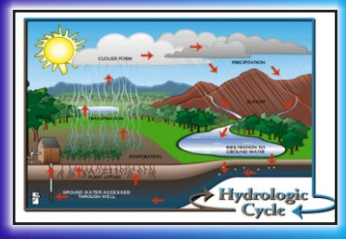
Issue No. 13 & 14, December 2018

# Hydrology for People™




Newletter of National Institute of Hydrology, Roorkee (India)






## From Director's Desk

Water is a key natural resource which is fundamental to life, livelihood, food, energy and water security as well as sustainable development. Due to rising population, industrial growth, changes in lifestyle, land use land cover change and other reasons, water demands are increasing in India whereas the availability is nearly the same for past many decades. As a result, the per capita availability is falling and the country as a whole is now water stressed. Considering that there is large variability in water availability across the nation, many areas are water scare which means that per capita availability of water is below 1000 cubic meter per year.

To meet the growing challenges in water resources development and management, a number of initiatives are required. These will cover a wide range of activities- data observation, processing and creation of online database; better understanding of hydrology of various river basins; efficient water management in agriculture; creating adequate infrastructure and maintaining it properly; sustainable withdrawal from surface and groundwater sources; robust and efficient institutions, enabling legal framework etc. In addition, the population and infrastructure is to be protected from water related disaster.

National Institute of Hydrology has been conducting applied research in the field of hydrology and water resources over the past four decades. During the period a number of demand driven studies have been completed to solve a range of real life problems. These have touched almost every sphere of water resources development in the country. The institute is growing and evolving keeping in view the need of country. We are also proactively contributing to technology transfer, mass awareness and capacity building programs.

**Sharad K Jain**

## 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 Centres located at Belagavi, Jammu, Kakinada and Bhopal, and two Centres for Flood Management Studies at Guwahati and Patna. The Institute has established state-of-art laboratory facilities in the areas of Nuclear Hydrology, Water Quality, Soil Water and Remote Sensing & GIS Applications.

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 230 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 National Hydrology Project and Neeranchal National Watershed Project (NNWP). Another major project being executed by the Institute is National Mission for Sustaining the Himalayan Ecosystem (NMSHE) (GoI funded).

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 hosts the Secretariats of Indian National Committee on Climate Change (INC-CC) and Indian National Committee for International Hydrological Programme of UNESCO (INC-IHP).

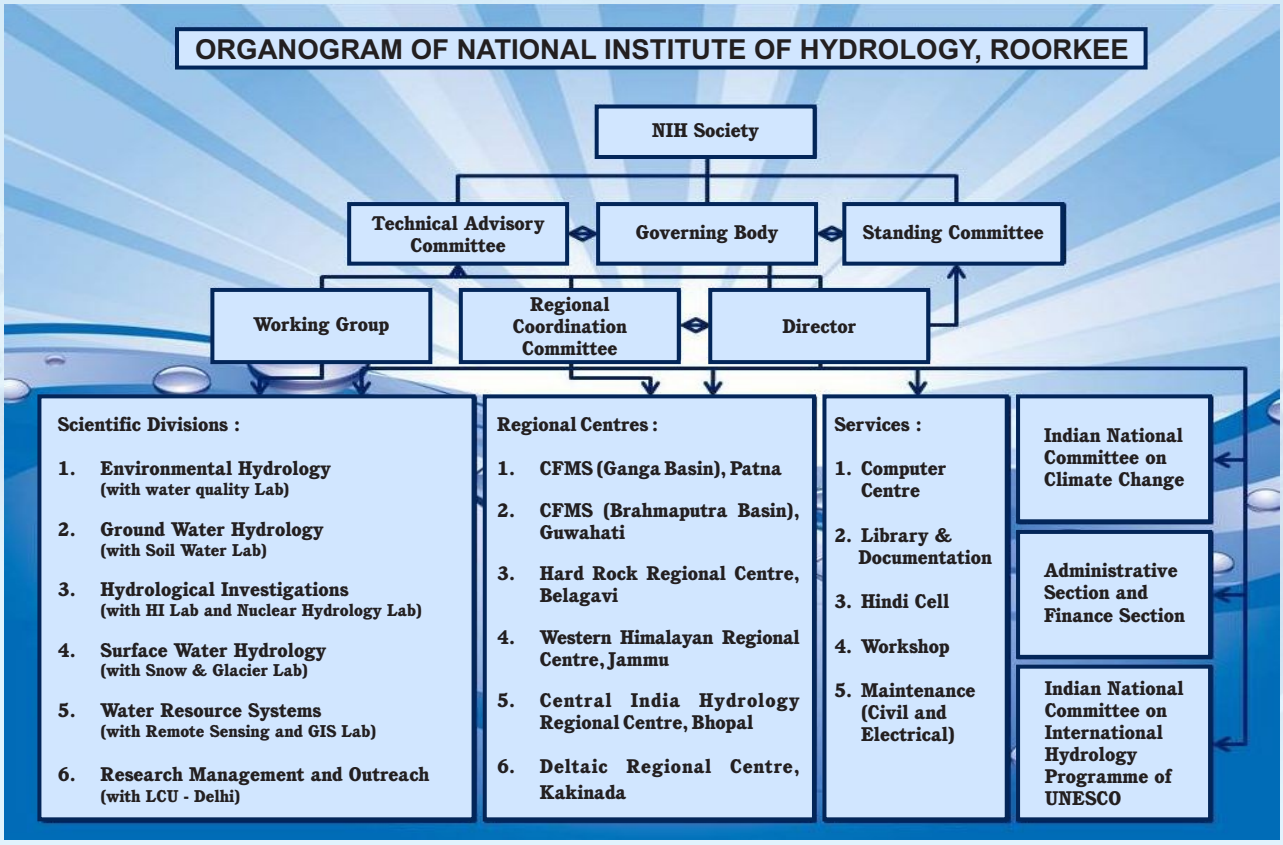
## Thrust Areas

- 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 solve hydrological problems

## Role of Hydrologists

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 hydrologist plays very important role in solving water-related problems being faced by the society through application of the proper scientific knowledge and mathematical principles.
- Scientists and engineers in the field of hydrology collect basic hydrological, geological, and 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




includes the assessment of water quality in the laboratory, remote sensing data processing and analysis 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.

- The hydrologist studies the basic processes to describe the quantity and quality of water as it moves through the hydrologic cycle (evaporation, precipitation, streamflow, infiltration, groundwater flow, and other components).
- A water resources engineer helps in planning, analysis, design, construction and operation of projects for the management of water resources.
- He/she may also deal with municipal water supply, irrigation water supply and management, mitigation of floods and droughts, integrated watershed management, ground water recharge and reservoir sedimentation problems.

## International Hydrological Programme (IHP) of United Nations Educational, Scientific and Cultural Organization (UNESCO)

The International Hydrological Programme (IHP) is the only intergovernmental programme of the United Nation system devoted to water research, water resources management, and education and capacity building. Since its inception in 1975, IHP has evolved from an internationally coordinated hydrological research programme into an encompassing, holistic programme to facilitate education and capacity building, and enhance water resources management and governance. UNESCO-IHP's work is built on three tracks:

- hydrological science for policy relevant advice
- education and capacity building responding to the growing needs of sustainable development
- water resources assessment and management to achieve environmental sustainability

IHP facilitates an interdisciplinary and integrated approach to watershed and aquifer management,

which incorporates the social dimension of water resources, and promotes and develops international research in hydrological and freshwater sciences. UNESCO's IHP, founded in 1975 and implemented in six-year programmatic time intervals or phases, has entered into its eighth phase during the period 2014-2021. IHP-VIII with emphasis on "Water Security" has six themes with different focal areas :

Theme 1 : Water-related Disasters and Hydrological Changes
Theme 2 : Groundwater in a changing Environment
Theme 3 : Addressing Water Scarcity and Quality
Theme 4 : Water and Human Settlements of the Future
Theme 5 : Ecohydrology - Engineering Harmony for a Sustainable World
Theme 6 : Water Education- Key for Water Security


## Projects Solving Real Life Problems

### NIH_Basin – A WINDOWS based model for water resource assessment in a river basin

In the recent past, a spatially distributed model was developed at NIH to assess various components of the hydrological cycle (actual evapo-transpiration, overland flow, groundwater recharge, and residual soil water content) in a river basin. The model incorporates spatial attributes of land-use, soil type, rainfall, evapo-transpiration, physiographic characteristics, cropping pattern, irrigation development, groundwater conditions, river network and hydraulic structures in a river basin and can be used to: a) visualize effect of land use change, cropping pattern change, climate change (in terms of rainfall and its distribution, temperature, humidity etc.), and population and industrial growth on the basin water resources, and b) analyze various management options like inter-basin transfer of water, development of new water resources projects etc.

In the present study, it was envisaged to carry out a number of modifications in the model methodology and develop a WINDOWS interface (named as NIH_Basin – NIH_Basin-Simulation) for easy application by the user groups. Some of the limitations of the model that have been addressed include: i) specification of EAC tables or corresponding relationships for various storage structures, ii) rule-curve based operation of reservoirs for analysis of different operation policies, iii) option of hydropower simulation in the basin, iv) continuous long-term simulation, and v) simplified representation of groundwater simulation.

The option of EAC specification for a reservoir has been added. Further, for reservoirs with non-availability of EAC table, the approach developed by J. Mohammadzadeh-Habili et.al (2009) for approximating the EAC relationships has been incorporated. Rule-curve based approach has been added for simulating operation of reservoirs as per specified policy. The option of hydropower simulation has been added. Model now works in two modes: a) monthly mode (in which the simulation is carried out at daily time step for a month and then spatial recharge and discharge pattern are externally used to find revised water table in the basin using groundwater simulation model, say MODFLOW, and the revised groundwater table is used for subsequent month), and b) continuous mode (in which the simulation is carried out at daily time step for the complete period for which hydro-meteorological data are available). In the second mode, grid-wise pumping and recharge estimations are accumulated over each sub-basin and then divided by the Specific yield ($S_y$) of sub-basin to convert water withdrawal/recharge to change in average groundwater level in the sub-basin to find the revised groundwater level in the sub-basin, thus avoiding the necessity of detailed groundwater simulation.

In WINDOWS interface of the model, various data input forms have been developed. Four important modules of the software include: a)

Database preparation, b) GIS analysis, c) Model execution, and d) Analysis of results. The "Database Preparation" module includes user-interactive forms for entry of attribute and temporal data of hydrological variables and model parameters. In the "GIS Analysis" module, free domain GIS (ILWIS system) has been linked for creating and processing geo-spatial data. This module also contains provisions for converting raster data to ASCII format. In the "Model Execution" module, various sub-models are run in sequential order. In "Analysis of Results" module, it is possible to view spatial and temporal hydrological results of the analysis. The model study can help water resources departments and river basin authorities in the analysis of water resources at river basin scale. It can also help in assessing the impact of various natural and anthropogenic activities on various components of the hydrological cycle at basin scale.

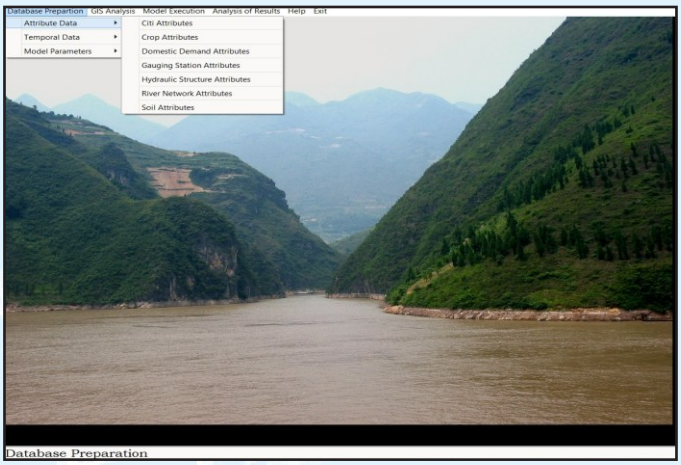



*Fig. 1: Sample opening banner of NIH_Basin*

## Modelling of Gangotri Glacier melt runoff and simulation of stream flow variation under different climatic scenarios

A semi-distributed conceptual hydrological model (HBV) is used for streamflow modelling. The model consists of different routines and simulates catchment discharge, usually on a daily time step, based on time series of precipitation and air temperature as well as estimates of monthly long-term evaporation rates. Initially, the model is calibrated for the duration of 2014 to 2015 using the available in-situ meteorological variables (air temperature, precipitation and evaporation) and catchment parameters. To identify the future response & sensitivity of the Gangotri Glacier streamflow (Bhagirathi River) and future water supply from the glacier catchment, the model is further run for the duration of 2014 to 2030. The contrasting meteorological parameters (air temperature, precipitation and evaporation) obtained through RegCM 4.3 regional climate model and sub-model conditions based on the calibrated data set were used in the semi-distributed modelling.

*Fig. 2a : AWS installed at the meteorological observatory at Bhojwasa*

*Fig. 2b : Snout of Gangotri glacier*

**Water Availability :**

The total seasonal volume of water observed during 2000 to 2017 are 993, 1097, 1033, 1114, 1074, 999, 931, 689, 1077, 879, 1061, 844, 899, 1043, 854, 882, 799 and 788 MCM, respectively. The individual concentration from snow/glacier melt, rainfall and sub surface flow is 87%, 3% and 10% respectively. The strong storage characteristics of the Gangotri Glacier are reflected by the comparable magnitude of runoff observed during daytime and night time. Results suggest that increment of 0.2°C in average air temperature is observed by 2030 whereas average evaporation rates will be decreased by 0.04 mm. Similarly, precipitation pattern will follow upliftment trend and will be increased by 11 mm in the Gangotri Glacier valley. Since, streamflow in the

glacierized catchment is highly dependent on the temperature fluctuation and precipitation pattern, slight increment of 0.04 mm in the Gangotri Glacier streamflow is marked by 2030.

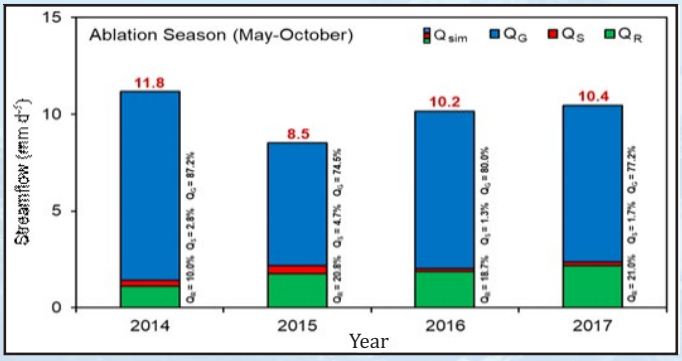



*Fig 2c : Average Gangotri Glacier streamflow and average contribution of rainfall, snowmelt and glacier melt to total streamflow during the ablation seasons.*

## Modelling of Narmada basin using GWAVA model

This project aims to improve understanding of hydro-climate services in India and involves collaboration between National Institute of Hydrology (NIH), India; Centre for Ecology and Hydrology (CEH), UK and University College of London (UCL), UK. There are two main strands to the project viz., i) catchment hydrological modelling and ii) assessment of the impacts of a variety of scenario types on water resources, including climate change, land cover change, irrigation and dam regulation scenarios. The Upper Narmada basin upto Hoshangabad with a catchment area of 44,725 km$^2$ and falling within the states of Madhya Pradesh and Chhattisgarh has been selected for hydrological modeling and analysis of future scenarios to understand their impact on water resources.

The Global Water Availability (GWAVA) model, a gridded hydrological model developed at CEH, UK has been applied in the Upper Narmada basin at a high resolution of 0.125° x 0.125° (Fig. 3a). The daily gridded precipitation data at 0.25° x 0.25° resolution; daily maximum and minimum temperature at 1.0° x 1.0° resolution and the daily discharge atfive sub-catchment gauging stations have been used for the model setup, calibration (1990-2000) and validation (2001-2010).Three major dams viz., Bargi and Barna along with their command areas as well as the Tawa dam have been incorporated in the model setup. Multi-site calibration approach was employed and the model efficiency (monthly NSE) of 0.93 and 0.89 was obtained during calibration and validation respectively (Fig. 3b).

The majority of GCMs project increases in mean annual precipitation across the study area. The Q10 (high flows) at each of the five gauging stations also show a general increasing trend of predicted high flows. Similarly, an increase is projected for the Q90 (low flows) at Manot, Mohgaon and Belkheri, with very high variability as compared Qmean and Q10. One of the key GWAVA outputs is the indices for water resources/scarcity across the region of interest. The water resources output has been produced for the baseline period (1990-2010) and compared with the future time period (2028-2060) and used to identify the water stressed grids, which are mostly located in the western part of the Barna command. The results of the study can be effectively used for the water resources planning and management in Upper Narmada basin.

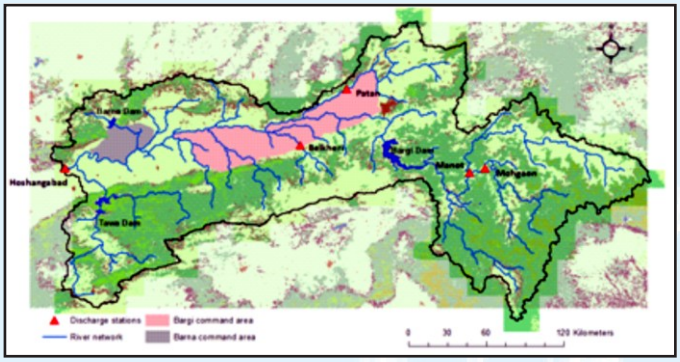



*Fig 3a: GWAVA model setup for the Upper Narmada basin*

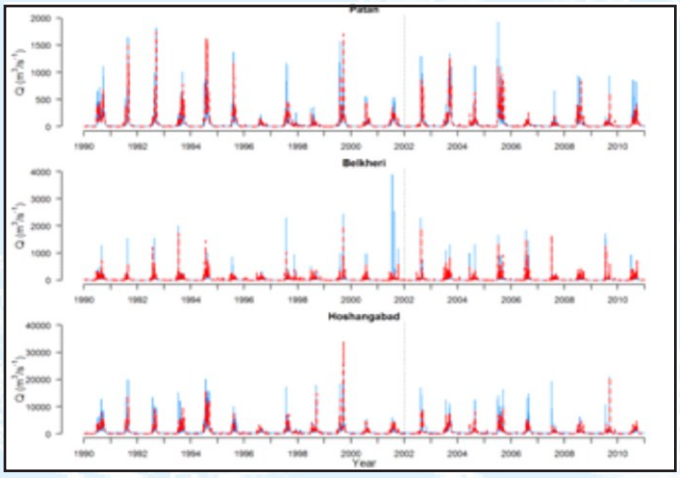



*Fig 3b: Observed and simulated daily discharge for calibration and validation periods (separated by dashed line)*

## Major Ongoing Projects at NIH

### National Hydrology Project (NHP) (World Bank funded)

The World Bank funded Hydrology Projects have been the central government initiatives and entails improving the planning, development and management of water resources, as well as flood forecasting and reservoir operations in real-time. The project completed in two phases (Phase I from 1996 to 2003 and Phase II from 2006 to 2014) has established the backbone of a comprehensive Hydrological Information System (HIS) in India, providing scientifically verified, uniformly accepted and widely accessed hydrological records covering all aspects of the hydrological cycle.

The Hydrology Project Phase III, now named as National Hydrology Project (NHP), is follow-on to the earlier Hydrology Projects.

**Role of NIH in NHP**

- § Nodal Agency for Demand Driven Research
- § Nodal Agency for Training and Capacity building
- § Training courses on hydrological topics
- § Training/Meetings and multi-media distance learning
- § Centre of Excellence for Hydrological Modeling
- § Decision Support System (DSS)

### Neeranchal National Watershed Project (NNWP) (World Bank funded, Under PMKSY component of DoLR)

- § Develop and pilot a DSS-Hydrology to implement Watershed Component of PMKSY at 18 demonstration watersheds in 9 States
- § Develop tools and systems to help all stakeholders to make better water management decisions during watershed planning (DPR) and post implementation (Impact Assessment)
- § Conduct capacity building programs for stakeholders (SLNAs)

**Objective of DSS-Hydrology**

The overall objective of the development of DSS-Hydrology is to support DoLR and States in bringing hydrology-based planning in watershed development and to facilitate improved returns from watershed management. The DSS-H will use new technologies and models for hydrological assessment and monitoring, and will translate complex and large data sets into simple and meaningful outputs designed for decision making. The DSS-H shall identify appropriate and feasible soil, land and water conservation interventions at the planning stage and facilitate impact assessment for the interventions based on scientific principles

### National Mission for Sustaining Himalayan Ecosystem (NMSHE) (Funded by Ministry of Science & Technology, GoI)

**Themes :**

- § Development of hydrological database in Upper Ganga basin
- § Real-time snow cover information system for Upper Ganga basin
- § Glacial Lakes & GlacialLake Outburst Flood (GLOF) in Western Himalayan region
- § Assessment of downstream impact of Gangotri glacier system at Dabrani and future runoff variations
- § under climate change scenarios Observation and modeling of various hydrological processes in a small watershed in Upper Ganga basin
- § Hydrological modeling in Alaknanda basin and assessment of climate change impact
- § Hydrological modeling in Bhagirathi basin up to Tehri dam and assessment of climate change impact
- § Study of river - aquifer interactions and groundwater potential in the upper Ganga basin up to Dabrani
- § Understanding of hydrological processes in study basin by using isotopic techniques
- § Environmental Assessment of Aquatic Ecosystem of Upper Ganga Basin
- § Water Census and Hotspot analysis in selected villages in Upper Ganga basin

## Publications in Journals

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Droughts in North-Western India Natural Hazards, Springer Publication, Published online 29th June 2018, DOI 10.1007/s11069-018- 3402 -0. (Manuscript No.NHAZ-D-18-00328R2).

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## Training courses attended by Scientist /Scientific Staff during 2018

| S.N. | Name of the Training Course | Place | Date & Month |
|---|---|---|---|
| 1. | Awareness and Documentation on Quality Management Systems as per IS/ISO 9001:2015 | NITS, BIS, Noida | 14-15 March, 2018 |
| 2. | Training course on 'Repair, Renovation & Restoration (RRR) of Water bodies & Watershed Development | CWC, Pune | 19-21 March, 2018 |
| 3. | Country-focused Training Course on 'Integrated Water Management' (Course -A) | Japan | 21 Jan.-10 Feb., 2018 |
| 4. | Training on 'Water Accounting Plus' | IHE, Delft, Netherlands | 5 March-1 June, 2018 |
| 5. | Customized training course on 'Ground Water Modelling" | IHE, Delft, The Netherlands | 12 March- 6 April, 2018 |
| 6. | Training on 'Establishment Rules' | ISTM, Delhi | 21-25 May, 2018 |
| 7. | Training on 'Financial Management' | ISTM, Delhi | 4-8 June, 2018 |
| 8. | Training on 'Climate Change - Impact on Water Resources, its Mitigation and Adaptation' | NWA, Pune | 11-14 June, 2018 |
| 9. | Training course on "QSWAT Modelling" | NIH, Roorkee | 11-22 June, 2018 |
| 10. | Training programme on 'Big Data Analysis in Government' | ISTM, Delhi | 18-20 June, 2018 |
| 11. | Training programme on 'Big Data Analysis (advanced) in Government | ISTM, Delhi | 18-20 July, 2018 |
| 12. | Handling of CAT Cases | ISTM, Delhi | 23-25 July, 2018 |
| 13. | Workshop on Noting & Drafting | ISTM, Delhi | 1-3 August, 2018 |
| 14. | Record Management- Right to Information | ISTM, Delhi | 6-8 August, 2018 |
| 15. | Right to Information Act, 2005 | ISTM, Delhi | 24 Sept, 2018 |
| 16. | Training course on "e-Procurement" | ISTM, Delhi | 27-28 Sept., 2018 |

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| 17. | Orientation Training Program on Preventive Vigilance | ISTM, Delhi | 2 Nov., 2018 |
| 18. | Training on 'e-office' | ISTM, Delhi | 15-16, Nov., 2018 |
| 19. | Training of Master Trainers on "Climate Change Impact, Vulnerability and Adaptation Planning in Water Sector for Himalayan States" under the project "Strengthening State Strategies for Climate Actions in Uttarakhand" | Water and Land Management Institute, Bhopal | 19-21 Nov., 2018 |
| 20. | Training of Master trainers on Climate Finance under the project " Strengthening State Strategies for Climate Actions in Uttarakhand" | Dr. R S Tolia Uttarakhand Academy of Admn., Nainital | 21-22 Dec., 2018 |

## Training Course/ Workshop Organised During 2018

| S.N. | Name of Course | Period | Venue |
|---|---|---|---|
| 1 | Five days training workshop on "River Basin Modelling" | Jan 15-19, 2018 | Bhopal |
| 2 | Science Academies' Refresher Course on "Hydrology of Floods" | Jan 8-19, 2018 | NIH Roorkee & GBPUA&T Pantnagar |
| 3 | eSWIS | Jan 29-31, 2018 | Neriwalm, Tezpur |
| 4 | 5-day NHP sponsored Training Workshop on "Basic Hydrology" | Feb 5-9, 2018 | Neriwalm, Tezpur, Aasam |
| 5 | NHP Sponsored Training Course "Ground Water Quality Modelling" | Feb 12-16, 2018 | NIH, Roorkee |
| 6 | Bank Filtration for Sustainable Drinking Water Supply | March 05 -09, 2018 | NIH Roorkee |
| 7 | Training Course on "Hydro-Meteorological Data Collection for Spring Mapping in Ravi River Catchment under NHP-PDS" under NHP-PDS | March 23-24, 2018 | HPTDC, Chamba, Himachal Pradesh |
| 8 | NHP Sponsored Training Course "Water Quality : Concepts and Analysis" | Mar 19-23, 2018 | NIH, Roorkee |
| 9 | Training Course on "Hydrologic Modelling using SWAT" | June 11-22, 2018 | Roorkee |
| 10 | UNDP sponsored International Training Course on "Hydrology, Water Resources Management and Climate Change" for the participants of Pacific Island Countries | June 25-20 July, 2018 | Roorkee |
| 11 | Training Workshop on "Reservoir simulation using NIH_ReSyP" | June 25-29, 2018 | BITS Pilani, Hyderabad campus |
| 12 | Workshop on "DSS(H): Demonstration of Modules" | July 20, 2018 | Raipur Chhattisgarh |
| 13 | Training course on Basics of Hydrology | July 23-27, 2018 | NIH, Bhopal |
| 14 | Training on "Hydrological modelling using HEC RAS and HEC HMS" | August 27-31, 2018 | NIH, Roorkee |

| | | | |
|---|---|---|---|
| 15 | Capabilities of Hydrological Modelling for Decision Making | Sep 9, 2018 | Bhopal |
| 16 | Modellers Meet under NHP | Sept.26-27, 2018 | New Delhi |
| 17 | Training Course on 'Environmental Isotopes for Climate Resiliency of Mountain Watersheds' | Oct.22-26, 2018 | NIH, Roorkee |
| 18 | UNESCO sponsored Training Course on "IWRM, Water Security and Climate Change for Developing Economies" | Nov.15-16, 2018 | NIH, Roorkee |
| 19 | Three Days Training Course on "Water Conservation: Practices, Security and Sustainability- A Practitioners Approach" | Dec.26-28, 2018 | NIH, Roorkee |


*International Training course on Hydrology, water resources management and climate change*


*Training workshop on interpretation of Isotopic data for Aquifer mapping*

*Training Course on Environmental Isotopes for resiliency of mountain watersheds*


*UNESCO sponsored training course on IWRM, water security and Climate change for Developing Economies*

*Training Course on Hydrologic Modeling using SWAT*

*Training course on Overview of Water Resources Sector*

## Important Meetings

- 46th and 47th meetings of Working Group, held at Roorkee during Feb 8-9, 2018 and Oct 23-24, 2018.
- 37th Annual General Meeting of NIH Society held at New Delhi on Feb 22, 2018.
- 71st meeting of Technical Advisory Committee (TAC), New Delhi on Apr. 23, 2018.
- 79th meeting of Governing Body, New Delhi on Dec 27, 2018.


*37th Annual General Meeting*


*46th Working Group Meeting*


*71st meeting of Technical Advisory Committee*

*47th meeting of Working Group*

## Mass Awareness Program

| S.N. | Activities | Organised by & Date |
|---|---|---|
| 1 | हिंदी मास | अगस्त 15 से सितम्बर 14, रा. ज. सं., रुड़की |
| 2 | हिंदी सप्ताह | सितम्बर 8 से 14, 2018 पश्चिम हिमालय क्षेत्रीय केन्द्र–जम्मू |
| 3 | Cleanliness of NIH office complex and NIH residential colony | 25 September-02 October, 2018 |
| 4 | Cleaning activities: Division/Units/Labs | 25 September-02 October, 2018 |
| 5 | Cleaning of Ghat and plantation | 28 September, 2018 |
| 6 | Cleanliness of NIH residential colony | 29 September, 2018 |
| 7 | Vigilance Awareness Week | 30th October - 4th November, 2018 |
| 8 | जल जागरुकता कार्यक्रम | केन्द्रीय विद्यालय – 1 रुड़की 30 अगस्त 2018 |
| 9 | 'स्वच्छता ही सेवा अभियान' | बालिका छात्रावास, कस्तूरबा गांधी बालिका विद्यालय बाजूहेड़ी, जिला हरिद्वार 10 अक्टूबर, 2018 |


*14th Jatiya Sanhati Utsav-O-Bharat Mela-2018*


*सतर्कता जागरुकता सप्ताह 2018 के समापन समारोह में उपस्थित मुख्य अतिथि प्रो0 अरुण कुमार, IIT रुड़की*


*हिंदी मास समारोह का समापन कार्यक्रम*


*स्कूली बच्चों के साथ स्वच्छता पखवाड़ा – 2018 का आयोजन*

*Meeting of the Consultative Committee of Ministry of Water Resources, RD & GR*

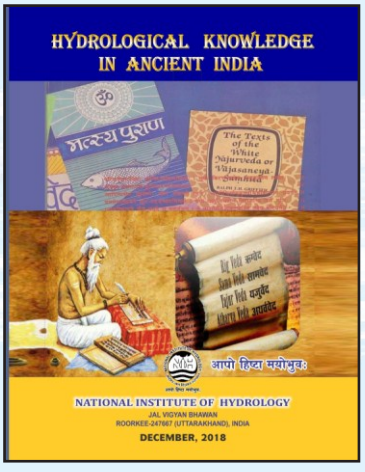

*जल जागरुकता कार्यक्रम, केन्द्रीय विद्यालय – 1 रुड़की 30 अगस्त 2018*

## NIH Celebrated 40th Anniversary of its Foundation Day

The National Institute of Hydrology celebrated 40th anniversary of its foundation day on December 16, 2018. The Institute hosted an 'Open day' for the school children and common public on December 15, 2018 for the visit of Laboratories, Meteorological Observatory and Library. Concurrently a brain storming session on the theme of 'Perspectives on water management in India and future directions' was held with participation of NIH scientists and experts from MoWR, RD & GR, CWC, CGWB, NWDA, CSMRS, IIRS, Indian Institute of Science, IIT Kharagpur, IIT Roorkee, IIT Delhi. In the morning of December 16, 2018, the newly constructed floor of a building at NIH was inaugurated by Hon'ble Minister of State for WR, RD & GR.

On this occasion saplings were planted by Hon'ble Minister of State for Water Resources, RD & GR Shri Arjun Ram Meghwal, Hon'ble Minister of Irrigation, Govt. of Uttarakhand Shri Satpal Maharaj and Shri U.P. Singh, Secretary, MoWR, RD & GR.

The Hon'ble Minister of State for WR, RD & GR, and the Secretary (WR, RD & GR) inaugurated the foundation day programme. The dignitaries released three books on this occasion namely, 'Hydrological Knowledge in Ancient India', 'A Glimpse of Research and Development at NIH', and "Pioneering Hydrological Research in India (Coffee Table Book). Mr. A. B. Pandya, Secretary-General, ICID, and Prof. Pradeep Mujumdar, Indian Institute of Science, Bangalore delivered keynote talks on emerging issues in the water sector. Subsequently, Hon'ble Minister of State for Water Resources, RD & GR Shri Arjun Ram Meghwal, Hon'ble Minister of Irrigation, Govt. of Uttarakhand Shri Satpal Maharaj and Shri U.P. Singh, Secretary, MoWR, RD & GR addressed the audience.


## Hindi Glossary for Hydrological terms

| | | | | | |
|---|---|---|---|---|---|
| Artesian Well | बम्ब कूप | Bracing | तानाबन्दी | Berth | घाट |
| Rain Gauge | वर्षा मापक | Affluent | सहायक नदी | Blind pipe | अछिद्रित नल |
| Yield | पैदावार | Afflux | जलोत्थान | Bore hole | वेध छिद्र |
| Delta | नदीमुख | Lined well | पक्की कुंआ | Hydrograph | जलालेख |
| Dehydrate | निर्जलित करना | Lined canal | पक्की नहर | Borrow pit | खन्ती |

आपो हिष्ठा मयोभुवस्था न ऊर्जे दधातन ।
महे रणाथ चक्षसे ॥१॥

हे जल! आपकी उपस्थिति से वायुमंडल बहुत तरोताजा है और हमें उत्साह और शक्ति प्रदान करता है। आपका शुद्ध सार हमें प्रसन्न करता है, इसके लिए हम आपको आदर देते हैं।

O Water, because of your presence, the atmosphere is so refreshing, and imparts us with vigour and strength. We revere you who gladdens us by your pure essence.

ईशाना वार्याणां क्षयन्तश्चर्षणीनाम् ।
महे रणाथ चक्षसे ॥ ५॥

हे जल! आपकी दिव्यता कृषि भूमियों में भी संचारित ! हे जल, मेरा आग्रह है कि आप फसलों का समुचित पोषण करे

O Water, may the divinity in Water dwell in the farm lands. O Water, I implore you to give nutrition (to the crops).

## जल सूक्ति

- पानी बिना जीवन नहीं।
- जल है तो कल है।
- पानी बचाइए, जीवन खुशहाल बनाइए।
- सब मिलकर करो सहयेाग, पानी का कभी न करोगे दुरूपयोग।
- पानी की रक्षा, जीवन की सुरक्षा।
- जल संरक्षण, जरूरत भी और कर्तव्य भी।
- जल जीवन का अनमोल रतन, इसे बचाने का करो जतन।
- पानी की समस्या है विकराल, जल बचाव की पेश करें मिशाल।
- जल बिना है जग सूना, पानी बचाव का प्रयास करो दूना।
- जल है अमूल्य निधि, जल बचाव से देश होगा समृद्धि।
- जल है जीवन का सार, इसके बिना है जीवन बेकार।
- जल ही बंदगी है, जल ही जिंदगी है।
- जीवन निर्भर है पानी पर और पानी निर्भर है हम पर।

## Forthcoming event :

**6th India Water Week 2019**
24-28 September, 2019 at Vigyan Bhawan, New Delhi
www. indiawaterweek.in

## Interesting Facts about Water

- Water covers nearly three-fourth of earth's surface.
- Most of the earth's surface water is permanently frozen or salty.
- Over 90% of the world's supply of fresh water is located in Antarctica.
- The earth's total allotment of water has a volume:
  - 93% is sea water.
  - 2.5% is in aquifer deep below the earth's surface.
  - 2% is frozen in polar ice caps.
  - <1% passes through the planet's lakes and streams, is atmospheric moisture and is locked within the bodies of living things.
- If the entire world's water were fit into a gallon jug, the fresh water available for us to use would be equal only about one table spoon.

## Well said about water

Water is the driver of Nature. *- Leonardo da Vinci*
When the well's dry, we know the worth of water. *- Benjamin Franklin*
Water is the mother of the vine, the nurse and fountain of fecundity, the adorner and refresher of the world. *- Charles Mackay*
Water is the lifeblood of our bodies, our economy, our nation and our well - being. *- Stephen Johnson*

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**We Will Appreciate Your Guest Articles!**

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:

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