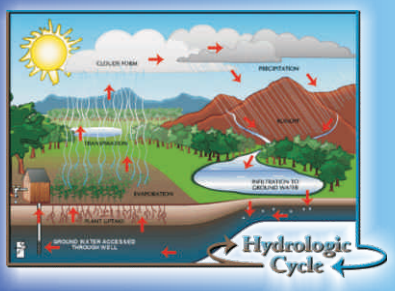
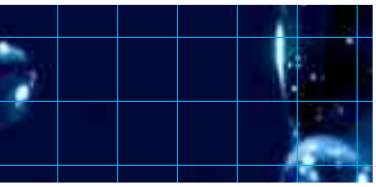
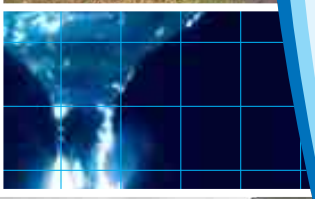
Issue 6 & 7 January & July 2013

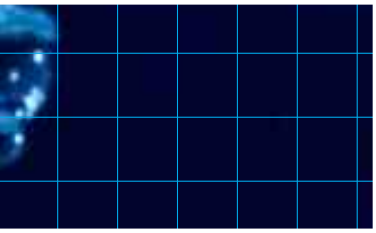
Hydrology for People™

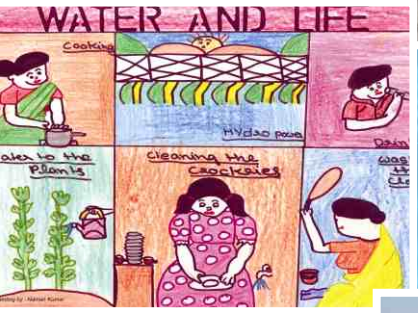


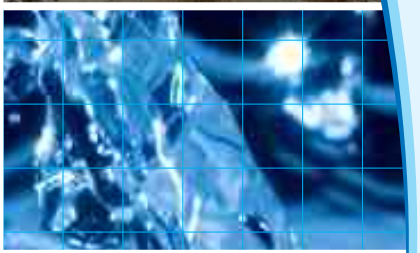
Newsletter of National Institute of Hydrology, Roorkee (India)

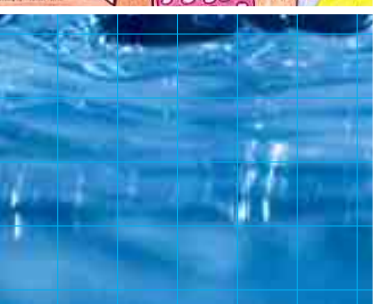












From Director's Desk

Water is the most important and perishable asset of our planet. On a global scale, we have only 0.75 percent accessible fresh water of the total water resources available on the earth. Our global economy, agricultural production, industrial growth, socio-economic structures, governance mechanisms and everyday life depends on this finite and vulnerable resource. In most parts of the world, including India, the water resources are under stress due to growing imbalance between the mounting demand for water and shrinking water reserve. In our country, the water table is falling due to intense ground water use, thus hampering our quest for the sustainable development. With increased prospects of feeding increased population in 2050, the industrial, individual and agricultural demand is expected to escalate dramatically. Also, the climate change is becoming a more and more important issue for growing water scarcity. This calls for awareness that water is very scarce and valuable natural resource and that we need to initiate innovative technological and management changes. Thus, we have to go for a 'blue revolution' to achieve food security and prevent a serious water crisis in the future.

National Institute of Hydrology has been conducting the research in the field of hydrology and water resources, over the last three decades. Many purpose driven studies and strategic projects were carried out to solve the various need based problems touching almost every sphere of water resources development. With growing interest of managing water resources under the constant threat of climate change, the Institute is gearing-up to conquer the challenges and fulfill the needs of the country via demand driven strategic studies. The Institute is also pro-actively contributing to the knowledge dissemination, mass awareness and capacity building programmes.

R D Singh

Editorial

Water is a key driver of economic and social development while it also has a basic function in maintaining the integrity of the natural environment. However water is only one of a number of vital natural resources and it is imperative that water issues are not considered in isolation. Managers, whether in the government or private sectors, have to make difficult decisions on water allocation. Drivers such as demographic and climatic changes further increase the stress on water resources. The traditional fragmented approach is no longer viable and a more holistic approach to water management is essential. Thus, comes the need of Integrated Water Resources Management (IWRM). IWRM envisages Social equity by ensuring equal access for all users (particularly marginalised and poorer user groups) to an adequate quantity and quality of water necessary to sustain human well being. Moreover, it supports Economic efficiency: bringing the greatest benefit to the greatest number of users possible with the available financial and water resources.

Global Water Partnership's definition says that IWRM is a process which promotes the co-ordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems. In changing scenario, supply-side solutions alone are not adequate to address the ever increasing demands from demographic, economic and climatic pressures; waste-water treatment, water recycling and demand management measures are being introduced to counter the challenges of inadequate supply. IWRM approach has now been accepted internationally as the way forward for efficient, equitable and sustainable development and management of the world's limited water resources and for coping with conflicting demands.

Hydrology has imperative role in ascertaining effectiveness of any IWRM programme. Hydrological studies aim at studying in detail various hydrologic processes which are prerequisites for IWRM .They provide useful insight into propagation of IWRM concept for sustainable development of water resources with community participation and evolve models of IWRM study for different hydrologic regions, for forward integration with Govt. schemes.

Publication of this newsletter is an attempt to rejuvenate the knowledge dissemination efforts of the Institute, with a flavour of 'connecting to the people'. The intent is to take the research findings to the community so that they are incited to develop interest in the scientific developments taking place in the country. This is the time to make information related with water reach all nooks of the country. And, NIH fraternity is zestful enough to do its bit in this endeavour.

Response to the previous issues has been encouraging. Your suggestions and feedback are welcome, and will help us in improving future issues!

V C Goyal

About National Institute of Hydrology

The National Institute of Hydrology (NIH), established in 1978 as an autonomous organization under Ministry of Water Resources (Government of India), is a premier R&D institute in the country to undertake, aid, promote and coordinate basic, applied and strategic research on all aspects of hydrology and water resources development. The Institute has its headquarters at Roorkee (Uttarakhand). To carry out field related research covering different regions of the country, the Institute has four Regional Centers located at Belgaum, Jammu, Kakinada and Bhopal, and two Centres for Flood Management Studies at Guwahati and Patna in Hydrology, Water Quality, Soil Water, Remote Sensing & GIS Applications, Groundwater Modelling and Hydrological Instrumentation.

The Institute acts as a centre of excellence for the transfer of technology, human resources development and institutional development in specialized areas of hydrology, and conducts user defined, demand-driven research through collaboration with relevant national and international organizations. The Institute vigorously pursues capacity development activities by organizing training programmes for field engineers, scientists, researchers and NGOs. NIH has so far completed more than 150 sponsored research and consultancy projects- the sponsors included Indian Army, PSUs, Planning Commission, National Productivity Council, State Government Departments, and central ministries of Science & Technology, Environment & Forests, Agriculture, Rural Development, etc. The Institute has undertaken a number of internationally funded projects, including those from UNDP, USAID, UNESCO, The World Bank, The Netherlands, Sweden and European Union. The Institute is presently participating in the World Bank funded Hydrology Project Phase-II.

Some of the significant contributions of NIH include studies for solution of real-life problems related to augmentation of water supply and water management in cities, glacier contribution in streamflow of Himalayan rivers for hydro-electric power projects, watershed development, water quality management plan for lakes, watershed development, storm water drainage network in cities, flood inundation mapping and flood risk zoning, and water quality assessment in major cities. The Institute is actively pursuing the IEC activities and mass awareness programmes of the Ministry of Water Resources. NIH works as a nodal centre of the Ministry for effective implementation of the National Water Mission.

VISION

Providing leadership in hydrologic research through effective R&D solutions for achieving sustainable development and self-reliance of the water sector in India

Mission

- Develop cost-effective techniques, procedures, software packages, field instrumentation, etc. for hydrological studies

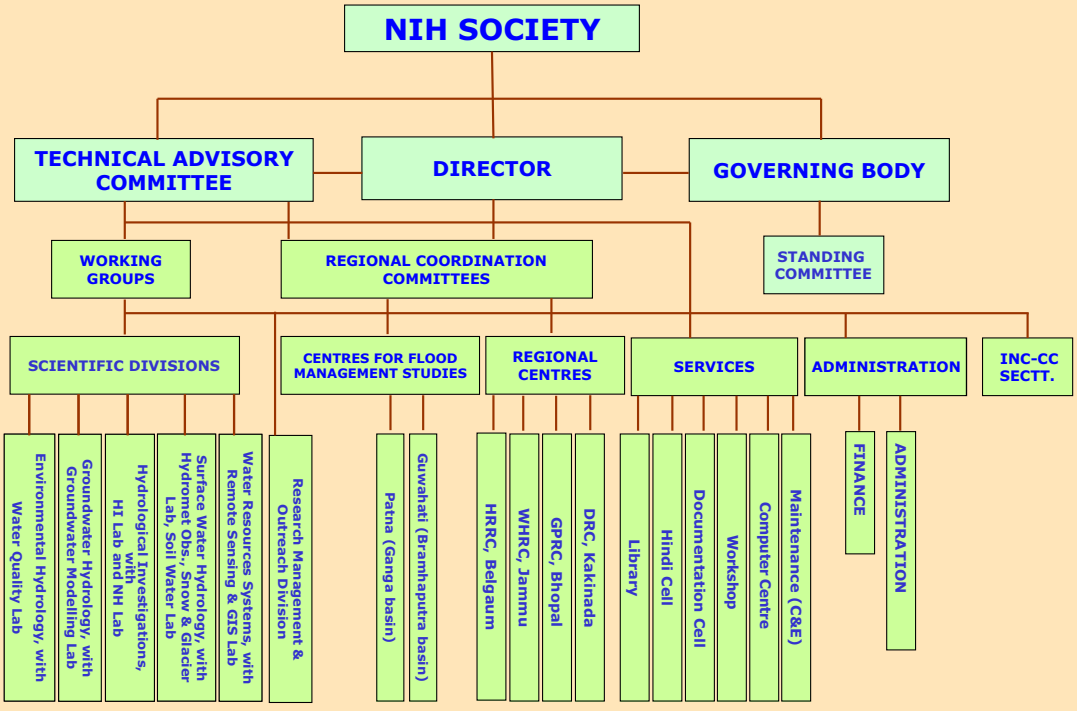
MISSION

- Develop cost-effective techniques, procedures, software packages, field instrumentation, etc. for hydrological studies
- Study scenarios of water resource availability under varying hydro-geological, climatic, socio-cultural conditions through modelling techniques
- Assess impact of climate change on water resources and suggesting measures for mitigation, adaptation and resilience
- Propagate application of emerging technologies for water resources development and management
- Provide cost-effective R&D solutions to need-based water-related problems
- Provide reliable advice to the various stakeholders
- Empower community through capacity building and awareness on water resources development and conservation

THRUST AREAS

- Water Resources Planning and Management
- Ground Water Modeling and Management
- Flood and Drought Prediction and Management
- Snow and Glacier Melt Runoff Estimation
- Prediction of Discharge in Ungauged Basins
- Water Quality Assessment in specific areas
- Hydrology of Arid, Semi-arid, Coastal & Deltaic Zones
- Reservoir / Lake Sedimentation
- Impact of Climate Change on Water Resources
- Application of modern techniques to provide the solution to hydrological problems

ORGANISATIONAL STRUCTURE



Hydrology Primer

•Hydrology is the science that treats the waters of the earth, their occurrence, circulation, movement and distribution, their chemical and biological properties and their reaction with the environment, including their relation to living things. The domain of hydrology embraces the full life history of water on the earth.

- The hydrologic cycle is a continuous process that exists on the earth by which the water from over and beneath the earth's surface (including the ocean) is transported to the atmosphere through the process of evaporation and evapo-transpiration from the vegetative cover and to the land surface through the process of rainfall and snowfall, and reaches to the surface and groundwater storages, and the ocean by means of the various paths.
- The various phases of the hydrologic cycle may be short, or it may take millions of years. Water may be captured for millions of years in polar ice caps, groundwater reservoirs (aquifers) and in the sea.
- The hydrological cycle moves enormous quantities of water about the globe. However, much of the world's water has little potential for human use because 97.5% of all water on earth is saline water. Out of remaining 2.5% fresh water, most of which lies deep and frozen in Antarctica and Greenland, only about 0.26% flows in rivers, lakes and in the soils and shallow aquifers which can be readily used.
- Certain hydrological problems and weaknesses have affected a large number of water resources all over the world due to the effect of Climate Change due to Global Warming.
- In case of India, floods and droughts affect vast areas of the country, transcending state boundaries. One-sixth area of the country is drought-prone. Out of 40 million hectares of the flood prone area in the country, on an average, floods affect an area of around 7.5 million hectares per year.

Role of Hydrologist

- The hydrologist plays very important role in solving water-related problems in society such as quantity, quality and water availability or basin water budgeting through application of the proper scientific knowledge and mathematical principles.
- The hydrologist studies the fundamental transport processes to be able to describe the quantity and quality of water as it moves through the hydrologic cycle (evaporation, precipitation, streamflow, infiltration, groundwater flow, and other components).
- Hydrologists estimate the volume of water stored underground by measuring water levels in local wells and by examining geologic records from well-drilling to determine the extent, depth and thickness of water-bearing sediments and rocks. Before an investment is made in full-sized wells, hydrologists may supervise the drilling of test wells. They note the depths at which water is encountered and collect samples of soils, rock and water for laboratory analyses. They may run a variety of geophysical tests on the completed hole, keeping and accurate log of their observations and test results. Hydrologists determine the most efficient pumping rate by monitoring the extent that water levels drop in the pumped well and in its nearest neighbors.
- The engineering hydrologist, or water resources engineer, is involved in the planning, analysis, design, construction and operation of projects for the control, utilization, and management of water resources.
- He may also deal with the study concerning the municipal water supply, irrigation water supply and management, mitigation of floods and droughts, integrated watershed management, ground water recharge and solving reservoir sedimentation problems.
- Scientists and engineers in the field of hydrology may be involved both in the field investigation and office work.

International Decade for Action Water for Life 2005–2015

World Water Day, 22 March 2005, heralded the start of the International Decade for Action proclaimed by the United Nations General Assembly. 'Water for Life' calls for a coordinated response from the whole United Nations system. The timing is significant: the end of the action decade in 2015 is the target date for achievement of many of the Millennium Development Goals (MDGs). Those goals were amplified by the 2002 World Summit on Sustainable Development in the Johannesburg Plan of Implementation, which set the following target:

HALVE, BY 2015, THE PROPORTION OF PEOPLE WITHOUT SUSTAINABLE ACCESS TO SAFE DRINKING WATER AND BASIC SANITATION.

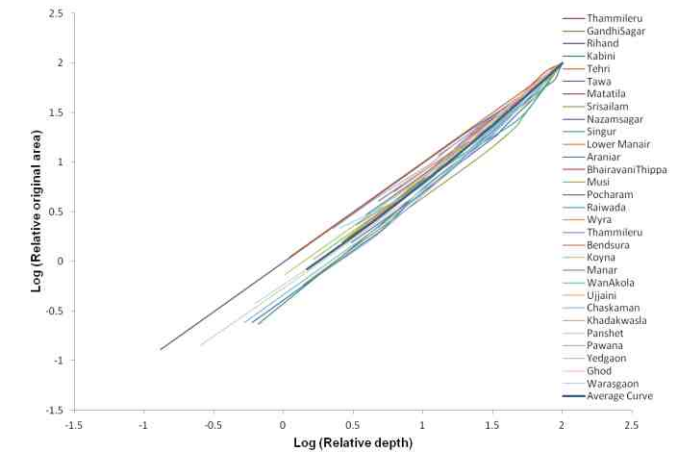
- In the field investigation, they may collect basic hydrological, geological, meteorological and water quality data, sometimes from remote and rugged terrains with use of measuring instruments and equipments. While, in the office, they may do many jobs that include the assessment of water quality in the laboratory, remote sensing data processing and analysis using GIS, interpretation and analysis of

- field data, modelling studies for flood hazards mitigation, groundwater replenishment, water-logging problems, sea water intrusion, reservoir operations in the command area and assessment of their impacts on environment.

PROJECTS SOLVING REAL LIFE PROBLEM

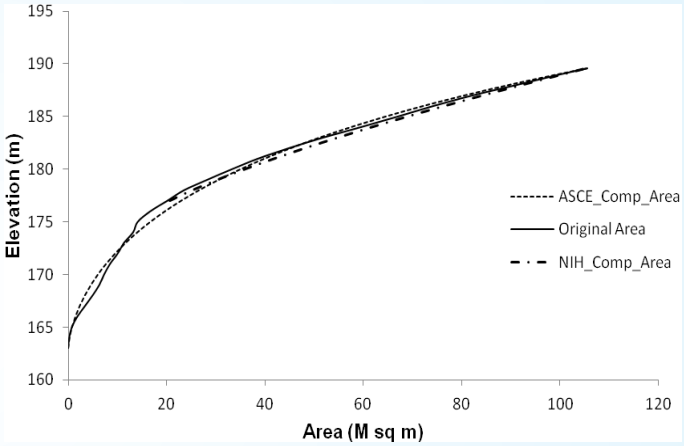
Mathematical Representation of Elevation-Area-Capacity Curves for Indian Reservoirs

Elevation-Area-Capacity (EAC) curves of a storage reservoir are among the primary requirements for various kind of reservoir analysis. A river basin may contain a large number of reservoirs/hydraulic structures. Though some of the general details like MDDL, FRL, and storage capacity/reservoir area at FRL and MDDL may be available from various sources, it may be difficult to gather EAC tables for various reservoirs. In this study, an effort has been made to characterize the elevation-area and elevation-capacity curves for Indian reservoirs. The elevation-area-capacity tables of 84 Indian reservoirs have been used to develop such relationships. Depending on the availability of type and range of original and revised EAC tables for different reservoirs, the reservoirs have been classified into four types: Gorge, Hill, Flood plain – foothill, and Lake. Dimensionless plots (relative depth vs. relative area or relative capacity) in the live storage zone of reservoirs in normal and Log scales have been prepared for each reservoir. Such plots have been clubbed for all the reservoirs for deriving representative unique mathematical equations for the area and capacity curves. The methodology has been programmed in MS-EXCEL. From the available plots, average dimensionless curves have been plotted and generalized mathematical equations have been derived which can be used to approximate the elevation-area and elevation-capacity curves within the live storage zone of a reservoir.

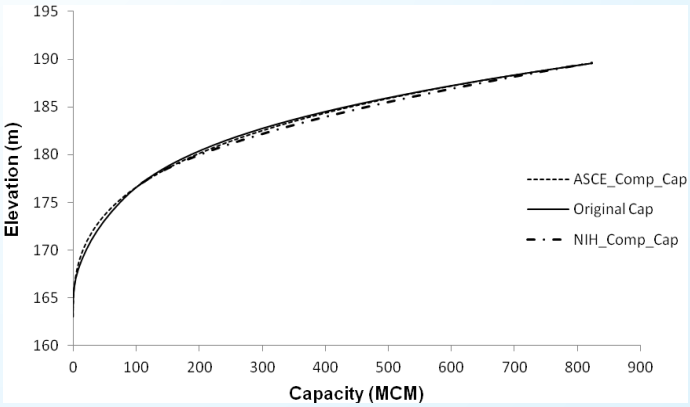


Plot of relative original area curves for various reservoirs used in the analysis

The developed mathematical relationships (within the live storage zone) and the method proposed by J. Mohammadzadeh-Habili et. al (2009) have been used to investigate their applicability for Indian reservoirs. A number of reservoirs, for which the data requirements of the two methods could be met, have been selected and comparative plots of areas and capacities from the two methods have been prepared in conjunction with the original curves. It is seen that the two methods approximate the intermediate areas and capacities quite close to the observed values. However, it needs to be mentioned that the developed equations only approximate the intermediate area and capacity curves of a reservoir. For those analyses which are highly sensitive to the accurate specification of reservoir areas and capacities at intermediate elevations, elevation-area-capacity table may be obtained from the capacity surveys.



Plot of observed and computed elevation - area curves for Dharoi reservoir



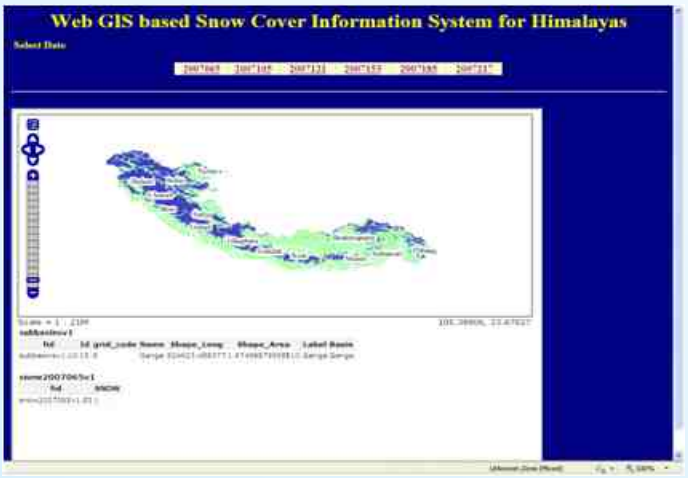
Plot of observed and computed elevation – capacity curves for Dharoi reservoir

Web GIS Based Snow Cover Information System for the Himalaya

Himalaya is 'Abode of snow'. In high altitude ranges in Himalaya, precipitation is received in solid form which replenishes glacier and snow fields in Himalaya. Governed by annual climatic variations, there exists accumulation and ablation cycle in Himalaya. In

winter, accumulation may be predominant. In summer, both accumulation and ablation may take place. In the most part in Himalaya, maximum snow extent happens in February to March and minimum extent happens in July and August months. Ablation is responsible for much of the perennial flow in rivers originating from Himalaya. Variation in snow extent relates to runoff generated from snow and glacier covered areas. This information may be obtained from remotely sensed data. On board Terra and Aqua satellite, 36 channel Moderate Resolution Imaging Spectroradiometer (MODIS) sensors provide twice daily coverage for most part of the earth. MOD09A1 is 7- channel 8-day composite data product available at 500 m pixel size. The product provides reduced cloud obstruction and is useful for monitoring of snow extent in basins. The satellite data and snow cover thematic maps are available in digital form for download. Availability of these maps in Web GIS for visualization and as Services is limited and thus a Geoserver Application is implemented here.

Snow cover was delineated using Normalized Difference Snow Index (NDSI) and Band 2 data with thresholds of 0.4 and 0.11 respectively. The maps were morphologically cleaned and converted to polygon maps. Basin boundaries were based on automatic delineation from SRTM 250 m data, adjusted for Indus basin using existing maps. GeoServer OpenLayers web pages for these layers were created. For year 2007, Indus sub basin has highest (maximum) snow cover area of 112573 sq. km. Other high snow extent sub basins are Brahmaputra and Satluj with snow cover of 54536 and 32901 sq. km respectively. Ghaghara, Chenab, Dibang, Jhelum, Kosi and Gandak have snow cover extent ranging from 19 to 10 thousand sq. km. Minimum snow cover extent in Indus basin is 14919 sq. km. Brahmaputra, Chenab and Kosi have minimum snow cover ranging from 2800 to 2000 sq km. Ganga, Gandak and Satluj have minimum snow cover ranging from 1190 to 940 sq. km. Web GIS page for snow cover extent in Himalaya is shown in Fig. 1.



Assessment of water Quality in Hindon River Basin

The river Hindon is subjected to varying degree of pollution caused by numerous untreated and/or partially treated waste inputs of municipal and industrial effluents. The main sources of pollution in river Hindon include municipal and industrial (sugar, pulp and paper, distilleries etc.) wastes from Saharanpur, Muzaffarnagar and Ghaziabad urban areas. The water quality of the river Hindon gets further deteriorated due to confluence of river Kali and river Krishni. The river is highly influenced due to heavy metals, pesticides, which enter the river system, by direct discharges of municipal and industrial effluents and surface runoff. These toxic pollutants will ultimately reach the groundwater and will enter in the food chain posing a threat to human health because of their carcinogenic nature. In view of these facts, the study of Hindon river basin was carried out with the objectives: i) to monitor and assess of water quality of Hindon river ii) to examine the suitability of ground water in the vicinity of river Hindon for various designated uses iii) to characterize different point sources contributing river Hindon iv) to estimate rate of re-aeration and de-oxygenation coefficients in different reaches of Hindon river v) to estimate downstream DO deficit in different stretches of river using Streeter-Phelps oxygen sag equation and vi) to explore possible remedial measures for improvement of river water quality. Water sample from river Hindon, wastewater samples from drains and ground water samples from various abstraction sources at various depths from different locations used for drinking purpose were collected in the pre-and post monsoon season during 2012 and were analysed for various water quality parameters, viz., physico-chemical and bacteriological parameters, heavy metals and pesticides. For the estimation of re-aeration and de-oxygenation coefficients in different reaches of Hindon river, the cross sections, flow velocities and water temperature were also measured during the water quality monitoring programs. Based on these investigations, the flow of water at respective monitoring locations in the river was computed. A relationship between mean stream depth (m) and discharge (cumec) obtained at various locations in the Hindon river (including drains/tributaries) was developed for October 2012. The R2 of the developed Equation (y=11.204 x2.2918) was found 0.65. The values of re-aeration coefficients and de-oxygenation coefficients for different stretches of river Hindon were computed and the results of estimated BOD at different sampling sites are well in agreement with observed values.

The water quality data for pre- and post-monsoon seasons was processed as per BIS and WHO standards to examine the suitability of ground water for drinking

purpose. Spatial distribution maps were prepared in the form of contour diagrams to identify degraded water quality zones. Water quality standards have been violated for TDS, hardness, alkalinity, Ca and Mg at few locations. Nitrate concentration in few of the ground water samples exceeded the maximum permissible limit of 45 mg/L, which may be attributed to contamination by domestic waste disposal. Bacteriological contamination was observed in few ground water samples in the vicinity of river Hindon, which may be attributed to unorganized sewerage system in the study area. The concentrations of Fe, Mn, Ni, Cr, Pb and Cd in few ground water samples exceeded the permissible limit prescribed for drinking purpose, which may be attributed to the leaching of effluent containing wastes from different industries operating in the basin. The concentration of α-BHC, γ-

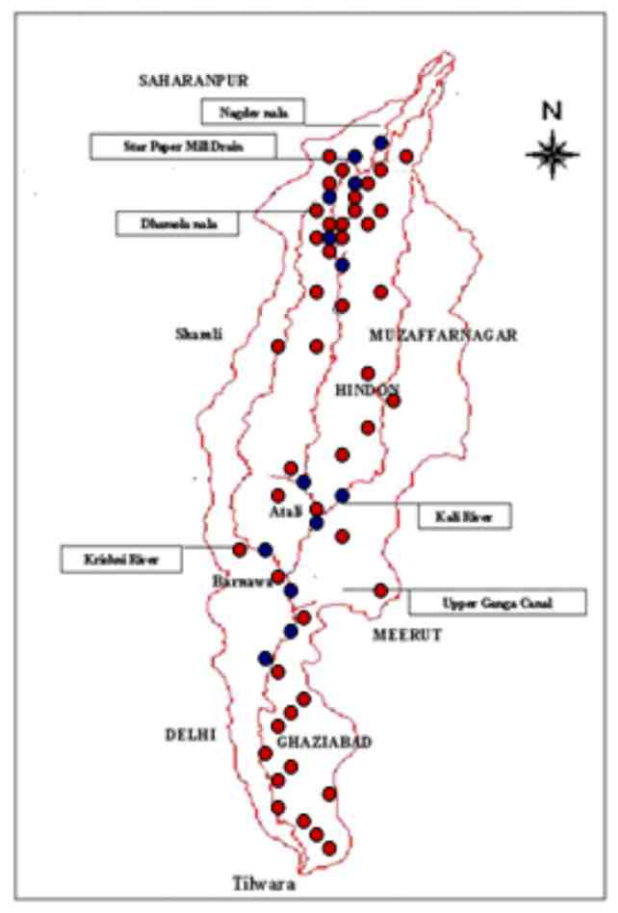


Fig. 1Map showing locations of ground water sampling sites in Hindon river basin

BHC and Methoxychlor were detected in few ground water samples of the study area, which may be attributed to extensive use of these pesticides in agricultural practice in the study area, which might have leached to ground water system. Most of the ground waters fall between good to excellent type on the basis of water quality Index. In post-monsoon season, the quality of ground water was observed to be improved.

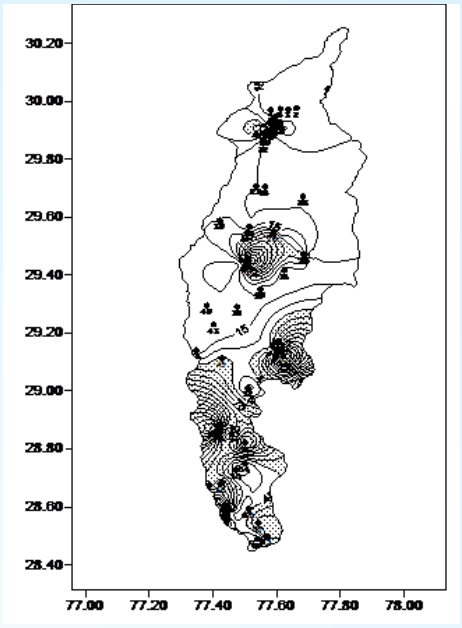


Fig. 2 Nitrate distribution (Pre-monsoon)

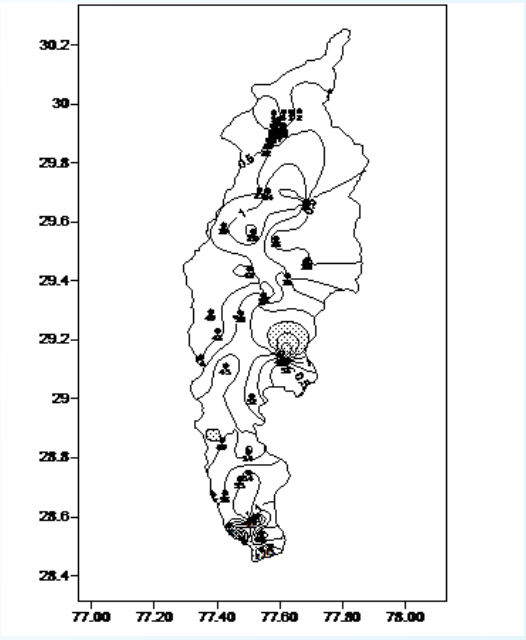


Fig. 3 Fluoride distribution (Pre-monsoon)

Fig. 4 River Hindon Sampling

Mechanism controlling ground water chemistry revealed that almost all collected groundwater samples from Hindon river basin falls in rock dominance zone suggesting evolution of water chemistry influenced by water-rock interaction. Assessment of suitability of the groundwater of the study area for irrigation purpose on the basis of total soluble salts, SAR, RSC revealed that these waters are of medium to good quality for irrigation purpose.

Drainage Area Mapping and Hydrological Studies in and Around Gurha (W) Lignite Block in Kolayat Tehsil of Bikaner District, Rajasthan

For ascertaining the drainage networks pattern of the area, and for assessing the impact of open cast lignite mining from its deposit located in the Gurha (W) in Bikaner district, on the hydrology, hydro-geology and eco-system of the area and for suggesting suitable remedial measures to restrain likely changes of those components, the Rajasthan State Mines and Minerals Ltd. (RSMML), a Govt of Rajasthan Enterprise, has referred the project entitled "Drainage area mapping and hydrological studies in and around Gurha (W) Lignite Block in Kolayat tehsil of Bikaner District, Rajasthan" to the National Institute of Hydrology (NIH), Roorkee.

The study outcomes deal with the analysis of the following:

(I) Delineation of the drainage network, drainage area characterization describing surface drainage pattern of the area, and preparation of Digital Elevation Map.

(ii) Land-uses, habitat settlements, water bodies, water uses in and around the study area,

(iii) Hydrology and geo-morphological characteristics of the area.

(iv) Geological setups, regional geological settings, surface and sub-surface geological formations, and characterizations, analysis of borelog data, stratification of geological formations, etc.

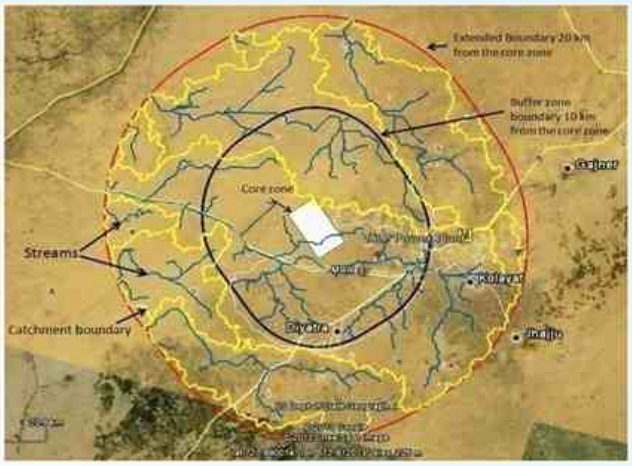
(v) Hydro-geology, hydro-geological characterization, groundwater scenarios-fluctuation and flow direction, etc. Groundwater balance, groundwater potential estimation, groundwater seepage estimation, disposal of mine drainage water, etc.

(vi) Isotopic characteristics of groundwater, groundwater dynamics, surface water and groundwater interaction.

(vii) Groundwater quality assessment.

(viii) Impact of mining activities on water resources and general eco-system.

The study area is a part of the Bikaner district, located about 50 km Southwest of Bikaner city in the Gurha (West) block of Kolayat tehsil between Longitudes 720 34'15" E to 730 00'40" E and Latitudes 270 40' 39" N to 280 05' 36" N.



Snapshot of the study area as seen from the 'Google earth' showing boundaries of the core zone, buffer zone and extended zone 'along with discretized drainage networks and their catchment boundaries.

Following recommendations have been made to encounter the probable risks:

(a) For overcoming the problem of suspended solids in the mine drainage water, cascade provision of settling ponds would be needed before discharge of mine drainage water to the natural drainage system. If found necessary, caustic soda(NaOH) can be added to the setting ponds to enhance the pH of the mine drainage water to a level of 6.5.

(b) Groundwater of Madogarh, Bithnok and Tejpura village area are not suitable for drinking without treatment for salinity removal to the extent of the permissible limit. Some degrees of treatment for salinity removal before use of groundwater for drinking purposes would be necessary. For supplying the needs of drinking from the groundwater source of Madogarh/Bithnok area to the workers and officials of RSMML to be located at the mining area, a desalinization treatment technique is recommended.

(c) For encountering the problem of atmospheric environmental hazards due to the disposal of overburden materials, water can be spread to the stacked soil materials from time to time.

(d) For overcoming the problem of lowering of groundwater level because of dewatering of mining pit and for diluting the groundwater quality threats, some rainwater harvesting and artificial groundwater recharge schemes in potential areas, particularly in the Kolayat, Diyatra, and Madhogarh area can be promoted. These artificial recharge structures can be constructed across/alongside of the ephemeral

drainage channels to catch monsoon runoffs for groundwater recharge. Check dam, Sand dam or Gully Plug types structures based on the condition of site can be used for rainwater harvesting and artificial recharge.

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

Network planning is the backbone of any monitoring system. In hydrology, monitoring of data is mostly site specific and proper representation of this data on spatial scale requires proper network planning. Therefore, going for any kind of instrumentation in any area or basin, planning for the establishment of network stations for instrumentation is of prime importance. The present study is, thus, in the context of planning a meteorological/hydrological/hydro-geological/hydro-chemical instrumentation network for data collection system to develop an Integrated Water Resources Management (IWRM) strategy of a basin. The data and information of the Bina basin, a tributary of Betwa river, has been used in the present study for planning the network design and instrument planning.

The study entitled "Hydrological Instrumentation and Data Monitoring Planning for Integrated Water Resources Management (IWRM) of the Bina River Pilot Basin" has been envisaged to examine the adequacy and gaps of existing databases and network of data monitoring schemes in place to help make realistic assessment of potential resources. It is further envisaged to develop methods and guidelines for hydrological data monitoring network planning, and assessment of instrumentation requirement of the Bina river basin using standard scientific approaches. The report gives detailed analysis of different methods and techniques and finally helps in identifying the gaps of hydrological data monitoring network. From the analysis, it is found that the basin needs 01 additional rain gauge, 01 full-climatic station, 02 additional stream gauge stations, 183 observation wells, 22 water quality sampling stations, 05 gauges at reservoirs and canals, 02 sediment discharge stations and 08 soil moisture gauging sites. The locations where these data monitoring stations will be required, have also been suggested. The methodologies and techniques suggested in the report can be used for designing hydrological data monitoring network system of other river basins as guiding document.

Publications in Journal

1. Sivakumar, N., Devadutta Das, N.P. Padhy, A R Senthilkumar, Nibedita Bisoyi, "Status of pumped hydro-storage schemes and its future in India", J. of Renewable and Sustainable Energy Reviews, 19(2013), pp.208-213. Singh, Surjeet, "A simplified analytical solution for predicting water table fluctuation subjected to variable recharge and variable ET in a sloping aquifer" in International Journal of Ecology and Development(2013), 24(1): 49-61.
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9. R. Venkata Ramana , B. Krishna , S.R. Kumar , N. G. Pandey (2013) "Monthly Rainfall Prediction using Wavelet Neural Network analysis" Accepted in Journal of Water Resources Management. WARM-D-12-00430.

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23. Senthil Kumar, A. R., Goyal, Mansih Kumar, Ojha, C. S. P., Singh, R. D., and Swamee, P. K. (2013). "Application of ANN, Fuzzy Logic and Decision Tree Algorithms for Modelling of Streamflow at Kasol in India." Water Science and Technology, Reference No: WST-EM13448R1. Accepted on 31.07.2013. (IF=1.102)

24. Satyaji Rao, Y.R., Keshari, A.K and Gosain, A.K (2013). Nitrogen Loading from Septic Tanks in the Coastal Plains. Asian Journal of Water, Environment and Pollution, 10(4):65-76.

Workshop/ Conference /Symposium attended by the Scientists/Staff

S.No	Title	Duration	Place
1.	International Conference on "Interdisciplinary Engineering and Sustainable Management Sciences"	Feb-22-23, 2013	Vickram College of Engg., Enathi Tamilnadu
2.	3rd National Conference on "Innovation in Indian Science Engineering & Technology"	Feb. 25-27, 2013	CSIR-NPL & IARI, New Delhi
3.	International Humboldt Kolleg on Management of water, Energy and Bio-Sciences in changing climate regime: Emerging issues and environmental challenges"	Feb.8-9, 2013	JNU, New Delhi
4.	Workshop on "GW Management in Uttarakhand State"	Feb15, 2013	Dehradun
5.	International Conference on Water Desalination, Treatment and management & Indian Desalination Assessment Annual Congress -2013	Feb.21-22, 2013	Jaipur
6.	International Seminar on "Hydro Power & Sustainable Development"	Feb.21-22, 2013	Bhubneshwar
7.	National Conference on "Assam Water Conference 2013"	Feb.21-22, 2013	Guwahati
8.	National Conference on "Recent perspective on Lakes, Rivers & Coastal wetlands"	Mar.24-25, 2013	Annamalai Univ. Annamalainagar
9.	National Seminar on "Clean water & Health"	April 5-6, 2013	Ghaziabad
10.	National Conference On "Sustainable water Res. Planning & Management and Impact of Climate Change"	April 5-6, 2013	BITS, Pilani
11.	Attending the Conference on "India Water Week-Efficient Water Management: Challenges and Opportunities"	April8-12, 2013	MoWR & NWDA, New Delhi
12.	8th International Congress on Climate change territorial classification & socio-economic crisis (ICCC-2013)	April 23-27, 2013	Bharathidasan Univ., Tiruchirappalli
13.	National Seminar on "Prospective of Interdisciplinary Research in Basic Sciences (NSIRBS)"	May 30-31, 2013	Kakinada
14.	National Workshop on "Climate change impacts in Water, Sanitation & Health (WASH)"	June 26-27, 2013	LBS National Academy, Mussoorie
15.	International conference on "Water, Wastewater and Isotope Hydrology (IC-WWISH-2013)	July 25-27, 2013	Bangalore
16.	All India Seminar on "Conservation & Protection of Underground Water"	Sept.21-21, 2013	Dehradun
17.	National Conference on "Managing Information resources in Digital Environment"	Sept. 21, 2013	New Delhi
18.	Asia Pacific Workshop on "Forest Hydrology, Water & Forests -Beyond Traditional Forest Hydrology	Sept.23-25, 2013	Dehradun
19.	Conference on "Sustainable Water Resources Development and Management (SWARDAM-2013)	Sept. 30-Oct.1, 2013	Aurangabad
20.	National Workshop on " Advances Soft Computing Techniques in Hydrology & its Applications (ASCTHA-2013)	Oct.21-25, 2013	Roorkee
21.	International Conference on "Advances in Water Resources Development & Management	Oct.23-27, 2013	Chandigarh
22.	International Conference on "Harmony with Nature in context of Eco-technological Intervention and Climate Change (HARMONY-2013)	Nov.11-13, 2013	Gorakhpur
23.	National Conference on "Hydrology with special emphasis on rain water harvesting (NCHRWH-2013)	Nov.15-16, 2013	Jaipur
24.	National Seminar on "Climate change impacts on water resources systems"	Nov.27-29, 2013	Vadodara
25.	International Conference on "Hydraulics, Water Resources, Coastal and Environmental Engg."	Dec.4-6, 2013	IIT, Madras
26.	International Rajbhasha Conference on Vishav ki pragati me vigyan aur prodigiki ka yogdhan"	Dec.5-7, 2013	Delhi
27.	National Seminar On "Recent Approaches to Water Resources Management (RAWRM-2013)	Dec.9-10, 2013	Dhanbad
28.	Ist International Forum on "Asian Water Environment Technology"	Dec.18-20, 2013	New Delhi

Organization of Workshops/ Training Courses/ Seminar/ Symposia

S.No.	Name of the Course	Duration	Place
1.	TOT DSS(P)	April 8-19, 2013	Roorkee
2.	Conservation and Management of Sukhna Lake	May 7, 2013	Chandigarh
3.	Hydrologic modeling using RS-GIS with reference to climate change	June 3-7, 2013	Roorkee
4.	Knowledge Dissemination Workshop of Kharun & Kodar	June 28, 2013	Raipur
5.	Workshop on DSS(P) Software	Aug.8, 2013	New Delhi
6.	Climate change and its impact on Water Resources	Aug.27-29, 2013	Belgaum
7.	Integrating hydrology, climate change & IWRM with Livelihood issues: Development of methodology & DSS for Water Scarce Bundelkhand region in India	Aug.23, 2013	Tikamgarh
8.	Training workshop on Analysis on Hydrological data	Sept.23-27, 2013	Belgaum
9.	Workshop on Water Conservation in Bina Sub-basin of Bundelkhand Region (M.P.)	Sept.27, 2013	Bina
10.	Advance of computing techniques in Hydrological modeling	Oct.21-25, 2013	Roorkee
11.	Role of Isotopes in Ground Water Management in India	Nov.12-14, 2013	Roorkee
12.	Integrated Catchment Modeling (ICMOD-2013)	Nov.11-15, 2013	Roorkee
13.	Significance of constructed wetland technology for treatment & reuse of sewages & industrial wastewaters	Nov.20-21, 2013	Mumbai
14.	Project Hydrology under PBS	Nov.20-22, 2013	Goa
15.	Training Course on "Long lead-time ensemble river and flood forecasting	Nov.18-23, 2013	Roorkee
16.	Training programme on "Hands on Advanced Instruments of Water Quality Testing"	Dec.2-6, 2013	Roorkee
17.	Workshop on "Spatial Analysis with reference to watershed modeling using TNPmips software	Dec.13-14, 2013	Roorkee
18.	Training Course on "Soil & Water Assessment Tool (SWAT) Modelling	Dec-16-20, 2013	Roorkee
19.	Orientation Training Couse for Newly Appointed Scientsis	Dec.17-21, 2013	Roorkee

Important Meetings (Director)

Sl. No.	Date(s)	Meeting – Subject	Place
	8-10.1.2013	Key Note Address on 'Land cover and land use change dynamics and their impacts in South Asia' at Karunya University, Coimbatore.	Coimbatore
2	29.1.2013	Lecture on "Disaster Management in Hills and Coastal Areas' during 5 days training course on "Role of Forestry sector in disaster management" at Forest Research Station, Dehradun.	Dehradun
3	5-6.2.2013	Key Note Address in seminar on 'Water Quality Assessme nt and Management of Kerala State' during 5-6 Feb. 2013.	Thiruvananthapuram
4	14-15.2.2013	Inaugurated a workshop on "SAFE WATER CAMPAIGN" under the aegis of Water Management Forum (IEI) organized by the Institutions of Engineers (India) (Punjab & Chandig arh State Centre).	Chandigarh
5	8.3.2013	Key Note Lecture in National Seminar on "Enhancing Water Productivity in Agriculture' in the Institute of Agricultural Sciences, BHU, Varanasi.	Varanasi
6	15.3.2013	Chaired the 14 th meeting of Reservoir & Lakes Sectional Committee, WRD 10 .	BIS, New Delhi
7	15.3.2013	Panelist for the topic "Impact of Climate Change on Water Resources during the session on 'Water & Waste Water Management in Industry' under the Seminar on "Sustainability: Issues, Challenges and Path Forward" organized by Indian Oil Corporation Ltd.	New Delhi
8	18.3.2013	Acted as a Peer and Subject Expert for one day Workshop on 'Mainstreaming Climate Change in Key Sectors' at New Delhi organized by Lal Bahadur Shastri Academy of Administration.	Mussorie

9	21.3.2013	Brain Storming Session on "Stakeholders' Cooperation and Participation in Developing IWRM Action Plan" organized by NIH.	India Habitat Centre, New Delhi
10	22.3.2013	1st meeting of High Level Steering Committee – National Water Mission under the Chairmanship of Secretary, MoWR.	New Delhi
11	25.3.2013	4th meeting of Indian National Committee on Climate Change (INCCC) Chaired by the Special Secretary (WR).	New Delhi
12	4.4.2013	Attended the Parliamentary Standing Committee on Water Resources for Oral evidence of the representatives of the MoWR in connection with the examination of demands for grants (2013-14) at Parliament Annexe.	New Delhi
13	10.4.2013	Signed MoU between NIH & CGWB on 'Isotopic stu dies for the identification of different aquifer groups, their recharge areas and groundwater dynamics in Upper Yamuna River Plains and held discussions with Dr. Pradeep Agarwal, Head, Isotope Division, IAEA, Vienna.	New Delhi
14	1-2.5.2013	Chaired Region al Coordination Committee (RCC) meeting of DRC, Kakinada.	Hyderabad
15	08.5.2013	Attended 'Review of progress of development and implementation of DSS(P) and plan of DSS(P) sustainability activities' and a Review Committee meeting under HP-II.	CWC, New Delhi
16	23.7.2013	Attended 5th meeting of INCCC under the Chairmanship of Special Secretary (WR).	MoWR, New Delhi
17	29.7.2013	1st meeting of the Sub-Committee of Standing Advisory Committee (Sub-SAC) of MoWR under the Chairmanship of Secretary (WR).	New Delhi
18	05.8.2013	माननीय मुख्यमंत्री, उत्तराखण्ड की अध्यक्षतामें उत्तराखण्ड के पर्यावरण तथा पारिस्थितिकीय सुरक्षा सुनिश्चित करने हेतु विभिन्न पर्यावरणीय सूचकांक विकसित करने के संबंध में आयोजित बैठक में भाग लिया.	देहरादून
19	14.8.2013	Hindi Salahakar Samiti meeting under the Chairmanship of Hon'ble Union Minister for Water Resources at MoWR.	New Delhi
20	19-20.8.2013	Chaired 12th RCC meeting of the NIH Centre for Flood Management Studies (CFMS).	Patna
21	21.8.2013	6th meeting of Expert Committee- CCP Division, DST.	New Delhi
22	27.8.2013	1st meeting of the Expert Committee on 'Water Footprint and Water Audit Standards' at MoWR.	New Delhi
23	22-23.9.2013	2nd meeting of the Expert Committee on 'Water Footprint and Water Audit Standards' at MoWR.	New Delhi
24	24.9.2013	Key Note Address in workshop on 'Forest Hydrology' and on the sub-theme: Modern Tools & Techniques in Forest Hydrology at FRI.	Dehradun
25	22-23.10.2013	Key Note Address in International Conference on 'Advances in Water Resources Development & Management (AWRDM-2013)' at Centre of Advanced Study, Dept. of Geology, Punjab Univ.	Chandigarh
26	07-9.11.2013	Key Note Address in the International Workshop on 'Climate Change Impact and Social Adaptation' at CURAJ,	Ajmer (Raj.)
27	21.11.2013	1st meeting of the Committee constituted for Independent Investigations of Selaulim Irrigation Reservoir for Pollution and Mitigation Steps at CSMRS.	New Delhi
28	12-13.12.2013	Conference on "Promoting Hydro Power" A Counter Strategy against Rising Fossil Fuel Prices" and participated in the session 5: Water, Environment Management & Forest Clearances: Mitigating the Environment Impact of Hydro Power Project as one of the Speakers – organized by IPPAI.	New Delhi

Mass Awareness

S.No.	Activities	Organised by & Date
1.	Groundwater Conservation and Development in Kandi Region, Punjab	16 April 2013, Bhaddi (Punjab)
2.	Water Conservation & Water Quality	4 May, 2013, Vill. Matlabpur, Distt. Haridwar
3.	Water Conservation & Water Quality	25 May, 2013, Vill. Banjarwala, Distt. Haridwar
4.	Water conservation & Water Quality	28 July, 2013, Vill. Brahampur, Distt. Haridwar
5.	Importance of water conservation to the general people – Pad Yatra	30 June, 2013, Rc Patna with CWC, CGWB, GFCC etc.
6.	Value of water and data measurement	30 July 2013 at RC, kakinada
7.	Water Conservation & Water Quality	28 July, 2013, Vill. Gumaniwala, Block Doiwala, Distt. Dehradun
8.	Water Conservation	31 Aug., 2013 at Kakinada
9.	Water Conservation & Water Quality	31 Aug. 2013 Vill. Pitthuwala, Dehradun
10.	Water Conservation	17 Sept., 2013 at Kakinada
11.	Debate Competition on the theme Water Conservation for School Children of Class IX-XII	19 Sept., 2013 at NIH, Roorkee
12.	Essay Competition on Water Conservation and Water Quality for School Children of Class VI-VII	20 Sept., 2013 at NIH, Roorkee
13.	Drawing Competition on Water Conservation for School Children of Class III-V	23 Sept., 2013 at NIH, Roorkee
14.	Quiz Competition on Water Conservation and Water Quality for Women Participants of Degree Colleges	24 Sept., 2013 at NIH, Roorkee
15.	Water Conservation	5 Oct., 2013 at Roorkee for Panchayati Raj Institutions
16.	Vigilance Awareness Week	Oct.28-Nov.1, 2013 at Roorkee
17.	Promoting good Governance-positive contribution of Vigilance	30 Oct.2013 at Patna
18.	Water Conservation & Water Quality for Panchayati Raj Institutions	5 Oct. 2013 at NIH, Roorkee
19.	Water Conservation (For NCC/NSS students)	31 Oct. 2013 at Kakinada
20.	Women and Water	19 Nov. 2013 at Kakinada

Other News

Distinguished Visitors' Lecture

Prof.Mark Bailey & Prof. Alanjenkim from Centre for Ecology & Hydrology, UK, visited the Institute on April 18, 2013. They visited the Water Quality Lab., Nuclear Hydrology Lab. & held discussion with Divisional Heads.

Exhibition

Organised a Brain Storming Session on "Stakeholders Cooperation and Participation in Developing IWRM Action Plan" on World Water Day at India Habitat Centre, New Delhi on March 21-22, 2013.

- NIH participated in 100th Indian Science Congress at University of Calcutta.

- NIH participated in the 33rd IITF at Pragati Maidan, New Delhi during Nov.14-27, 2013.

Retirement

1. Sh. S.S. Kanwar, Doc. Off.
2. Sh. S.C. Gulati, S.O.
3. Sh. A.K. Chatterjee, P.A.
4. Sh. N.I. Siddiqui,P.A.
5. Sh. Surendra Pal, Att.

Institute's Important Meetings

1. Standing Committee on Water Resources held at New Delhi on Jan. 17, 2013.
2. 30th meeting of Standing Committee of Governing Body of NIH held at New Delhi on March 15, 2013.
3. 38th Working Group Meeting, held at Roorkee during April 3-4, 2013.
4. 66th Meeting of Technical Advisory Committee (TAC), held at CWC, New Delhi on July 29,2013.
5. 33rd Meeting of AGM held at New Delhi on July 17, 2013.
6. 39th Working Group Meeting, held at Roorkee during October 21-22, 2013.
7. 36th Foundation Day of NIH held on December 16, 2013.


38th WORKING GROUP MEETING
3-4 APRIL, 2013


33वीं वार्षिक साधारण सभा
राष्ट्रीय जलविज्ञान संस्थान समिति
बुधवार, 17 जुलाई 2013, नई दिल्ली
33rd ANNUAL GENERAL MEETING
NATIONAL INSTITUTE OF HYDROLOGY SOCIETY
WEDNESDAY, 17th JULY 2013, NEW DE
HARISH RAWAT
M. MOHAN MURAR
R.S. SINGH
MEMBER SECRETARY


39th WORKING GROUP MEETING
NATIONAL INSTITUTE OF HYDROLOGY


36th FOUNDATION DAY
16th December, 2013
NATIONAL INSTITUTE OF HYDROLOGY
(An ISO 9001:2008 Certified Organization)
ROORKEE-247667
SANJAY K. JAIN
R. D. SINGH
P. P. BHOUVIAD
R. ANBALAGAN

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You can share your knowledge with others on topics highlighting 'water resources for community benefits' by contributing an article to the Guest Article Column. For more information, please contact: Dr V C Goyal, vcg@nih.ernet.in or vcgoyal@yahoo.com

National Institute of Hydrology
Roorkee (Uttarakhand, India)
Phone: +91-1332-272106
Fax: +91-1332-272123
www.nih.ernet.in

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