

**MINUTES OF THE
36TH MEETING OF WORKING GROUP OF NIH
HELD AT NIH, ROORKEE, DURING APRIL 3-4, 2012**

The 36th meeting of the Working Group of NIH was held at NIH, Roorkee, during April 3-4, 2012 under the Chairmanship of Director, NIH. The list of the participants of the meeting is given in **Annexure-I**.

ITEM NO. 36.1: OPENING REMARKS BY THE CHAIRMAN

The Chairman, WG welcomed the Working Group members and the Scientists of the Institute. He apprised the members on the organizational structure of NIH, and on the role of Working Group in the technical programme of the Institute. The chairman informed that the Institute is undertaking Pilot Basin Studies (PBS) as an important R&D activity in the XIIth 5-year Plan. Under this program, up gradation and automation of data collection system will be achieved using advanced instrumentation. Also, laboratory and technical up gradation at Headquarter as well at RC's of the Institute will be carried out through DFID funding.

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"> ▪ Studies on the management aspects of water resources. ▪ Studies on the water-energy relationships. ▪ Aquifer demarcation. ▪ CO₂ sequestration in saline aquifers. ▪ Part demand management of aquifers in RBs. ▪ Water balance studies in different aquifers. ▪ Protection and augmentation of ground water in over-exploited areas. ▪ Studies on efficiency of recharge structures. ▪ Studies on operational research models.
2	Dr G P Juyal	<ul style="list-style-type: none"> ▪ Studies on forest hydrology.
3	Dr S K Bartarya	<ul style="list-style-type: none"> ▪ Estimation of hill aquifer parameters. ▪ Study of dying springs. ▪ He suggested the collaborative studies by NIH and WIHG for (i) estimation of aquifer properties in Himalaya, and dating of waters for different aquifers

		for Himalayan region.
4	Dr R D Deshpande	<ul style="list-style-type: none"> ▪ Three important topics which required to be covered in the new R&D projects during XIIth plan are <ul style="list-style-type: none"> i. Dew water harvesting: using existing technology or developing newer ones ii. Soil Aquifer Treatment (Geo-purification) to reuse the primarily treated waste water iii. Thermal springs and thermal artesian wells in the country in light of geothermal gradient and tectonic framework, and to explore the means of socio-economic benefits. ▪ One of the points in the R&D under National Water Mission refers to “research and studies on all aspects related to impact of climate change on hydrological cycle and water resources”. One of the major stumbling block in the global efforts in this direction is the difficulty in differentiating between the hydrological impacts of three drivers namely, (i) engineering intervention; (ii) temperature effects through green house gas and aerosol emissions; and (iii) long-term natural climate variability. It is very important to initiate activities aimed at identifying specific parameters/tracers/ logic which can convincingly delineate the impact of these drivers in any planned hydrological investigations. ▪ The present format of agenda document, which provides a summary of each research project, contains a lot of information about the work done and the results (pattern of data) obtained, but lacks in the inferences drawn from the work already done. The format of agenda document should be improvised by giving much more importance to inferences rather than description of the work done or presentation of data. Such a format will entail greater responsibility on the part of scientists to churn the data more rigorously and drive convincing inferences. ▪ From a critical looks at the reports given in the Agenda document, and the presentations in the meeting, it seems that in case of several studies, much more robust and conclusive inferences could have been drawn. In view of this, it may be useful if thematic group discussions are organized after grouping the projects with similar objectives and/or methodologies. Respective experts may be invited during these group discussions. The discussions in these groups should be more intensive and extensive than those during WG meetings.

		<ul style="list-style-type: none"> ▪ Several programmes, though undertaken by different divisions and with different perspectives, have converging and overlapping research interests. Clubbing of the observations from such projects for the purpose of interpretations can result in very significant research papers from NIH. ▪ It will be of great use to society at large and hydrology researchers in particular if the results and inferences derived from various projects undertaken by NIH scientists are published in the form of an edited book containing thematic chapters in which results from similar type of projects undertaken by NIH scientists are compiled in a holistic manner.
5	Dr. S N Rai	<ul style="list-style-type: none"> ▪ Emphasis must be given on the sustainability of source, particularly ground water.
6	Er. Ravindra Kumar	<ul style="list-style-type: none"> ▪ Impact of climate change on water resources should be studied in more details. ▪ Study of cropping pattern and land use change under glooming climate change with emphasis on post monsoon scenarios should be under taken.
7	Sh. B.M. Murali Krishna Rao	<ul style="list-style-type: none"> ▪ Impact of sand mining on ground water. ▪ Studies related to declining ground water levels under drought situation. ▪ Prediction of total contribution to ground water. ▪ Ground water modeling. ▪ Preparation of protocol containing methodology and procedure to collect ground water data.
8	Sh. N K Sharma	<ul style="list-style-type: none"> ▪ Studies on the Green House (GH) emission in the hydropower projects.
9	Prof. J S Rawat	<ul style="list-style-type: none"> ▪ Surface water assessment in the Brahmaputra river. ▪ Transfer of water from perennial rivers to non-perennial rivers. ▪ Studies related to drying up of streams, especially non-glacier fed streams.
10	Prof. K.C. Patra	<ul style="list-style-type: none"> ▪ Study of ponds and lakes in coastal areas. ▪ Study on sea water intrusion – temporal dynamics. ▪ Study on minimum environmental flow.
11	Dr. M. Perumal	<ul style="list-style-type: none"> ▪ Studies related to improving yield of springs. ▪ Collaborate with organization (Himolthan work, Dehradun) working for springs.
12	Dr. R C Trivedi	<ul style="list-style-type: none"> ▪ Not only environmental flow but also environmental water need in context of green and blue water and

		<p>also for ground water required to be properly assessed</p> <ul style="list-style-type: none"> ▪ He informed that lots of such studies are carried out in the Australia.
13	Dr S S Grewal	<ul style="list-style-type: none"> ▪ Research studies on the ground water in the Himalayan / Arvali region is required to be undertaken. ▪ Problems related to environmental degradation and thickly populated areas required to be addressed. ▪ In reply, Dr N. C. Ghosh informed that NIH has already submitted Indo-US project proposal to MoES to work in hard rock area. Further, Dr. V. C. Goyal asked whether there is any proposal to work in co-ordination mode. In reply to this question, Dr. Grewal informed that NGO's and other group have already started the work in this area.
14	Dr Ritesh Arya	<ul style="list-style-type: none"> ▪ Studies on hydro-geology safe habitats. ▪ Hydro-geology of springs. ▪ Hydrology of extremes. ▪ Himalayan hydro-geology for study of ground water aspects and energy generation. ▪ Study of hot water springs.
15	Dr A P Singh	<ul style="list-style-type: none"> ▪ Emphasis must be given on the recycling and reuse of water, water policy, water pricing and water economics by undertaking case studies. ▪ Studies related to ground water contamination and vulnerability should be undertaken.

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. 36.2: CONFIRMATION OF THE MINUTES OF 35TH MEETING OF THE WORKING GROUP

The 35th meeting of the Working group was held during October 11-12, 2011. The minutes of the meeting were circulated to all the members and invitees vide letter No. NIH/RCMU/35th WG/11 dated February 22, 2012. As no comments were received on the circulated minutes, the minutes were confirmed.

ITEM No. 36.3: 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 35th working group meeting.

ITEM NO. 36.4: ACHIEVEMENTS DURING THE 11TH PLAN PERIOD

The Member-Secretary presented a list of the thrust areas and studies carried out by different divisions during the 11th Plan, as listed below:

Coverage of Thrust Areas & Studies by Divisions during 11th Plan Period

Division → Theme and Studies ↓	EH	GWH	HI	SWH	WRS	RCMU
I. Hydrology of Extremes 1. Flood routing 2. Real time flood forecasting 3. Dam break flood wave simulation 4. Flood plain zoning 5. Flash floods studies 6. Flood estimation 7. Integrated drought vulnerability assessment 8. Drought characterization in different climatic regions 9. Regional drought studies				✓ ✓ ✓ ✓ ✓ x ✓ ✓ ✓ ✓		
II. Impact of Climate (landuse) Change on Water Resources 1. Impact of urbanization on hydrologic regime 2. Land use changes vis-à-vis hydrological components 3. Sedimentation and soil erosion in lake catchments 4. Forest hydrology and socio-economics	✓ 		 ✓ 	 ✓ 	 ✓ 	
III. Groundwater Modeling and Management 1. Resource estimate and water availability studies 2. Aquifer dynamics and artificial recharge and resource management 3. Inverse modeling for source identification 4. Surface water groundwater interaction 5. Management of groundwater in hard rock formations. 6. Management of coastal aquifers 7. Fresh water saline water interactions 8. Groundwater contamination and remediation 9. Aquifer remediation, wellhead protection and management 10. Impact of climate change on	 ✓ ✓ 	 ✓ ✓ ✓ ✓ ✓ ✓ 		 ✓ 		

groundwater 11. Groundwater-environment-energy interaction 12. Impact of inter-basin transfer of water on groundwater regime 13. Policy evaluation modeling for groundwater management and its regulation		√				
IV. Sustainable Water Systems Management 1. Risk based management of water systems 2. Cumulative impact of dams and diversions 3. Adaptation of hydro-systems to climate change 4. Assessment of water demand and availability using spatially distributed modeling 5. Inter-basin water transfer 6. Conjunctive use of surface water and aquifers 7. Hydro-informatics for water systems management 8. Water, energy and food security nexus 9. Spatial estimate of AET using RS data 10. Data driven models for analysis of water systems				√	√	
V. Surface Water Modeling and Regional Hydrology 1. Prediction of extreme hydrologic events in ungauged catchments 2. Design flood estimation for gauged as well as ungauged catchments 3. Water availability 4. Hydrological modeling 5. Isotopic characterization of water resources on regional scale			√	√	√	
VI. Environmental Hydrology 1. Water quality and human health 2. Natural and organic contaminants 3. Non-point source pollution 4. Assessment of environmental flows 5. River bank filtration for water supply 6. Sediment dynamics 7. Integrated hydrological studies of lakes 8. Low cost treatment/remediation technologies	√	√	√	√	√	

ITEM NO. 36.5: THRUST AREAS/ACTIVITIES PROPOSED DURING THE 12TH PLAN

The Member-Secretary presented a list of the thrust areas and studies proposed by different divisions during the 12th Plan, as listed below:

Involvement of Divisions in Thrust Areas & Studies during 12th Plan Period

Division → Theme and Studies ↓	EH	GWH	HI	SWH	WRS	RCMU
I. Hydrology of Extremes 1. Flood management 2. Urban flooding 3. Drought mitigation and management 4. Glacier lakes outburst flood 5. Early warning systems				√ √ √ √ √		
II. Regional Hydrology		√		√		
III. Environmental Hydrology 1. Pollution from point and non-point sources 2. Water quality and health 3. Environmental flow in rivers 4. River bank filtration studies 5. Water treatment/ remediation technologies	√ √ √ √ √					
IV. Integrated Water Resources Management (IWRM) 1. Hydrology for sustainability of water sources 2. Integrated operation of reservoirs 3. Groundwater management 4. Conjunctive use of surface and Ground Water 5. Pilot basin studies 6. DSS (Planning) activities 7. Hydrological studies in Brahmaputra basin					√ √ √ √ √ √ √	
V. Hydrology for Watershed Management 1. Forest hydrology 2. Hydrology for springs management 3. Hydrology of lakes and other water bodies 4. Water management in mined areas 5. Water management in salinity-affected areas 6. Water management in coastal and hard rock aquifers 7. Impact assessment studies				√		√

<p>VI. R&D Under National Water Mission</p> <ol style="list-style-type: none"> 1. Development / implementation of modern technology for measurement of various data 2. Research and studies on all aspects related to impact of climate change on hydrologic cycle and water resources, including quality aspects 3. Projection of the impact of climate change on water resources 4. Dynamics of deeper aquifers 5. Centre for Climate Change Studies 6. Centre for Snow & Glacier Studies 						<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>
<p>VII. Technology Transfer and Outreach Activities</p> <ol style="list-style-type: none"> 1. Training workshops 2. Seminars/symposia 3. User interaction workshops 4. Science-policy interface 5. IPR issues in hydrology and water resources 6. PPP linkages 	<p>✓</p> <p>✓</p>	<p>✓</p> <p>✓</p>	<p>✓</p> <p>✓</p>	<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>	<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>	<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>

ITEM No. 36.6: PRESENTATION AND DISCUSSION ON THE STATUS AND PROGRESS OF THE WORK PROGRAMME FOR THE YEAR 2011-12, AND FINALIZING THE WORK PROGRAMME FOR THE YEAR 2012-13.

The Member-Secretary made a brief presentation outlining progress made under different studies for the work programme of 2011-12 and the proposed studies for the year 2012-13. Division wise details on each study/project presented during the meeting are given below, and the respective work programme recommended for the year 2012-13 are given in **Annexure-II**.

ENVIRONMENTAL HYDROLOGY DIVISION

S. N.	Title of the Project/Study, Study Team, Date of Start and Completion	Status and Recommendation/Suggestion
Research Studies		
1.	Assessment of Groundwater Quality in Hindon River Basin. Team: M.K. Sharma (PI), V. K. Choubey, Omkar Singh, Rajesh Singh, Babita Sharma, Beena Prasad, Rakesh Goel, Dayanand DOS: 11/2011, DOC: 10/2014	Ongoing study Study was presented by Dr. M.K. Sharma No specific comments/suggestions
2.	Development of low cost media for fluoride removal from drinking water of fluoride affected areas. Team: Rajesh Singh (PI), V. K. Choubey, Omkar Singh, M.K. Sharma, Dayanand DOS: 04/2011, DOC: 03/2013	Ongoing study Study was Presented by Dr. Rajesh Singh Dr. Deshpande suggested use of pottery clay, PVC media, etc. for Fluoride removal. PI informed to comply suggestions in another study.
3.	Water Quality Modeling of Hindon River. Team: Omkar Singh (PI), V. K. Choubey, M.K. Sharma, Rajesh Singh, A.R. Senthil Kumar, Babita Sharma, Beena Prasad, Rakesh Goel, Dayanand DOS: 04/2012, DOC: 03/2015	New study was proposed and presented by Shri Omkar Singh No specific comments/suggestions
4.	Impact of sewage effluent on drinking water sources of Shimla city and suggesting ameliorative measures Team: V.K.Choubey (PI), Omkar Singh, M.K. Sharma, Rajesh Singh and I&PHE Dept. Shimla DOS: 04/2009, DOC: 03/2012	PDS under HP-II. The PDS has been completed and progress was presented by Mr. Omkar Singh on behalf of the PI No specific comments/suggestions The final report would be submitted by 30.4.2012.

GROUND WATER HYDROLOGY DIVISION

Dr. N. C. Ghosh, Scientist-F & Head of the division presented the list of studies carried out and broad areas covered during the 11th Plan period. He also presented the board areas of research to be covered under the 12th Plan period. While presented the technical activities carried out & progress made on different studies during last six months, he gave an account of man-power available at the division and the consultancy projects pursuing by the division. Dr. Ghosh informed that out of 6 R & D studies approved for the year 2011-12, one study is

concluded, and 5 research studies are to be continued in the next financial year. The division also proposed to undertake 2 more new studies during the year 2012-13. With continuation of 5 research studies of the year 2011-12 and proposed 2 new studies, the work programme of the division for the year 2012-13 is given at annexure-1.

It was also informed that under the European Commission funded collaborative R & D project 'Saph Pani', the division organized the 'Saph Pani' project inception workshop during Nov. 3-4, 2011 at India Habitat Centre, New Delhi. In which, all project partners from 8 countries participated and discussed about the project activities and finalized the work programme for the coming one year. Dr. Ghosh also informed that Scientists of the Division have submitted/published a number of research papers in various journals/conferences/symposia during the period and also delivered lectures in various training courses.

Thereafter, PIs of the concerned studies presented the detailed progress of each study. The Study-wise progress reported, and suggestions emerged are given below.

1.0 QUANTIFICATION OF IMPACT OF RAINWATER HARVESTING ON GROUNDWATER AVAILABILITY IN ARAVALLI HILLS – PART II: MATHEMATICAL MODELING

Dr. Anupma Sharma explained about the background and objectives of the study, data monitoring and field investigations carried-out in Savana macro-watershed located in Jaisamand Lake catchment. She also informed that 'Wells for India' (an NGO) and the local villagers are providing support in the data monitoring and field investigations for the study. Due to delay in analysis of soil samples on account of lab renovation work and to carry out some more field tests, an extension of six months was sought from the Working Group members. Dr. Anupma Sharma explained about the use of GIS for identification of potential runoff harvesting sites in Savana watershed. On a query from Dr. S.N. Rai about suitability of sites for artificial recharge to groundwater, it was explained that the proposed sites are only for rainfall-runoff harvesting. Geology and presence of lineaments/ fractures need to be included in the analysis for identification of groundwater recharge sites.

2.0 IMPACT OF CLIMATE CHANGE ON DYNAMIC GROUNDWATER RECHARGE IN A DROUGHT PRONE AREA

Dr. Surjeet Singh presented the results of the completed study. The results reported on the projected were on: rainfall and temperature for the Sonar basin for years 2039, 2069 and 2099 based-upon IPCC SRES scenarios (A1FI and B1), estimation of groundwater recharge at 12 locations using Visual HELP model for future climate scenarios and simulation of groundwater levels in 10

zones of the Sonar basin. Dr. Ritesh Arya enquired about the geological formations and the findings of the study. Mr. C.P. Kumar clarified the queries.

3.0 COASTAL GROUNDWATER DYNAMICS AND MANAGEMENT IN THE SAURASHTRA REGION, GUJARAT.

Dr. Anupma Sharma presented the groundwater salinity issues in Coastal Saurashtra and the various measures taken by the State Dept. to prevent ingress of saline water through creeks and freshwater reservoir schemes. The objectives of the study, details of data collection program undertaken for the Minsar Basin, geology of Minsar Basin, variations in water table and groundwater salinity along the coast were explained. Details of geophysical surveys, pump tests and analysis carried out in the study area were also presented. On queries from Dr. S.N. Rai and Dr. R. Arya about the geology of the region and weathered zone thickness, it was explained that on moving from coast towards inland areas, the thickness of limestone and Gaj formations reduces. The thickness of weathered zone varies up to 31 m in inland areas.

4.0 SAPH PANI - ENHANCEMENT OF NATURAL WATER SYSTEMS AND TREATMENT METHODS FOR SAFE AND SUSTAINABLE WATER SUPPLY IN INDIA

Dr. N. C. Ghosh, Project coordinator of NIH-component presented the activities carried out and initiated under the project. He informed that NIH is involved in four work packages (WP-1 : Riverbank Filtration studies; WP-2: Managed Aquifer Recharge; WP-5 : Modelling and System Design; and WP-7 : Training & Dissemination) of the project along with other partners. As follow up tasks, NIH has taken initiative to carry out R & D programs for the WP1 & WP2, and field visits and data collection efforts are in progress. It was also informed that the 'Saph Pani' project has participated in the India Water Week-2012 as a 'Platinum Sponsor' and is organizing a training workshop under the WP-7 entitled "Bank Filtration for sustainable drinking water supply in India" as an add-on to the India Water Week-2012 on 13th April, 2012 at New Delhi.

It was also informed that the first biannual review meeting of the project to take stock of the progress and finalize the activities for future is scheduled to be held at Basel, Switzerland during 9-11 May, 2012.

5.0 MANAGEMENT OF 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. Dr. R.C Jain advised that in case of MAR one should ensure that improved quality of surface water body is recharged to the aquifer. It was suggested that title of the study should be Managed Aquifer Recharge instead of Management of Aquifer Recharge.

Some queries about the study area and data collection were also enquired. It was informed that specific study site in the Raipur Municipal area is to yet to be finalized; the data collection activities will be followed thereafter in consultation with the other project partners.

6.0 GROUND WATER FLUORIDE CONTAMINATION IN DIFFERENT PARTS OF INDIA

The progress of the study was presented by Mr. A.K. Dwivedi, PI of the study. Mr. Dwivedi indicated that the status report is yet to be completed. He informed that some geochemistry part are to be included in the report. Dr Desh Pandey, Dr R.C. Trivedi, Dr S.N. Rai and Dr R.C. Jain suggested to include the status of effect of fluoride on human, causing various diseases, in addition to Dental and Skeletal Fluorosis. They also suggested to include latest techniques of defluoridation, ways and means for supplying fluoride free potable water to the village people at large. PI informed that efforts would be made to include maximum possible information and the report would be completed within in a month or two.

7.0 HYDROLOGICAL INSTRUMENTATION AND DATA MONITORING PLANNING FOR INTEGRATED WATER RESOURCES MANAGEMENT (IWRM) OF THE BINA RIVER PILOT BASIN

Dr. Surjeet Singh presented the objective of the proposed new study on the Bina Pilot basin for developing procedures and guidelines for instrumentation and data monitoring network in the basin. Dr. N.C. Ghosh suggested to include scientists involved from the Regional Centre, Sagar in the Pilot study of Bina basin. Director, NIH suggested to have a P.I. under this study from RC, Sagar for supplying necessary data and Dr. Surjeet Singh shall be the P.I. from HQ for carrying out analysis work under this study.

8.0 FLOW AND CONTAMINANT TRANSPORT MODELING OF RIVERBANK FILTRATION

Mrs. Shashi Poonam Indwar, Scientist-B & PI of the study presented the objectives, statement of the problem, baseline data requirement, methodology, action plan and timeline, list of deliverables etc. She presented the Haridwar riverbank filtration wells network, which would be considered for modeling. It was asked whether 5-10 m distance of well from riverbank is adequate for riverbank filtration. Mrs Shashi informed that all those wells have been constructed long back, and they are being operated as the bank filtrate wells. In the present study, the performance of the wells with regard to the travel time, contaminants' removal efficiency and effectiveness of the wells would be examined and modeled.

HYDROLOGICAL INVESTIGATION DIVISION

S. N.	Title of Project/Study, Study Team, Start and Completion Dates	Status and Recommendations/Suggestions
1.	<p>Surface Water and Groundwater Interaction at Selected Locations along River Yamuna in NCT, Delhi: Phase-II</p> <p>Sudhir Kumar (PI), M. S. Rao and P. K. Garg</p> <p>DOS: 4/2009, DOC: 03/2012</p>	<p>Status: Completed</p> <p>No specific comments/suggestions</p>
2.	<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, Bhishm Kumar, Rakesh Kumar, Naresh Kumar, Vishal Gupta and Jamil Ahmad</p> <p>DOS: 04/2010, DOC: 03/2013</p>	<p>Status: On-going Study</p> <p>Dr. J. S. Rawat asked about the low contribution of rainfall-runoff. It was replied that there were only two rain events of more than 10 mm which contributed significantly to river discharge. On a query from Dr. R. D. Deshpande, Dr. Rai explained about the d-excess of melt water and rainfall.</p>
3.	<p>Identification of Recharge Zones of Some Selected Springs of Uttarakhand using Isotopes</p> <p>S. D. Khobragade (PI), Bhishm Kumar, Sudhir Kumar, S. P. Rai and P. K. Garg</p> <p>DOS: 04/10, DOC: 03/2012</p>	<p>Status: Completed</p> <p>Dr. S. S. Grewal, Chandigarh cautioned that care must be taken before suggesting engineering methods as engineering structures may cause landslides. Mr. Ritesh Arya, Chandigarh indicated that so-called drying springs may actually not be drying at all and it may be due to lowering of water tables only. He further commented that sometimes a pit near the spring can lead to increased discharge in the springs. Dr. Deshpande, PRL, Ahmedabad suggested to analyze the results in light of the isotopic variation obtained in the data. Chairman, Working Group, enquired whether causes of decline of spring discharges are also being investigated. Dr. Khobragade informed that no historical data on spring discharges are available; therefore these are not being investigated in the present study.</p>
4.	<p>Assessment of Radon Concentration in Waters and Identification of Paleo-Groundwater in Punjab State</p>	<p>Status: On-going Study</p>

	S. K. Verma (PI), Sudhir Kumar, M. S. Rao, Mohar Singh DOS: 04/2011, DOC: 03/2013	No specific comments/suggestions
5.	Hydro-geological Assessment of Ghar Area for Artificial Recharge and Water Management Planning P. K. Garg (PI), Sudhir Kumar, V. C.Goyal M. S. Rao, C. P. Kumar, Tanveer Ahmad and Rajesh Agarwal DOS: 04/2011, DOC: 03/2013	Status: On-going Study Mr. Niladari Naha, Ground Water Department, West Bengal suggested to check the EC in terms of dissolved constituents (cation & anion).
6.	Assessment of Sensitivity of Open Water Evaporation to Increase in Temperature for Different Climatic Regions of India S. D. Khobragade (PI), C. P. Kumar, Manohar Arora and A. R. Senthil Kumar DOS: 04/2012, DOC: 03/2014	Status: New Study No specific comments/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 and Pankaj Garg DOS: 07/2007, DPC: 06/2012 (DOC To be extended upto Aug, 2013)	Dr. R. D. Deshpande highly appreciated the experiments and value of the data generated. He provided the following suggestions: 1. To observe the date of first rain at Roorkee along with the depletion in the value of isotope composition of ground level vapour and to find their correlation. 2. To present the data obtained by P&T method also with the condensation method. 3. To look at humidity aspect in presenting the isotopic data.
8.	Groundwater Dynamics of Bist-Doab Area, Punjab Using Isotopes M. S. Rao (PI), Bhishm Kumar, Sudhir Kumar, S. K. Verma, Pankaj Garg and CGWB Officials DOS: 07/2009, DOC: 06/2012	Dr. S. S. Grewal appreciated the work. He suggested to investigate groundwater recharge to deep aquifers near Garhshankar-Hoshiarpur due to Swan river that flows on other side slope of Siwalik hills. Dr. S. N. Rai, NGRI suggested to correlate the isotopic data with the water quality data.

9.	<p>Groundwater Management in Over-Exploited Blocks of Chitradurga and Tumkur Districts of Karnataka</p> <p>Sudhir Kumar (PI), J. V. Tyagi, S. P. Rai, Anupma Sharma, B. K. Purandara and Prof. C. Rangaraj</p> <p>DOS: 07/2009, DOC: 06/2012</p>	<p>Status: On-going</p> <p>The PI emphasized the need to collect the data for atleast one more year to draw some meaningful conclusions.</p> <p>No specific comments/suggestions</p>
10	<p>Impact Assessment of Landuse on the Hydrologic Regime in the selected Micro-watersheds in Lesser Himalayas, Uttarakhand</p> <p>S. P. Rai (PI), Bhishm Kumar, J. V. Tyagi, M. P. Singh (FRI), Rajeev Tiwari (IGNA), Vishal Gupta, Jamil Ahmad and V. K. Agarwal</p> <p>DOS: 04/2010, DOC: 03/2013</p>	<p>Status: On-going</p> <p>On a query from Dr. J. S. Rawat, Dr. S. P. Rai informed about the rainfall-runoff and sediment yield of both watersheds. Dr. S. N. Rai suggested that infiltration rates should be used to estimate the recharge rates in the watershed. Dr. S. S. Grewal enquired about the impact of landuse on infiltration rates. Dr. Rai informed that higher rates of infiltration in agricultural land and degraded forest indicates the impact of soil depth, fracture density and slope etc.</p>
11	<p>Development of Spring Sanctuaries in an Urban and a Rural Watershed in District Pauri Garhwal, Uttarakhand</p> <p>S. P. Rai (PI), Bhishm Kumar, Sudhir Kumar, S. D. Khobragade, Pankaj Garg, Jamil Ahmad and Vishal Gupta</p> <p>DOS: 04/2010, DOC: 03/2013</p>	<p>Status: On-going</p> <p>No specific comments/suggestions</p>
CONSULTANCY PROJECTS		
12	<p>Hydro-geological Studies of Jhamarkotra Mines, Udaipur, Rajasthan</p> <p>Sudhir Kumar (PI), S. K. Verma, P. K. Garg</p> <p>DOS: 07/2010, DOC: 06/2011</p> <p>Extended upto Dec, 2012</p>	<p>Status: On-going</p>

13	Assessment of Groundwater Resources & Development Potential of Yamuna Flood Plain, NCT, Delhi Sudhir Kumar (PI), Vijay Kumar, AK Keshari (IIT Delhi), S. Shekhar (Delhi Univ), YB Kaushik (CGWB), PS Datta (ICAR), Executive Engineer (CWC) and AK Gupta (Delhi Jal Board) DOS: 02/2010, DOC: 12/2011	Status: Completed
14	Hydro-geological Studies and Rainwater Harvesting Technology / Design Report for 4x600 MW Coal Based Thermal Power Plant of Jindal Power Limited, Tamnar, District Raigarh, Chhattisgarh Sudhir Kumar (PI) DOS: 07/2011, DOC: 12/2011	Status: Completed
15	Impact of Mining on Groundwater Regime in Ghogha-Surka, Khadsaliya-I and Khadsaliya-II Lignite Mines, Bhavnagar District, Gujarat Sudhir Kumar (PI) DOS: 08/2011, DOC:12/2011	Status: Completed
16	Integrated Hydrological Investigations of Sukhna Lake, Chandigarh for its Conservation and Management S. D. Khobragade (PI), C. P. Kumar, R. D. Singh, S. P. Rai and Vipin Agrawal DOS: 07/2011, DOC: 06/2013	Status: On-going Project

SURFACE WATER HYDROLOGY DIVISION

Dr. Avinash Agarwal, Scientist F presented a summary of studies carried out by Surface Water Hydrology Division during 11th Plan period. He also presented the proposed thrust areas for taking up studies during 12th Plan. He then presented the brief details of various studies carried out by the division during 2011-12 along with number of research papers published/accepted for publication/ communicated as well as other research and technical activities and also the proposed studies for the year 2012-13. 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 2011-12

1. STUDY ON INTEGRATED WATER RESOURCES MANAGEMENT OF A BASIN TO COPE WITH DROUGHTS

Dr R.P. Pandey, PI of the project presented the study. Dr. Pandey informed that the base maps like soil map, DEM, drainage map, land use map, etc. has been prepared for the study area in Tons basin. He reported that a field visit was carried out during Nov. 2011 to gather information for verification of the results obtained from past meteorological data from 1969 to 2008. Monthly, seasonal and annual rainfall departure analysis indicated that the basin has faced drought events with an average frequency of once in five year. The maximum deficiency in monsoon season rainfall has been observed in the order of about 60% of corresponding mean value. Trend analysis of monthly rainfall and temperature data for annual and monsoon, summer & winter seasons have been carried out and the results were presented before the Working Group. The PI further informed that the discharge data for two sites in Tons basin was obtained from CWC office Varanasi. The results of streamflow data analysis were presented to explain hydrological drought conditions in the basin in past 20 years in the basin. PI reported that the strategic water resources in the basin to be used during the drought situation are inter-basin canal from Bansagar Dam on the Sone river and Govindgarh Tank for parts of Rewa district. For the other parts in the basin (i.e. Nagod, Maihar, Birsingpur, Hanumanaand, and Mauganj blocks), special attention is required to create provisions for storage of monsoon water to moderate the hardships due to drought. The PI informed that the report is under writing and it will be submitted by the end of April 2012. The Chairman asked to prepare a pamphlet incorporating the techniques used and findings of the study in brief.

2. SNOW MELT RUNOFF MODELLING IN SUTLEJ BASIN

Dr. A. R. Senthil Kumar, PI of the project, presented the objectives, methodology, and final results of the study in brief. DR. S. N. Rai inquired about the utilization of the results of the study. The PI of the study informed that the outcome of the study could be used by BBMB Nangal to regulate the reservoir for conservation and flood control purposes. Shri J. S. Rawat queried about the source of the satellite imageries used for snow cover computation. The PI informed that imageries were procured from NRSA Hyderabad..

3. 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, progress, results and deliverables of the study. Mrs Sarkar informed that the 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 for the country. She informed the house that the first part of the report consisting snow cover mapping which would be an input to the snowmelt runoff model in the second part of the study has been completed. She

further informed that the input data for snowmelt runoff model like the precipitation and temperature data for the study area has also been processed elevation band wise. She further presented the preliminary calibration results of the SNOWMOD program runs. Sh. R.D. Deshpande, Member of the working group enquired about the calibration and validation years. Mrs Sarkar replied that the model is calibrated for three years (2000-03) and would be validated on two years data (2004-05). Sh. S.N. Rai, Member of the working group enquired about the average annual rainfall in the Tibet part. Mrs Sarkar informed that average annual rainfall is about 300-350 mm in the Tibet part. Sh Rai also enquired if the MODIS data gives the depth of snow. Mrs Sarkar informed that MODIS data gives only the areal extent of snow cover.

4. MONITORING AND MODELLING OF STREAMFLOW FOR THE GANGOTRI GLACIER

Dr Arora presented the progress of the study. He informed the house that the data collection for the ablation period of 2011 was started in the month of May. He presented the results of the data collected during the ablation period 2012. He informed the house that the discharge was less in comparison to previous years especially in month of July. The AWs data has also been analysed and the parameters required for modelling were also estimated. The SRM model was applied for the simulation of the flows. Shri N.K. Sharma SE enquired about the estimation of sediment load in Himalayan Rivers. Dr Arora informed that the sediment load from Gangotri glacier is estimated. There were no specific comments from the members.

5. 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 outlined the procedure for selecting a particular model output for the basin. Out of 24 GCM's downscaled five have performed better for the Satluj basin. There were no specific comments from the members.

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

Dr. Avinash Agarwal presented the revised objectives in the light of suggestion from previous meeting. Presented study area and methodology in brief. Study progress of last five months was presented with updated data and spring flow lag to rainfall on daily and monthly basis. Climatic variability impacts on stream flow were also presented. Some inquiries were from working group and the same were explained. No specific comment / suggestion were added.

7. 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 objectives of the study alongwith the progress made so far. Dr. Ritesh Arya said that the

study is very important and useful. Dr. J S Rawat asked whether any GLOF study has been carried out in past. Dr. Loahni said that a number of studies on GLOF have been carried out for Bhutan, Sikkim and Uttarakhand. Dr. Perumal said that if more vulnerable lakes are in series then which lake has to be considered. Dr. S.K. Jain said that the lake which is near to project site or giving more flood will be considered. If the lake is fragmented then all the lakes will be taken up for the study. Dr. S.N. Rai enquired about the lake shown during presentation. Dr. A K Lohani said that there are number of lakes and some of them are having names. Dr. Jain said that the names are given arbitrarily in clockwise direction.

8. HYDROLOGICAL STUDIES FOR UPPER NARMADA BASIN

Mr. Jagadish Prasad Patra, PI of the study presented the progress during first year of the ongoing three year study scheduled to complete by March 2014. Objectives of the study with brief methodology and data collected for this study were presented. Design floods at Bargi dam estimated using CWC guide line (unit hydrograph approach) were presented. Further, the floods for various return periods estimated by regional flood frequency relationships developed based on the L-moments approach for Upper Narmada and Tapi Subzone 3(c) were also discussed. There were no specific comments from the members.

B. NEW STUDIES FOR 2012-13

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

Dr. R.P. Pandey, PI of the project informed the house that the Bundelkhand region of the country is currently facing water shortages during summer months and this problem became more severe during drought years i.e. 2004-2008. Accordingly, it has been planned to take up a study in a pilot area in Bundelkhand region with the major objective 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 specific objectives of this project are to: (a) assessment of drought frequency, duration and severity in the selected pilot area in Bundelkhand region; (b) quantification of surface water and groundwater availability in space and time; (c) assessment of total water demands for domestic, industries and agriculture; (d) assessment of supplemental irrigation to minimize crop loss due to dryspells and droughts, and (e) delineation of zones vulnerable to different degree of drought severity. The PI informed that the study will be useful to devise area specific plan for water management in the study area to deal with the drought situation.

2. SEDIMENTATION STUDIES FOR PONG RESERVOIR, HIMACHAL PRADESH

Dr. A. R. Senthil Kumar, PI of the project, presented the proposed objectives, methodology and expected results of the study in brief. Dr. N. C. Ghosh, suggested to include the effect of the climate change into the sediment yield model to predict the increase or decrease in the storage capacity of the

reservoir. The chairman also suggested to do the same analysis as briefed above. Shri S. S. Grewal suggested to prioritize the watershed for computing the sediment yield from the catchment.

WATER RESOURCES SYSTEMS DIVISION

WATER RESOURCES SYSTEM DIVISION		
S. N.	Title of the Project/Study, Study Team, and Start and Completion Dates	Status, and Recommendation/suggestion
Research studies 2011-12		
1.	Application of a distributed hydrological model for river basin planning and management M. K. Goel (PI), D. S. Rathore, Deepa Chalisgaonkar, and Rama Mehta DOS: 10/2009; DOC: 3/2012	Completed study (Research study) Sh. Ravindra Kumar suggested to use MODIS data for cropping pattern mapping; Sri G. P. Juyal suggested to carry out ground truthing of the remote sensing observations Dr. S. S. Grewal inquired if rainfall variation with time is accounted for in the model. Dr. Goel informed that classified landuse map has been obtained from NRSC. The model runs at daily time step and spatial and temporal variation of rainfall and evapo-transpiration is considered in the model.
2.	Web based information system for major and important lakes in India Deepa Chalisgaonkar (PI), and Suhas Khobragade DOS: 04/2010; DOC: 3/2012	Completed study (Research study) Dr. R. C Trivedi enquired about the size of the water body being considered as lake. Dr. Khobragade informed that the lakes which are significant for water supply for drinking or irrigation, religious significance, recreation, tourism, etc., have been included irrespective of their size, however, the water bodies conventionally designated as lakes in India have been included.
3.	Analysis of water management scenarios in Tapi River basin using MIKE Basin Rama Mehta (PI), M. K. Goel, and D. S. Rathore DOS: 04/2010; DOC: 3/2013	Ongoing study (Research study) Dr. Ravindra Kumar inquired whether the emphasis is on the analysis of water management scenarios or on use of Mike-Basin software. Dr. Rama Mehta clarified that both aspects have been considered, and water management scenarios have been analyzed using the results of Mike-Basin
4.	Development of analytical equation for alternate depths for flow in rectangular channels Sushil K. Singh DOS: 4/2011; DOC: 3/2012	Completed study (Research study) Dr. M. Perumal enquired about the difference between the intended solution and that given in the book by Subhash. Dr. Sushil K. Singh informed that intended solution is generalized one and both alternate depths can be obtained from

		<p>the known value of the non-dimensional specific energy, while the solution available in books requires one alternate depth and specific energy to be known to compute the other alternate depth.</p> <p>Dr. S. N. Rai suggested and encouraged the possible use of developed solutions in dealing with the surges due to tsunami. Dr. Sushil K. Singh added that such solutions if obtained for unsteady flow can more appropriately be useful in dealing with the problems of surges in open channels and rivers due to tide or tsunami.</p> <p>Dr. A. P. Singh opined that the developed solution will also be useful for students and academic organizations. Dr. Sushil K. Singh added that this would make thinner the thin boundary between the research and academic organizations.</p>
5.	<p>A transfer function model for event based runoff Sushil K. Singh DOS: 4/2011; DOC: 3/2012</p>	<p>Completed study (Research study) No specific comment/suggestion.</p>
6.	<p>Trend and variability analysis of Rainfall and Temperature in Himalayan region L. N. Thakural (PI), Sanjay Kumar, Sanjay K. Jani, and Tanveer Ahmed DOS: 10/2011; DOC: 09/2014</p>	<p>Ongoing study (Research study) Dr. V. C. Goyal suggested redefining the objectives of the study to include the innovative aspects. Dr. R. P. Deshpande suggested that the rainfall and temperature data from APHRODITE data may be compared with available ground based observation from state weather observations, IMD or SASE and if ground based observations is not available in study area the nearest locations outside the study area may also be used for this purpose.</p>
7.	<p>Integrated approach for snowmelt runoff studies and effect of anthropogenic activities in Beas basin Sanjay K. Jain (PI), S. P. Rai, and L. N. Thakural DOS: 04/2009; DOC: 03/2012</p>	<p>Ongoing study (PDS under HP-II) Dr. Deshpande inquired about the possible reasons for the high intercept of Local Meteoric Line presented on the basis of Snow in modeling. Dr. Jain explained that the high intercept of the snow is due to change in source of vapour. Similar slope and intercept in the Local Meteoric Line developed for snow and river reveals that the contribution of snow is dominant in the river discharge. On inquiry from Dr. S. K. Sharma, Dr. Jain informed that the snow samples have been collected for two years 2010-2011. Dr K. C. Patra Observed that the presented scenario for rainfall in Mahanadi are not very good. Dr. Jain said that in this study the</p>

		precipitation at Bhunter is not projected well (2001-2010) while temperature is giving good results.
8.	<p>Assessment of effects of sedimentation on the capacity/ life of Bhakra Reservoir (Gobind Sagar) on River Satluj and Pong Reservoir on River Beas</p> <p>Sanjay K. Jain (PI), J. V. Tyagi, D. S. Rathore, and Rama Mehta DOS: 04/2009; DOC: 03/2012</p>	<p>Ongoing study (PDS under HP-II)</p> <p>Dr. J. S. Rawat inquired about the frequency of the data collections. Dr. Jain informed that sediment data have been collected from BBMB for 20 years on daily basis.</p> <p>On inquiry from Dr. A. P. Singh about the transfer function used for ANFIS modeling and the period during which the silt variation is more, Dr. Rama Mehta informed that Gaussian function has been used, and Dr. Jain said that the silt is maximum in monsoon seasons.</p> <p>Dr. S. N. Rai and Dr. Deshpande asked about the possible reasons for the simulated values being underestimated for some of the years. Dr. J. V. Tyagi said that the unavailability of data in upper part of the catchment results in the poor matching of the peaks and the calibration will be further improved to get better results. Dr. S. N. Rai suggested carrying out sensitivity analysis, which would be helpful in improving the results.</p>
9.	<p>Hydrological assessment of ungauged catchments (small catchment)</p> <p>Pradeep K Bhunya (PI), Rakesh Kumar, D. S. Rathore, Sanjay Kumar, P. C. Nayak DOS: 05/2009; DOC: 05/2012</p>	<p>Completed study (PDS under HP-II)</p> <p>No specific comment/suggestion.</p>
Consultancy projects		
10.	<p>Vetting of water availability studies of the Gulf of Khambhat Development Project (Kalpasar Project)</p> <p>M. K. Goel, P. K. Agarwal, and Yatveer Singh DOS: 04/2011; DOC: 10/2011</p>	Ongoing study
11.	<p>Snowline estimation snowmelt runoff study and Glacial Lake Outburst Flood study for Kuri-Gongri H.E. Project in Bhutan (NHPC, Faridabad)</p> <p>Sanjay K. Jain, A. K. Lohani, Sudhir Kumar, L. N. Thakural,</p>	Completed study

	Anju Chaudhary, and Tanveer Ahmed	
Proposed research studies 2012-13		
12.	<p>Mathematical representation of elevation-area-capacity curves for Indian reservoirs M. K. Goel, Sushil K. Singh, and P. K. Agarwal DOS: 04/2012; DOC: 03/2013</p>	<p>New research study Dr. M. Perumal, and Dr. S. S. Grewal apprehended that since the EAC curves depend on the shape of valley of different projects, unique mathematical equations may not be practicable. Dr. Sushil K. Singh informed that the objective is to mathematically represent these curves (elevation-area, and elevation-capacity) by suitable parameteric and computationally simple functions, which finds application in estimating the reservoir elevation for a known predicted inflow to the reservoir based on real time occurrence of rainfall in upstream reaches. Use of a parametric simple functional form would avoid errors due to interpolation from the tabulated values, and subjectivity involved in reading the values from the graph. The possible generalization of these functional approximations for different reservoirs is also intended to be taken up. Members observed if generalized functional forms could be established, these would be of considerable help while dealing with the planning and management studies for reservoir projects.</p>
13	<p>WebGIS based snow cover information system for Himalayas D. S. Rathore, Deepa Chalisgaonkar, L. N. Thakural, and Tanveer Ahmed DOS: 04/2012; DOC: 03/2013</p>	<p>New research study Dr R. D. Deshpande suggested that the scope of the study may include other hydrometeorological data such as temperature, rainfall, relative humidity etc. The data are already being collected in other ongoing studies and may be readily available. Further, information available from Indian satellites may be included. Shri Rathore said that attempt will be made to include other data and snow cover information available from Indian satellites. Dr J. S. Rawat inquired if the ETM+ data could be used and whether information will be accessible to user. Shri Rathore replied that snow cover map based on any satellite may be used.</p>
14.	<p>Software for Frequency Analysis in Hydrology Deepa Chalisgaonkar, Sushil K. Singh, D. S. Rathore, and M. K. Goel DOS: 04/2012; DOC: 03/2013</p>	<p>New research study No specific comment/suggestion.</p>

15.	Event-based rainfall-runoff modelling using soft computing techniques Rama Mehta, Sushil K. Singh, and Yatveer Singh DOS: 04/2012; DOC: 03/2013	New research study Dr. S. S. Grewal suggested that the proposed study should be supported with past experience of used techniques. Dr. Rama Mehta informed that in the present study the event based modeling in intended to be taken up using the past experiences and the results would be compared to those obtained by using the conventional techniques.
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RESEARCH COORDINATION & MANAGEMENT UNIT (RCMU)

S. N.	Title of Project/Study, Study Team, Start/Completion Dates	Status and Recommendations/Suggestions
1.	Recession Flow Analysis for Evaluation of Spring Flow in Indian Catchments Team: Ravindra V. Kale (PI), V. C. Goyal DOS: Apr 2011 DOC: March 2013	Status: Ongoing study Dr. S. K. Bartarya suggested that it would be interesting if recession flow analysis may be made according to control/classification of springs such as Fracture joint or Fluvial related spring etc. (as given in Valdiya & Bartarya, 1991) or on types of aquifer. Further, he also suggested that tracers and isotopes may be incorporated as another tool.

The Working Group noted the progress of the studies undertaken and recommended the new studies initiated by different Divisions of the Institute.

The Chairman 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 36th WG meeting

1	Sh. R.D. Singh Director, NIH	Chairman
2	Dr. R C Jain, Regional Director, CGWB, Dehradun	Member
3	Sh. R.D. Ram, IMD, New Delhi	Represented DDG (H)
4	Sh. Sanjeev K. Sharma, Geological Survey of India, New Delhi	Member
5	Dr. G.P. Juyal, CSWCRT, Dehradun	Member
6	Dr. S.K. Bartarya, Wadia Institute of Himalayan Geology, DehraDun	Member
7	Dr. R.D. Deshpande, Physical Research Laboratory, Ahmedabad	Member
8	Dr. S. N. Rai, National Geophysical Research Institute, Hyderabad	Member
9	Er. Ravindra Kumar, SWRA, Lucknow	Represented Chief Engineer
10	Sh. Niladri Naha, State Water Investigation Directorate, Kolkata	Member
11	Sh. B.M. M. Krishna Rao, GWD, Hyderabad	Member
12	Sh. N K Sharma, IRI, Roorkee	Member
13	Prof. J.S. Rawat, Kumaun University, Almora	Member
14	Prof. K.C. Patra, NIT Rourkela	Member
15	Prof. Ajit Pratap Singh, BITS, Pilani	Member
16	Dr. G.J. Chakrapani, IIT, Roorkee	Member
17	Dr. M. Perumal, IIT Roorkee	Member
18	Dr. R.C. Trivedi, (Retd), CPCB	Member
19	Dr. S.S. Grewal, Chandigarh	Member
20	Dr. Ritesh Arya, Panchkula, Haryana	Member
21	Dr. Sharad K. Jain, IIT, Roorkee	Invitee
22	Dr. N.C. Ghosh, Sc. F & Head GWH Division, NIH	Member
23	Dr. V.K. Choubey, Sc. F & Head EH Division, NIH	Member
24	Sh. C.P. Kumar, Sc. F & Head HI Division, NIH	Member
25	Dr. S.K. Singh, Sc. F & Head WRS Division, NIH	Member
26	Dr. V. C. Goyal, Sc. F & Head RCMU, NIH	Member-Secretary

Scientists from National Institute of Hydrology, Roorkee

1. Dr. Sanjay Jain, Sc.F
2. Dr. Avinash Agarwal, Sc.F
3. Dr. J.V. Tyagi, Sc.F
4. Dr. Sudhir Kumar, Sc.F
5. Dr. D.S. Rathore, Sc.E2
6. Dr. M.K. Goel, Sc.F
7. Smt. D.Chalosgaonkar, Sc.F
8. Dr. A.K. Lohani, Sc.E2
9. Dr. R.P. Pandey, Sc.E2
10. Dr. Omkar Singh, Sc.E2
11. Sh. Suhas Khobragade, Sc.E1
12. Dr. P.K. Bhunya, Sc.E1
13. Dr. S.P. Rai, Sc.E1
14. Sh.A R Senthil Kumar, Sc.E1
15. Dr. Anupama Sharma, Sc.E1
16. Dr. M.S. Rao, Sc.E1
17. Dr. Sanjay Kumar, Sc.E1
18. Dr. Surjeet Singh, Sc.E1
19. Dr. R.D. Mehta, Sc.C
20. Sh. S.K. Verma, Sc.C
21. Smt. Archana Sarkar, Sc.C
22. Sh. A.K. Dwivedi, Sc.C
23. Dr. Manohar Arora, Sc.C
24. Dr. M.K. Sharma, Sc.C
25. Sh. P.K. Garg, Sc.B
26. Sh.Rajan Vatsa, Sc.B
27. Dr. Ravindra Vittal Kale, Sc.B
28. Sh. J.P. Patra, Sc.B
29. Sh. Sumant Kumar, Sc.B
30. Dr. Rajesh Singh, Sc.B
31. Sh. L.N. Thakural, Sc.B
32. Mrs. Shashi Poonam, Sc.B
33. Sh. Biswajit Chakravorty, Sc.E2,CFMS, Patna
34. Sh. Pradeep Kumar, Sc.B, WHRC, Jammu
35. Sh. Sanjay K. Sharma, Sc.B, CFMS, Guwahati
36. Sh. T. Thomas, sc.C, GPSRC, Sagar
37. Dr. YRS Rao, Sc.E2, DRC, Kakinada
38. Sh. Manish Nema, Sc.B, WHRC, Jammu
39. Dr. Chandramohan T., Sc.E1, HRRC, Belgaum

ANNEXURE-II**Recommended Work Program of Different Divisions for the Year 2012-13****ENVIRONMENTAL HYDROLOGY DIVISION**

S.N.	Study	Study Team	Duration
Internal Studies			
1.	Assessment of Groundwater Quality in Hindon River Basin	<u>M.K. Sharma</u> , V. K. Choubey, Omkar Singh, Rajesh Singh, Babita Sharma, Beena Prasad, Rakesh Goel, Dayanand	3 Years (11/2011-10/2014)
2.	Development of low cost media for fluoride removal from drinking water of fluoride affected areas.	<u>Rajesh Singh</u> , V. K. Choubey, Omkar Singh, M.K. Sharma, Dayanand	2 Years (4/2011-3/2013)
3.	Water Quality Modeling of Hindon River	<u>Omkar Singh</u> , V. K. Choubey, M.K. Sharma, Rajesh Singh, A.R. Senthil Kumar, Babita Sharma, Beena Prasad, Rakesh Goel, Dayanand	3 years (4/2012-3/2015) <u>New Study</u>

GROUND WATER HYDROLOGY DIVISION

S. N.	Study	Study Team	Duration & Status	Funding Source
1.	Quantification of Impact of Rainwater Harvesting on Groundwater Availability in Aravalli Hills – Part II: Mathematical Modeling	Anupma Sharma (PI) ; C.P. Kumar (Co-PI); N.C. Ghosh; Sudhir Kumar; Rajan Vatsa; Sanjay Mittal	2 years (04/10 – 03/12) Extended by 6 months after March, 2012	NIH
2.	Groundwater Fluoride Contamination in different parts of India and study severity of Fluorosis in a Drought prone area	A.K. Dwivedi (PI) ; N.C. Ghosh; Anupma Sharma; Sumant Kumar; Sanjay Mittal; Ram Chandra	3 years (04/11 – 03/14) Position document to be completed by May, 2012	NIH
3.	Coastal Groundwater Dynamics and Management in the Saurashtra Region, Gujarat.	N. C. Ghosh (Coordinator); Anupma Sharma (PI) ; C P Kumar (Co-PI); A.D. Gohil; C.K. Jain; Sudhir Kumar; D.S. Rathore; Surjeet Singh; Rajan Vatsa	3 years (10/09 – 06/12) Continuing study	PDS (HP-II)

4.	Saph Pani - Enhancement of Natural Water Systems and Treatment Methods for Safe and Sustainable Water Supply in India”	Project Director : R. D. Singh; N. C. Ghosh (Coord.) ; V. C. Goyal; C. K. Jain; Sudhir Kumar; B. Chakravorty; A. K. Lohani ; Anupma Sharma; Surjeet Singh ;Sumant Kumar, Shashi Indwar.	36 months (10/11- 9/14)	European Union under 7 th - Framework Programme
5.	Managed Aquifer Recharge (MAR) and Aquifer Storage Recovery (ASR)	Sumant Kumar (PI) ;Rajan Vatsa; N.C. Ghosh; C. P. Kumar; Surjeet Singh; Sanjay Mittal	3 years (04/11 – 03/14)	Under Work Package-II of ‘Saph Pani’ Project
6.	Hydrological Instrumentation and Data Monitoring Planning for Integrated Water Resources Management (IWRM) of the Bina River Pilot Basin	Surjeet Singh (PI-HQ) ; Mr. T. Thomas (PI-RC, Sagar) Mr. Tej Ram Nayak(RC-Sagar) N.C. Ghosh R.K. Jaiswal (RC-Sagar)	1 year (4/12 – 3/13) New study	NIH
7.	Flow and Contaminant Transport Modeling of Riverbank Filtration	Shashi Poonam Indwar (PI) , N.C. Ghosh, Anupma Sharma, Rajan Vatsa, Stefanie Fischer - Research Student (Germany) - six months, HTWD Germany, Uttarakhand Jal Sansthan (UJS), Haridwar & Dehradun	30 months (4/12 – 9/14) New study	Under the Work Package-I of ‘Saph Pani’ Project

HYDROLOGICAL INVESTIGATION DIVISION

S. N.	Study	Team	Duration/ Status
INTERNAL STUDIES			
1	Estimation of Snow and Glacier Melt Contribution in Melt Water of Gangotri Glacier at Gaumukh using Isotopic Techniques	S. P. Rai (PI) Manohar Arora Bhishm Kumar Rakesh Kumar Naresh Kumar Jamil Ahmad Vishal Gupta	3 years (4/10 – 3/13) Continuing Study

S. N.	Study	Team	Duration/ Status
2	Assessment of Radon Concentration in Waters and Identification of Paleo-Groundwater in Punjab State	S. K. Verma (PI) Sudhir Kumar M. S. Rao Mohar Singh	2 years (04/11-03/13) Continuing Study
3	Hydro-geological Assessment of Ghar area for Artificial Recharge and Water Management Planning	P. K. Garg (PI) Sudhir Kumar V.C. Goyal M. S. Rao C. P. Kumar Tanveer Ahmad Rajesh Agarwal	2 years (04/11-03/13) Continuing Study
4	Assessment of Sensitivity of Open Water Evaporation to Increase in Temperature for Different Climatic Regions of India	S. D. Khobragade (PI) C. P. Kumar Manohar Arora A. R. Senthil Kumar	2 years (04/12-03/14) New study
SPONSORED PROJECTS			
5	National Program on Isotope Fingerprinting of Waters of India (IWIN)	M. S. Rao (PI) Bhishm Kumar Sudhir Kumar S. P. Rai S. K. Verma Pankaj Garg	5 years (07/07–06/12) (To be extended upto Aug, 2013) Continuing Study
6	Groundwater Dynamics of Bist-Doab Area, Punjab Using Isotopes	M. S. Rao (PI) Bhishm Kumar Sudhir Kumar S. K. Verma PankajGarg CGWB Officials	3 years (07/09-6/12) Continuing Study
7	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 Prof. C. Rangaraj	3 years (07/09-6/12) Continuing study
8	Impact Assessment of Landuse on the Hydrologic Regime in the selected Micro-watersheds in Lesser Himalayas, Uttarakahand	S. P. Rai (PI) Bhishm Kumar J. V. Tyagi M. P. Singh, FRI Rajeev Tiwari, IGNA Vishal Gupta Jamil Ahmad V. K. Agarwal	5 years (4/08– 3/13) Continuing Study

S. N.	Study	Team	Duration/ Status
9	Development of Spring Sanctuaries in an Urban and a Rural Watershed in District Pauri Garhwal, Uttarakhand	S. P. Rai (PI) Bhishm Kumar Sudhir Kumar S. D. Khobragade Pankaj Garg Jamil Ahmad Vishal Gupta	3 years (04/10-03/13) Continuing Study
CONSULTANCY PROJECTS			
10	Hydro-geological Studies of Jhamarkotra Mines, Udaipur, Rajasthan	Sudhir Kumar, (PI) S. K. Verma P. K. Garg	1 year (07/10-06/11) Extended upto Dec, 2012 Continuing Study
11	Integrated Hydrological Investigations of Sukhna Lake, Chandigarh for its Conservation and Management	S. D. Khobragade (PI) C. P. Kumar R. D. Singh S. P. Rai Vipin Agrarwal	3 years (07/11-06/13) Continuing Study

SURFACE WATER HYDROLOGY DIVISION

S. No. & Ref. Code	Title	Study Team	Duration
Internal Studies			
1. NIH/SWD/NIH/ 10-13	Snowmelt Runoff Modeling and Study of the Impact of Climate Change in part of Brahmaputra River Basin	Archana Sarkar R. D. Singh Rakesh Kumar Sanjay K. Jain	3 years (April 10- March 13)
2. NIH/SWD/NIH/ 08-	Monitoring and modelling of streamflow for the Gangotri Glacier	Manohar Arora Rakesh Kumar	March 08 - To be continued
3. NIH/SWD/NIH/ 10-13	Climatic Scenarios Generation for Satluj Basin using Statistical Downscaling Techniques	Manohar Arora Rakesh Kumar	3 years (April 10 - March 13)
4. NIH/SWD/NIH/ 10-13	Climatic variability analysis and its impact on Himalayan watershed in Uttarakhand	A. Agarwal, Manohar Arora R K Nema	3 years (Nov. 10 - Oct. 13)
5. NIH/SWD/NIH/ 11-13	Impact of Climate Change on Glaciers and Glacial Lakes: Case Study on GLOF in Tista basin	A.K. Lohani Sanjay K. Jain Rakesh Kumar	2 years (April 11 - March 13)

6. NIH/SWD/NIH/ 11-14	Hydrological Studies for Upper Narmada Basin.	Jagdish P. Patra Rakesh Kumar Pankaj Mani T R Sapra	3 years (April 11 – March 14)
Proposed new Internal studies			
7. NIH/SWD/NIH/ 12-15	Study of Hydro-Meteorological Droughts for Bundelkhand Region in India	R.P. Pandey	3 years (April 12- March 15)
8. NIH/SWD/NIH/ 12-15	Sedimentation Studies for Pong Reservoir, Himachal Pradesh	A. R. S. Kumar, Manohar Arora Suhas D Khobragade, A. Agarwal, Sanjay K. Jain	3 years (April 12 – March 15)
Consultancy Projects			
1.	Estimation of Design Basis - flood & safe grade elevation in the Upstream of Bargi Dam at Chutka Nuclear Power Project site, situated in Narmada Valley in Madhya Pradesh (NPCIL)	Rakesh Kumar Pankaj Mani J. P. Patra R. D. Singh T. R. Sapra N.K. Bhatnagar	Under Progress
2.	Site Specific Area Drainage Study for Plant and Ash Dyke for Khargone Super Thermal Power Project (2 x 660 MW) (NTPC)	Rakesh Kumar R.P. Pandey Pankaj Mani J. P. Patra R. D. Singh T. R. Sapra Om Prakash	Under Progress
3.	Area Drainage Study for Plant and Ash Dyke for Gajmara Super Thermal Power Project (4x800 MW) (NTPC)	Rakesh Kumar Pankaj Mani J. P. Patra Archana Sarkar R. D. Singh T. R. Sapra Hukum Singh	Under Progress
4.	Drainage study for Rourkela Expansion Power Project (1*250 MW) (NTPC)	Rakesh Kumar Pankaj Mani J. P. Patra R. D. Singh A.R. Senthilkumar T. R. Sapra S.P.L. Shrivastava	Under Progress

5.	Carrying Out Dam Break Analysis and Preparation of Emergency Action Plan for Nagarjunasagar Dam	A.K. Lohani Rakesh Kumar S.K. Jain	Under Progress
6.	Study of hydro-meteorological droughts for Bundelkhand region in India	R.P Pandey M.K. Goel D.S. Rathore S.K.Singh	Under Progress

WATER RESOURCES SYSTEMS DIVISION

S.N.	Title	Study Team	Duration	Funding
Internal Studies				
1.	Trend and variability analysis of rainfall and temperature in Himalayan region	L.N.Thakural Sanjay Kumar Sanjay K. Jain Tanvear Ahmed	3 years (10/11-09/14) Continuing study	NIH
2.	Analysis of water management scenarios in Tapi river basin using MIKE basin	Rama Mehta M.K.Goel D.S.Rathore	3 years (4/10-3/13) Continuing study	NIH
Sponsored Studies				
3.	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 (4/09-3/12) Continuing study	PDS (HP-II)
4.	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 D. S. Rathore Rama Mehta	3 years (4/09-3/12) Continuing study	PDS (HP-II)
New Internal Studies				
5.	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) New Study	NIH
6.	Web GIS based snow cover information system for Himalayas	D. S. Rathore D. Chalisgaonkar L. N. Thakural Tanvear Ahmed	1 year (4/12-3/13) New Study	NIH
7.	Software for frequency analysis in Hydrology	D. Chalisgaonkar Sushil K. Singh D. S. Rathore M. K. Goel	1 year (4/12-3/13) New Study	NIH

8.	Event-based rainfall runoff modelling using soft computing techniques	Rama Mehta Sushil K. Singh Yatveer Singh	1 year (4/12-3/13) New Study	NIH
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RESEARCH COORDINATION & MANAGEMENT UNIT (RCMU)

SN	Study	Team	Duration
Internal Studies			
1	Recession Flow Analysis for Evaluation of Spring Flow in Indian Catchments	Ravindra V Kale (PI) V C Goyal	DOS: Apr 2011 DOC: Mar 2013
2	Understanding Water Use Efficiency: A Field Based Research and Documentation of Best Practices on Water Use Efficiency and Conservation	Joint study I. NIH: V C Goyal (PI) Subhash Kichlu Rajesh Agrawal II. Indian Environment Law Offices, Gurgaon: Ms Archana Vaidya Ms Shilpa Chohan Mr Shawahiq Siddiqui (PI)	DOS: Apr 2012 DOC: Mar 2013 (New Study)
3	Pilot Basin Studies (PBS) at six identified sites, jointly with the RCs and CFMSs	Joint study NIH HQs: V C Goyal (Leader) Ravindra V. Kale New Scientist NIH RCs/CFMSs: RC-Belgaum RC-Jammu RC-Kakinada RC-Sagar CFMS-Guwahati CFMS-Patna	DOS: Apr 2012 DOC: Mar 2015 (New Study)