

**MINUTES OF THE
38TH MEETING OF WORKING GROUP OF NIH
HELD AT NIH, ROORKEE, DURING APRIL 3-4, 2013**

The 38th meeting of the Working Group of NIH was held at NIH, Roorkee, during April 3-4, 2013 under the Chairmanship of Director, NIH. The list of the participants of the meeting is given in Annexure-I.

ITEM NO. 38.1: 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 mentioned the monthly monitoring of milestones/deliverables by the Ministry of Water Resources, and suggested that the scientists should prepare the internally-funded studies in the same format as of the sponsored projects (including the provision of budget under defined heads). He advised the Divisional Heads to get such studies of 2013-14 prepared in the “sponsored project format” in their respective Divisions, which should be presented in the next meeting of the Working Group.

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

S N	Member	Suggestion(s)
1	Dr. R C Jain	<ul style="list-style-type: none"> ▪ Advanced research to reduce uncertainty in prediction of aquifer characteristics and yield ▪ Interdisciplinary and multi disciplinary approach to solve water management issues ▪ Studies on hydraulic properties of aquifer/basin, rock formation should be planned ▪ Studies on geochemistry using knowledge of rock formation ▪ More collaboration with institutions ▪ Mechanism to reach policy makers and parliamentarians
2	Sri Sanjiv Sharma	<ul style="list-style-type: none"> ▪ Ground water quality studies for Malwa region of Punjab where cancer cases growing with alarming rate ▪ Emphasized geological component in hydrological studies ▪ GSI can provide geologic map at scale 1:50,000 of the required study areas free of cost for research purposes
3	Dr. N B N Prasad	<ul style="list-style-type: none"> ▪ Find out appropriate funding agencies for sponsored projects. More emphasis on sponsored studies ▪ Provide list of publications in the working group meeting agenda document ▪ Six month time for literature survey is not justifiable ▪ Select a river basin in Kerala for the PBS Program ▪ Studies on sand mining impact on ecology and water resources ▪ River inter-basin water transfer studies ▪ NIH should plan hydrological studies for at least one river basin from each State in the country

		<ul style="list-style-type: none"> ▪ Hire services to improve presentation skill such as preparation of PPT
4	Dr. M. Perumal	<ul style="list-style-type: none"> ▪ Plan a “Handbook of Hydrology” with chapters prepared by NIH Scientists and outside experts ▪ Softwares developed at NIH should be kept in public domain.
5	Dr. S. K. Bartarya	<ul style="list-style-type: none"> ▪ Start student program to provide helping hand in the research activities
6	Dr. Kireet Kumar	<ul style="list-style-type: none"> ▪ Incorporation of research finding in policy making ▪ Discussion with scientist/scientific community on data sharing issues in hydro-metrological data policy ▪ Suggested inter-Divisional linkage and mapping of studies/projects.
7	Dr. U. Saravanan Kumar	<ul style="list-style-type: none"> ▪ Studies on isotopes, modeling and carbon dating ▪ Groundwater dating
8	Dr. R D Deshpande	<p>Possible areas of new / innovative research:</p> <ul style="list-style-type: none"> ▪ Dew Water harvesting ▪ Hydrothermal springs and geothermal energy as a possible source of alternate power. ▪ Submarine groundwater discharge ▪ Defluoridation experiments of using non-synthetic means such as pottery, brick, clay etc. ▪ Design and development of electromechanical sampling devices for small diameter observation wells. <p>Exploiting the research potential in the field of isotope hydrology, glaciology or hydrological consequences of climate change to clinch long pending scientific issues:</p> <ul style="list-style-type: none"> ▪ Eastern extent of the influence of western disturbances in Himalayan glaciers ▪ Western extent of eastern tropical jet stream in Himalayan glaciers ▪ Trans-Himalayan vapor flux ▪ Local recycling of vapor from Himalayan glaciers ▪ Post-depositional isotopic modification of snow due to evaporation and sublimation ▪ Isotopic signatures of pre-monsoon or post-monsoon characteristic weather/ monsoonal processes ▪ Standardization of parameters/ processes to identify exclusively climatic signals in hydrological indices <p>Applied research of societal importance and its permeation in the society:</p> <ul style="list-style-type: none"> ▪ New knowledge generated from the completed projects is translated into socio-economic advantage and the applied technology, method or approach is replicated by communities or NGOs with support (mainly consultative and marginally analytical) from NIH. This is possible by sharing the scientific knowledge, procedure, technique with organizations who can communicate with masses and teaming with them to some extent.

		<p>Suggestions/observations concerning RMOD:</p> <ul style="list-style-type: none"> ▪ Developing video conferencing facility for quick, convenient and cheaper communication with regional centers/ pilot basin studies /mass awareness programmes. ▪ Initiation of division seminars / colloquium / invited lecture series to facilitate interaction, collaboration and cooperation among scientists working in closely related disciplines. ▪ Seeking consultative guidance/ support from professional agency for developing presentation skills (oral, poster, slides) and for efficient time management. ▪ Alternative strategy of presenting new/ ongoing and completed programmes such that presentations are more effective and deliberations are much more productive in terms of achieving the targeted objectives. ▪ New studies should get maximum time to get ideas from working group members ▪ For effective organization of working group meeting, new planned studies are allowed to be presented after completion of one year ▪ Equitable distribution of time for studies of all divisions during presentations in working group meeting ▪ Mapping of a division based on its manpower, number of projects, significance of projects, external funding obtained, internal funding spent, research output in terms of international and Indian journals with their impact factors, H-index for the scientist and divisions. ▪ Placing the reports of all the completed projects on NIH website. ▪ Placing the WG minutes and reports on the website so that WG members are not required to post the hardcopy and any previous report is accessible. ▪ Current presentation screen is too small compared to the dimension of the society room. A much larger screen starting from one foot above its present position is necessary. <p>General comments:</p> <ul style="list-style-type: none"> ▪ Study hydrological consequences on environment ▪ Continuous study on column absorption for longer period ▪ Explore clubbing together the projects of closely similar nature, e.g. from climate change, glaciology and hydrology
9	Dr. S N Rai	<ul style="list-style-type: none"> ▪ Concentrate on problematic areas and carry out integrated studies ▪ Emphasis must be given to develop own methodology/technology for hydrological studies e.g. modeling discharge of springs ▪ In spring flow studies, geological structure of area should be given due consideration ▪ Translate scientific results to community ▪ Continuous discussion among the groups with same area of interest to come up with innovative ideas

10	Dr. R. K. Goyal	<ul style="list-style-type: none"> ▪ Impact assessment of climate change on water resources highlighting positive as well as negative aspects.
11	Er. N. Naha	<ul style="list-style-type: none"> ▪ Studies on water projections for various need in the future ▪ Collaborative projects with Govt. of West Bengal.
12	Sri. N. K. Sharma	<ul style="list-style-type: none"> ▪ Many PSU/ Corporate houses award research funding in water sector in the form of CSR. NIH may explore sponsored projects from such PSUs.
13	Er. R K Khanna	<ul style="list-style-type: none"> ▪ Training course on environmental & social impact studies for line departments & stakeholders ▪ Environmental studies of completed projects ▪ Certificate/Diploma/PG course on “Integrated Water Resources Management (IWRM)”
14	Sri. Anshuman	<ul style="list-style-type: none"> ▪ Study impact of climate change on water quality ▪ Coupling of research and implementation activity and assess the acceptability by people ▪ Climate change impact studies should be presented in useable form and also using WINDOW based interface for the benefit of the users ▪ Possibilities should be identified to carry out collaborative studies with TERI ▪ Prepare Policy Briefs
15	Dr. Ravi Chopra	<ul style="list-style-type: none"> ▪ Find out mechanism to reach out to parliamentary standing committee to incorporate research finding in the policy of country ▪ Collaboration between scientific institutes, end users and implementing agencies
16	Dr. Himanshu Kulkarani	<ul style="list-style-type: none"> ▪ Articulation of conceptual models missing in modelling studies ▪ More emphasis on field implementation of research results and good research publications ▪ Incorporate social issues into water resources management studies ▪ Fruitful collaboration between academic institutes, knowledge centers & implementing agencies (including NGOs) ▪ Need of strengthening outreach activities ▪ Proper sequencing is required during presentation of studies for understanding and convenience of committee members ▪ Time management should be exercised during presentations.
17	Sh. Kaushendra	<ul style="list-style-type: none"> ▪ Studies on climate change adaptation strategies, highlight actionable points for users ▪ Collaboration with state agricultural university for studying impact of climate change on agricultural productivity ▪ Dissemination of knowledge at grass root level ▪ Translation of IWRM deliverables to grass root level ▪ Certificate course by NIH ▪ Improve presentations and time management during the meeting.

After taking the views of the members and their self-introduction, the Chairman asked the Member-Secretary to take up the agenda of the meeting.

ITEM No. 38.2: CONFIRMATION OF THE MINUTES OF 37TH MEETING OF THE WORKING GROUP

The 37th meeting of the Working group was held during October 29-30, 2012. The minutes of the meeting were circulated to all the members and invitees vide letter No. RMOD/37th WG/NIH/11 dated January 28th, 2013. As no comments were received on the circulated minutes, the minutes were confirmed.

ITEM No. 38.3: ACTION TAKEN ON THE DECISIONS/RECOMMENDATIONS OF THE PREVIOUS WORKING GROUP MEETING

Dr. V. C. Goyal, Scientist F & Member Secretary, gave a brief account of the actions taken on the recommendations/decisions of the 37th working group meeting.

ITEM No. 38.4: PRESENTATION AND DISCUSSION ON THE STATUS AND PROGRESS OF THE WORK PROGRAMME FOR THE YEAR 2013-14.

The Member-Secretary made a brief presentation about organizational structure, achievement of ISO 9001:2008 to the institute and schedule & time frame for presenting the progress of studies and work programme of 2013-14. On the second day (i.e. April 4, 2013), Dr Sharad Jain chaired the meeting in absence of Er R D Singh, Director, who was on tour. Division wise minutes of each study/project presented during the meeting are given below:

ENVIRONMENTAL HYDROLOGY DIVISION

S.No.	Title of the Study, Study Group, Date of Start and Completion	Recommendation/Suggestion
Ongoing Studies		
1.	<p>Assessment of Water Quality in Hindon River Basin</p> <p>Study Group: M. K. Sharma (PI), Omkar Singh, Rakesh Goyal, Dayanand</p> <p>DOS: 11/2011, DOC: 10/2014</p>	<p>Dr. N. B. Narasimha Prasad commented that NIH being an apex Institute, it should take-up studies on some new aspects.</p> <p>Dr. S. K. Jain, Director in-charge also suggested to think of some innovative elements in the study.</p>
2.	<p>Development of Low Cost Media for Fluoride Removal from Drinking Water of Fluoride Affected Areas</p> <p>Study Group: Rajesh Singh (PI), Dayanand</p> <p>DOS: 04/2011, DOC: 03/2013 Extended for 6 months up to Sep. 2013</p>	<p>Dr. R. D. Deshpande suggested to carry out column studies for longer duration after exhaustion of media to understand the leachability behaviour of the media and pointed out that in case of any leaching, this would be more damaging to the environment.</p> <p>He also advised to use non synthetic means such as pottery, brick clay etc. for defluoridation.</p>
New Studies		
3.	<p>Ground Water Quality Mapping and Surveillance for Safe Water Supply in District Hardwar and Dehradun, Uttarakhand</p> <p>Study Group: C. K. Jain (PI) P. K. Garg (IITR), Rama Mehta, S. K. Sharma, Yatveer Singh, Babita Sharma</p> <p>DOS: 04/13, DOC: 03/14</p>	<p>Dr. R. C. Jain mentioned that the results of the study will be useful for CGWB for installation of tube wells in the region and suggested to share the findings of the study with CGWB.</p>

GROUND WATER HYDROLOGY DIVISION

Dr. N.C. Ghosh, Scientist-F and Head of the division presented an overview of studies and activities carried out by the Division during the year 2012-2013. He gave an account of scientific strength available at the division and the consultancy projects being pursued by the division. Out of 6 R&D studies approved for the year 2012-13, two studies have been concluded, and four studies would be continued during 2013-14. In addition to the four continued studies, the division also proposed to take up two new studies during the year 2013-14.

Two training courses; one under the European Commission funded collaborative R&D project 'Saph Pani', on "Managed Aquifer Recharge: Methods, Hydrogeological Requirements and Impact Assessment", jointly by Anna University and NIH during 11-12 December, 2012 at Chennai and the other one under Purpose Driven Studies "Coastal Groundwater Dynamics and Management in the Saurashtra Region, Gujarat", on "Coastal groundwater assessment and modeling", jointly by NIH and GWRDC, Gujarat during 4-8 March, 2013 at Rajkot were organized.

PIs of the studies presented progress of each study; suggestions emerged are given below.

Project Ref. Code: NIH/GWD/NIH/10-12

Quantification of Impact of Rainwater Harvesting on Groundwater Availability in Aravalli Hills – Part II: Mathematical Modeling

Dr. Anupma Sharma presented the background, objectives, data monitoring and field investigations carried-out in Savana macro-watershed located in Jaisamand Lake catchment. 'Wells for India' (an NGO) and the local villagers provided support in the data monitoring and field investigations for the study. She gave details about seasonal cropping pattern interpreted from satellite data, geophysical surveys carried out in the region and the use of GIS for estimation of groundwater balance in the watershed. Dr. R.C. Jain opined that in view of large number of harvesting structures constructed in the area, the study should include optimization of locations of anicuts and rainwater harvesting structures in the watershed. It was informed that the present study is getting completed and the report is under preparation. Therefore, the suggested task would be undertaken in a subsequent study to be taken up in another watershed of Jaisamand Lake catchment. On a query from Dr S.N. Rai, it was informed that depending upon the site parameters, different types of rainwater harvesting structures had been constructed in the watershed.

Project Ref. Code: NIH/GWD/NIH/12-13

Hydrological Instrumentation and Data Monitoring Planning for Integrated Water Resources Management (IWRM) of the Bina River Pilot Basin

Dr. Surjeet Singh presented the outcomes of the study and informed that it has been completed and report preparation in under completion. The outcomes of the study have been reported mainly on the development of procedures and methodologies for designing data monitoring network of the Bina River Pilot Basin study for IWRM. The instrumentation required for 'Pilot Basin Study (PBS)' of the Bina river basin and the locations of data monitoring network have been identified using various statistical methods and suggested

guidelines. Dr. R.C. Jain, CGWB suggested to consider the underground rock formations while designing the well network. Dr. N.B.N. Prasad and Dr. R.C. Jain suggested to include the instruments for water sampling from the piezometers.

Project Ref. Code: NIH/GWD/HP-II/10-12

Coastal Groundwater Dynamics and Management in the Saurashtra Region, Gujarat.

Dr. Anupma Sharma presented the progress of the study and groundwater salinity issues in the coastal Saurashtra region and the various measures taken by the State Dept. to prevent ingress of saline water through creeks and freshwater reservoir schemes. The details of data collection program undertaken for the Minsar Basin, geology of Minsar Basin, geophysical surveys and pump tests and analysis carried out in the study area were also presented. Impact of low rainfall with resulting variations in water table and groundwater salinity along the coast monitored during pre- and post- monsoon months were also explained. Results obtained from chemical analysis of water samples were shown using various plots of different water quality parameters. Possible ion-exchange reactions in the region were discussed. Dr. NBN Prasad and Dr S N Rai queried about the geophysical surveys carried out in the region and opined that the results obtained by GWRDC should be verified. Dr. H. Kulkarni queried about the geophysical survey instrumentation utilized in the study.

Project Ref. Code: EU-sponsored Project no. 282911

Saph Pani - Enhancement of natural water systems and treatment methods for safe and sustainable water supply in India”

Dr. N. C. Ghosh presented the progress made during the last six months period in the EU sponsored collaborative R & D project. He informed that NIH is involved in four work packages of the project, namely WP1 -Bank Filtration in Urban areas under varying Pollutant loads and flood situation; WP2- Managed Aquifer Recharge and Soil Aquifer Treatment; WP5- Modelling and system design; and WP7 - Training and Dissemination. Under WP1, NIH is working on Haridwar site and in collection of baseline data from existing RBF sites in India; under WP2, NIH is involved in Raipur Municipal Area; in WP5, based on the baseline data to be collected from WP1, & WP2 NIH will be involved in modelling of the respective site; and for WP7, NIH is the task leader and has the responsibility of taking forward the tasks as envisaged in the project.

Dr. Ghosh informed that in Haridwar, 22 large diameter (10 m) bottom entry caisson RBF wells of 7-10 m deep are operated to abstract bank filtrate water from the river Ganga and the Upper Ganga Canal (UGC) to meet the demand of 50% drinking water supply of the city. Monthly water samples from 29 locations which include 22 IWs, 3 locations each from the river Ganga and the UGC, 3 locations for groundwater samples (Open well) collected for previous six months since September, 2012 to determine the concentrations of 20 water quality constituents (16 physico-chemical, 2 bacteriological and 2 heavy metals) and isotopic composition. Groundwater levels and river stages had also been measured simultaneously. Other auxiliary data for modelling the well fields of the RBF wells such as, meteorological data, borelog data, and aquifer properties had also been collected from different organizations, and sources. The Ganga river stage-discharge data for 11 years (2002-2012) had also been collected. The results of the water quality and isotope analysis are used for further analysis in conjunction with the RBF processes. The various other data collected from the field investigations are used for modelling using MODFLOW coupled with MT3D.

Some baseline data for potential RBF sites in Bihar, Jammu, Madhya Pradesh, Andhra Pradesh, and Karnataka have been collected using the network of NIH-Regional Centres at Patna, Jammu, Bhopal, Kakinada and Belgaum.

Under the WP2 activities, in the Raipur area, two sites have been identified for MAR study; one is Talibanda Lake area and other one is Talibanda village area. Based on the data collected so far on Meteorology, hydrogeology, groundwater level data, etc. some analysis work has been done.

As a part of the WP5 deliverable, a 3-Dimensional simulation model using MODFLOW and its sub-modules has been developed incorporating all the RBF wells for the Haridwar site. The model has been calibrated and validated for the steady-state condition. From the steady-state runs of the model travel time and flow path have been ascertain. The flow modelling has also been intended to determine the travel time, flow path and also flow budgeting.

Progresses of activities under WP7: the second biannual review meeting of the ‘Saph Pani’ project was held during 13-14 December, 2012 at Chennai. Anna University organized the meeting.

The second training program on “Managed Aquifer Recharge: Methods, Assessment, Hydrogeological and Water Quality Considerations” had successfully been organized by NIH and Anna University during 11-12 December, 2012 at Chennai.

As part of the dissemination activity, “Saph Pani” matter had been exhibited in different exhibition events where NIH has participated.

The third and the last training course of its series on “Application of wetlands and other natural systems in India” will be organized by IIT Bombay and NIH at Mumbai during November, 2013 along with the fourth biannual review meeting. The third biannual review meeting of the project together with a Practioner exposure tour to Berlin is scheduled to be held during 27, May to 1 June, 2013.

Members of the Working Group appreciated the progress of the project. Dr. Perumal enquired whether RBF wells constructed along the bank of the UGC, which is meant for irrigation water, are admissible. Dr. Ghosh replied that these wells have been constructed by the UJS long back and NIH is only studying the physical processes of RBF for such wells and improvement of water quality being achieved by the RBF technique.

Project Ref. Code: NIH/GWD/NIH/11-14

Managed Aquifer Recharge (MAR) and Aquifer Storage Recovery (ASR)

Mr. Sumant Kumar (PI) presented the objectives, statement of the problems, achievements and the future plan of the study. PI informed that two recharge sites have been identified and corresponding runoff has been calculated. Next step would be to estimate the groundwater recharge from the selected sites. On enquiry from Dr. R.C. Jain about the cross-sectional view of the geological formations of the area, PI informed that, data are yet to be collected from the RMC/CGWB, Raipur. He also informed that possibility of drilling of new wells for obtaining borelogs is in progress. PI also clarified the query about GW level and its flow direction in the area.

Project Ref. Code: EU-sponsored Project no. 282911

Flow and Contaminant Transport Modeling of Riverbank Filtration.

[Under the framework of 'SAPH PANI' Project Work Package – 1(WP-1) – Bank Filtration in Urban Areas under varying Pollutants Loads and Flood situation]

Ms. Shashi Poonam Indwar (PI) presented the study, "Flow and Contaminant Transport Modeling of Riverbank Filtration", its objectives, statement of the problem; aquifer characterization, geological and hydrogeological evaluation of bank filtration case study site. Ms. Indwar informed that the conceptualization of the flow model has been completed and Steady-state modelling of bank filtrate travel-time and flow path has been completed. PI also informed that further data analysis of water quality for modeling the contaminant transport of Riverbank Filtration would be taken up in near future.

Project Ref. Code: NIH/GWD/NIH/13-14 (New study)

Estimation of specific yield and storage coefficient of aquifers

Dr. Surjeet Singh presented the need, objectives, and methodology of the proposed new study entitled "Estimation of specific yield and storage coefficient of aquifers". Dr. N.C. Ghosh highlighted the importance of precise estimation of specific yield and storage coefficient in groundwater estimations. Dr. S.N. Rai and Dr. R.C. Jain suggested to make a comprehensive review of the literature of various methods.

Project Ref. Code: NIH/GWD/NIH/13-14

State-of-the-Art Report on Modeling of Coastal Aquifers Vulnerable to Sea Water Ingress

Dr. Anupma Sharma presented the importance and the need of the new study to be undertaken for one year. The factors affecting coastal aquifers were highlighted and the objectives of the study were discussed.

The work programme proposed by the division and recommended by the Working Group for the year 2013-14 is given in annexure-I.

Annexure-I

**WORK PROGRAMME OF GROUND WATER HYDROLOGY DIVISION FOR
YEAR 2013-14**

S. No. & Reference Code	Project	Project Team	Duration & Status	Funding Source
1. NIH/GWD/NIH/13-14	Estimation of specific yield and storage coefficient of aquifers	Surjeet Singh (PI) N.C. Ghosh (Co-PI) Sumant Kumar	1 year (04/13 – 03/14) Status: New Study	NIH
2. NIH/GWD/NIH/13-14	* State-of-the-Art Report on Modeling of Coastal Aquifers Vulnerable to Sea Water Ingress	Anupma Sharma (PI) C.P. Kumar (Co-PI) Rajan Vatsa	1 year (04/13 – 03/14) Status: New Study	NIH (Referred by MoWR)
Sponsored & HP-II Projects				
3. NIH/GWD/HP-II/10-12	Coastal Groundwater Dynamics and Management in the Saurashtra Region, Gujarat.	N. C. Ghosh (Coordinator) Anupma Sharma (PI) C P Kumar SE(GWRDC, Gujarat) C.K. Jain Sudhir Kumar D.S. Rathore M.S. Rao Surjeet Singh Rajan Vatsa	3 years (10/09 – 12/13) Status: Continuing	PDS (HP-II)
4. EU-sponsored Project no. 282911	Saph Pani - Enhancement of natural water systems and treatment methods for safe and sustainable water supply in India”	Project Coordinator & P.I. : N. C. Ghosh Other Team Members V. C. Goyal C. K. Jain Sudhir Kumar B. Chakravorty A. K. Lohani Anupma Sharma Surjeet Singh Sumant Kumar Shashi Poonam Indwar	36 months (Oct., 2011- Sept.,2014) Status: Continuing	European Union under 7 th - Framework Programme
5. NIH/GWD/NIH/11-14	Management of Aquifer Recharge (MAR) and Aquifer Storage Recovery (ASR)	Sumant Kumar (PI) Rajan Vatsa N.C. Ghosh C.P. Kumar Surjeet Singh	3 years (04/11 – 03/14) Status: Continuing	Saph Pani Project

		Sanjay Mittal		
6. EU-sponsored Project no. 282911	Flow and Contaminant Transport Modeling of Riverbank Filtration	Shashi Poonam Indwar (PI) N.C. Ghosh Anupma Sharma Rajan Vatsa Sanjay Mittal Support: Uttarakhand Jal Sansthan (UJS	2 ½ years (04/12 – 09/14) Status: Ongoing	Saph Pani Project
Consultancy Project				
	Drainage Area Mapping and Hydrological Studies in and around Gurha (W) Block in Kolayat Tehsil of Bikaner District, Rajasthan	N.C. Ghosh (PI) Surjeet Singh Rajan Vatsa Sumant Kumar S.P. Rai Sanjay Mittal	09 months Status: In progress	RSMML, Rajasthan

Division proposed to organize two Brainstorming session/Training courses on following topics:

(i) Brainstorming session, probable topic:

Managed Aquifer Recharge for sustainable groundwater development & management / Bank Filtration for sustainable drinking water supply /Drinking water source sustainability.

(ii) Training course, probable topic:

Coastal groundwater modelling and management / Groundwater modelling and management / Managed aquifer recharge or Artificial Groundwater Recharge / Conjunctive use of surface water and groundwater.

HYDROLOGICAL INVESTIGATIONS DIVISION

S. No.	Title of Study/Project, Study Team, Date of Start (DOS) and Date of Completion (DOC)	Status and Recommendations/Suggestions
INTERNAL STUDIES		
1.	<p>Estimation of Snow and Glacier Melt Contribution in Melt Water of Gangotri Glacier at Gaumukh using Isotopic Techniques</p> <p>S. P. Rai (PI), Manohar Arora, C. P. Kumar, Rakesh Kumar, Naresh Kumar, Jamil Ahmad, Vishal Gupta DOS: 04/2010, DOC: 03/2013</p>	<p style="text-align: center;">Status: Study completed</p> <p>There were no specific suggestions.</p>
2.	<p>Assessment of Radon Concentration in Waters and Identification of Paleo-Groundwater in Punjab State</p> <p>S. K. Verma (PI), Sudhir Kumar, M. S. Rao, Mohar Singh DOS: 04/2011, DOC: 03/2013</p>	<p style="text-align: center;">Status: Study completed</p> <p>There were no specific suggestions.</p>
3.	<p>Hydro-geological Assessment of Ghar Area for Artificial Recharge and Water Management Planning</p> <p>P. K. Garg (PI), M. S. Rao, Sudhir Kumar, C.P. Kumar, Tanveer Ahmad, Rajesh Agarwal, Gopal Krishan DOS: 04/2011, DOC: 03/2013</p>	<p style="text-align: center;">Status: Study completed</p> <p><i>N.C. Ghosh</i> suggested to remove the extrapolated portion of the rainfall trend beyond the data limit, as the decreasing trend of rainfall may be misinterpreted as rainfall turning to zero after some period.</p>
4.	<p>Assessment of Sensitivity of Open Water Evaporation to Increase in Temperature for Different Climatic Regions of India</p> <p>S. D. Khobragade (PI), C. P. Kumar, Manohar Arora, A. R. Senthil Kumar DOS: 04/2012, DOC: 03/2014</p>	<p style="text-align: center;">Status: On-going Study</p> <p>There were no specific suggestions.</p>
5.	<p>Water Quality, Hydrogeology and Isotopic Investigations in SW Punjab</p> <p>M. S. Rao (PI), C. P. Kumar, Gopal Krishan DOS: 07/2012, DOC: 06/2014</p>	<p style="text-align: center;">Status: On-going Study</p> <p><i>Mr. R. C. Jain</i> suggested that since from the earlier studies, it is known that hydro-chemistry of Punjab is mainly governed by the hydro-geology of the study area, therefore during sample collection and data interpretation, details of the hydro-geology should be included.</p>

		<i>Mr. Himanshu Kulkarni</i> suggested to include chemistry of vadose zone, if required.
6.	Water Availability Studies for Sukhna Lake, Chandigarh S. D. Khobragade (PI), C. P. Kumar, Sudhir Kumar, A. R. Senthil Kumar , P. K. Garg, V. K. Agarwal DOS: 04/2013, DOC: 03/2015	New Study There were no specific suggestions.
SPONSORED PROJECTS		
7.	National Program on Isotope Fingerprinting of Waters of India (IWIN) M. S. Rao (PI), Bhishm Kumar, Sudhir Kumar, S. P. Rai, S. K. Verma, P. K. Garg DOS: 07/2007, DOC: 06/2013	Status: On-going Study There were no specific suggestions.
8.	Groundwater Dynamics of Bist-Doab Area, Punjab using Isotopes M. S. Rao (PI), Bhishm Kumar, Sudhir Kumar, S. K. Verma, P. K. Garg, CGWB Officials DOS: 10/2008, DOC: 12/2013	Status: On-going Study There were no specific suggestions.
9.	Groundwater Management in Over-Exploited Blocks of Chitradurga and Tumkur Districts of Karnataka Sudhir Kumar (PI), J. V. Tyagi, S. P. Rai, Anupma Sharma, B. K. Purandara, C. Rangaraj DOS: 10/2008, DOC: 03/2014	Status: On-going Study There were no specific suggestions.
10.	Impact Assessment of Landuse on the Hydrologic Regime in the selected Micro-watersheds in Lesser Himalayas, Uttarakhand S. P. Rai (PI), J. V. Tyagi, M. P. Singh (FRI), Rajeev Tiwari (IGNA), Vishal Gupta, Jamil Ahmad, V. K. Agarwal DOS: 04/2008, DOC: 03/2013	Status: Study completed There were no specific suggestions.
11.	Development of Spring Sanctuaries in an Urban and a Rural Watershed in District Pauri Garhwal, Uttarakhand S. P. Rai (PI), Sudhir Kumar, S. D. Khobragade, P. K. Garg, S. Tarafdar (GBPIHED), Jamil Ahmad, Vishal Gupta	Status: Study completed There were no specific suggestions

	DOS: 04/2010, DOC: 03/2013	
12.	The Use of Environmental Isotopes to Assess Sustainability of Intensively Exploited Aquifer Systems in North Eastern Parts of Punjab, India M. S. Rao (PI), C. P. Kumar, S. P. Rai DOS: 09/2012, DOC: 08/2013	Status: On-going Study There were no specific suggestions.
13.	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, V. K. Agarwal, Rajeev Gupta, S. L. Srivastava, Vishal Gupta, Mohar Singh DOS: 06/2012, DOC: 05/2015	Status: On-going Study There were no specific suggestions.
14.	Review of Groundwater Resources in the Indo-Gangetic Basin: A Case Study on Resilience of Groundwater in the Punjab to Withdrawal and Environmental Change M. S. Rao (PI), C. P. Kumar, Gopal Krishan DOS: 02/2013, DOC: 05/2014	New Study There were no specific suggestions.
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 S. P. Rai (PI), R. V. Kale, M. S. Rao, C. P. Kumar, Sudhir Kumar, V. K. Agarwal, Vishal Gupta, Mohar Singh DOS: 10/2012, DOC: 09/2015	New Study There were no specific suggestions.
16.	Isotope Studies for the Identification of Different Aquifer Groups and their Dynamics in Upper Yamuna River Plains Sudhir Kumar (PI), C. K. Jain, S. P. Rai, S. D. Khobragade, P. K. Garg, Two Officers from CGWB DOS: 07/2013, DOC: 06/2015	New Study There were no specific suggestions.
CONSULTANCY PROJECTS		
17.	Hydro-geological Studies of Jhamarkotra Mines, Udaipur, Rajasthan Sudhir Kumar (PI), S. K. Verma, P. K. Garg DOS: 07/2010, DOC: 12/2012	Status: Project completed
18.	Integrated Hydrological Investigations of	

	<p>Sukhna Lake, Chandigarh for its Conservation and Management</p> <p>S. D. Khobragade (PI), C. P. Kumar, R. D. Singh, Sudhir Kumar, S. P. Rai, C. K. Jain, V. K. Agarwal</p> <p>DOS: 07/2011, DOC: 06/2013</p>	Status: On-going Project
19.	<p>Pre-dredging and Post-dredging Bathymetric Survey of Ramgarh Tal Lake, Gorakhpur, UP</p> <p>S. D. Khobragade (PI), C. P. Kumar, R. D. Singh, V. K. Agarwal</p> <p>DOS: 11/2012, DOC: 04/2013 (Pre-dredging)</p>	New Project
20.	<p>Assessment of Impact of Coal Mining from Mahan Coal Block on Groundwater Recharge and Sedimentation in Rihand Reservoir and to Suggest Appropriate Measures to Mitigate the Identified Impacts</p> <p>Sudhir Kumar (PI), Sanjay Kumar Jain, Jai Vir Tyagi, Surjeet Singh, S. D. Khobragade, R. K. Jaiswal, P. K. Garg</p> <p>DOS: 04/2013, DOC: 09/2013</p>	New Project

SURFACE WATER HYDROLOGY DIVISION

Dr. Avinash Agarwal, Scientist F presented brief details of various studies carried out under the Surface Water Hydrology Division during 2012-13 as well as other research and technical activities and also the proposed studies for the year 2013-14. The progress of studies was then presented by the respective P.I. of the study. The details are as under.

A. PROGRESS OF WORK PROGRAMME FOR THE YEAR 2012-13

1. SNOWMELT RUNOFF MODELING AND STUDY OF THE IMPACT OF CLIMATE CHANGE IN PART OF BRAHMAPUTRA RIVER BASIN

Mrs Archana Sarkar, PI of the study presented the statement, objectives, study area, approved action plan, methodology, results and deliverables of the study (completed). She informed that study area is the Subansiri River basin, the biggest northern tributary of Brahmaputra River within India which originates in Tibet, contains snow-fed tributaries and glaciers and has a huge hydropower potential. Snowmelt runoff modeling for the Subansiri basin and study of the impact of climate change on basin runoff has been carried out for the first time and the results of the present study would be very useful for water resources planning and management in the region. Dr R.D. Despande enquired about the time required for procurement and processing of MODIS data. Mrs Sarkar replied that she took about six months time for procurement and processing of seven years of MODIS data for the Subansiri basin.

2. IMPACT OF CLIMATE CHANGE ON GLACIERS AND GLACIAL LAKES: CASE STUDY ON GLOF IN TISTA BASIN

The study was presented by Dr. A K Lohani. He explained the importance and objectives of the study. He further presented the results of glacial mapping and GLOF modeling. Dr Lohani informed that the analysis is complete and he presented the results in detail. Shri Ravi Chopra asked the reasoning of high flood value at lake side and low flood at project site. Dr Lohani explained the flood routing method adopted for modeling and further explained the reasoning of attenuation of flood peak.

3. CLIMATIC SCENARIOS GENERATION FOR SATLUJ BASIN USING STATISTICAL DOWNSCALING TECHNIQUES

Dr Arora presented the progress of the study. He presented the results of the AO GCM quantitative evaluation of the downscaled output of the data for precipitation and temperature for the period 1980 to 2000 for the Satluj basin. He explained the analogy used for quantitative evaluation and presented the downscaled output for the 20th Century raw data and 20th Century corrected data. The raw data for A1B scenario and the corrected data for A1b corrected scenario were also presented. The extreme values in rainfall data were ranked and presented after bias correction. There were no specific comments from the members. Dr V C Goyal wanted to know whether the study is completed. The PI informed that the study is complete and final report will be submitted.

4. CLIMATIC VARIABILITY ANALYSIS AND ITS IMPACT ON HIMALAYAN WATERSHED IN UTTARAKHAND.

Dr. Avinash Agarwal presented the study and the results in the light of suggestion from previous meeting. Presented study area and methodology and results so obtained in details along with the climatic variability and the impacts on stream and spring flows. It was informed that the study will conclude by next working group meeting. Dr. SN Rai inquired for any relation developed between measured climatic variables and soil moisture. In was informed that no such work has taken up in this study, but the data is sufficient and it can be taken up in next study. Discussion held on modeling of cumulative spring, recession flow and variability of spring behavior and its broad classification.

5. MONITORING AND MODELLING OF STREAMFLOW FOR THE GANGOTRI GLACIER

Dr Arora presented the progress of the study and informed that the data collected for the ablation period of 2012 has been analyzed and the results were presented. He informed the house that the discharge was less in comparison to previous years. Shri Kireet Kumar was interested to know the discharge during the winter months. The PI replied that the winter data is being analysed. Dr S N Rai wanted to know the gist of the results from this long term study. Dr Arora explained the motive behind this long term study and the results obtained. Dr S K Jain was interested in knowing the lag time for the flow at the discharge site. It was informed that initially during the start of the season the lag time is about one day and reduces to about 4 hours as the season progresses.

6. HYDROLOGICAL STUDIES FOR UPPER NARMADA BASIN

Mr. Jagadish Prasad Patra, PI of the study presented the progress during past two year of the ongoing three year study scheduled to complete by March 2014. Objectives of the study with brief methodology and work progress in past six months are presented. The Calibration and validation of mike-11 model along with Mike-flood model setup were discussed in details during the presentation. There were no specific comments from the members.

7. STUDY OF HYDRO-METEOROLOGICAL DROUGHTS FOR BUNDELKHAND REGION IN INDIA

The PI of the project presented progress of the study and informed the house that the Bundelkhand region of the country is currently facing drinking water shortages during summer months and this problem has become more severe during drought years in the recent past i.e. 2004-2008. The major objective of the study is to quantify water scarcity during droughts and to identify possible options for augmenting water supply and minimizing crop loss due to droughts. The PI further reported that the necessary base maps required for this study have been prepared. These include maps of DEM, drainage, soil, landuse etc. It was reported that long-term monthly rainfall data for 1901-2010 and daily rainfall and other meteorological records for 1969-2011 were collected and analyzed for rainfall departure and dryspell analysis and presented in the meeting. It was informed that a new methodology has been devised for regular drought monitoring using rainfall data. The method has been compared with Standardized Precipitation Index (SPI) and Effective Drought Index (EDI). The method provides comparable assessment of onset of drought and its progression. Further refining works on this methodology will be carried out. IT will also be evaluated for other

sites. The PI informed that the flow measurement record for Paisuni river are not available. Therefore, MIKE Basin NAM Model has been used to estimate flow series using Tons flow data for its calibration. It is hoped that this study will be useful to devise area specific plan for water management in the study area to deal with the drought situation in study area. It was informed that the interim Report on progress of this study is under preparation and it will be submitted in April 2013.

8. SEDIMENTATION STUDIES FOR PONG RESERVOIR, HIMACHAL PRADESH

Dr. A. R. Senthil kumar, PI of the project, presented the objectives, methodology and progress of the study for the period from October 2012 to March 2013 in brief. He presented the development of sediment yield model for pong dam using ANN and the simulation of sediment yield for future 25, 50, 75 and 100 years using the generated series of rainfall and flow volume. He also presented the future work to be carried out for the next six months. There were no queries from the members of the working group.

B. NEW STUDIES FOR 2013-14

1. DEVELOPMENT OF REAL TIME FLOOD FORECASTING FOR DOWNSTREAM OF HIRAKUD DAM

Dr. A K Lohani presented the background and objectives of the proposed study. Dr Lohani mentioned that the floods are among one of the most destructive acts of nature. Flood forecasting is used to provide warning to people residing in flood plains and can alleviate a lot of distress and damage. Flood forecasting is an important non-structural solution for reducing flood damages and is used to provide warning to people residing in flood plains. Dr Lohani mentioned that the soft computing based models will be developed and for the downstream of Hirakud dam.

2. STATUS REPORT ON SOIL EROSION AND SEDIMENT TRANSPORT MODELLING

Dr. J. V. Tyagi, PI of the study informed the house that the National Water Mission document of National Action Plan on Climate Change (NAPCC) has recommended for building a Universal Soil Loss model depicting erosion and sediment transport etc. Before taking up the model development, the action plan of the activity envisages preparation of a state-of-the-art report on soil erosion and sediment transport modeling and the work is entrusted to NIH. Accordingly, preparation of state-of-the-art report has been taken up. Dr. Tyagi further informed that the literature on soil erosion and sediment transport modeling would be collected from web resources, academic and R&D institutions. A thorough review of the collected literature and analysis of various methodologies available for soil erosion and sediment transport modelling would be carried out for preparation of the state-of-the-art report. Dr S.N. Rai suggested for modifying the objective to incorporate the development of the model in the present report. Dr. Tyagi informed that the development of the model will be taken up in the second phase in collaboration with other R&D institutes as have been identified in the action plan. The present state-of-the art-report has to be submitted in six months and will serve as a guiding document for development of the appropriate model.

3. APPLICATION OF DSS(P) FOR INTEGRATED WATER RESOURCES DEVELOPMENT AND MANAGEMENT

Dr. A K Lohani presented the background and objectives of the proposed study. Dr Lohani mentioned that the DSS(P) software has been developed under HP-II and the same model will be applied in a selected basin to demonstrate the capabilities of the DSS(P) model. Members of the working group appreciated the proposed study.

4. QUANTITATIVE ASSESSMENT OF UNCERTAINTIES IN RIVER DISCHARGE ESTIMATION

Dr. Sanjay Kumar proposed the study. He explained the background and objectives of the study and mentioned that the proposed study is a part of the systemic review of uncertainty clause of the ISO 9123 document as recommended by the India member body of ISO. He explained the methodology based on ISO documents GUM (Guide to the expression of uncertainty in measurement), HUG (Hydrometric uncertainty guidance) and presented the work plan for the study. The members inquired about the discharge measurement methods and the assessment of associated uncertainty. Dr. Perumal mentioned that uncertainties in the velocity measurements using current meter compared to velocity measurements using float are considerably different and should be considered for overall uncertainty estimation in discharge observations. Dr. Sanjay Kumar replied that this will be considered as per the guidelines in HUG and GUM and other related ISO standards on flow measurement.

5. SUSPENDED SEDIMENT FLUX MODELLING IN THE LARGEST SUB-BASIN OF BRAHMAPUTRA

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 Subansiri River basin. She informed the house that Hydrological modeling studies in Brahmaputra basin” is one of the thrust areas of “12th Five Year Plan” of the institute. She further informed Subansiri River promises stupendous hydropower potential (22 projects having potential of 15,191 MW already proposed/in progress) for the country, therefore, accurate assessment of sediment flux is of prime importance. Mrs Sarkar proposed back propagation feed forward ANN models to be developed to simulate the suspended sediment flux for the catchment of Subansiri River up to Choudhuaghat gauging site using various combinations of the historical data of rainfall, rainfall intensity, temperature, snow cover area, discharge and suspended sediment concentration on daily, ten-daily and monthly basis. Sediment rating curves (SRC) and multiple linear regression (MLR) models would also be developed to simulate the suspended sediment flux for the catchment of Subansiri River up to Choudhuaghat gauging site using data similar to that used for ANN models for inter-comparison of developed models. Mrs Sarkar informed that this study would conclude by providing discussion about how the different type of input data, length of input data, lagging of input data and scale of input data effect the accuracy of sediment flux estimation in a large Himalayan River basin and also guidance on the types of tasks for which different types of input data may be preferable.

WATER RESOURCES SYSTEM DIVISION

1. Ongoing study: Web GIS based snow cover information system for Himalaya

The progress of the study was presented by Mr D.S. Rathore. In the study, MODIS data MOD09A1 were downloaded for year 2007 and data for selected dates in 2007 were processed using partial MODIS snowmap algorithm. Many data/ area are cloud free and thus useful information is extracted from the data. Sub basins were delineated from SRTM250 data. Snow cover zonal statistics and depletion curves were prepared. The snow cover maps were generalized and polygonized. Polygon data (snow cover and sub basins) were published in desktop environment using GeoServer Web GIS software. OpenLayers web pages created in GeoServer were also used in HTML document. HTML document was demonstrated. Permission for dissemination of the processed Aphrodite rainfall data was not received till date and thus these data were not included in the study. Final resolution data (Landsat ETM+ for complete area and AWiFS for part of the area) and SRTM 90 m were downloaded but were not included in the application in paucity of elaborate plan. Dr Anshuman inquired if the maps are available for download. Mr Rathore replied that the data may be consumed in desktop web GIS clients e.g. ArcGIS, Quantum GIS etc. Chairman noted that the some of the slides in the presentation were lacking titles.

2. New Study: Web GIS based snow cover information system for Indus basin

The study proposal was presented by Mr D.S. Rathore. Several elaborate algorithms are available for delineation of snow cover maps. Snowmap algorithm of NSIDC has global applicability and is useful for automatic mode. Other algorithms are also available. Methods were also used for post processing. Snow masks are also available with varied information. It is proposed to use variations of the algorithm for finding suitable method for manual and region delineations. The algorithm development will be done for Indus basin. The generated maps will also be published on web using server e.g. GeoServer. Javascript with OpenLayers library will be used for generating web pages.

3. Completed study: Software for Frequency Analysis in Hydrology

Mrs. Deepa presented the study. She informed that a menu driven, user-friendly software has been developed in Visual Basic language to carry out frequency analysis with of hydrological data using different distributions. This software calculates probability plotting positions, estimate the parameters of the various statistical distributions, evaluate the fit of these distributions, estimate flood quantiles, and compare estimates. The software also computes the maximum likelihood estimates of probability distribution parameters for several statistical distributions used in flood frequency analysis.

4. New Study: Assessment of Water Footprint of the National Capital Territory (NCT) of India

Mrs. Deepa presented the study. She informed that the water footprint of a country is defined as the volume of water needed for the production of the goods and services consumed by the inhabitants of the country. The water footprint is divided into a blue, a green and a gray component. The blue component refers to the evaporation of groundwater and surface water during the production of a commodity, the green component to the evaporation of rain water for crop growth, and the gray component to the water required to dilute the water pollution that is caused by the production of the commodity to acceptable levels.

The New Delhi – the National Capital Territory (NCT) of India, a metropolitan cities with a population of 1.67 crore (Census, 2011) is the second largest populous cities in India. There are huge variations in supply, primarily due to the population expanding at a rate that was never factored in plans. To get more insight on whether the water scarcity in the NCT region is a manifestation of local consumption or by the increasing industrial demand, the water footprints of the region needs to be assessed with the following major objectives:

- To quantify the different components of water footprint i.e. Blue; Green, & Gray components of the NCT region;
- To assess the international and interstate virtual water flows from and to the NCT region to establish the virtual water balance;
- To analyze past-present-future water footprint of the NCT region for making realistic water management plan;

Sri R C Jain enquired whether this study has been sponsored by some organisation. Mrs Deepa replied that this is an internally funded project. Sri Anshuman informed that his institute is also working on water footprint. He suggested that in this type of study boundary should not be a constrained.

5. Completed study: Mathematical representation of Elevation-Area-Capacity curves for Indian reservoirs

Dr. M. K. Goel (MKG) presented the progress of the study. He informed that based on availability of data, original and revised Elevation – Area and Elevation – Capacity tables for a number of Indian reservoirs have been digitized. The reservoirs have been divided in four different types according to the shape of the gorge and characteristics of submergence area (Gorge, hill, foothill, and flood plain etc.). The methodology of the study has been programmed in MS-Excel and analysis for various reservoirs under various types has been carried out. He elaborated that for a particular type of reservoir, dimensionless (relative depth vs. relative area or relative capacity) graphs have been plotted for the live storage zone of reservoirs in normal and Log scales. The dimensionless plots for common type of reservoirs have been clubbed to find their range of variation. The capacity curves mostly converge within a close band which can be represented with unique mathematical equations. However, the variation for area curves was found to be large. He showed the dimensionless plots for some reservoir types. MKG informed that data for some more reservoirs is being incorporated in the analysis. He asked for three months extension for the completion of study which was approved.

6. New Study: *NIH_Basin* – A WINDOWS based model for water resources assessment in a river basin

MKG presented the study in detail. He informed that a basin-scale model has been developed at NIH in the past. He briefly presented the methodology for the model and its output. He informed that there are some limitations which need to be overcome. Some of these limitations include: i) specification of EAC tables or corresponding relationships for various storage structures, ii) rule-curve based operation of reservoirs so that different operation policies of the system can be simulated, iii) option of hydropower simulation in the basin, iv) routing of flows, and v) simpler representation of groundwater modeling aspects at river basin scale. He informed that efforts would be made to make refinements in these aspects. Further, it is envisaged to develop a WINDOWS interface (named as *NIH_Basin – NIH_Basin-Simulation*) of the model for easy application by the user groups.

Sh. R. C. Jain, CGWB, informed that GW contribution from beyond the basin boundaries (based on geological structures) is a limitation of basin scale models. In response to a query from Dr. S. N. Rai, NGRI, regarding the rainfall computation (which is an input to model), MKG informed that computations are made for estimation of rainfall volume over various land uses in different sub-basins which becomes an output for evaluation of hydrological components for those land uses. Some discussions were held by Dr. S. N. Rai and Prof. M. Perumal, IIT-Roorkee regarding the marketing, pricing, and outreach of the modeling tools developed at NIH. Dr. Anshuman, TERI made a remark that SWAT model can be linked to a groundwater model, such as MODFLOW for groundwater simulation.

7. Ongoing study: Cryospheric system studies and runoff modeling of Ganglass catchment, Leh, Ladakh Range

8. Ongoing study: Glaciological studies of Phuche glacier, Ladakh Range

Dr Renoj J Thayyen, Scientist “D” has been recently transferred from WHRC Jammu to NIH Roorkee. He was PI of the above two studies which have also been transferred to HQs. Dr Thayyen presented the two studies. There were no specific suggestions/ comments from any Working Group Member.

9. PDS Study: Hydrological assessment of un-gauged catchments by Dr. P. K. Bhunya, Scientist “D”

Dr. P K Bhunya apprised the committee about the completed project on Hydrological assessment of un-gauged catchments and was presented in a gist as the time was short. Next, he proposed a new project titled impact of climate and land use change on floods of various return periods. Apprised the committee about the objectives, methodology to be followed in this study coupled with phase wise works to be done as per the time program, referred works and the deliverables. The study area was also focused in the meeting out of which the major basin is Mahanadi from state of Orissa and that was considered in the HP2 project. There were no such queries or comments from the working group members.

10. New study: Impact of climate and landuse change on floods of various return periods

Dr. P K Bhunya presented the above proposed study.

11. Ongoing study: Event-based rainfall runoff modelling using soft computing techniques

12. Ongoing study: Analysis of water management scenarios in Tapi river basin using MIKE basin software

Both the studies were presented by Dr. Rama Mehta, Scientist “C”. No specific suggestions/ comments were received from any Working Group Member.

13. Ongoing study: Trend and variability analysis of rainfall and temperature in Himalayan region

The study was presented by Sh. L. N. Thakural. The objective of the study is to create the database (Rainfall, Temperature) for the Himalayan region and carry out statistical analysis to detect trend and variability in these variables in the Himalayan region, India. The parametric and non-parametric approaches will be used to determine the trends in the time series data of these meteorological variables. During the presentation temporal and spatial characteristics of the temperature and rainfall hydro-meteorological were explained. The parametric and non-

parametric approach used to find out the trend in temperature and rainfall time series at the observational sites in central Himalayas was presented. Sh Ravi Chopra informed that data for Chaukhutia station can also be explored station. He also said that IMD Pune can be visited and availability of more data at other observational sites can be explored. There were no specific comments

14. New Study: Assessing climate change impact across KBK region of Odisha

The proposed new study was presented by Shri P.K. Mishra on behalf of his team. The study envisages identifying long-term trend and its attributes for the KBK region. Also, the current and future water scenario for the region will be assessed for suggesting a reliable water management plan. In the end of the presentation, Dr. N.C. Ghosh, Scientist "F", GWH Division, NIH Roorkee enquired whether groundwater component is included while assessing the water supply & demand in the region during the proposed study. The PI proposed to include only the surface water components or else assumptions will be made on the likely availability and utilization of groundwater in the region based on available data/literature if any. Further, the PI evinces his interest to seek Dr. Ghosh's help in this regard.

WORK PROGRAMME OF WRS DIVISION FOR YEAR 2013-14

S.N.	Title	Study Team	Duration	Funding
Ongoing Internal Studies				
1.	Mathematical representation of Elevation-Area-Capacity curves for Indian reservoirs	M. K. Goel Sushil K. Singh P. K. Agarwal	1 year (4/12-3/13) Completed study	NIH
2.	Event-based rainfall runoff modelling using soft computing techniques	Rama Mehta Sushil K. Singh Yatveer Singh	1 year (4/12-3/13) Completed study	NIH
3.	Analysis of water management scenarios in Tapi river basin using MIKE basin software	Rama Mehta M.K.Goel D.S.Rathore	3 years (4/10-3/13) Completed study	NIH
4.	Web GIS based snow cover information system for Himalayas	D. S. Rathore D. Chalisgaonkar L. N. Thakural Tanveer Ahmed	1 year (4/12-3/13) Completed study	NIH
5.	Software for frequency analysis in Hydrology	D. Chalisgaonkar D. S. Rathore Sushil K. Singh M. K. Goel	1 year (4/12-3/13) Completed study	NIH
6.	Trend and variability analysis of rainfall and temperature in Himalayan region	L.N.Thakural Sanjay Kumar Sanjay K. Jain Sharad K. Jain Tanveer Ahmed	3 years (10/11-09/14) Continuing study	NIH

Sponsored Studies				
1.	Integrated approach for snowmelt runoff studies and effect of anthropogenic activities in Beas basin	Sanjay K. Jain S. P. Rai L. N. Thakural	3 years (4/09-12/13) Continuing study	PDS (HP-II)
2.	Assessment of effects of sedimentation on the capacity/life of Bhakra reservoir (Gobind sagar) on river Satluj and Pong reservoir on river Beas	Sanjay K. Jain J. V. Tyagi Rama Mehta	3 years (4/09-6/13) Continuing study	PDS (HP-II)
3.	Hydrological assessment of Ungauged Catchments (Small catchment)	P.K. Bhunya Rakesh Kumar Sanjay Kumar D.S. Rathore P.C. Nayak	4 years (5/09-3/13) Completed study	PDS (HP-II)
4.	Title: Preparation of Ganga River Basin Environment Management Plan (GRBEMP)	Dr Sharad K Jain, PI Dr N C Ghosh, Dr Sanjay K Jain, Dr M K Goel,	Till Dec. 2013	Funding by MOEF thru IIT Kanpur, Rs 12.0 Lakhs
New Internal Studies				
1.	NIH_Basin A WINDOWS based model for water resources assessment in a river basin	M.K. Goel S.K. Jain D. Chalisgaonkar P.K. Mishra	2 years (4/13-3/15) New study	NIH
2.	Impact of climate and landuse change on floods of various return periods	P.K. Bhunya Sanjay Kumar D.S. Rathore	2 years (4/13-3/15) New study	NIH
3.	Web GIS based snow cover information system for the Himalaya	D.S. Rathore D. Chalisgaonkar L.N. Thakural T. Ahmed	2 years (4/13-3/15) New study	NIH
4.	Assessment of Water Footprint of the National Capital Territory (NCT) of India	D. Chalisgaonkar Sharad K. Jain P.K. Mishra	2 years (4/13-3/15) New study	NIH
5.	Assessing climate change impact across KBK region of Odisha	P.K. Mishra Sharad K. Jain Sanjay K. Jain P K Bhunya	2 years (4/13-3/15) New study	NIH

**RESEARCH MANAGEMENT AND OUTREACH DIVISION (RMOD)
2013-14**

S.N.	Title of Project/Study, Study Team, Start/Completion Dates	Status and Recommendations/Suggestions
1.	<p>Recession Flow Analysis for Evaluation of Spring Flow in Indian Catchments Team: Ravindra V. Kale (PI), V. C. Goyal DOS: Apr 2011; DOC: Mar 2013 Extended for 6 months (up to Sep 2013)</p>	<p>Status: Ongoing study</p> <ol style="list-style-type: none"> 1. Dr S N Rai mentioned exploring the use of Basel functions 2. Dr H Kulkarni suggested hydro-geological classification of springs; analysis of variability of spring flows based on slopes, dip/escarpment 3. Dr Ravi Chopra suggested use of typologies; measures for rejuvenation of springs
2.	<p>Pilot Basin Studies (PBS) at six identified sites, jointly with the RCs and CFMSs (Joint study)</p> <p>NIH HQs: V C Goyal (Leader) Omkar Singh Ravindra V. Kale</p> <p>NIH RCs/CFMSs: RC-Belgaum, RC-Jammu, RC-Kakinada, RC-Sagar, CFMS-Guwahati, CFMS-Patna DOS: Apr 2012; DOC: Mar 2015</p>	<p>Status: Ongoing study</p> <p>No specific comments.</p>
3.	<p>Action Research for Water Conservation and Management in Selected Village (s) in Hardwar District (Uttarakhand)</p> <p>Team: Omkar Singh, V.C. Goyal and C.K. Jain DOS: Apr 2013; DOC: March 2015</p>	<p>Status: New study</p> <p>No specific comments.</p>

The Working Group noted the progress of the studies undertaken by all divisions. Dr. S.K. Jain, Scientist F & Head, WRS Division presided over the proceeding of the working group on 2nd day and 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 attended the 38th WG meeting

1.	Er. R.D. Singh, Director, NIH	Chairman
2.	Dr. S.K. Jain, Sc. F & Head WRS Division, NIH	Member
3.	Dr. R C Jain, Regional Director, CGWB, Dehradun	Member
4.	Sh. Sanjiv K. Sharma, Director, GSI, New Delhi	Member
5.	Dr. R.D. Deshpande, PRL, Ahmedabad	Member
6.	Dr. S.N. Rai, CSIR-NGRI, Hyderabad	Member
7.	Dr. N.B. Narasimha Prasad, CWDRM, Kozhikode	Member
8.	Dr. S.K. Bartarya, WIHG, Dehradun	Member
9.	Dr. Kireet Kumar, GBPIHED, Almora	Member
10.	Dr. U.Saravana Kumar, BARC, Mumbai	Member
11.	Dr. R.K. Goyal, CAZRI, Jodhpur	Member
12.	Sh. Niladri Naha, State Water Invest. Dir., Kolkata	Member
13.	Er. R K Khanna, Chief Engineer (Retd.), CWC, New Delhi	Member
14.	Sh. N.K. Sharma, IRI, Roorkee	Member
15.	Dr. M.Perumal, IIT, Roorkee	Member
16.	Dr. Himanshu Kulkarni, ACWADAM, Pune	Member
17.	Sh. Kaushlendra, Bihar	Member
18.	Sh. Anshuman, TERI, New Delhi	Member
19.	Dr. Ravi Chopra, PSI, Dehradun	Member
20.	Dr. N.C. Ghosh, Sc. F & Head GWH Division, NIH	Member
21.	Dr. C.K. Jain, Sc. F & Head EH Division, NIH	Member
22.	Sh. C.P. Kumar, Sc. F & Head HI Division, NIH	Member
23.	Dr. V.C. Goyal, Sc. F & Head RMO Division, NIH	Member-Secretary

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4. Dr. J.V. Tyagi, Sc.F
5. Dr. Sudhir Kumar, Sc.F
6. Dr. M.K. Goel, Sc.F
7. Smt. D.Chalosgaoonkar, Sc.F
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14. Dr.A R Senthil Kumar, Sc.D
15. Dr. Anupama Sharma, Sc.D
16. Dr. Sanjay Kumar, Sc.D
17. Dr. Surjeet Singh, Sc.D
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20. Dr. Manohar Arora, Sc.C
21. Sh. P.K. Garg, Sc.B
22. Sh.Rajan Vatsa, Sc.B
23. Dr. Ravindra Vitthal Kale, Sc.B
24. Sh. J.P. Patra, Sc.B
25. Sh. Sumant Kumar, Sc.B
26. Dr. Rajesh Singh, Sc.B
27. Sh. L.N. Thakural, Sc.B
28. Mrs. Shashi Poonam, Sc.B
29. Sh. P.K. Mishra, Sc.B