

**MINUTES OF THE
44TH MEETING OF WORKING GROUP OF NIH
HELD AT NIH, ROORKEE, DURING APRIL 18-19, 2016**

The 44th meeting of the Working Group of NIH was held at NIH, Roorkee, during April 18-19, 2016 under the Chairmanship of Director, NIH. The list of the participants of the meeting is given in Annexure-I.

ITEM NO. 44.1: 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 additional responsibilities assigned to the Institute by the Ministry of WR, RD & GR. Also, he mentioned that some new projects have been sanctioned to commence 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) is likely to be approved soon.

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

ITEM No. 44.2: CONFIRMATION OF THE MINUTES OF 43rd MEETING OF THE WORKING GROUP

The 43rd meeting of the Working group was held during December 8-9, 2015. The minutes of the meeting were circulated to all the members and invitees vide letter No. RCMU/WG/NIH-10 dated January 22, 2016. No Comments were received. The members confirmed the Working Group minutes.

ITEM No. 44.3: 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 43rd working group meeting.

ITEM Nos. 44.4 & 44.5: PRESENTATION AND DISCUSSION ON THE STATUS AND PROGRESS OF THE WORK PROGRAMME FOR THE YEAR 2015-16 AND FINALIZATION OF THE WORK PROGRAMME FOR THE YEAR 2016-17.

The Member-Secretary requested the respective Divisional Heads to present the progress of studies carried out during 2015-16 and work programme for the year 2016-17. Accordingly, the progress of various studies and sponsored projects was presented by all Scientific Divisions on their turn 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 2015-16

S.No.	Study	Recommendation / Comments
Internal Studies		
1.	<p>Water Quality Modelling using Soft Computing Techniques</p> <p>Study Group: Rama Mehta (PI), C. K. Jain, Anju Choudhary</p> <p>Duration: 2 Years (05/14-05/16)</p>	Extension granted for 3 months and report will be submitted by Aug. 2016.
2.	<p>Himalayan River Water Quality Assessment in a Stretch from Gangotri to Haridwar</p> <p>Study Group: Rajesh Singh (PI), C. K. Jain, M. K. Sharma, S. P. Rai, Renoj J. Thayyan, J. P. Patra</p> <p>Duration: 3 Years (07/14-06/17)</p>	Report will be submitted by May 2016 and further work will be Continued under NMSHE Project.
3.	<p>Status Report on Phytoremediation of Wastewater</p> <p>Study Group: Rajesh Singh (PI), C. K. Jain</p> <p>Duration: 6 Months (11/15 – 04/16)</p>	Extension granted for 1 month and report will be submitted by May 2016.
Sponsored Projects		
1.	<p>Ionic Enrichment Dynamics of Glacial Sediment and Melt water of Gangotri Glacier</p> <p>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 (04/14-03/17)</p>	No comments
2.	<p>Low Cost Technology for Purification of Arsenic and Microbes Contaminated Water using Nanotechnology</p> <p>Study Group: Vijaya Aggarwala, IITR (PI) Rama Mehta, NIH (Co-PI)</p> <p>Duration: 2 Years (04/14-03/16); Extended granted for 6 months by DST.</p>	No comments

Approved Work Programme for the year 2016-17

S.No.	Study	Remarks
Internal Study (New)		
1.	<p>Assessment of suitable habitats for the aquatic species of Western Himalayan Streams</p> <p>Study Group: Pradeep Kumar and C. K. Jain</p> <p>Duration: 2 Years (04/16-03/18)</p>	It was decided to change the title to "Development of habitat suitability curves for the aquatic species of Western Himalayan Streams"
Sponsored Projects (Continuing)		
2.	<p>Ionic Enrichment Dynamics of Glacial Sediment and Melt water of Gangotri Glacier</p> <p>Study Group: M. K. Sharma (PI), C. K. Jain, Renoj Thayyan, Manohar Arora, Naresh Saini, Jatin Malhotra, Rakesh Goyal and Shyam Lal</p> <p>Duration: 3 Years (04/14-03/17)</p>	-
3.	<p>Low Cost Technology for Purification of Arsenic and Microbes Contaminated Water using Nanotechnology</p> <p>Study Group: Vijaya Aggarwala, IITR (PI) Rama Mehta, NIH (Co-PI)</p> <p>Duration: 2 Years (04/14-03/16); Extended for 6 months by DST.</p>	-
Sponsored Projects (New)		
4.	<p>Environmental Assessment of Aquatic Ecosystem of Upper Ganga Basin</p> <p>Study Group: C. K. Jain (PI), Manohar Arora, M. K. Sharma, P. Kumar, R. Singh and D. S. Malik (GKU)</p> <p>Duration: 5 Years (04/16-03/21) Sponsored by DST under NMSHE Project Cost: 2.25 Crore</p>	-
Consultancy Projects (Continuing)		
5.	<p>Petroleum Product Contamination at Akolner Village, District Ahmednagar, Maharashtra and Suggesting Remedial Measures</p> <p>Study Group: C. K. Jain (PI), Sudhir Kumar, B. K. Purendra, Anupma Sharma, M. K. Sharma and Rajesh Singh</p> <p>Duration: One Year (10/15 – 09/16) Sponsored by: MPCB, Mumbai Amount: Rs. 54.72 Lacs</p>	-
Consultancy Projects (New)		

6.	<p>Study on Ash Disposal from Ramagundam STPS and Telangana STPP into Mine Void of Medapalli Open Cast Mines</p> <p>Study Group: C. K. Jain (PI), Sudhir Kumar, Y. R. S. Rao, Anupma Sharma, M. K. Sharma and Pradeep Kumar</p> <p>Duration: 15 months (03/16 – 05/17) Sponsored by: NTPC Amount: Rs. 54.96 Lacs</p>	-
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GROUND WATER HYDROLOGY DIVISION

Dr. N. C. Ghosh, Scientist 'G' & Head presented an overview and progress of studies and activities carried out by the division during the period December 2015 to March 2016. While presenting the technical activities carried out by the division and progress made on different studies during last four months, he gave an account of scientific personnel available at the division and the sponsored projects being pursued by the Division. He informed that five in-house R&D studies and one sponsored study approved for the year 2015-16, which are being continued. Five new studies were proposed for the year 2016-17, out of these three were sponsored studies and two were in-house studies.

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

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 necessity of the study and described about the six demonstration sites to be developed at Laksar (Uttarakhand), Agra and Mathura (Uttar Pradesh), Sahebganj (Jharkhand), Bhojpur (Bihar) and Visakhapatnam (Andhra Pradesh) under the Peya Jal Suraksha Project sponsored by Ministry of Water Resources, River Development and Ganga Rejuvenation, Govt. of India. Dr. Surjeet Singh presented the objectives, mechanism of riverbank filtration (RBF) and the progress of the study made so far for the Agra, Mathura and Laksar sites. The progress for the other three sites at Sahebganj, Bhojpur and Visakhapatnam was reported by Dr. N.C. Ghosh. No comments were received.

2. **Project Ref. Code: NIH/GWD/NIH/15-18: Development of Website and e-Portal on "Mitigation and Remedy of Arsenic Menace in India"**

Dr. N. C. Ghosh informed that the study requires funding from Ministry of Water Resources, River Development and Ganga Rejuvenation (MoWR) and also confirmation on ownership of the developed portal by MoWR. Since, no funding and official confirmation were received from the Ministry, the project activities were deferred. The study will be taken up only after getting funds and ownership confirmation from Ministry of Water Resources, River Development and Ganga Rejuvenation.

Since the above study could not be initiated so far due to non-availability of funds and ownership confirmation from MoWR, it would be appropriate that it may not be included in the Work Plan of 2016-17. The study can be included in the work plan later whenever confirmation from MoWR is received.

3. **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 study area. The decline in areas near the Eastern Yamuna Canal was less. Field observations carried out for water level and water quality monitoring as well as soil surveys for estimation of groundwater recharge along Saharanpur, Shamli and Muzaffarnagar district were highlighted. Results of soil

texture and soil moisture retention analyses were shown. Suggestions were made about reanalyzing field capacity values for soil samples along the Hindon River Bank.

4. 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, progress and future plans of the study. PI seeks extension of 6 months for completion of study and permission was granted. Dr. Bartarya suggested that risk zone mapping can be done based on arsenic concentration in the study area. Director, NIH asked PI to do sampling for all the blocks of Ballia district to prepare Arsenic risk map. WG members enquired about the instrument and its principle for arsenic analysis and same was clarified by PI.

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

Ms. Suman Gurjar (PI) demonstrated the completed study on Web Enabled “Groundwater Recharge Estimation Model (WE-GREM)” and explained about objectives, methodology and scope of the project. Working group members appreciated and approved to host it in public domain. They also suggested to publicize it as much as possible.

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

Dr. Gopal Krishan presented the progress made under the study and presented the future work plans. He also clarified the action taken on the comments of experts made during the 43rd WG meeting. Dr. S.S. Grewal suggested to take the meteorological data from RRSKA, Ballawal Saunkhri and KVK, Kapurthala.

7. 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. Dr. J.V. Tyagi, Sc. G suggested to modify the title. Dr. D.V. Reddy (NGRI) suggested to plot conductivity, water level and rainfall together. Dr. D.V. Reddy (NGRI) and Dr. S.K. Mittal, CSIO, Chandigarh asked about the role of Sehgal Foundation, Gurgaon. Dr. N.C. Ghosh (Head, GWHD) replied that the Sehgal Foundation has motivated NIH to take up the study and will provide the historical data as they are working on Mewat area since last 15 years.

8. 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 research needs, objectives, future plans and scope of the study. He described about the field visit made during the month of March, 2016 and also the topography, formations type and existing hand pumps in the higher altitudes of the Himalayan basin. No comments were received.

9. 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) proposed new study on Web Enabled “Conjunctive Use Model for Management of Surface and Ground Water using concept of MAR and ASR” and explained about objective, methodology and scope of the project. Working group members suggested to merge this with the WEGREM but looking at its scope and after discussions they agreed to make it as the new study and extension of WEGREM. They suggested to host it as Version 2 in public domain.

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

Dr. N. C. Ghosh had informed that MoWR, RD & GR has sponsored the study with timeline of six months starting from March, 2016. Dr. Ghosh gave a brief objective of the study and expected deliverables. He elaborated the results of field visit undertaken during 11-13th April, 2016 along with a team.

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

The training course was sponsored by DST, Govt. of India to organize four training courses with a cost of Rs.36.4 lakhs. Dr. Ghosh informed the objectives and methodologies of the training courses. He informed that first training course shall be organized during the month of September, 2016 and the second course shall be organized during February, 2017. The calendar for the 3rd and 4th training courses shall be decided later on.

The work program of the division for the year 2016-17, as recommended by the Working Group, is given below:

WORK PROGRAM FOR THE YEAR 2016-17

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.	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)	3 years (12/14 – 11/17) Status: In progress.	Internal Funding.
3. 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	Sumant Kumar (PI) N.C. Ghosh, Rajesh Singh, R.P. Singh, Suman Gurjar, S.L. Srivastava, Anju Choudhary	1 year (04/15 – 3/16) Status: In progress.	Internal Funding.

4. NIH/GWD/NIH/ 15-16	Web Enabled “Groundwater Recharge Estimation Model (WE-GREM) ”.	Suman Gurjar (PI), N.C. Ghosh, Sumant Kumar, Surjeet Singh, Anupma Sharma	1 year (08/15 – 3/16) Status: In progress.	Internal Funding.
5. NIH/GWD/NIH/ 16-17	Groundwater fluctuations and conductivity monitoring in Punjab.	Gopal Krishan (PI), N.C. Ghosh, Surjeet Singh, Dan Lapworth (PI from UK) Alan MacDonald (Project Coordinator)	1 year (01/16 – 12/17) Status: In progress.	NIH in association with BGS, UK
Proposed New Study				
6. NIH/GWD/NIH/ 16-17	Baseline data collection and analysis of Mewat district, Haryana.	N.C. Ghosh (Project Coordinator), Gopal Krishan (PI), Surjeet Singh, C.P. Kumar, Brijesh Yadav (IITR), Lalit Mohan Sharma (Sehgal Foundation, Gurgaon)	1 year (03/16 – 03/17) Status: New.	Internal Funding.
7. 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.	Sponsored by DST under NMSHE.
8. 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.
9. NIH/GWD/NIH/ 16-16	Evaluation of Saryu Nahar Pariyojna (SNP) National Project in Uttar Pradesh.	N. C. Ghosh (PI), Gopal Krishan, R.P. Singh, J. K. Mishra	06 Months (03/16-08/16) Status: New.	Sponsored by MoWR, RD & GR.
10./NIH/GWD/1 6-17	<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 – 12/17) 4 training courses	Sponsored by DST

HYDROLOGICAL INVESTIGATIONS DIVISION

Dr. Sudhir Kumar, Scientist G and Head, presented an overview and progress of studies and activities carried out by the Hydrological Investigations Division during the year 2015-16. He informed that out of 7 internal R&D studies, 4 have been completed. Out of the 5 sponsored studies, one project has been completed, while 4 studies are being continued. He further informed that the scientists of the division have also completed 1 consultancy project, conducted 4 training programs / workshops / National Seminar and published more than 20 papers in Journals and conferences.

Dr. Sudhir Kumar informed that for the next year, i.e., 2016-17, 3 internal studies, 4 sponsored projects, and 8 consultancy project shall continue from the year 2015-16. Further, 2 new internal studies and one sponsored project has been proposed for the year 2016-17. Also, many consultancy projects have been submitted by the scientists of the division and expected to be started during 2016-17.

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

INTERNAL STUDIES:

S.N.	Project Reference No.	Title of Study	Comments/Remark
1.	NIH/HID/INT/2013-15/2	Isotopic Studies for the Identification of Different Aquifer Groups and their Dynamics in Upper Yamuna River Plains	Study completed No comments received
2.	NIH/HID/INT/2013-15/4	Estimation of Radon Concentration in Waters and Identification of Paleo-groundwater in Part of Punjab Located in Satluj River Basin using Isotopes	Study completed
3.	NIH/HID/INT/2014-16/1	Interaction between groundwater and seawater along the parts of East Coast of India	No comments received
4.	NIH/HID/INT/2014-16/2:	Isotopic investigation of benchmark Himalayan glaciers	Study to be completed by June, 2016. No comments received
5.	NIH/HID/INT/2014-16	Assessment of dissolved radon concentration for groundwater investigations in Haridwar district	Study completed
6.	NIH/HID/INT/2015-16/1	Hydrological Aspects of Rewalsar Lake, Himachal Pradesh (Status Report)	Study extended upto July 2016 due to proposed summer WQ sampling. No comments received
7.	NIH/HID/INT/2015-18/1	Lake-Groundwater Interaction Studies for Sukhna Lake, Chandigarh	No comments received.

SPONSORED PROJECTS:

	Project Reference No.	Title of Study	Comments/Remark
8.	NIH/HID/MOES/2012-15	The Structure and Dynamics of Groundwater Systems in Northwestern India under Past, Present and Future Climates	Study extended upto July 2016 No comments received
9.	NIH/HID/IAEA-1/2012-15:	The Use of Environmental Isotopes to Assess Sustainability of Intensively Exploited Aquifer Systems in North Eastern Parts of Punjab, India	Completed
10.	NIH/HID/IAEA-2/2012-15	Assessment of Baseflow and its Impact on Water Quality in the Part of Satluj River in India using Environmental Isotopes and Age Dating Techniques	Study extended upto December, 2016 No comments received
11.	NIH/HID/IAEA-3/2013-15	Integration of Isotope Hydrology in Aquifer Mapping Efforts in India: A Pilot Study of Upper Yamuna Plains	No comments received

Three new projects proposed for the year 2016-17 were also presented as given below:

NEW STUDIES

	Project Reference No.	Title of Study	Comments/Remark
12.	NIH/HID/INT/2016-18 (Internal study)	Radiocarbon dating of deeper groundwater of Indo-Gangetic Basin	No comments received
13.	NIH/HID/INT/2016-18 (Internal study)	Isotopic Investigations in parts of Upper Yamuna River Basin	No comments received
14.	NIH/HID/SPON/2016-21 (Sponsored Project)	Understanding of hydrological processes in Upper Ganga basin by using isotopic techniques	No comments received

The approved program for the year 2016-17 is given below:

APPROVED WORK PROGRAMME FOR 2016-2017

S. No.	Study	Team	Duration/ Status
INTERNAL STUDIES			
1.	Interaction between groundwater and seawater along the northern part of east coast of India	M. S. Rao (PI), Sudhir Kumar Pankaj Garg	2 years (01/15 - 12/16) Continuing Study

S. No.	Study	Team	Duration/ Status
2.	Status Report on Rewalsar Lake, Himachal Pradesh	SD Khobragade (PI) Sudhir Kumar, C. K. Jain	1 year (04/15 – 03/16) Continuing Study (to be extended upto July, 2016)
3.	Lake-Groundwater Interaction Studies for Sukhna Lake, Chandigarh	S.D Khobragade (PI); Sudhir Kumar; S. P. Rai, Senthil Kumar; Pankaj Garg	3 years (04/15 – 03/18) Continuing Study
4.	Radiocarbon dating of deeper groundwater of Indo-Gangetic Basin	M. S. Rao (PI) Sudhir Kumar	3 years (04/16 – 03/19) New Study
5.	Isotopic Investigations in parts of Upper Yamuna River Basin	S. K. Verma (PI), Sudhir Kumar, S P Rai, Mohar Singh, Vishal Gupta	2 years (04/16 – 03/18) New Study
SPONSORED PROJECTS			
6	The Structure and Dynamics of Groundwater Systems in Northwestern India under Past, Present and Future Climates	S. P. Rai (PI); M. S. Rao; Surjeet Singh; S. K. Verma; C. P. Kumar; Sudhir Kumar	3 years (06/12-03/16) Continuing Study To be extended upto July, 2016
7	Assessment of Baseflow and its Impact on Water Quality in the Part of Satluj River in India using Environmental Isotopes and Age Dating Techniques	S. P. Rai (PI) R. V. Kale M. S. Rao C. P. Kumar Sudhir Kumar	3 years (10/12-04/16) Continuing Study To be extended upto July, 2016
8	Integration of Isotope Hydrology in Aquifer Mapping Efforts in India: A Pilot Study of Upper Yamuna Plains	Sudhir Kumar (PI); S. P. Rai; S. D. Khobragade; C. K. Jain; P. K. Garg	2 years (05/13-03/16) Extended by IAEA till Jun 16
9.	Understanding of hydrological processes in Upper Ganga basin by using isotopic techniques	S. P. Rai (PI); Sudhir Kumar; Rajesh Singh; S. D. Khobragade; M. Arora; Dr. R. J. Thayyen; Sh. P. K. Garg	5 Years 04/16-03/21 New Study
CONSULTANCY PROJECTS			
1.	Hydrogeological Study for Dewatering of Jhamarkotra Mines, Distt. Udaipur	Sudhir Kumar	05/13-04/16 Continuing Study
2	Hydro-geological study for Gadawara super thermal power project, Madhya Pradesh	SD Khobragade	07/15-06/16 Continuing Study
3	Hydro-geological study for Katwa super thermal power project, West Bengal	Sudhir Kumar	07/15 – 4/16 Continuing Study
4	Hydro-geological study for Darlipali super thermal power project, Odisha	Sudhir Kumar	9/15 – 8/16 Continuing Study

S. No.	Study	Team	Duration/ Status
5	Hydro-geological study for Khargone super thermal power project, Madhya Pradesh	SD Khobragade	07/15 – 4/16 Continuing Study
6	Hydro-geological and isotopic study for 1x660 MW Harduaganj thermal power project, UP	Sudhir Kumar	11/15 – 10/16 Continuing Study
7.	Hydro-geological and isotopic study for 1x660 MW Panki thermal power project, UP	Sudhir Kumar	12/15 – 11/16 Continuing Study
8.	Hydro-geological study for Kudgi super thermal power project, Karnataka	Sudhir Kumar	11/15 – 10/16 Continuing Study
9.	Hydro-geological study for Jawaharpur thermal power project, Etah, UP	Sudhir Kumar	12/15 – 11/16 Continuing Study

SURFACE WATER HYDROLOGY DIVISION

Dr. Rakesh Kumar, Head, Surface Water Hydrology Division gave a brief overview of the various scientific and other technical activities carried out by the Division after the previous meeting of the Working Group. Thereafter, the Scientists of the Surface Water Hydrology Division presented the progress achieved in carrying out the various studies as mentioned below.

Work Program for the Year 2015-16

S.No. & Ref. Code	Title	Study Team	Duration
1. 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 March, 2016)
2. NIH/SWHD/ NIH/13-16	Quantitative assessment of uncertainties in river discharge estimation	Sanjay Kumar Sharad Jain	3.5 Years (April 2013 to Sept. 2016)
3. NIH/SWHD/ NIH/13-16	Evaluation and modeling of hydrological support system for watersheds of Garhwal, Uttarakhand hills.	Avinash Agarwal Manohar Arora RK Nema	3 Years (November 2013 to October 2016)
4. 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)
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)
6. NIH/SWHD/ NIH/14-17	Study of Rainfall Patterns and Comparison of Rainfall Data from different Sources for Uttarakhand State	Archana Sarkar Vaibhav Garg, Sc C, IIRS, Dehradun Rakesh Kumar N.K. Bhatnagar	3 years (April 2014 to Sept. 2017)
7. NIH/SWHD/ NIH/14-17	Monitoring and modelling of streamflow for the Gangotri Glacier	Manohar Arora Rakesh Kumar	3years (May 2014 to March 2017)
8. 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 March 2017)
9. NIH/SWHD/ NIH/15-16	Analytical Solution for meeting of two surges or bores	Dr. S.K. Singh	1 year (April 2015 to March 2016)
10. NIH/SWHD/ NIH/15-16	Generalization and parameter estimation of GEV distribution for flood analysis	Dr. S.K. Singh	1 year (April 2015 to April 2016)
11. 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)
12. NIH/SWHD/	Snowmelt Runoff Modelling and Study of the Impact of Climate Change in	Achana Sarkar T. Thomas	3 years (April 2015 to

NIH/15-18	Sharda River Basin	Vaibhav Garg	March 2018)
13. 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 Sahas Khobragade Manohar Arora	3 years (April 2015 to March 2018)
14. 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)
15. 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 March 2017)
New Studies			
16. 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)
17. 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 March 2017)
18. 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)

S.N.	Title of Project/Study, Study Group, Start/Completion Dates	Status and Recommendations/Suggestions
1	<p>Application of DSS (P) for Integrated Water Resources Development & Management</p> <p>Study Group:</p> <p>A.K. Lohani Surjeet Singh Rahul Jaiswal D.K. Sonkusale Akilesh Verma</p> <p>DOS: April 2013 DOC: March 2016</p>	<p>Dr. A.K. Lohani mentioned that the DSS (P) software, which was developed under HP-II has been applied in Arpa basin of Seonath river basin to demonstrate the capabilities of the DSS (P) model. Dr. Lohani mentioned that the hydrological time series data and spatial data have been collected from Water Resources Department, Chhattisgarh for the application of DSS (P) software. Dr Lohani further mentioned that the NAM rainfall-runoff model has been setup in Mike-11 RR. ANN Rainfall-runoff model was also developed on the same set of data. Using the DSS (P) software crop planning has been carried out for (i) normal rain years, (ii) 10% above normal rain and (iii) 10% below normal rain. He further mentioned that the report writing is in progress. Dr. S.S. Grewal mentioned that the planning may be carried out for the situations beyond 10% blow or above normal rainfall criteria. Dr. Lohani agreed that the crop water planning will be attempted for suggested cases also and incorporated in the final report. Dr D.V. Reddy, NGRI suggested that the micro level DSS being developed under other projects should be merged with this DSS to extend the</p>

		capabilities of the DSS. Director, NIH mentioned that the DSS (P) is a basin level DSS and it cannot be merged with the micro scale level DSS. Dr. Rakesh Kumar, Scientist G and Head Surface Water Hydrology Division also mentioned that the DSS (P) was developed under Hydrology Project-II and it is a best planning DSS in basin Scale. It has five components for (i) Surface water planning; (ii) Integrated operation of reservoirs; (iii) Conjunctive surface water and ground water planning; (iv) Drought monitoring, assessment and management; and (v) Management of both surface and ground water quality. As the spatial scale of a micro level and a Basin level DSS are very much different and both have their own specific purpose therefore it is not advisable to have a common DSS for both the purpose.
2	<p>Quantitative assessment of uncertainties in river discharge estimation</p> <p><u>Study Group:</u></p> <p>Sanjay Kumar Sharad Jain</p> <p>DOS: April 2013 DOC: March 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), HUG (Hydrometric uncertainty guidance) and presented the progress of the study. He mentioned that, based on the discussions in the Tokyo meeting (held on 15th May 2015), all the comments and suggestions from member countries were incorporated in the Draft international standard (DIS). This DIS document was sent to BIS on 15th January 2016 for uploading on ISO site for further comments of member countries. As BIS is in the process of uploading the document, further comments on the documents are awaited. Considering above, P.I. of the study requested for the extension of six months to incorporate possible changes in the DIS documents based on the further suggestions/comments from member countries. Taking into account the progress of the study, Chairman and members agreed to extend the study for next six months.</p>
3	<p>Evaluation and modeling of hydrological support system for watersheds of Garhwal, Uttarakhand hills.</p> <p><u>Study Group:</u></p> <p>Avinash Agarwal, Manohar Arora R.K. Nema</p> <p>DOS: November 2013 DOC: October 2016</p>	<p>Dr. Avinash Agarwal, Scientist ‘G’ has presented the study, entitled “Evaluation and modeling of hydrological support system for watersheds of Garhwal, Uttarakhand hills”. He informed that analysis has been completed and writing of the report is in progress.</p> <p>Some of the Working Group members stated that a long term and very useful data base has been created for monitoring, modeling and rejuvenation of the springs in this study. The springs are a very important source of fresh water in the hilly regions. The members expressed that not many studies are available on this important aspect of drinking water in the hilly regions. The Working Group members suggested that the research work on monitoring, modeling and rejuvenation of the springs should be continued by the Institute.</p>

4	<p>Estimation of Water Balance for Integrated Water Resources Management in Yerrakalva Pilot Basin, A.P.</p> <p><u>Study Group:</u></p> <p>J.V.Tyagi YRS Rao</p> <p>DOS: April 2014 DOC: March 2016</p>	<p>Dr. J.V. Tyagi presented the study and 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 model has been employed to quantify the water balance of the basin in the present study. The model was calibrated and validated on monthly data and water balance components were computed for the basin. It was, however, informed that all files stored in the computer (including word files, excel files, pdf files, data files etc) were infected and crypted by some unknown virus. The files could not be recovered despite all efforts by experts. Therefore, entire exercise including data file preparation, SWAT model set up and calibration and validation processes have to be redone. In view of the reasons beyond control, the P.I. requested for six months extension of the study period. The working Group considered the problem and granted the extension up to September 2016.</p>
5	<p>Hydrological modelling of Brahmani Baitarani river basin using eWater Source platform</p> <p><u>Study Group:</u></p> <p>J.P. Patra Rakesh Kumar Pankaj Mani</p> <p>DOS: April 2014 DOC: March 2017</p>	<p>Sri J.P. Patra explained the objectives of the study and stated that the eWater source is Australia's first national river basin scale water modelling system. The source modelling platform has been developed to take a holistic approach to water management including human and ecological impacts. This includes integrating policy, addressing water savings and sharing for a whole river and connected groundwater systems including cities, agricultural and environmental demands. In the India-Australia Water Science and Technology Partnership programme, Australia is collaborating with the Ministry of Water Resources to pilot the source river basin modelling platform in India. The MoWR, RD & GR is planning to develop an Integrated Water Resources Management (IWRM) plan for Brahmani Baitarani basin using the source river basin modelling platform. Hence, the present study has been taken up to develop a rainfall runoff model for Brahmani Baitarani river basin in source platform and test its applicability by generating hydrological time series. It was informed that collection of hydro meteorological data, satellite images, thematic maps etc., compilation, statistical and trend analysis of rainfall and river discharge and rainfall-runoff model set up in eWater Source platform have been completed and implications of different rainfall inputs and sub catchment size and calibration and parameter estimation are under progress. Thereafter, model performance evaluation with in various time periods would be taken up.</p> <p>It was explained that catchment modelling of Brahmani Baitarani river basin in eWater source platform is being carried out. The rainfall runoff model was setup with daily rainfall data of .25°x.25° obtained from IMD and ET data from Terrestrial Hydrology Group, Princeton University. The model calibration is being carried out with gauged sub catchments represented by a small proportion of the basin. Various objective functions</p>

		<p>viz. NSE Daily, NSE Monthly, NSE Monthly & Bias Penalty, NSE Daily & Flow Duration, NSE Daily & log Flow Duration, Minimise Absolute Bias, NSE Daily & Bias Penalty etc. are used for calibration of the model. Further optimization algorithm like Shuffled Complex Evolution (SCE), Uniform Random Sampling (URS), Rosenbrock, SCE then Rosenbrock etc is evaluated for their performance. In case of SCE then Rosenbrock, the variability among different simulation runs are found to be minimum. Comparison of simulated discharge obtained from various models viz. GR4J, Sacramento and SimHyd with observed discharge have been compared. It is found that the GR4J model has performed better in comparison to other model for this basin. Further it has only four parameters to calibrate, which also reduces uncertainty. Further, the exercise with available daily point rainfall data is being carried out.</p>
6	<p>Study of Rainfall Patterns and Comparison of Rainfall Data from different Sources for Uttarakhand State</p> <p><u>Study Group:</u></p> <p>Archana Sarkar Vaibhav Garg, Sc C, IIRS, Dehradun Rakesh Kumar N.K. Bhatnagar</p> <p>DOS: April 2014 DOC: March 2017</p>	<p>Mrs Archana Sarkar, PI of the study presented the background, objectives, methodology and expected deliverables of the new study. Mrs Sarkar 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. Mrs Sarkar informed the house that a good knowledge of local rainfall-regime is crucial for planning and management of domestic, urban as well as industrial water use, irrigation and crop practices besides forecasting and management of extreme events like floods and droughts. She further informed that in view of the recent flood disaster in the Uttarakhand state, it becomes all the more important to carry out a scientific analysis of the rainfall regime of the region. Mrs Sarkar also informed 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. Mrs Sarkar presented the 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 Kumoan and Garhwal regions using IMD gridded rainfall data of 113 years (1901 to 2013). She also informed about the processing of TRMM rainfall data being processed. Mrs Sarkar informed about the further work that will be carried out for rainfall comparison for different sources if rainfall. Working group members noted the progress of the study as well as appreciated the work.</p>
7	<p>Monitoring and modelling of streamflow for the Gangotri Glacier</p>	<p>Dr Arora presented the progress of the study. He informed the house that the data collected for the ablation period of 2015 was analyzed and the results were presented in the last working group. He informed the house that the future scenarios have been developed in collaboration with IIT Delhi.</p>

	<p><u>Study Group:</u></p> <p>Manohar Arora Rakesh Kumar</p> <p>DOS: May 2014 DOC: March 2017</p>	<p>It is observed that the statistical downscaling has limitation in this area because of non availability of historical observed data. The Cordex experiment data can be used for the future water availability analysis. In addition the mathematical model to be used for simulation has to be tuned with the observed physical phenomena in the region. The aspect consideration with the extent of debris cover will be incorporated in the model to improve efficiency. The aspect map developed for the Gangotri glacier was presented.</p>
8	<p>Effect of climate change on evaporation at point scale</p> <p><u>Study Group:</u></p> <p>Digambar Singh A. R. Senthil kumar Manohar Arora</p> <p>DOS: June 2014 DOC: March 2017</p>	<p>Shri Digambar Singh, PI of the study, presented the objectives, methodology and progress of the study from Jan 2016 to March 2016. The PI explained about the Turc and Thornthwaite method to calculate the evapotranspiration. The PI also explained about the yearly variability of sun shine and wind speed, temperature and humidity. Sensibility analysis was also carried out during this period. Wind speed shows sinusoidal behavior on the yearly basis. Sunshine duration decreases in the later part of the year. Sunshine analysis shows that the temperature has major control in evaporation.</p>
9	<p>Analytical Solution for meeting of two surges or bores</p> <p><u>Study Group:</u></p> <p>S.K. Singh</p> <p>DOS: April 2015 DOC: March 2016</p>	<p>Dr. S. K. Singh informed that the study is complete and the report will be submitted by this month.</p>
10	<p>Generalization and parameter estimation of GEV distribution for flood analysis</p> <p><u>Study Group:</u></p> <p>S.K. Singh</p> <p>DOS: April 2015 DOC: April 2016</p>	<p>Dr. S. K. Singh informed that the study is complete and the report will be submitted by this month.</p>
11	<p>Flood and Sediment studies in Himalayan basin using MIKE-11 Model</p> <p><u>Study Group:</u></p> <p>A.K. Lohani Sanjay K. Jain</p> <p>DOS: April 2015</p>	<p>Dr. A. K. Lohani, Scientist G presented the progress of the study. He mentioned that the cloudburst data of District Uttarkashi of Uttarakhand have been collected. Using the DEM slope maps, river cross section and drainage network of Assiganga river basin have been prepared. Further a cloudburst event of 2012 has been considered and it has been converted to flood event considering triangular hydrograph. This hydrograph is routed to downstream using MIKER-11 model. Further flood inundated area has been plotted. Dr. Lohani mentioned that the study of other cloud burst events is in progress. He also mentioned that the sediment modelling is</p>

	DOC: March 2018	also planned in the study and efforts are being made to procure sediment modelling module of MIKE-11 or MIKE HYDRO RIVER from DHI. Dr S.S. Grewal appreciated the study. Shri N.K. Sharma, IRI also appreciated the study and mentioned that the results will be useful for water resources planning purpose.
12	<p>Snowmelt Runoff Modelling and Study of the Impact of Climate Change in Sharda River Basin</p> <p><u>Study Group:</u></p> <p>Achana Sarkar T. Thomas Vaibhav Garg</p> <p>DOS: April 2015 DOC: March 2018</p>	<p>Mrs Archana Sarkar, PI of the study presented the background, objectives, methodology and expected deliverables of the new study. Mrs Sarkar 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. Mrs Sarkar informed the house that a good knowledge of local rainfall-regime is crucial for planning and management of domestic, urban as well as industrial water use, irrigation and crop practices besides forecasting and management of extreme events like floods and droughts. She further informed that in view of the recent flood disaster in the Uttarakhand state, it becomes all the more important to carry out a scientific analysis of the rainfall regime of the region. Mrs Sarkar also informed 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. Mrs Sarkar presented the 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 Kumoan and Garhwal regions using IMD gridded rainfall data of 113 years (1901 to 2013). She also informed about the processing of TRMM rainfall data being processed. Mrs Sarkar informed about the further work that will be carried out for rainfall comparison for different sources if rainfall. Working group members noted the progress of the study as well as appreciated the work.</p>
13	<p>Study on effect of climate change on sediment yield to Pong reservoir</p> <p><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. Suhas D Khobragade, Co- PI of the project presented the objectives, methodology and the progress made during January 2016 to March 2016. The sediment inflow to Pandoh reservoir located in the upstream of the Pong reservoir is not observed and it is an important input to the SWAT model. The Co-PI presented the sediment yield to Pandoh reservoir computed from the sediment observed at Mandi downstream of Pandoh reservoir using the average trap efficiency of Bhakra and Pong reservoir. The sediment volume computed to Pandoh reservoir is 3924.485 Mm³ which is much higher than the reservoir volume of 41 Mm³. The Co-PI informed that information of sediment yield to a reservoir similar to Pandoh would be collected and used. The Co-PI also informed that the study would be merged with the NMSHE (National Mission for Sustaining the Himalayan Eco-system) project in case the</p>

		required information was not available.
14	<p>Study of regional drought characteristics and long term changes in supplemental irrigation water requirement in Seonath Basin in Chhattisgarh</p> <p><u>Study Group:</u></p> <p>R.P. Pandey Rakesh Kumar</p> <p>DOS: April 2015 DOC: March 2017</p>	<p>The Head Surface Water Hydrology Division reported an overview about the progress of studies and subsequently invited Dr R.P. Pandey, PI of the 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 08-09 December 2015. Dr Pandey presented the complete progress on preparations of base-maps, methodology used in the analysis and results of the work done under 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 has progressed well. 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 informed that the study will be continue for the next years to achieve the objectives of the study and to determine Long Term Trend in net irrigation requirement and changes in total Irrigation Water Demand (IWD). It is expected that this study will yield objective quantification of changes in irrigation water demand over past 50 years and projections for the next 50 years. He informed that the progress of the study is satisfactory.</p>
15	<p>Effect of Changing Global Tropospheric Temperature on Asia-Pacific Monsoon Circulation and Rainfall Fields across India</p> <p><u>Study Group:</u></p> <p>Ashwini Ranade</p> <p>DOS: Oct 2014 DOC: March 2017</p>	<p>Dr. Ashwini Ranade, PI of the project presented the overview of the project with objectives and progress done in last six months. She has also presented some important results of the study. The working group has well appreciated the work on onset and withdrawal of monsoon and extreme rain events.</p>
<u>New Studies</u>		
16	<p>Snow cover variability in the Upper Yamnotri Basin</p> <p><u>Study Group:</u></p>	<p>Shri Naresh Kumar proposed a new study entitled, "Snow cover variability in the Upper Yamnotri Basin". In this study, snow cover variability in the Upper Yamnotri Basin will be studied and snow depletion curves for Upper Yamnotri Basin</p>

	<p>Naresh Kumar Manohar Arora Rakesh Kumar</p> <p>DOS: Oct 2016 DOC: March 2018</p>	<p>will be developed. For this study MODIS Mod 10 A2 data will be down loaded from National Snow and Ice Data Center (NSIDC) and will be used for Snow cover analysis of the study area and preparation of snow depletion curves for the study area for different years. The study will be completed by June 2018. The beneficiaries of this study will be the stakeholders in the downstream. It will be a valuable input for the modelling studies to be undertaken for the Yamnotri Basin.</p>
17	<p>Generalization and parameter estimation of GEV distribution for flood analysis: Specific application on Indian data</p> <p><u>Study Group:</u></p> <p>S.K. Singh</p> <p>DOS: April 2016 DOC: March 2017</p>	<p>Dr S. K. Singh proposed this new study of one year duration covering the application of developed generalization of GEV-2 and GEV-3 distribution to extensive Indian data-set (flood data at various GD sites) available/collected at NIH and CWC. In an earlier report, the practical unification of both type 2 and type 3 GEV distributions in a single GEV was taken up and a simple and an optimization methods for estimation of its parameters were considered with limited testing/application for flood frequency analysis At this stage there was no comment from the members.</p>
18	<p>Application and development of analytical models on data collected at NIH under Saph-Pani Project</p> <p><u>Study Group:</u></p> <p>S.K. Singh</p> <p>DOS: April 2016 DOC: March 2019</p>	<p>Dr. S. K. Singh presented the intended objectives of the study specifically utilizing/on the data collected during the Saph-Pani project completed at NIH, as (1) To apply and illustrate on the above surface-water groundwater interaction data, the developed and published analytical models by the author, a complied detail of which has earlier been submitted to our Ministry and Institute both directly and indirectly; (2) To possibly develop new analytical models if application on the data as at item 1 suggests so; (3) The items 1 and 2 are also with the aim to suggest general application of these and other methodology concerning the area of surface-water groundwater interaction in general with respective merits/demerits.</p> <p>It is an application study in which the developed methodologies and analyses by the author are intended to be applied on the concerning data collected at NIH as stated above. The intended development of new analytical model and methodology would be along those adopted in the development of earlier such models by the author. At this stage, there was no comment from members.</p>

WATER RESOURCES SYSTEM DIVISION

Suggestion/comments received from members during 44th working group meeting (18-19 April, 2016)

Dr. Sharad K Jain, Scientist “G” and Head (WRS Div.), presented an overview of the division – scientific strength, the ongoing studies, sponsored & consultancy studies, technical publications and training courses organized. He also informed about the upcoming National Hydrology project (NHP), the project on National Mission for Sustainable Himalayan Ecosystem (NMSHE), and involvement of scientists of the division in other activities. Subsequently, Dr. M. K. Goel (MKG) gave an overview of NMSHE. Following are the comments received from working group on the presentations of the various studies.

NIH_Basin – A WINDOWS based model for water resources assessment in a river basin PI: Dr. M. K. Goel, Scientist “G”

MKG made a brief presentation of the study and informed about the various modifications that have been introduced in the modeling methodology till date. He informed that after the last working group, considerable efforts have been made in developing an excel-based procedure for preparing interactive data files, to run an executable program with the data files, and evaluate the results in MS-Excel. This procedure has been developed for an ongoing project related to Krishna basin study and the same is planned to be followed in the present case also. A brief demonstration of the procedure was demonstrated in the meeting.

MKG clarified that the procedure will help in avoiding the development of a separate code in Visual Basic for the linkage of various data files and programs. He said that because of extensive efforts in this development, the finalization of the main program for the river basin model is still in progress. He requested to extend the time frame for the present study by one year which was agreed by the members. No specific queries were raised during the presentation.

Glacier change and glacier runoff variation in the upper Satluj river basin

PI: Dr. Sanjay K. Jain (SJ), Scientist “G”

SJ informed the house that glacier change study for the upper Satluj basin have been completed and presented in the previous meeting. He informed that the data base for modeling snow/glacier melt runoff has been completed. The future projections for rainfall and temperature from IIT Bombay have been received recently. Now snow/glacier melt runoff vis a vis climate change will be studied. SJ asked for extension of six months for completion of the study. House granted the permission of extension.

Modelling of Narmada Basin using GWAHA Model (Ongoing)

PI: Dr. Sanjay K. Jain (SJ), Scientist “G”

Mr. P. K. Mishra (PKM) presented the status as well as the progress of the study. He informed that all the mandatory input files, viz., Physical Parameter files, Water Demand Files and Climate Files in the required format have been completed. The crop data file has also been done. A pre-calibrated run of the model has already been done, but with an over estimation of flows. Few bugs in the Pre-processor have been removed at CEH and a new version of PREPROCESSOR.EXE has been sent by CEH recently. There is some error in flow direction of grids based on the automated extraction in ArcGIS. Single site calibration of the model with minimum data requirements is expected to be completed by May 15, 2016. Dr. Reddy recommended to revise the Objective 1. The suggestion has been noted and will be addressed.

Decision Support System for Water Resources Planning in Upper Bhima basin, Maharashtra

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

Work progress for the study was presented by Mr D.S. Rathore. During the period, work was carried out pertaining to drought index and water quality modelling. Standardised Precipitation Index (SPI) of 1 to 4 month scale was used to estimate probabilities of occurrence of drought and mild dry conditions for monsoon months (June- September). In case, SPI is lower than 1 in any period, the drought condition was assumed. In case of negative values, mild dry condition was assumed. SPI values estimated from cumulative rainfall values for 1 to 4 months June onwards. Drought and mild dry probabilities were 20 and 10% respectively. Probabilities for percent deficit rainfall (June-September) classes <20, 20-40, 40-60 and >60 were also estimated. Excel based procedure was developed for computed catchment wise non point and point source pollutant loading and distribution of the load based on runoff values. Maximum generated pollutant load was simulated for conservative transport and low values of decay coefficients. The values simulated were higher than observed pollutant concentration and thus it will be possible to calibrate the model using suitable coefficients. Dr D.V. Reddy pointed out that in view of ongoing large scale drought conditions in India, drought prediction aspect may be looked into. Director suggested to analyze the current data for the purpose.

Development of Ganga Information Portal

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

In absence of the PI (DC), it was informed that the study is progressing well.

Catchment scale evaluation of cold-arid cryospheric system hydrology, Ganglass catchment, Ladakh

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

This project is aimed to evaluate the catchment scale hydrologic processes of the cold-arid regime. RJT informed about the progress made after the last working group. Winter and summer mass of Phuche glacier is calculated during this period and found to be positive. Discharge at 4700m asl is derived from the AWLR data and found to be highest since the monitoring began in this catchment. RJT informed about the delay in procuring the soil thermometers for the permafrost study. No specific suggestions received for this study.

Runoff modelling of Shyok River, Karakorum Range

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

This project is being executed in coordination with Border Roads Organisation (BRO) at km 150 of Durbuk—DBO axis. Since the last working group snow cover depletion curves for the basin have been developed. It is found that the most of the basin become snow free by June itself but the discharge starts increasing significantly since July, suggesting large contributions from glacier dominant areas. RJT informed that runoff modelling is hampered due to delay in procurement of AWS for the basin and no other temperature and precipitation information is available from the basin. No specific suggestions received for this project.

RJT also informed about two newly sanctioned sponsored projects by SERB titled “Mass and Energy balance of Phuche and Khardung glaciers Ladakh range” and NMHS project , where NIH is co-lead entitled “Dynamics of Himalayan Ecosystem and its impact under changing climate scenario”

Study of hydrological changes in selected watersheds in view of climate change in India

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

LNT presented the objectives, methodology and the status of the ongoing study. Hydro-meteorological data namely rainfall, temperature and discharge data processed for Ramganga and Bina river basins and its preliminary analysis carried out was presented. The status of the GIS database prepared using remote sensing data (Land sat 8 imagery) and NBSS & ULIP data for Land use/Land cover and soil maps respectively in ERDAS 9.3 and ARCGIS 9.3 environment for these basins were also deliberated. The preliminary analysis rainfall data at 3

month scale prepared for the drought characterization using SPI method for these river basins was also presented in the meeting. Ground water data processing and in turn generation of fluctuation map for the Bina river basin for year 2014 was also presented. No specific suggestions were received for this project.

Hydrological Processes and Characterization of Lesser Himalayan Catchments (Ongoing)

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

While presenting the progress of the study, MKN informed that the study is experimental in nature and requires setting up variety of instruments in the proposed catchments, which is a time-taking and challenging job particularly in Himalayan conditions. He informed that the stream gauging structures at both the stream have been completed and manual monitoring is also being done since Feb, 2016. One AWS has also been installed and data is being received at NIH, Roorkee Servers. He further updated that work order for AWLR has been placed and installation is yet to be done. No major comments were made by the WG members.

Studies on Temporal Variation of Sediment Yield in a Hilly Watershed of Upper Ganga Basin, Uttarakhand

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

PKS presented the progress report of the project. Shri C.P. Kumar asked about the initial soil moisture (V_0) proposed to be incorporated in the time distributed sediment yield model development. The PI informed that the V_0 will be incorporated in the basic proportionality concept ($Q/P-I_a = F/S$) in volumetric terms to account for the moisture before the storm. Dr. S.K. Bartarya, WIHG, Dehradun suggested to explore the possibility of incorporating the dissolved solids loads along with suspended sediment load. A suggestion regarding sampling of bed load was also emerged during discussion. However, it was decided that the possible inclusion of both the aspects will be explored in the next monsoon season.

Assessing Climate Change Impact across KBK (Kalahandi-Bolangir-Koraput) region of Odisha (Completed)

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

Being a completed study, PKM presented objective-wise final results of the study. Shri Mishra presented the trend for rainfall (110 years), temperature (102 years), and potential evapotranspiration (102 years) for the eight districts coming under KBK region. The year having considerable shift in rainfall and temperature pattern in the region has also been presented. PKM presented the downscaled future rainfall and temperature for the region using HadCM3 Global Climate Model (GCM) for A2 and B2 scenarios. He also presented the water availability and utilization for the Tel basin, and discussed the outputs from the Soil and Water Assessment Tool (SWAT) modeling carried out for the Tel basin.

Hydrological modeling of a part of Satluj basin using SWAT model

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

The progress of the study was presented by PKA before the members of the Working Group. It was informed that data processing and preparation is in progress. Spatial data have been prepared in the format required by SWAT. PI informed that the required discharge data at Harike will be collected shortly. No specific comments were received from the members of the Working Group.

WORK PROGRAMME FOR THE YEAR 2016-2017

SN	Title	Study Team	Duration	Funding (Rs. in Lakhs)
CompletedSponsored/ Internal Studies				
1.	Assessing climate change impact across KBK region of Odisha	P. K. Mishra Sharad K. Jain Sanjay K. Jain	3 Years (04/13-03/16)	NIH (28)
Ongoing Internal Studies				
1.	NIH_Basin – A WINDOWS based model for water resources assessment in a river basin	M. K. Goel Sharad K. Jain DeepaChalisgaonkar Prabhash K. Mishra	3 Years (04/13-03/16)	NIH (16)
2.	Glacier change and glacier runoff variation in the upper Satluj river basin	Sanjay K. Jain Sharad K. Jain Renoj J. Thayyen	2.5 Years (10/13-03/16)	NIH (12)
3.	Catchment scale evaluation of cold-arid cryospheric system Hydrology, Ganglass catchment, Ladakh	Renoj J. Thayyen S. P. Rai Sanjay K Jain Sudhir Kumar	3 years (04/14-03/17)	NIH (48)
4.	Hydrologic Modelling of a part of Satluj Basin using SWAT Model	P. K. Agarwal Sharad K. Jain Tanvear Ahmad M. K. Goel Sanjay K. Jain M. K. Nema	2 -3/4 Years (06/14-03/17)	NIH (23)
5.	Decision Support System for Water Resources Planning in Upper Bhima basin, Maharashtra	D. S. Rathore M. K. Goel, R.P. Pandey Sanjay Kumar Surjeet Singh	2 years (07/14-06/16)	NIH (34)
6.	Modeling of Narmada basin by using the GWAVA model	Sanjay K. Jain Sharad K. Jain T. Thomas (RC-Bhopal) P. K. Mishra P. K. Agarwal M. K. Nema	2.25 years Dec. 2014 – Mar 2017	NIH
7.	Runoff modeling of Shyok River, Karakorum Range	Renoj J.Thayyen Sanjay K.Jain	3 years Dec-2014 to Nov.2017	NIH (38)
8.	Hydrological process and characterization of Lesser Himalayan Catchments	M. K. Nema Sharad K. Jain Sanjay K. Jain Renoj J.Thayyen P. K. Mishra P. K. Agarwal	5 Years 12/14-12/19	NIH+
9.	Development of Ganga Information Portal	DeepaChalisgaonkar Sharad K. Jain D. S. Rathore Sanjay K. Jain	3 years (04/15-03/18)	MoWR (65.55)

		Sudhir Kumar P. K. Mishra P. K. Agarwal M. K. Nema		
10.	Study of hydrological changes in selected watersheds in view of climate change in India.	L. N. Thakural D. S. Rathore Surjeet Singh Tanveer Ahmad Sanjay K. Jain Sharad K. Jain	3 years (04/15-03/18)	MoWR (44.30)
11.	Studies on Temporal Variation of Sediment Yield in Hilly Watershed of Upper Ganga Basin, Uttarakhand	P.K. Singh Sharad K. Jain Sanjay K. Jain M. K. Nema	2 Years 01/16-12/17	NIH (8.20)
New Sponsored Study for the year 2016-2017				
1.	Mass and Energy balance of Phuche and Khardung glaciers, Ladakh range	R.J. Thayyen Farooq Azam P.G. Jose A.P. Dimri	3 Years (03/16-02/19)	SERB (65.14)
2.	NMSHE SUB-PROJECTS	-	-	-

RESEARCH MANAGEMENT AND OUTREACH DIVISION (RMOD)

Progress Under Work Programme For Year 2015-2016

SN	Title of Project/Study, Study Team	Status and Recommendations/Suggestions
1.	<p>Water conservation and management in Ibrahimpur Masahi village of Haridwar district (Uttarakhand)</p> <p>Team: Omkar Singh, V.C. Goyal, Dinesh Kumar</p> <p>DOS: April 2013, DOC: March 2016 (extended upto Sept., 2016)</p>	<p>The study was presented by Shri Omkar Singh (PI). The PI requested for 6 months extension to carry out the task of preparing a water conservation plan in this study, which was agreed by the WG.</p>
2.	<p>WEAP Model set up for four sub-basins under Pilot Basin Studies (PBS) Programme, jointly with the RCs/CFMSs</p> <p>NIH HQs: Jyoti Patil and V C Goyal (PBS Leader)</p> <p>Co-investigators from NIH RCs/CFMSs: Chandramohan T (RC-Belgaum), Y R S Rao (RC-Kakinada), T R Nayak (RC-Bhopal), B Chakravorty (CFMS-Patna), R V Kale (RC-Jammu)</p> <p>DOS: Apr 2015, DOC: Mar 2017</p>	<p>The study was presented by Dr. Jyoti P Patil. Database development and draft WEAP model setup is under progress. Shortcomings of the study are inaccessible classified data of Mahi river and demo/ training needed by RCs. There was no specific comment from the WG members.</p>
3.	<p>Customization of WEAP model for application in Ur river watershed in Tikamgarh district of Bundelkhand region. (Under TIFAC Project)</p> <p>Team: R V Kale (PI Till Feb,2016), T Thomas-RC Bhopal, Jyoti Patil, Rajesh Agarwal,</p> <p>DOS: Apr 2014, DOC: March 2016 (completed).</p>	<p>The study was presented by Dr. Jyoti P Patil. This was completed study and efforts made by team were well appreciated by the WG members. There was no specific comment except to understand the optimization process of WEAP model.</p>

WORK PROGRAMME FOR YEAR 2016-2017

SN	Title of Project/Study	Study Team	Duration	Funding
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: March 2016 (requires 6 month extension)	NIH
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 (Ongoing study)	NIH
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- preparation of final report	V C Goyal (PI), T Thomas, Jyoti Patil, Rajesh Agrawal	DOS: Aug 2013 DOC: Jul 2016	TIFAC (Rs 56.64 lakh)
4.	IWRM Based Development Plan for Water Security in Four Districts of Bundelkhand Region in India	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: Dec 2016	MoWR, RD & GR (Rs 299.4 lakh)
5.	Development of a DSS for Hydrology and Watershed Management in Neeranchal Project	V C Goyal (PI)	DOS: May 2016* DOC: Mar 2021	DoLR (Gol)

*Final approval from the DoLR (Gol) is awaited.

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 44th WG meeting**

1.	Er. R.D. Singh, Director, NIH	Chairman
2.	Dr. S.K. Bartarya, WIHG, Dehradun	Member
3.	Dr. D V Reddy, CSIR-NGRI, Hyderabad	Member
4.	Dr. G P Juyal, CSWCRTI, Dehradun	Member
5.	Dr. S K Mittal, CSIR-CSIO, Chandigarh	Member
6.	Er. Kireet Kumar, GBPIHED, Almora	Member
7.	Dr. S S Grewal, Chandigarh	Member
8.	Er. R K Khanna, New Delhi	Member
9.	Dr. S.K. Jain, Sc. G & Head WRS Division, NIH	Member
10.	Dr. N C Ghosh, Sc.G & Head GWH Division, NIH	Member
11.	Dr. Rakesh Kumar, Sc. G & Head SWH Division, NIH	Member
12.	Dr. Sudhir Kumar, Sc. G & Head HI Division, NIH	Member
13.	Dr. C K Jain, Sc.G & Head EH Division, NIH	Member
14.	Dr. V C Goyal, Sc. G & Head, RMO Division, NIH	Member-Secretary

Scientists from National Institute of Hydrology, Roorkee

	EH Division		SWH Division
1	Dr. M.K. Sharma, Sc.D	17	Dr. J.V. Tyagi, Sc.G
2	Dr. Rajesh Singh, Sc.C	18	Dr. Avinash Agarwal, Sc.G
3	Dr. Pradeep Kumar, Sc.C	19	Dr. A.K. Lohani, Sc.G
	GWH Division	20	Dr. S.K. Singh, Sc.F
4	Er. C.P. Kumar, Sc.G	21	Dr. R.P. Pandey, Sc.F
5	Dr. Anupama Sharma, Sc.D	22	Dr. Sanjay Kumar, Sc.D
6	Dr. Surjeet Singh, Sc.D	23	Dr (Mrs) Archana Sarkar, Sc.D
7	Er. Sumant Kumar, Sc.C	24	Dr. Manohar Arora, Sc.D
8	Ms. Suman Gurjar, Sc.C	25	Sh. Digamber Singh, Sc.C
9	Dr. Gopal Krishan, Sc.C	26	Sh. J.P. Patra, Sc.C
	HI Division	27	Dr. Ashwini A. Ranade, Sc.C
10	Dr.Suhas Khobragade, Sc.E	28	Sh. Naresh Saini, Sc.B
11	Dr. M.S. Rao, Sc.D		WRS Division
12	Sh. S.K. Verma, Sc.D	29	Dr. Sanjay Jain, Sc.G
13	Sh. P.K. Garg, Sc.B	30	Dr. M.K. Goel, Sc.G
	RMO Division	31	Er. D.S. Rathore, Sc.F
14	Er. Omkar Singh, Sc.F	32	Dr. Renoj J. Thayyen, Sc.D
15	Dr. Jyoti Patil, Sc.C	33	Dr. L.N. Thakural, Sc.C
16	Dr. Hitendra Singh, Sc.C	34	Sh. Manish Nema, Sc.C
		35	Dr. P.K. Singh, Sc.C
		36	Sh. P.K. Mishra, Sc.B
		37	Sh. Tanveer Ahmad, Sc.B
		38	Sh. P.K. Agrawal, Sc.B