

**MINUTES OF THE  
37<sup>TH</sup> MEETING OF WORKING GROUP OF NIH  
HELD AT NIH, ROORKEE, DURING OCTOBER 29-30, 2012**

The 37<sup>th</sup> meeting of the Working Group of NIH was held at NIH, Roorkee, during October 29-30, 2012 under the Chairmanship of Director, NIH. The list of the participants of the meeting is given in Annexure-I.

**ITEM NO. 37.1: OPENING REMARKS BY THE CHAIRMAN**

Er R D Singh, Director, NIH, was not available due to an urgent official meeting in the Ministry of Water Resources. Dr S K Jain, Director-in-charge, chaired the meeting. The Chairman, WG welcomed the Working Group members and the Scientists of the Institute. 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:

<b>S N</b>	<b>Member</b>	<b>Suggestion(s)</b>
1	Dr R C Jain	<ul style="list-style-type: none"> <li>▪ Pro-active approach for water resources investigations</li> <li>▪ Integration of disciplines and collaboration across sectors</li> <li>▪ Farmers participation</li> <li>▪ Knowledge management</li> </ul>
2	Dr G P Juyal	<ul style="list-style-type: none"> <li>▪ Studies on climate change &amp; variability</li> <li>▪ Impact assessment of landuse changes</li> </ul>
3	Dr V V Rao	<ul style="list-style-type: none"> <li>▪ Energy balance estimation</li> <li>▪ Suggested shortening of the meeting duration</li> </ul>
4	Dr R D Deshpande	<ul style="list-style-type: none"> <li>▪ Dew water harvesting</li> <li>▪ Soil aquifer treatment</li> <li>▪ Thermal energy use- thermal regime of groundwater</li> <li>▪ Discussion of selected studies, with grouping of common activities/studies</li> <li>▪ Presentation should have more emphasis on results and interpretation</li> </ul>
5	Dr. S N Rai	<ul style="list-style-type: none"> <li>▪ Concentrate on few areas and carry out integrated studies</li> <li>▪ Literature survey should be done before formulating a project/study</li> <li>▪ Deliverable should be useful to the society</li> </ul>
6	Sri Sanjeev Sharma	<ul style="list-style-type: none"> <li>▪ River embankments</li> <li>▪ Controlled sand quarrying</li> </ul>
7	Dr Kishore Kumar	<ul style="list-style-type: none"> <li>▪ Use of ICT</li> </ul>

8	Dr S C R Vishwakarma	<ul style="list-style-type: none"> <li>▪ Cloud burst prone area mapping</li> </ul>
9	Prof. J S Rawat	<ul style="list-style-type: none"> <li>▪ Studies related to drying up of springs and streams.</li> <li>▪ Develop model for rejuvenation of streams.</li> <li>▪ Studies on eco-hydrology.</li> </ul>
10	Er R K Khanna	<ul style="list-style-type: none"> <li>▪ Organize training courses on environmental aspects of water resources development</li> <li>▪ Post project evaluation of completed projects</li> <li>▪ Studies should have applicability to the users</li> <li>▪ Approach stakeholders &amp; line departments</li> </ul>
11	Dr N B Narsimha Prasad	<ul style="list-style-type: none"> <li>▪ Develop national level projects</li> <li>▪ Suitability of river basin transfers</li> <li>▪ Impact of sand mining on river regime</li> <li>▪ Wetland hydrology</li> <li>▪ Name of funding agency and cost should be mentioned for sponsored projects</li> <li>▪ Need for collaboration between NIH &amp; CWRDM</li> </ul>

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. 37.2: CONFIRMATION OF THE MINUTES OF 36<sup>TH</sup> MEETING OF THE WORKING GROUP**

The 36<sup>th</sup> meeting of the Working group was held during April 3-4, 2012. The minutes of the meeting were circulated to all the members and invitees vide letter No. RCMU/36<sup>th</sup> WG/NIH/11 dated May 7, 2012. As no comments were received on the circulated minutes, the minutes were confirmed.

#### **ITEM No. 37.3: 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 36<sup>th</sup> working group meeting.

#### **ITEM No. 37.4: PRESENTATION AND DISCUSSION ON THE STATUS AND PROGRESS OF 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 2012-13. Division wise progress on each study/project presented during the meeting is given in the next section.

## ENVIRONMENTAL HYDROLOGY DIVISION

S.No.	Title of the Project/Study, Study Team, Date of Start and Completion	Status and Recommendation/Suggestion
<b>Research Studies</b>		
1.	Assessment of Groundwater Quality in Hindon River Basin. Team: M.K. Sharma (PI), Omkar Singh, Rajesh Singh, Rakesh Goel, Dayanand DOS: 11/2011, DOC: 10/2014	Dr S N Rai advised to interpret water quality data on the basis of geological formations in the basin. Dr. Sharma noted the suggestions. Dr V V Rao suggested to prepare spatial distribution for different parameters. Dr Sharma replied that these plots are being prepared and will be included in the report.
2.	Development of low cost media for fluoride removal from drinking water of fluoride affected areas. Team: Rajesh Singh (PI), Omkar Singh, M.K. Sharma, Dayanand DOS: 04/2011, DOC: 03/2013	Dr. S. N. Rai advised to refer de-fluoridation technology developed by NEERI. PI noted the suggestions.
3.	Water Quality Modeling of Hindon River. Team: Omkar Singh (PI), M.K. Sharma, Rajesh Singh, A.R. Senthil Kumar, Beena Prasad, Dayanand DOS: 04/2012, DOC: 03/2015	Dr. N B Narasimha Prasad advised to combine Study S.No. 1 & 3 keeping in view of the same study area for both studies. Chairman informed that it would be a combined study. Dr. S. N. Rai informed that pollution from drains can be substantially reduced through the use of sand/carbon barrier/filter. PI noted the suggestions.

## GROUND WATER HYDROLOGY DIVISION

Dr. N.C. Ghosh, Scientist-F and Head of the division presented an overview of the scientific activities pursued by the division in the last six months, outlining particularly the R & D studies, consultancy project, and other technical activities. Dr. Ghosh informed that out of 7 approved R&D studies for the year 2012-13, two studies were to be completed, however, because of non-availability of soil samples analyzed results the study entitled "Quantification of Impact of Rainwater Harvesting on Groundwater Availability in Aravalli Hills – Part II: Mathematical Modeling" could not be completed. While the remaining five studies, which have time line up to March, 2013 or beyond, will continue.

It was also informed that under the European Union funded collaborative R&D project 'Saph Pani', a training workshop on "Riverbank Filtration" was organized in the month of April, 2012 at New Delhi, and two more training courses, one on

“Managed Aquifer Recharge” scheduled during December, 2012 at Chennai under ‘Saph Pani’ and the other one on “Coastal aquifer management” scheduled for February, 2013 at Gujarat under HP-II(PDS) are in the pipe line to organize during the current financial year. An account of scientific papers submitted/published in various journals/conferences/symposia, lectures delivered in various training courses and ME/M.Tech and summer trainees guided by the scientists during the period had also been indicated,

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 Saph Pani - Enhancement of natural water systems and treatment methods for safe and sustainable water supply in India [Project Ref. Code : EU-sponsored Project no. 282911].**

Dr. N. Ghosh presented an overview of the ‘Saph Pani’ and the work packages in which NIH are associated. He had also briefed the various activities pursued during the last six months; which included preparation of a MAR review report; organizing training course & participation in the India Water Week-2012 and its exhibition; participation in the biannual review meeting held at Basel, Switzerland; progress of different work packages, etc.

On an enquiry from Dr. Deshpande, NPL with regard to ‘Soil Aquifer Treatment (SAT)’ and from Dr. NBN Prasad, CWRDM, Kerala on “Wetland Management Technique”, Dr. Ghosh informed that SAT as a component of ‘MAR’ is already taken into consideration in some of the pilot case studies, and the ‘Wetland Management’ component is being studied by IIT Bombay along with other partners.

### **2. Quantification of Impact of Rainwater Harvesting on Groundwater Availability in Aravalli Hills – Part II: Mathematical Modeling [Project Ref. Code: NIH/GWD/NIH/10-12].**

Dr. Anupma Sharma explained the background and objectives of the study, data monitored and field investigations carried-out in Savana macro-watershed located in Jaisamand Lake catchment. Due to delay in analysis of soil samples on account of lab renovation work, she informed that the mathematical modeling work was yet to be completed and therefore the project report would be completed by the end of the current financial year. Dr. G.P. Juyal informed that studies on recharge from ponds in Gujarat had been carried out by CSWCRTI and suggested to consult these reports for additional information. 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. On a query from Dr Ravi Chopra about use of landuse information in locating suitable runoff harvesting sites, it was informed that information about the same had already been included in the analysis.

### **3. Coastal Groundwater Dynamics and Management in the Saurashtra Region, Gujarat [Project Ref. Code: NIH/GWD/HP-II/10-12].**

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. On a query from Dr. NBN Prasad, the groundwater TDS values monitored using TLC meter were graphically shown and the depth-wise increase in salinity at a specific location was

explained. Dr S N Rai queried about the sudden rise in water table in one of the piezometers. It was informed that the same phenomena had been observed in all the nearby piezometers with a consequent decrease in salinity levels. Results of socio-economic survey were also presented.

#### **4. Hydrological Instrumentation and Data Monitoring Planning for Integrated Water Resources Management (IWRM) of the Bina River Pilot Basin [Project Ref. Code: NIH/GWD/NIH/12-13]**

Dr. Surjeet Singh presented the progress of the study for developing procedures and guidelines for instrumentation and data monitoring network in the Bina pilot basin. The progress was reported mainly on the data collection, GIS database development, characterization of the study area, existing monitoring network and proposed schemes in the basin. Some of the Working Group members enquired about the GIS and toposheet scale but no recommendations were made.

#### **5. Managed Aquifer Recharge (MAR) and Aquifer Storage Recovery (ASR) [Project Ref. Code: NIH/GWD/NIH/11-14].**

Mr. Sumant Kumar (PI) presented the objectives, statement of the problems, achievements and the future plan of the study. PI informed that there are two options for GW recharge; one is through existing talabs in Raipur city, and other option is to recharge the GW in New Raipur area which is under development. PI was advised to see the connectivity between surface water of existing talabs and GW. Query was raised for recharge site and it was clarified.

#### **6. 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] [Project Ref. Code: EU-sponsored Project no. 282911].

The progress of this study was presented in two parts; one part by Ms. Shashi Poonam Indwar, Scientist-B and the other part by Ms. Stefanie Fischer, Intern from Germany.

Ms. Indwar presented mainly the objectives, statement of the problem, baseline data collection efforts from time to time for the Haridwar site emphasizing mainly on, measurements of groundwater level and river stages at different locations of the River Ganga, water samples collection for water quality and isotope analysis, and various other data efforts for RBF modeling. She had also presented graphical plots of some of the analyzed data.

Ms. Stefanie Fischer gave a brief presentation on the RBF modelling of the Haridwar site. Starting from the conceptualization of the area under the Visual MODFLOW framework including inputs data preparation and up to presentation of results for some preliminary runs, Ms. Fischer explained a general behaviour of the flow patterns and flow paths of the Haridwar RBF site comprising 22 RBF wells with the river Ganga and the Upper Ganga Canal as its time varying model boundaries at two different sides. She informed that precise calibration of the model and its refinement will be carried out as more data are collected. A number of queries on boundary conditions applied, calibration procedure, etc. raised by the members were replied suitably.

## HYDROLOGICAL INVESTIGATION DIVISION

S. No.	Title of Study/Project, Study Team, Date of Start (DOS) and Date of Completion (DOC)	Status and Recommendations/Suggestions
<b>INTERNAL STUDIES</b>		
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>Status: On-going Study</p> <p>No specific comments/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>Status: On-going Study</p> <p>No specific comments/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>Status: On-going Study</p> <p>No specific comments/suggestions</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>Status: On-going Study</p> <p>Dr. V. V. Rao commented that limited data have been analyzed for Udaipur region. He suggested that more data should be used.</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><b>New Study</b></p> <p>No specific comments/suggestions</p>

### SPONSORED PROJECTS

6.	<p>National Program on Isotope Fingerprinting of Waters of India (IWIN)</p> <p>M. S. Rao (PI), Bhishm Kumar, Sudhir Kumar, S. P. Rai, S. K. Verma, P. K. Garg DOS: 07/2007, DOC: 06/2013</p>	<p>Status: On-going Study</p> <p>Dr. R. D. Deshpande suggested to find out the sources of air moisture at Kakinada using the meteorological parameters.</p>
7.	<p>Groundwater Dynamics of Bist-Doab Area, Punjab using Isotopes</p> <p>M. S. Rao (PI), Bhishm Kumar, Sudhir Kumar, S. K. Verma, Pankaj Garg, CGWB Officials DOS: 07/2009, DOC: 12/2013</p>	<p>Status: On-going Study</p> <p>Dr. S. N. Rai, NGRI suggested to find out the possible locations of shallow and deep groundwater interaction.</p>
8.	<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, C. Rangaraj DOS: 07/2009, DOC: 03/2014</p>	<p>Status: On-going Study</p> <p>No specific comments/suggestions</p>
9.	<p>Impact Assessment of Landuse on the Hydrologic Regime in the selected Micro-watersheds in Lesser Himalayas, Uttarakhand</p> <p>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</p>	<p>Status: On-going Study</p> <p>No specific comments/suggestions</p>
10.	<p>Development of Spring Sanctuaries in an Urban and a Rural Watershed in District Pauri Garhwal, Uttarakhand</p> <p>S. P. Rai (PI), Sudhir Kumar, S. D. Khobragade, P. K. Garg, S. Tarafdar (GBPIHED), Jamil Ahmad, Vishal Gupta DOS: 04/2010, DOC: 03/2013</p>	<p>Status: On-going Study</p> <p>No specific comments/suggestions</p>
11.	<p>The Use of Environmental Isotopes to Assess Sustainability of Intensively Exploited Aquifer Systems in North Eastern Parts of Punjab, India</p> <p>M. S. Rao (PI), C. P. Kumar, S. P. Rai</p>	<p><b>New Study</b></p> <p>No specific comments/suggestions</p>

	DOS: 09/2012, DOC: 08/2013	
12.	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, S. L. Srivastava, Vishal Gupta, Mohar Singh DOS: 06/2012, DOC: 05/2015	<b>New Study</b>  No specific comments/suggestions
<b>CONSULTANCY PROJECTS</b>		
13.	Hydro-geological Studies of Jhamarkotra Mines, Udaipur, Rajasthan  Sudhir Kumar (PI), S. K. Verma, P. K. Garg DOS: 07/2010, DOC: 12/2012	Status: On-going Project
14.	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, C. K. Jain, V. K. Agarwal DOS: 07/2011, DOC: 06/2013	Status: On-going Project

### **SURFACE WATER HYDROLOGY DIVISION**

Dr. Rakesh Kumar, Scientist F and Head, Surface Water Hydrology Division presented a summary of studies being carried out by Surface Water Hydrology Division along with number of research papers published/accepted for publication/communicated as well as other research and technical activities carried out by the division. The progress of studies was then presented by the respective P.I. of the study. The details are as under.

#### **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, 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 and second part of the report consisting snow cover mapping which is an input to the snowmelt runoff model in the second part of the study has been completed. She further informed that the study of the impact of climate change on runoff of Subansiri basin in the third part was going under. She further presented the results of trend analysis of daily rainfall, rainy days,



daily temperature (maximum, mean, minimum) and diurnal temperature carried out on annual and seasonal periods using parametric (regression) and non-parametric (Mann-Kendall) techniques. Dr Deshpande enquired about the length of data used for trend analysis. Mrs Sarkar replied that 37 years of daily data of rainfall and 33 years of daily data of temperature has been used for the study. Sh. S.N. Rai, Member of the working group enquired about the threshold of Mann-Kendall method used for trend observation. Mrs Sarkar informed that the Mann-Kendall method was used with a 95% criterion in the present study and the Z-statistics (threshold value) for this is 1.96. Sh Patra, Member of the working group enquired about the most robust and popular method of trend analysis. Mrs Sarkar informed that modified Mann-Kendall technique is one of the robust and most popular technique of trend analysis, which is also evident from published literature on trend analysis work.

## **2. MONITORING AND MODELLING OF STREAMFLOW FOR THE GANGOTRI GLACIER**

The study was presented by Dr. Rakesh Kumar, Head, Surface Water Hydrology Division. Dr. Rakesh Kumar explained the objectives of the study viz. (i) continuous monitoring of meteorological and hydrological data for monthly, and seasonal specific water yield and its variability from the year to year; and (ii) to improve the hydrological model developed by the institute for simulating daily streamflow. It was explained that the hydro meteorological data collected for the winter season of 2011 have been processed and analysed. During the winter season, the minimum temperature was observed as  $-19.8^{\circ}\text{C}$  on 10<sup>th</sup> February 2011 and maximum temperature was  $16.1^{\circ}\text{C}$  on 12<sup>th</sup> October 2011. The discharge during winter was observed between 3 cumecs to 21 cumecs. The suspended sediment data collected from 2008 to 2011 were analysed and it was found that mean monthly suspended sediment concentrations for May, June, July, August and September during the study period were 1011, 1384, 1916, 1675 and 567 ppm respectively, indicating highest suspended sediment concentration in July, followed by August. For the entire melt season, the mean daily suspended sediment concentration was estimated to be 1320 ppm. Similar trends were also found for the sediment load and about 67% of the total suspended sediment load of the melt period was transported during the months of July and August. Sediment yield for the study basin was computed to be about  $2,863 \text{ tonnes km}^{-2}\text{yr}^{-1}$ . For the entire ablation period, the erosion from the Gangotri Glacier basin is estimated to be about 1.0 mm. There was a poor relationship between sediment concentration and discharge and hysteresis effect was prominent in the melt stream. The average percentages of clay, silt and sand were found to be 3, 67 and 30% respectively, which suggest maximum content of silt followed by sand. The collection of data for summer season started in the month of May 2012 and it continued upto 8<sup>th</sup> October 2012. The processing and analysis of the data are under progress.

## **3. Climatic Scenarios Generation for Satluj Basin using Statistical Downscaling Techniques**

Dr. Rakesh Kumar, Head, Surface Water Hydrology Division explained that it is an internal study and the objectives of the study are: (i) to downscale the GCM Output of CMIP3 models and (ii) to predict future climatic scenarios for Satluj basin. It was explained that for studying the impact of climate change the future climatic scenarios are needed. These scenarios will be downscaled for the Satluj basin using

statistical downscaling technique. The review of literature and data processing have been completed. The data has been downloaded and the procedure for AO quantitative evaluation has been finalized. The quantitative evaluation has been carried out for the CMIP 3 models and it has been found that nearly 5 models out of 24 models are performing better for the region. The study is under progress.

#### **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. Discussion were held on the infiltration and water holding capacity of soils, watershed runoff ratio and its variation, modeling of cumulative spring and recession flow and variability of spring behavior and its broad classification. Chairman discussed the possibility of retreating effect of a change while forming a cumulative series. It was informed that retreating effect is possible only when the affect is of noise type but it will be opposite when process is continuously changing with time. There was no specific comment on the study.

#### **5. 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 progress of the study and results of glacial mapping and GLOF modeling. Dr Lohani informed that the analysis is almost complete and sensitivity analysis and report writing is in progress. Dr. J.S. Rawat asked the type glacial lakes and the potential dangerous glacial lakes. Dr Lohani explained the types of lakes in the Himalayan region. Dr S.N. Rai appreciated the work. Further he enquired about the change in size of the glacial lake in the past few years. Dr Lohani explained the procedure and data used for delineating the change in the glacial lake. Dr. V.V. Rao asked the criteria for identifying the potentially dangerous glacial lake. Dr Lohani explained the criteria. Dr T.B. Joseph asked the distance of catchment outlet from the lake. Dr Lohani explained the study area, position of lake and catchment outlet.

#### **6. 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 work progress in past six months were presented. The river cross-section survey of Narmada, rainfall frequency analysis and estimated PMF were presented. Further, the Mike-11 model setup and various difficulties in calibrating the model were discussed. There were no specific comments from the members.

## **7. STUDY OF HYDRO-METEOROLOGICAL DROUGHTS FOR CHITRAKOOT 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: (a) assessment of drought frequency, duration and severity in Bundelkhand; (b) quantification of surface water and groundwater availability; (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; (e) delineation of zones vulnerable to different degree of drought severity, and (f) to suggest an area specific plan for water management in Paisuni Basin. The PI presented the progress of the study and the work remaining to be done during the current year.

## **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 in brief. Dr. V. V. Rao, NRSA, Hyderabad 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. Dr. T B Joseph, BARC, Mumbai suggested computing the reservoir life from analyzing the sediment samples from the reservoir by isotope techniques. PI of the project informed that the above suggestions may be taken into account once the envisaged objectives of the project are fulfilled. The chairman asked the PI whether to have more time for carrying the analysis suggested by the members of the working group. The PI of the project replied that additional time will be requested once the envisaged objectives of the project are fulfilled.

## **WATER RESOURCES SYSTEMS DIVISION**

### **1. INTEGRATED APPROACH FOR SNOWMELT RUNOFF STUDIES AND EFFECT OF ANTHROPOGENIC ACTIVITIES IN BEAS BASIN**

Dr. Sanjay K. Jain presented the objectives and progress of the study. He informed that snowmelt runoff simulation, trend analysis etc. have been carried out and presented earlier. He informed that work is in progress to achieve two objectives of the study. Dr. Jain informed that the task of climate modeling (future scenarios) has been completed by IISc, Bangalore and a report has been received. He informed that simulation of stream flow with this future scenario value is under progress. He also presented the work of water quality analysis. The work carried out using isotopic investigation were also explained. Dr. Deshpade (PRL) asked about the  $\delta$  excess of the snow and melt water and their variation with the season. Dr. S. P. Rai replied about the query in detailed and mentioned that the  $\delta$  excess of snow and meltwater varies between 20 to 30 permil. Dr. Sharad K. Jain inquired about the variation in snow and glacier melt contribution in different months. Dr. Rai replied that due to variation of air temperature and other climatic condition the meltwater contribution vary in the river discharge. Dr. V. V. Rao, asked about the maximum contribution of

snow melt during the summer months. Dr. Rai replied his query also. Mr. R K Khanna said that the future values of rainfall/temperature are very important for climate change studies. Mr. SCR Sharma said that the snow cover in Rohtang pass side is almost finished by the end of August. Dr. Sanjay Jain replied that the snow cover area now is melted out by the end July not in August, may be because of climate change. Dr. V V Rao said that once this type is completed then future prediction can also be made. Mr. R C Jain said that in future values of base flow is not changed much. Dr. Sanjay Jain informed that so far impact of temperature change has been studied. Once precipitation scenarios are incorporated then all these aspects will be studied in detail. Dr. Sanjay Jain informed that the study will be completed by the end of 2013.

## **2. ASSESSMENT OF EFFECTS OF SEDIMENTATION ON THE CAPACITY/ LIFE OF BHAKRA RESERVOIR (GOBIND SAGAR) ON RIVER SATLUJ AND PONG RESERVOIR ON RIVER BEAS**

Dr. Sanjay K Jain informed that a PDS has been taken up by BBMB. NIH is collaborating with BBMB for this study. Dr. Jain presented the objectives and work elements along with the progress of the study. He informed that work of sedimentation rate in both the reservoirs and sediment discharge relationship is already over. The work on sediment yield modeling using ArcSWAT is under progress. ArcSWAT has been applied for Satluj catchment and results of the study have been finalised. Dr. S N Rai asked what the use of this study is. Dr. Sharad Jain said that regular assessment of sedimentation in reservoir is required for that sediment yield estimation is useful. Dr. Sanjay Jain said that in ArcSWAT model whole basin is divided into sub basins therefore sources of sediment can be identified. Dr. Rai further asked whether any catchment treatment study will also be carried out. Dr. J V Tyagi said that the catchment treatment is not in the scope of the study therefore it is not planned. Dr. Jain informed that the study will be completed by the end of June, 2013.

## **3. Trend and Variability Analysis in Rainfall and Temperature in Himalayan Region**

The study was presented by Sh. L. N. Thakural. The objectives of the study are to create the database (Rainfall, Temperature) for the Himalayan region and carry out statistical analysis, trend and climatic variability changes in climatic variables namely temperature and rainfall in 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 presentations collection and availability status of data of temperature and Rainfall time series data for various ground stations for N.E, Central & Western Himalayan region from various sources was presented. For the available raw data of rainfall and temperature which have been processed, the preliminary analysis done for the North-East region was also presented. Dr. R.P Deshpande inquired which part of Himalayan region is more stable as it affects the Indus, Ganges and Brahmaputra basin for which Sh. L. N. Thakural replied that as the analysis for all the Himalayan region is done then can only clear trend will be available. Dr. NBN Prasad inquired about the sources of the data collected for the study.

#### **4. ANALYSIS OF WATER MANAGEMENT SCENARIO IN TAPI RIVER BASIN USING MIKE BASIN**

The study was presented by Dr. Rama Mehta. She presented the analysis for Hatnur and Girna reservoirs using Mike Basin. Dr. V.V. Rao, NRSC, Hyderabad suggested that the ground water data for sub basins can also be included for better management. The PI replied that the availability and collection of data from different concerned agencies is very difficult as it is not readily available and this study has to be completed by March 2013. But in future, it can be considered separately.

#### **5. MATHEMATICAL REPRESENTATION OF ELEVATION-AREA-CAPACITY CURVES FOR INDIAN RESERVOIRS**

Dr. M. K. Goel (MKG) presented the progress of the study. He informed that the methodology to be adopted for the study has been programmed in MS-Excel and data of 19 reservoirs has been entered. He showed a few slides of data analysis for a few reservoirs. He explained that based on the analysis and data availability of a few reservoirs, it is now envisaged to develop the mathematical relationships within the operation range of a reservoir (between MDDL and FRL).

In response to a query from Prof. K. C. Patra regarding the sedimentation pattern in a reservoir from original and revised curves, MKG informed that the data as supplied by various State Govt. Departments have been used. Prof. Patra informed that appreciable sedimentation has occurred in Hirakud reservoir and its analysis may be included in the study. MKG agreed to the suggestion as the EAC curve of the reservoir is available. Mr. Kishore Kumar suggested that data of 78 major reservoirs in the country is being continuously monitored by CWC and their analysis may be included in the study. MKG agreed to the suggestion as the data is being constantly received at NIH. In response to a query from Dr. V. V. Rao regarding the characterization of a basin for sediment yield, MKG informed that such an inference would not be possible from the present study as all the reservoirs pertaining to a particular type (Type I – IV) would be clubbed for developing a representative mathematical relationship. The Chairman (Dr. S. K. Jain) suggested that such attempts have been tried in the past but acceptable relations could not be established.

#### **6. WEB GIS BASED SNOW COVER INFORMATION SYSTEM FOR HIMALAYAS**

The study was presented by Shri D. S. Rathore. The objective of the study is to publish snow cover information on web/ intranet using GIS server for Himalaya. Snow cover thematic maps (2009), GLOBE/ SRTM (250 m) DEM and for part of the area AWiFS data (2009) were downloaded. Temperature data and Aphrodite data were available at NIH. Snow cover maps were mosaiced and processed for removal of clouds, converted to polygon map. Snow cover map were generated from AWiFS data using NDSI technique. Aphrodite rainfall data were processed to created class intervals, polygons and contours. DEM were converted to elevations zone polygons and contours were generated. Basins and elevation zones will be extracted from DEM and statistics of snow cover will be processed for these units. Dr S.N. Rai stressed the need for showing geographical coordinates and annotations in all maps in the presentations. Dr V.V. Rao inquired regarding resolution of the data in the Web GIS, value addition, validation of results and informed that snow maps are available from WRIS Web GIS site. Dr Rao also stated that MODIS data are freely available to the researchers. Mr Rathore replied that for value addition overlay operation is performed on the MODIS snow cover data to remove cloud cover.

Resolution of data is same as that of source except some generalization. The snow maps may be compared with maps derived from other data sources. Availability data in other Web GIS platform will be explored. Dr J.S. Rawat inquired whether ETM+ and more fine resolution DEM data will be used and which Web GIS software is proposed to be used. Mr Rathore replied that Indian satellite data (AWiFS) are included in the study and attempt will be made to include ETM+ and fine resolution DEM data. Geoserver open source GIS is proposed in the study. Dr Kishor Kumar inquired regarding access over web/ intranet, web services, dynamic data, continuity of the study. Mr Rathore replied that few data are of external origin and data will be put on web depending on the rights, access policy of the data. WMS, WFS and WCS web GIS services will be made available. Further, it is proposed to provide data for selected years. The proposal for continuing the study, if any, will be brought up subsequently.

## **7. SOFTWARE FOR FREQUENCY ANALYSIS IN HYDROLOGY**

Mrs. Deepa presented the project. She informed that the objective is to develop a menu driven, interactive software for frequency analysis of hydrological data using different distributions. She informed that the idea behind the development of this package is to develop a low cost, flexible, easily upgradable software for frequency distribution having many features. She also informed that a menu driven, user-friendly software is being developed in Visual Basic language to carry out frequency analysis. The software will provide an efficient environment and will be easy to use by water managers. Furthermore, the software will be built with a graphical user interface that requires little training for using it. The software will use a multitude of algorithms for data import, validation and analysis. It allows the handling of a multiple site project and the comparison of quantile estimates with or without historical information. This software will help to calculate probability plotting positions, estimate the parameters of the various statistical distributions, evaluate the fit of these distributions, estimate flood quantiles, and compare estimates obtained with and without use of historical information. The software will compute the maximum likelihood estimates of probability distribution parameters for several statistical distributions used in flood frequency analysis. The demonstration of the present version of the software was also given in the meeting.

Dr Kishore suggested providing the details of the input data file. Mrs. Deepa informed that a sample input as well as output file will be included in the online 'Help' module. DR S K Khanna suggested contacting CWC to avoid the duplication.

## **8. Event Based Rainfall Runoff Modelling Using Soft Computing Techniques.**

Dr. Rama Mehta presented the study and showed the comparison of results obtained using the grid and cluster methods of soft computing on the published data of Bree (1978; 22 storms) with those obtained using two conventional methods [viz., Bree (1978); and Singh (2007)]. Based on the criteria of percent error in peak and time to peak, the soft computing methods outperformed the Bree's (1978) method, but under performed Singh's (2007) method. Dr. S. N. Rai suggested to critically analyze the factors as why the soft computing methods under performs the Singh's (2007) method and possibly improve upon if some of the techniques used by Singh (2007) can be used also in soft computing. Well receiving and accepting the suggestion, Dr. Rama added that the analysis is in progress for published multi-storms of two other catchments and informed that other more suitable criteria for performance evaluation including the visual graphs are also intended.

## 9. Hydrological Assessment of Ungauged Catchments (Small Catchment)

Dr. P K Bhunya presented the status of the study in brief covering the objectives, methodology, analysis, and results. He further appraised the house regarding duration of this purpose driven study (PDS). Also informed the house about the progress of studies that was presented in last working group, and the works carried from inception of this project till date Dr. Bhunya presented briefly about the expected outcome, results in regards to the objectives and the works that is being left and have to complete by March 2013. Dr. Bhunya also briefed the house regarding the technical results that included regional flow duration curve. He also presented the revised results of heterogeneity tests, and the regional flood frequency model-parameter, regional hydrographs parameters using the earlier method and a new method. Dr. Bhunya further briefed the house about the last training course. The photos taken recently by staffs during the field trip to the basins were displayed and the technical publications that are allied in this project area were also discussed. There were no questions from the members.

## RESEARCH MANAGEMENT AND OUTREACH DIVISION (RMOD)

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  No specific comments.
2.	Pilot Basin Studies (PBS) at six identified sites, jointly with the RCs and CFMSs ( <b>Joint study</b> )  <b>NIH HQs:</b> V C Goyal (Leader) Ravindra V. Kale New Scientist  <b>NIH RCs/CFMSs:</b> RC-Belgaum, RC-Jammu, RC-Kakinada, RC-Sagar, CFMS-Guwahati, CFMS-Patna DOS: Apr 2012; DOC: Mar 2015	Status: Ongoing study  No specific comments.

The Working Group noted the progress of the studies undertaken. 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 37<sup>th</sup> WG meeting

1	Dr.S.K. Jain, Director-Incharge, NIH	Chairman
2	Dr. R C Jain, Regional Director, CGWB, Dehradun	Member
3	Sh. Sanjeev K. Sharma, Director, GSI, New Delhi	Member
4	Dr. Kishore Kumar, NIC, WRID, New Delhi	Member
5	Dr G P Juyal, CSWCRTI, Dehradun	Member
6	Dr. S.C.R. Vishwakarma, GBPIHED, Almora	Member
7	Sh. T.B. Joseph, BARC, Mumbai	Member
8	Dr. R.D. Deshpande, PRL, Ahmedabad	Member
9	Dr. V V Rao, NRSC, Hyderabad	Member
10	Dr. S. N. Rai, NGRI, Hyderabad	Member
11	Dr. N.B. Narasimha Prasad, CWDRM, Kozhikode	Member
12	Prof. J S Rawat, Kumaun University, Almora	Member
13	Prof. K.C. Patra, NIT Rourkela	Member
14	Er. R K Khanna, Chief Engineer (Retd.), CWC	Member
15	Dr. N.C. Ghosh, Sc. F & Head GWH Division, NIH	Member
16	Dr. Rakesh Kumar, Sc. F & Head SWH Division, NIH	Member
17	Dr. C.K. Jain, Sc. F & Head EH Division, NIH	Member
18	Sh. C.P. Kumar, Sc. F & Head HI Division, NIH	Member
19	Dr. V. C. Goyal, Sc. F & Head RMO Division, NIH	Member-Secretary



## **Scientists from National Institute of Hydrology, Roorkee**

1. Dr. S. K. Singh, Sc. F
2. Dr. Sanjay Jain, Sc.F
3. Dr. Avinash Agarwal, Sc.F
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
8. Dr. D.S. Rathore, Sc.E2
9. Dr. A.K. Lohani, Sc.E2
10. Dr. R.P. Pandey, Sc.E2
11. Er. Omkar Singh, Sc.E2
12. Dr. Suhas Khobragade, Sc.E1
13. Dr. P.K. Bhunya, Sc.E1
14. Dr. S.P. Rai, Sc.E1
15. Dr.A R Senthil Kumar, Sc.E1
16. Dr. Anupama Sharma, Sc.E1
17. Dr. M.S. Rao, Sc.E1
18. Dr. Sanjay Kumar, Sc.E1
19. Dr. Surjeet Singh, Sc.E1
20. Dr. R.D. Mehta, Sc.C
21. Sh. S.K. Verma, Sc.C
22. Smt. Archana Sarkar, Sc.C
23. Sh. A.K. Dwivedi, 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 Vitthal 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