India	3 years (from the date of sanction)	Under MoU with CGWB
8.	Isotope investigation of contemporary and past hydro-meteorological processes across Indian Himalaya (DoS)	3 years (from the date of sanction)	New project with PRL
9.	Integrated hydrological investigations of Renuka lake, Himachal Pradesh, for its conservation and management	3 years (from the date of sanction)	New project under NHP

10.	Chemical & Isotopic Characterization of Deep Aquifer Groundwater of Middle Ganga Basin	3 years (from the date of sanction)	New project under NHP
11.	Development of management strategies for the rejuvenation of Rispana and Bindal rivers in Dehradun district of Uttarakhand	3 years (from the date of sanction)	New project under NHP
12.	Dating very old groundwaters of deeper aquifers in Ganga Plains, India	3 years (from the date of sanction)	New project under NHP
13.	Development of a comprehensive plan for conservation and sustainable management of Bhimtal and Naukuchiatal lakes, Uttarakhand	3 years (from the date of sanction)	New project under NHP
<u>CONSULTANCY PROJECTS:</u>			
14.	Hydro-geological study for Gadarwara super thermal power project, MP	12 months (07/15-06/16)	Draft Report submitted
15.	Hydro-geological study for Darlipali STPP, Odisha	9 months (09/15-07/16)	Draft Report submitted
16.	Hydro-geological study for Khargone STPP, Madhya Pradesh	9 months (07/15-04/16)	Draft Report submitted
17.	Hydro-geological and isotopic study for 1x660 MW Harduaganj PTS, UP	12 months (11/15-10/16)	Draft Report submitted
18.	Hydro-geological and isotopic study for 1x660 MW Panki PTS, UP	12 months (12/15-11/16)	Draft Report submitted
19.	Detail Hydro-geological study of ash pond area, Talcher STPS, Angul, Orissa	12 months (7/16 to 6/17)	Continuing project
20.	Identification of source of seepage in the villages surrounding the Ash Dykes of Barh STPP	3 months (04/17 – 03/20)	New Project

SURFACE WATER HYDROLOGY DIVISION

Work Program 2016-17

S.No. & Ref Code	Title	Study Team	Duration
COMPLETED STUDIES			
1. NIH/SWHD/ NIH/14-16	Estimation of Water Balance for Integrated Water Resources Management in Yerrakalva Pilot Basin, A.P.	J.V. Tyagi YRS Rao	2.5 years (April 2014 to Sept. 2016)
2. NIH/SWHD/ NIH/13-16	Application of DSS (P) for Integrated Water Resources Development & Management	A.K. Lohani Surjeet Singh Rahul Jaiswal D K Sonkusale Akilesh Verma	3 years (April 2013 to May, 2016)
3. NIH/SWHD/ NIH/15-17	Study of regional drought characteristics and long term changes in supplemental irrigation water requirement in Seonath Basin in Chhattisgarh	R.P. Pandey Rakesh Kumar	2 years (April 2015 to March 2017)
4. NIH/SWHD/ NIH/13-16	Quantitative assessment of uncertainties in river discharge estimation	Sanjay Kumar Sharad Jain	3.5 Years (April 2013 to December 2016)
5. NIH/SWHD/ NIH/14-17	Hydrological modelling of Brahmani Baitarani river basin using eWater Source platform	J.P. Patra Rakesh Kumar Pankaj Mani	3years (April 2014 to March 2017)
ONGOING STUDIES			
6. NIH/SWHD/ NIH/16-17	Generalization and parameter estimation of GEV distribution for flood analysis: Specific application on Indian data	Sushil K. Singh	1 year (April 2016 to September 2017)
7. NIH/SWHD/ NIH/16-19	Application and development of analytical models on data collected at NIH under Saph-Pani Project	Sushil K. Singh	3 years (April 2016 to March 2019)
8. NIH/SWHD/ NIH/14-17	Study of Rainfall Patterns and Comparison of Rainfall Data from different Sources for Uttarakhand State	Archana Sarkar Vaibhav Garg Rakesh Kumar N.K. Bhatnagar	3 years (April 2014 to Sept. 2017)
9. NIH/SWHD/ NIH/15-18	Snowmelt Runoff Modelling and Study of the Impact of Climate Change in Sharda River Basin	Achana Sarkar T. Thomas Vaibhav Garg	3 years (April 2015 to March 2018)
10. NIH/SWHD/ NIH/14-17	Monitoring and modelling of streamflow for the Gangotri Glacier	Manohar Arora Rakesh Kumar	4years (May 2014 to March 2018)

11. NIH/SWD/N IH/14-17	Effect of Changing Global Tropospheric Temperature on Asia-Pacific Monsoon Circulation and Rainfall Fields across India	Ashwini Ranade	3 years (Oct. 2014 to Oct 2017)
12. NIH/SWHD/ NIH/15-18	Study on effect of climate change on sediment yield to Pong reservoir	A. R. Senthil Kumar J. V. Tyagi Avinash Agarwal Suhash Khobragade Manohar Arora	3 years (April 2015 to March 2018)
13. NIH/SWHD/ NIH/14-17	Effect of climate change on evaporation at point scale	Digambar Singh A. R. Senthil Kumar Manohar Arora	3years (June 2014 to Oct 2017)
14. NIH/SWHD/ NIH/15-18	Flood and Sediment studies in Himalayan basin using MIKE-11 Model	A.K. Lohani	3 years (April 2015 to March 2018)
15. NIH/SWD/N IH/16-18	Snow cover variability in the Upper Yamnotri Basin	Naresh Kumar Manohar Arora Rakesh Kumar	2 years (April 2016 to June 2018)

Proposed Work Program 2017-18

NEW STUDIES			
1. NIH/SWHD/ NIH/17-18	Development and regionalization of unit hydrograph for runoff modeling on Indian catchments	S.K. Singh	1 year (April 2017 to March 2018)
2. NIH/SWHD/ NIH/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)
3. NIH/SWHD/ NIH/17-20	An integrated assessment of a middle Himalayan watershed for sustainability of its water resources	A. R. Senthil Kumar Manohar Arora Digambar Singh M S Rao R K Nema Pradeep Kumar S K Mishra	3 years (April 2017 to March 2020)
4. NIH/SWHD/ NIH/17-20	Development of regional methods for design flood estimation in Uttarakhand	J.P.Patra Rakesh Kumar Pankaj Mani Sanjay Kumar	3 years (April 2017 to March 2020)

Work Program 2016-17

	Title of Project/Study, Study Group, Start/ Completion Dates	Status and Recommendations/Suggestions
COMPLETED STUDIES		
1.	<p>Estimation of water balance for integrated water resources management in yerrakalva pilot basin, a.p.</p> <p style="text-align: center;"><u>Study Group:</u> J.V. Tyagi YRS Rao</p> <p>DOS: April 2014 DOC: September 2016</p>	<p>Dr. J.V. Tyagi presented the study and explained the background, objectives and the methodology of the study. He informed the house that the water balance study is taken up in Yerrakalva river basin in coastal Andhra Pradesh which is selected as pilot basin by NIH for integrated water resources management. SWAT, one of the most recent models developed by the USDA, has been used for estimation of water balance components and water yield in Yerrakalva river basin. SWAT has been chosen as it is an integrated river basin scale, physically based, continuous-time, long-term simulation, semi-distributed watershed model. Also, its suitability to different parts of the world has been well established. The model was calibrated and validated for daily river discharges at Ananathapalli G-D site (1662 sq km) which is located downstream of Yerrakalva reservoir. Since discharges at G-D site are regulated by the reservoir, the reservoir is also incorporated in the model to take into account the effect of reservoir on flows at G-D site. The details of model set-up and the results of the study were presented in detail. Dr. Tyagi informed that the study is complete and the report is ready. No comments were received on the study.</p>
2.	<p>Application Of DSS (P) For Integrated Water Resources Development And Management.</p> <p style="text-align: center;"><u>Study Group:</u> A.K. Lohani Surjeet Singh Rahul Jaiswal D K Sonkusale Akilesh Verma</p> <p>DOS: April 2013 DOC: May 2016</p>	<p>During the working group meeting it was informed that the study entitled "Application of DSS (P) for Integrated Water Resources Development and Management" has been completed and the presentation of the study has been made in the 69th TAC meeting of NIH at New Delhi. In addition to rainfall runoff modeling, water resources planning has also been carried out for different rainfall conditions in the basin. Water requirement during kharif and rabi season have been computed. The water requirement from minor tanks during normal rainfall year is also estimated. Various scenarios have been developed considering different cropping patterns in the command area so as to utilize the available water more judiciously.</p>
3.	<p>Study of regional drought characteristics and long term changes in supplemental</p>	<p>The Head Surface Water Hydrology Division reported an over view about the progress of studies and subsequently invited Dr R.P. Pandey, PI of the</p>

	<p>irrigation water requirement in Seonath Basin in Chattisgarh</p> <p><u>Study Group:</u> R.P. Pandey Rakesh Kumar</p> <p>DOS: April 2015 DOC: March 2017</p>	<p>project to make presentation and explain the details of the work done and the progress of study after the previous Working Group meeting held during 18-19 April 2016. Dr Pandey presented the complete progress on preparations of base-maps, methodology, results of analysis and the conclusions of this study. He informed that the occurrence of droughts in various parts of Seonath basin have been major concern of crop failure and acute water shortages from time to time. He informed that the Seonath river basin is the longest tributary of the Mahanadi basin draining three districts of Chhattisgarh namely Durg, Rajandgaon and Bilaspur. The drainage area of the Seonath river basin is 30,860 Sq km. which comprises nearly 25% of the upper catchment of the Mahanadi basin. In the presentation, the working group was informed that the analysis of meteorological data, future predictions of climate scenarios and estimation of long term changes in irrigation water requirement has been completed. The analysis of variability and long-term trends of meteorological variables (i.e. rainfall, maximum & minimum temperature, humidity, wind speed and the evapotranspiration) have been carried out for annual and seasonal time scales. Dr Pandey He further informed the Working Group that all the objectives have been met. The report writing has also been completed and it is ready for submission after this working group meeting. It is hoped that the results of this study will be very useful in objective quantification and predictions of changes in irrigation water demand and water resources planning in Seonath river basin in Chhattisgarh state.</p>
4.	<p>Quantitative assessment of uncertainties in river discharge estimation</p> <p><u>Study Group:</u> Sanjay Kumar Sharad Jain</p> <p>DOS: April 2013 DOC: December 2016</p>	<p>Dr. Sanjay Kumar presented the study on “Quantitative assessment of uncertainties in river discharge estimation”. He explained the background and objectives of the study and informed that study is a part of the systemic review of uncertainty clause of the ISO 9123 document. He explained the methodology based on ISO documents GUM (Guide to the expression of uncertainty in measurement) and HUG (Hydrometric uncertainty guidance). He summarized the progress of the study since the submission of the New Work Implementation Program (NWIP) and working draft of ISO 9123. He mentioned that the comments on the working draft were discussed in the ISO meeting held during May 2015 in Tokyo. Based on these discussions an updated draft (DIS) was submitted to BIS/ISO for uploading on ISO website for further comments from</p>

		member countries. The comments on DIS from member countries were received during October 2016 and these comments were incorporated in the Final Draft International Standard (FDIS). Dr. Sanjay Kumar, informed that the study has been completed and FDIS was submitted to ISO secretariat in December 2016. There were no comments from WG members.
5.	<p>Hydrological modelling of Brahmani Baitarani river basin using eWater Source platform.</p> <p style="text-align: center;"><u>Study Group:</u></p> <p>J.P. Patra Rakesh Kumar Pankaj Mani</p> <p>DOS: April 2014 DOC: March 2017</p>	<p>Mr. Jagadish Prasad Patra, presented the objectives, brief methodology with results of the completed study entitled “Hydrological modelling of Brahmani Baitarani river basin using eWater Source platform”. It is reported that the study was taken up as a part of piloting the source river basin modelling platform of Australia in India. The statistical and trend analysis of various hydrological variables were presented. It was informed that the catchment modelling was setup with daily gridded rainfall data of .25°x.25° obtained from IMD and ET data from Terrestrial Hydrology Group, Princeton University. It is also reported that the station rainfall data have lot of gaps and it was not possible to use these as input to model. The GR4J model found to perform better in comparison to other model for this basin. Moreover, it has only four parameters to calibrate, which also reduces uncertainty. Hence, GR4J model for catchment modelling is recommended with Shuffled Complex Evolution (SCE) then Rosenbrock optimization algorithm for auto calibration of the parameter. There was no specific question from the working group members.</p>
ONGOING STUDY		
6.	<p>Generalization and parameter estimation of GEV distribution for flood analysis: Specific application on Indian data</p> <p style="text-align: center;"><u>Study Group:</u></p> <p>Sushil K. Singh</p> <p>DOS: April 2016 DOC: September 2017</p>	<p>Dr. S. K. Singh presented the progress of the ongoing study and mentioned that this study has been taken up for application of developed methodology on available data on few GD sites of CWC. IT is also reported that the results are encouraging and a concept of deterministic confidence interval has been developed to replace the existing and widely used concept of the probabilistic confidence interval. The application is further intended to extend to possible data available with State Departments particularly of flood prone area of UP, e.g. Raptiriver. It is mentioned that the report is writing and finalizing stage and the study will be completed by 30th September 2017.</p>

7.	<p>Application and development of analytical models on data collected at NIH under Saph-Pani Project</p> <p>Study Group: Sushil K. Singh</p> <p>DOS: April 2016 DOC: March 2019</p>	<p>Dr. S. K. Singh presented the progress of the ongoing study "Application and development of analytical models on data collected at NIH under Saph-Pani Project". The PI of study presented objectives and brief methodology. The compilation of the developed methodology and analytical models and new innovative solution involved therein is complete and the first part of the report containing these systematically at one place is at the writing state and will be submitted shortly. The PI mentioned that due to non availability of data from the Saph-Pani Project, the application of developed methodology is yet to be carried out.</p>
8.	<p>Study of Rainfall Patterns and Comparison of Rainfall Data from different Sources for Uttarakhand State</p> <p>Study Group: Archana Sarkar Vaibhav Garg Rakesh Kumar N.K. Bhatnagar</p> <p>DOS: April 2016 DOC: March 2019</p>	<p>Dr Rakesh Kumar, Sc G & Head, SWHD explained the background, objectives, methodology and expected deliverables of the study. He informed that the study area is the Uttarakhand State, often referred to as the "Land of the Gods" due to the many holy Hindu temples and pilgrimage centres found throughout the state which observed a massive flood disaster in June 2013. He explained that a comparative accuracy assessment of various data sources of rainfall viz, Rain gauges, satellite sensors (TRMM), and high resolution gridded re-analysis rainfall (APHRODITE) is of prime importance as the rainfall data from these data sources are further provided to hydrological models to produce forecasts. Progress of the study with results of trend analysis of historical rainfall series of number of rainfall events of various intensity (annual and monsoon) by parametric and non-parametric methods for ten rainfall stations (grid centres) five each in Kumaon and Garhwal regions using IMD gridded rainfall data of 113 years (1901 to 2013) was explained. Dr Kumar also informed about the processing of TRMM rainfall data being processed and work being carried out for rainfall comparison for different sources of rainfall. He also informed the house about PI's request for six months extension (until Dec 2017) for completion of the study. Working group members noted the progress of the study and agreed for the extension.</p>
9.	<p>Snowmelt Runoff Modelling and Study of the Impact of Climate Change in Sharda River Basin</p> <p>Study Group: Achana Sarkar T. Thomas Vaibhav Garg</p> <p>DOS: April 2016</p>	<p>Dr Rakesh Kumar, Sc G & Head, SWHD explained the background, objectives, methodology and expected outcomes of the study. He informed that the Institute has already carried out related studies for the Ganges basins mostly in the Garhwal Himalayas but the present study would be the first one for the Kumaon Himalayan River basin. He further told that rainfall data collected for the Sharda River basin in a previous study was being utilized in addition to other procured data during</p>

	DOC: March 2019	study. Degree day approach along with soft computing has been followed for hydrological modeling including snowmelt runoff modelling. Various scenarios of precipitation and temperature would be considered to study the impact of climate change on the hydrological regime of the study basin using GCM outputs. The progress of the study was explained with results showing various snowcover maps for four years using MODIS data as well as results of SRM and SNOWMOD models simulation. Working group members noted the progress of the study.
10.	<p>Monitoring and modelling of Gangotri Glacier melt runoff and simulation of streamflow under different climatic scenarios</p> <p style="text-align: center;"><u>Study Group:</u> Manohar Arora Rakesh Kumar</p> <p>DOS: April 2014 DOC: September 2016</p>	Dr Arora presented the progress of the study. He informed the house that the data collected for the ablation period of 2016 is analyzed. He informed the house the DST has accorded an extension of three months of the project. The field investigations for the current season will be started and in the mean time further extension of one year will be accorded by DST after the PAMC meeting. The results were presented before the committee and it was shown that the data collected from AWS can be helpful in the frequency analysis of the wind data. Dr Sharad Jain Sc G was interested in knowing how the wind classification was done. In response to this it was explained that wind can be classified in two categories i.e. Katabatic wind and Warm synoptic wind. The results presented showed that the year 2015 was healthy for the glacier and the precipitation values also supported the wind analysis. The total volume of water from the glacier was very much in tune with the previous year values. It was also informed to the members that different models are being tried and the parameters are being determined.
11.	<p>Effect of Changing Global Tropospheric Temperature on Asia-Pacific Monsoon Circulation and Rainfall Fields across India</p> <p style="text-align: center;"><u>Study Group:</u> Ashwini Ranade</p> <p>DOS: Oct 2014 DOC: Oct 2017</p>	Dr. Ashwini Ranade, PI of the project was on official tour, so Dr. Rakesh Kumar, Head, Surface Water Division has presented the objectives of the project and informed about the progress done in last six months. He mentioned that the study was about to document meteorological conditions (e.g. global atmospheric thermal condition, pressure and moisture field and circulation pattern) that has caused persistent large-scale heavy wet spell over India during 23-28 July 2005. He reported the important outcome of the study as 'The eastward stretched, moderately intense and persistent eastern monsoon component due to the intensification of lower level convergence across entire Asia-Pacific region from Indian region through the Aleutian Islands as well as atmospheric dynamism over southern hemisphere produced the

		heaviest rainstorm over India during 23-28 July 2005'.
12.	<p>Study on effect of climate change on sediment yield to pong reservoir</p> <p style="text-align: center;"><u>Study Group:</u></p> <p>A. R. Senthil Kumar J. V. Tyagi Avinash Agarwal Suhas Khobragade Manohar Arora</p> <p>DOS: April 2015 DOC: March 2018</p>	<p>Dr. A. R. Senthil Kumar, PI of the project presented the objectives, methodology and the progress made during April 2016 to April 2017. He informed that the sediment yield at Jwala Mukhi (Nadaun Bridge), Haripur, Jwali and Nagrota was modelled by ARC Soil and Water Assessment Tool (ARCSWAT). The required input such as Land Use Land Cover, Soil map, DEM, aspect map were generated from different sources such as NASA, National Bureau of Soil Survey and Land Use Planning (NBSSLUP) and NRSC. Grid based meteorological data were obtained from Indian Meteorological Department (IMD) and European Centre for Medium-Range Weather Forecasts (ECMWF) (ERA Interim data). The parameters of the SWAT were calibrated manually by using the historical data of discharge and sediment yield from 1993 to 1996 and were validated by the data from 1999 to 2002. The coefficient of determination (R^2) for the simulation of discharge during the calibration and validation were 0.93 and 0.96 respectively. The coefficient of determination (R^2) for the simulation of sediment yield during the calibration and validation were 0.95 and 0.92 respectively. He also informed that the different scenarios such as RCP2.6, 4.5, 6 and 8.5 from CMIP5 models of different institutes are being downscaled.</p>
13.	<p>Effect of climate change on evaporation at point scale.</p> <p style="text-align: center;"><u>Study Group:</u></p> <p>Digambar Singh A. R. Senthil kumar Manohar Arora</p> <p>DOS: April 2014 DOC: October 2017</p>	<p>Shri Digambar Singh, PI of the study, presented the objectives, methodology and progress of the study from April 2016 to March 2017. The PI explained about the development of MLR model with input considered for the development of ANN model. The ANN model performed better than MLR based on the performance indices such as coefficient of correlation, root mean squared error (RMSE), and Nash-Sutcliffe Model Efficiency. He also informed that the different scenarios such as RCP2.6, 4.5, 6 and 8.5 from CMIP5 models of different institutes are being downscaled. One year extension is required for the application of climate scenarios to predict the future evaporation using different models.</p>
14.	<p>Flood and Sediment studies in Himalayan basin using MIKE-11 Model (NIH Funded Project)</p> <p style="text-align: center;"><u>Study Group:</u></p> <p>A.K. Lohani</p>	<p>Dr. Surjeet Singh, Scientist D presented the progress of the study on behalf of Dr A.K. Lohani PI of the Study. He mentioned that a cloudburst event of 2012 in Assigangahas been considered for the study. Various raster and vector maps of the study area have been prepared using the satellite data, DEM and google earth. MIKE-11 model has been used to model the cloud burst flood event. A</p>

	DOS: April 2015 DOC: March 2018	detailed review have been made on the cloud burst events of Uttarakhand. Dr Surjeet Singh mentioned that the study is in progress.
15.	Snow cover variability in the Upper Yamnotri Basin <u>Study Group:</u> Naresh Kumar Manohar Arora Rakesh Kumar DOS: April 2014 DOC: September 2016	Dr Arora explained the study area and the importance of the study. He further iterated that this will be used as input for the modeling of melt water from the Yamnotri glacier and disaster planning. He explained that satellite data has been downloaded and the work is progressing satisfactorily.
16.	Hydrological modeling in Alaknanda basin and assessment of climate change impact (DST Sponsored Project)	Dr A.R. Senthil Kumar, Scientist E presented the progress of the study on behalf of Dr A.K. Lohani, PI of the Study. Dr Senthil Kumar mentioned that the considerable progress has been made in this study. Various maps such as landuse map, DEM, River network , Snow cover area maps have been prepared. Furthermore temporal meteorological data have been collected for the study basin. Flow data have been identified and attempts are being made to collect the G&D data of various gauging sites in the study basin. VIC model has been setup for the basin and the calibration of the model is in progress.
17.	Hydrological modelling in Bhagirathi basin up to Tehri dam and assessment of climate change impact (2016 to 2021) (NAMSHE) <u>Study Group:</u> A. R. Senthil Kumar	Dr. A. R. Senthil Kumar, PI of the project presented the objectives, methodology and the progress made during February 2016 to April 2017. PI informed that the discharge and sediment yield at Tehri dam from Bhagirathi river was modelled by ARC Soil and Water Assessment Tool (ARCSWAT). The required input such as Land Use Land Cover, Soil map, DEM, aspect map were generated from different sources such as NASA, National Bureau of Soil Survey and Land Use Planning (NBSSLUP) and NRSC. The soil database outside India was obtained from Harmonized World Database (HWSD) from International Institute for Applied Systems Analysis (IIASA). Rainfall, Maximum Temperature, Minimum Temperature, Solar radiation, Wind speed, Dew point temperature, surface pressure were obtained from ERA Interim database from European Centre for Medium Range Weather Forecasts (ECMWF). The discharge and sediment yield were simulated from these inputs by taking the calibration parameters randomly. The parameters of the model have to be calibrated using observed data.

18.	<p>Integrated Assessment of Areas Vulnerable to Desertification, Land Degradation and Drought (DLDD) for Climate Change Adaptation and Mitigation in Bundelkhand region of India.</p> <p><u>Study Group:</u> R P Pandey</p>	<p>The Working Group was informed that the Ministry of Environment, Forest & Climate Change (MoEF & CC) has invited to submit a research project on above topic for possible funding. The purpose of this project is to devise a methodology for areas vulnerable to desertification, land degradation and drought (DLDD) using regional climatic, physical, environmental, hydrological, social and anthropogenic indicators/factors; including appraisal of regional climate change indicators. The deliverables would include sustainable land management (SLM) practices and suitable regional water management option to combat DLDD in Bundelkhand region.</p> <p>The project proposal is under preparation and it will be submitted to MoEF&CC, Govt. of India, New Delhi shortly.</p>
19.	<p>Development hydrological drought indices computation system to add in India WARIS.</p> <p><u>Study Group:</u> R.P. Pandey</p>	<p>The Working Group was informed that the Central Water Commission (CWC), New Delhi has invited to submit a project on above topic for possible funding. The purpose of this project is to develop a software system for computation of hydrological drought indices (HDIs) which are included in Drought Manual-2016. This software system is proposed to be added in India-WARIS to compute HDIs using reservoir storage data, groundwater and stream flow data available in India-WARIS. It is proposed to validate the use of in Bundelkhand/Marathwara region.</p> <p>The project proposal is under preparation and it will be submitted to CWC, New Delhi.</p>
NEW STUDY		
20.	<p>Development and regionalization of unit hydrograph for runoff modeling on Indian catchments</p> <p><u>Study Group:</u> Sushil K. Singh</p> <p>DOS: April 2017 DOC: March 2018</p>	<p>The new study is proposed by Dr. S. K. Singh as internal study for a duration of one year. The objectives of the study are: to develop and systematically compile the new unit-hydrograph model for runoff modelling by the author. This is in view to analyze the parameters of the models for possible regionalization and to develop the regionalization approach for the model-parameters to enable possible applicability to ungauged catchment.</p>
21.	<p>Development of regional relationships for water availability analysis and flood estimation for lower Godavari basin (3f)</p> <p><u>Study Group:</u> Sanjay Kumar Rakeh Kumar J. P Patra</p>	<p>Dr. Sanjay Kumar presented the new study on "Development of regional relationships for water availability analysis and flood estimation for lower Godavari basin (3f)". He explained the background, objectives and methodology to be adopted in the study. He stated that the study specifically focuses on developing design flood estimation methods for partially gauged or un-gauged regions based on the concept of regionalization. For estimation of T-year return period flood at a site, the estimate for mean</p>

	<p>Pankaj Mani</p> <p>DOS: April 2017 DOC: September 2021</p>	<p>annual peak flood is required. For gauged catchments, such estimates can be obtained based on the at-site mean of the annual maximum peak flood data. At-site and regional flood frequency analysis will be performed using the L-Moments approach, which includes various frequency distributions. In regions where only rainfall data is available, the study would carry out at-site and regional rainfall frequency analysis using L-moments. The study would also develop relationship between mean annual peak floods and physiographic characteristics of the basin and develop regional relationships for NASH and Clark IUH model parameters. These developed relationships would finally used for estimation of floods of various return periods.</p> <p>After the presentation, Dr. Rakesh Kumar suggested to include the effect of climate change on design flood estimation. Dr. Reddy suggested to focus on a particular region. However, Dr. Rakesh Kumar mentioned that the lower Godavari basin (specified as 3f Zone) is a well defined zone and has already been specified by CWC, IMD and RDSO.</p>
22.	<p>An integrated assessment of a middle Himalayan watershed for sustainability of its water resources (2017 to 2020) (Proposed as PDS under)</p> <p><u>Study Group:</u> A. R. Senthil Kumar Manohar Arora Digambar Singh M S Rao R K Nema Pradeep Kumar S K Mishra</p> <p>DOS: April 2017 DOC: March 2020</p>	<p>Dr. A. R. Senthil Kumar, PI of the project presented the objectives, methodology to be adopted in the project. This project is proposed as PDS under NHP. The proposed objectives are to monitor the existing springs in the watershed, model the runoff by SCS method considering the slope factor, develop an ANN model to simulate the runoff, compare the results of ANN model with SCS CN method, determine the isotopic and chemical characterization of springs, identify rechargeable zone by isotope techniques, suggest the measure for the rejuvenation of few springs of the watershed and study the impact of climatic variability on runoff and spring flows, The Nodal Agency of Uttarakhand for NHP, Irrigation Research Institute (IRI) is the partner organization of the proposed project. The cost of the project is 50 lakhs. Dr. R. D. Deshpande, PRL, suggested to consult the reports of BARC regarding the rejuvenation of the springs.</p>
23.	<p>Development of regional methods for design flood estimation in Uttarakhand.</p> <p><u>Study Group:</u> J.P.Patra Rakesh Kumar Pankaj Mani Sanjay Kumar DOS: April 2017 DOC: March 2020</p>	<p>Mr. Jagadish Prasad Patra, presented the objectives, need for such study with brief methodology of the new study entitled "Development of regional methods for design flood estimation in Uttarakhand" under PDS of NHP. The various objectives of the proposed study were presented. The working group members appreciated usefulness of such study and suggested considering climate change aspects also in design flood estimation process.</p>

WATER RESOURCES SYSTEM DIVISION

SUGGESTION/ COMMENTS RECEIVED FROM MEMBERS

Dr. Sharad K Jain, Sc. G and Head (WRS Div.), presented an overview of the division – scientific strength, the ongoing studies, sponsored & consultancy studies, Studies under National Hydrology project (NHP) and National Mission for Sustainable Himalayan Ecosystem (NMSHE), technical publications and training courses organized. He also informed about involvement of different scientists of the division. Following are the comments received from working group on the presentations of the various studies.

ONGOING INTERNAL STUDIES

PI: Dr. M. K. Goel, Scientist “G”

Study title: NIH_Basin – A WINDOWS based model for water resources assessment in a river basin (Ongoing)

Since Dr. M. K. Goel (MKG) is on long leave and out of country, therefore, his study could not be presented.

PI: Dr. Renoj J. Thayyen, Scientist “D”

Study title: Catchment scale evaluation of cold-arid cryospheric system Hydrology, Ganglass catchment, Ladakh (Ongoing)

This project is aimed to evaluate the catchment scale hydrologic processes of the cold-arid regime. RJT presented the progress made on installing the ground temperature sensors for studying the seasonal freeze –thaw and permafrost in the study basin and discharge and electrical conductivity response for the year 2016. RJT requested extension of one year for this study to incorporate the data analysis from ground temperature loggers.

RJT informed about the formation of “ Indian Permafrost Network (IPN)” led by NIH with an objective of promoting the permafrost research in the country. RJT requested seed money of 2.5 Lakh to initiate the activities of IPN

No specific suggestions received for this project.

PI: Shri P. K. Agarwal (PKA), Scientist “B”

Study title: Hydrologic Modelling of a part of Satluj Basin using SWAT Model (Ongoing)

PI informed that from the results of the study, it has been seen that the observed discharge at outlet of the basin (Harike) is much lower than the discharge obtained from the model. While studying the reasons, it has been found that huge amount of water is diverted through two canals namely Nangal Hydrel Channel and Anandpur Saheb canal from Nangal dam d/s of Bhakra dam. Due to the same, the observed discharge at Harike may be much lower than the discharge obtained from the study.

Attempts have been made to collect the discharge diverted through these canals from Punjab Irrigation/BBMB. A visit has also been made to Chandigarh on 3.5.2017. BBMB is asking a payment of Rs. 17000/- per station per year to supply the required data. The cost of the data required comes in several lakh rupees. A request has been made to Secretary BBMB to waive off the data charges.

PI also requested to extend the time period of the study by six months. The members accepted the request.

PI: D. S. Rathore (DSR), Scientist “F”

Study Title: Decision Support System for Water Resources Planning in Upper Bhima basin, Maharashtra (Ongoing)

A Decision Support System (Planning) was developed under Hydrology Project - II and case studies were done for pilot basins selected for States. In this study further development of applications and interfaces, porting of models to Mike Hydro is being carried out for Upper Bhima basin. Streamflow drought index (SDI) was computed for inflow to catchments and water quality modelling was carried out. Pollutant load was calculated source wise using population (interpolated values for rural, urban: municipal corporation, cumulative value for towns), livestock population and per unit load and total pollutant for agriculture source. Effluent pollutants were considered as diffuse source. Population fraction contributing to untreated sewage was based on pumped and generated sewage. Measured (BOD) and assumed (N, P, E Coli) concentrations and discharges were used in computing effluent pollutant load. Simulation was carried out for year 2006. Simulated and observed (average) values of water quality variables for Daund and Koregaon were matched in calibration. STP Effluent average BOD concentration is nearly 10 and 16 mg/l in Pune and PCMC respectively. The simulated water quality concentrations were compared at Koregaon and Daund stations. Simulated BOD values at Koregaon and Daund were 3 and 6 mg/l and measured values are 6 and 7.3 mg/l. For E Coli values were 200, 100 and 240, 194 MPN/ 100 ml respectively. NO₃-N values were 0.6, 1.5 and 0.4, 0.5 respectively. Simulated NH₃-N value for Koregaon was 0.2 mg/l. Simulated and observed values of NH₃- N for Daund were 1 and 0.4 mg/l respectively. Simulated values of Total- P for Koregaon and Daund were 0.4 and 1.5 mg/l respectively. Observed Average Phosphate-P for Daund was 0.9 mg/l. Dr Ghosh enquired which scenario will be developed in the decision support system. Dr. Singh Singh replied that presently modeling work is in progress and subsequently, scenario will be developed.

PI: Shri P. K. Mishra (PKM), Scientist “B”

Study Title: Modelling of Narmada Basin using GWAVA Model (Ongoing)

PKM presented the study and informed that the normal run of the model (without calibration) has been carried out successfully. During this process, the bugs in the pre-processor as well as GWAVA engine were rectified and new EXE versions of these were used for normal runs. The major issue due to which the codes had to be modified pertained to the computation of total flows and local flows in the grid cells which was erroneous. After completion of the normal run of the model, efforts were made to calibrate the model manually by the trial and error approach, to have an idea of the range of the various sensitive parameters. The multisite calibration approach has been attempted with discharges available at Manot, Mohgaon and Hoshangabad. Presently the calibration is being carried out up to Manot gauging site, but the issue of the observed data being overwritten by simulated data still persists, when the simulation period is more than two years. There has been regular interaction with the GWAVA modelling team at CEH. Discussion were held with the senior team at CEH recently, and it is expected that very soon the appropriate replacement of the CEH staff will be done after which the modelling exercise is expected to gain momentum. Therefore this study needs an extension of 12 months. No specific comments have been received.

PI: Dr. Renoj J. Thayyen, Scientist “D”

Study Title: Runoff modelling of Shyok River, Karakorum Range (Ongoing)

This project is executed in coordination with border Roads Organisation (BRO) at km 150 of Durbuk—DBO axis. The project has been initiated in January 2015. RJT informed that only discharge data is being collected so far and no meteorological data is available from the region. This leads to difficulty in modelling runoff from the basin. RJT discussed the snow cover depletion in the upper Shyok basin during 2016 period. No specific suggestions were received for this study.

PI: Shri M. K. Nema (MKN), Scientist “C”

Study Title: Hydrological Processes and Characterization of Lesser Himalayan Catchments (Ongoing)

MKN presented the progress of the study and informed that one AWS and AWLR have been installed in the experimental catchment and data is being received at NIH, Roorkee Servers. Soil monitoring station has also been established at project site. Few more storage rain-gauges and Pan Evaporimeter shall be installed soon before the monsoon. He has also presented the preliminary data analysis of rainfall, air temperature, humidity, wind speed and direction, solar radiation and various soil parameters collected for the last one year. He further updated that the Eddy Covariance flux tower along with AWS is delayed due to administrative reasons and those installation are yet to be done. No major comments were made by the WG members.

PI: D. Chalisgaonkar (DC), Scientist “F”

Study Title: Development of Ganga Information Portal (Ongoing)

Mrs. Deepa presented the progress of the study. She informed that Ganga Information Portal is envisaged to provide a unique platform comprising multisource information on Ganga basin. The major objective for developing such a portal is to develop a knowledge/ information e-portal with updated information on Ganga basin. The GIP is being developed using World Wide Web (WWW) technology which is based on an open unstructured distributed hypermedia information system.

The publications related to Ganga basin are being collected from various sources including websites, reports, journals, thesis, organizations etc. The information collected is being converted to digital form for presentation on web platform. The publications of NIH scientists on Ganga basin have also been included in the portal. Moreover, the papers published in the international conference on Ganga basin organized by NIH few years back have also been included.

Dr Prabhash Mishra informed that the action will be taken very shortly to strengthen the section 'Ganga for Kids'. Dr Sharad Jain suggested to given suitable title to the thematic maps.

Working group noted the progress of the work.

PI: Shri L N Thakural (LNT), Scientist “C”

Study Title: Study of Hydrological Changes in selected watersheds in view of Climate Change in India (Ongoing)

LNT presented the objectives, methodology and the status of the ongoing study. The status of the GIS database prepared using remote sensing data such as DEM, Landsat imagery for delineation of stream network/watershed boundary, Landuse/Land cover along with soil map in GIS environment was presented. The spatio-temporal analysis of hydro-meteorological data using parametric and non-parametric approaches for the Ramganga, Bina and Chaliyar river basins was also presented in the meeting. The outcomes of hydrological models (NAM and SWAT) calibrated and validated for the three river basins i.e. Ramganga, Bina and Chaliyar river basins were also shown. No specific suggestions were received for this project.

ONGOING SPONSORED STUDIES

PI: Dr. Renoj J Thayyen (RJT), Scientist “D”

Study Title: Mass and Energy balance of Phuche and Khardung glaciers, Ladakh range

This SERB sponsored project is aimed at generating a long-term glacier mass balance data series from Ladakh region representing the cold-arid system of the Himalaya. Studying the surface energy mass balance of Phuche and Khardung glaciers are also an objective of the

study, RJT presented the progress and informed that the both the glaciers experienced very heavy melting in the year 2016 which is highest during the observation period. Initial results of the surface energy balance studies also presented by RJT. No specific suggestions received for this project

PI: Dr. M. K. Goel, Scientist “G”

Study title: Development of a project website and hydrological database in Upper Ganga Basin (NMSHE-Sub-Project-1)

Since Dr. M. K. Goel is on long leave and out of country, this study could not be presented.

PI: D. S. Rathore (DSR), Scientist “F”

Study Title: Real-time snow cover information system for Upper Ganga basin’ (NMSHE-Sub project 2) of project ‘

The progress of the study was presented by Mr D.S. Rathore. Work was carried out in delineation of snow cover from satellite remotely sensed data and development of web GIS applications for snow cover. Landsat data for years 2002, 2010 and 2015 and MOD09GA were downloaded for four, three and one dates respectively. From Landsat DN, TOA reflectance were estimated. The reflectance values for Landsat and MODIS data were used in computing NDSI. For snow delineation, NDSI threshold of 0.4 was used ($NDSI \geq 0.4$ as snow class). Snow extent delineated from MODIS data was consistently lower than that from Landsat data. Water and shadow area (cloud shadow in cloudy scenes and mountain shadow in September- October months) was misclassified to snow in Landsat data. Boundary pixels of snow class in MODIS data were misclassified as non snow. MOD10A2 snow cover maps 12 in each year (one for each month) were published in a Web GIS application. Web pages were created for each year and snow in different years for February and September end. DR S.K. Jain observed that field verification shall be carried out for snow cover maps especially in areas of misclassification. It was noted that DGPS is procured and the same will be used in future field verification campaigns.

PI: Dr. Sanjay K Jain , Scientist “G”

Study Title: Glacial Lakes & Glacial Lake Outburst Flood (GLOF) in Western Himalayan Region (NMSHE- Sub-Project – 3)

Dr. Sanjay K Jain informed the house that the preparation of data base of the study areas is under progress. In this study, four basins viz Satluj, Beas, Chenab and Ganga have been taken. The satellite data of the years 2000 and 2014 have been downloaded. From Satellite data of the years 2000 and 2014, inventory of glacier and glacial lakes have been prepared. The data base preparation will taken another three months and then modelling study will be taken up. The progress of the study is as per work schedule.

PI: Dr. Renoj J Thayyen (RJT), Scientist “D”

Study Title: Assessment of downstream impact of Gangotri glacier system at Dabrani and future runoff variations under climate change scenarios (NMSHE-Sub Project-4)

RJT presented the progress made on this project during the past one year including the generation of snow cover depletion curves for 16 years for basin above Maneri and snow cover duration at different altitude bands of the basin. Steps taken to improve the snow cover information by removing the cloud cover from MODIS imagery was discussed. RJT informed that the discharge data of Maneri is collected and is under process and the after the collection of meteorological data from IMD, runoff modelling will be attempted.

No specific suggestions received for this project

PI: Dr. Sharad K Jain (SKJ), Scientist “G”

Study Title: Observation and modelling of various hydrological processes in a small watershed in Upper Ganga basin (NMSHE- Sub-Project – 5)

This project under NMSHE is focussing on studying the linkages between land surface processes and atmosphere under the orographic system at the lesser Himalayan Herval catchment. Role of seasonal variations in liquid condensation levels(LCL) and other meteorological variables were discussed by RJT. The role of anabatic and katabatic winds in controlling the temperature was also discussed. RJT also informed about the progress in the procurement of AWS and other equipments under the project.

The progress of the project work was presented during the meeting. Three erosion prediction models, i.e., Universal Soil Loss Equation (USLE), Revised Universal Soil Loss Equation (RUSLE) and Morgan-Morgan and Finney (MMF) models coupled with GIS and Remote Sensing data at a spatial grid of 30 m x 30 m were applied for quantifying the average annual soil loss and its spatial variation in Herval watershed. Dr. Sanjay K. Jain asked about the relative performance of all the three models. As per the estimates, MMF model was found to be predicting lower rates of erosion as compared to the USLE and RUSLE models. However, the daily data on sediment yield will be finally used to validate the results of all the three models through sediment delivery ratio and routing concepts to choose the best model to describe the process of soil erosion within the Herval watershed.

No specific suggestions received for this project

PI: Dr P. K. Mishra

Study Title: Water Census and Hotspot analysis in selected villages in Upper Ganga basin (Sub-basin-11)

Shri P K Mishra presented the study. It has been pointed out by Dr Deshpandey asked the criterion considered for identification of villages. Mr. Mishra explained the different criteria have been considered for the same.

No specific comments have been received.

PI: Dr. Renoj J Thayyen (RJT), Scientist “D”

Study Title: Dynamics of Himalayan Ecosystem and its Impact Under changing climate scenario

This is a newly launched project funded by MoEF in collaboration with Jawaharlal Nehru University and 4 other institutions. RJT informed the progress in procuring 50 temperature/ humidity sensors and analysis of temperature lapse rate of Sutlej basin under this study and new findings.. He also discussed instrumentation strategy along five transects in Uttarakhand Himalaya and few stand alone station pairs in Himachal and Jammu and Kashmir.

No specific suggestions received for this project

RESEARCH MANAGEMENT AND OUTREACH DIVISION (RMOD)

WORK PROGRAMME FOR 2016-17

SN	Title of Project/Study	Study Team	Duration	Status
Internal Studies				
1.	Study- 1 (RMOD/2015-16/TS-1) Water Conservation and Management in Ibrahimpur Masahi Village of Hardwar District (Uttarakhand)	Omkar Singh (PI), V C Goyal, Dinesh Kumar	DOS: Apr 2013 DOC: Sep 2016	Continuing
2.	Study-2 (RMOD/2015-16/TS-3) WEAP Model set up for four sub-basins under Pilot Basin Studies (PBS) Programme, jointly with the RCs/CFMSs	NIH HQs: Jyoti Patil (PI), V C Goyal NIH RCs/CFMSs: Chandramohan T (Belgaum), Y R S Rao (Kakinada), T R Nayak (Bhopal), B Chakravorty (Patna), R V Kale (Jammu)	DOS: Apr 2015 DOC: Mar 2017	Completed
Sponsored Projects				
3.	Integrating hydrology, climate change and IWRM with livelihood issues: Development of methodology and a DSS for water-scarce Bundelkhand region in India TIFAC (Rs 56.64 lakh)	V C Goyal (PI), T Thomas, Jyoti Patil, Rajesh Agrawal	DOS: Aug 2013 DOC: Jul 2016	Final report is under preparation
4.	IWRM Based Development Plan for Water Security in Four Districts of Bundelkhand Region in India MoWR, RD & GR (Rs 299.4 lakh)	V C Goyal (PI), Omkar Singh, Jyoti Patil, T R Nayak, Ravi Galkate, T Thomas, R K Jaiswal, Shashi P Indwar, Subhash Kichlu, Rajesh Agrawal, Dinesh Kumar	DOS: Apr 2016 DOC: Jun 2017	Continuing

PROPOSED WORK PROGRAMME FOR 2017-18

SN	Title of Project/Study	Source of Fund	Study Team	Duration
1	Development of IWRM Plan for Ibrahim-Masahi village (Haridwar district) (Ongoing)	Internal study	Omkar Singh (PI), V C Goyal, Dinesh Kumar	Apr 2013- Sep 2016; Extn. Sought upto Sep 2017
Sponsored Projects				
2	Development of IWRM Plan for identified watersheds in Jhansi, Lalitpur and Chhatarpur districts	MoWR-funded Bundelkhand-	NIH: V C Goyal (PI), Jyoti Patil MPCST: Sandeep	Apr 2016- Jun 2017; Extn. Sought upto

	(Ongoing)	4 district project	Goyal, Rajesh Saxena UP-RSAC: Rajiva Mohan, Sudhakar Shukla	Mar 2018
3	Rejuvenation of village ponds for identified villages in Muzaffarnagar and Meerut districts (New Study)	MoWR-funded project	V C Goyal (PI), Dinesh Kumar, Omkar Singh	Apr 2017- Mar 2020
4	Vulnerability assessment of identified watersheds in Neeranchal Project States (New Study)	Neeranchal Project	Jyoti P Patil + RCs	Jul 2017- Jun 2019

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 45th WG meeting

1.	Er. R.D. Singh, Director, NIH	Chairman
2.	Dr. R .D. Deshpande, PRL, Ahmedabad	Member
3.	Dr. D V Reddy, CSIR-NGRI, Hyderabad	Member
4.	Dr. Ashok K. Das, IMD, New Delhi	Member
5.	Dr. S.K. Jain, Sc. G & Head WRS Division, NIH	Member
6.	Dr. N C Ghosh, Sc.G & Head GWH Division, NIH	Member
7.	Dr. Rakesh Kumar, Sc. G & Head SWH Division, NIH	Member
8.	Dr. Sudhir Kumar, Sc. G & Head HI Division, NIH	Member
9.	Dr. C K Jain, Sc.G & Head EH Division, NIH	Member
10.	Dr. V C Goyal, Sc. G & Head, RMO Division, NIH	Member-Secretary

Scientists from National Institute of Hydrology

	EH Division		SWH Division
1	Dr. M.K. Sharma, Sc.D	16	Dr. J.V. Tyagi, Sc.G
2	Dr. Pradeep Kumar, Sc.C	17	Dr. R.P. Pandey, Sc.G
	GWH Division	18	Dr. S.K. Singh, Sc.F
3	Er. C.P. Kumar, Sc.G	19	Dr. Sanjay Kumar, Sc.E
4	Dr. Anupama Sharma, Sc.E	20	Dr. Manohar Arora, Sc.D
5	Dr. Surjeet Singh, Sc.E	21	Sh. Digamber Singh, Sc.C
6	Er. Sumant Kumar, Sc.C	22	Sh. J.P. Patra, Sc.C
7	Ms. Suman Gurjar, Sc.C	23	Sh. Naresh Saini, Sc.B
8	Dr. Gopal Krishan, Sc.C	24	Sh. N.K. Bhatnagar, Sc.B
	HI Division		WRS Division
9	Dr. S.P. Rai, Sc.F	25	Dr. Sanjay Jain, Sc.G
10	Dr.Suhas Khobragade, Sc.F	26	Smt. Deepa Chalisgaonkar, Sc. F
11	Dr. M.S. Rao, Sc.E	27	Er. D.S. Rathore, Sc.F
12	Sh. S.K. Verma, Sc.D	28	Dr. Renoj J. Thayyen, Sc.D
13	Sh. P.K. Garg, Sc.B	29	Dr. L.N. Thakural, Sc.C
	RMO Division	30	Sh. Manish Nema, Sc.C
14	Er. Omkar Singh, Sc.F	31	Dr. P.K. Singh, Sc.C
15	Dr. Jyoti Patil, Sc.C	32	Sh. P.K. Mishra, Sc.B
		33	Sh. P.K. Agrawal, Sc.B