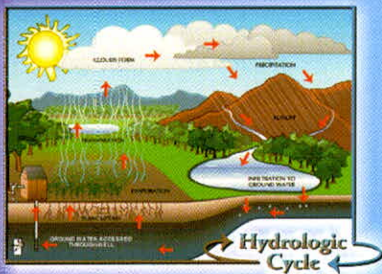
Issue 15 June 2019

NATIONAL INSTITUTE OF HYDROLOGY
राष्ट्रीय जल विज्ञान संस्थान
आपो हिष्टा मयोभुवः

Hydrology for People™

जन साधारण के लिए जलविज्ञान अंक:15



Newsletter of National Institute of Hydrology, Roorkee (India)
राष्ट्रीय जलविज्ञान संस्थान रूड़की द्वारा प्रकाशित समाचार पत्र

From Director's Desk

Pre-monsoon season in current year (2019) was one of the most difficult times concerning management of water resources in India. The progress of monsoon had been slow so far and the month of June has been one of the driest months in the recent times. Consequently, residents of many urban and rural areas found it difficult to get enough water, even for drinking water needs. Many reservoirs were close to their minimum level or had dried up; many small tanks and ponds were almost dry. To manage the situation, Ministry of Jal Shakti has launched a massive Jal Sanrakshan Abhiyan covering 254 most water stressed districts of the country. The first phase of the program will run from 01 July 2019 to 15 Sept. 2019.

In order to find a sustainable solution to water scarcity problem in India, several steps would be essential. First, we will have to prepare schemes to conserve flood flows by employing a range of tools such as surface storage reservoirs, minor irrigation tanks, ponds and sub-surface storage. Small structures need to be constructed for inducing recharge to ground water at village level. Second, there is a need to make and implement schemes for transfer of water from surplus to deficit region, at local, regional as well as at national level.

Unchecked withdrawal from ground water is causing a number of problems as water tables are rapidly falling in many parts of India and we have to regulate ground water use. Besides, due attention has to be given for rejuvenation of rivers and environment. To overcome the ill effects of poor quality of water in rivers, shallow aquifers, and ponds, it would be necessary to strictly enforce the water quality norms.

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. 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 National Mission for Sustaining the Himalayan Ecosystem (NMSHE) (GoI funded).

The Institute is actively pursuing the IEC and mass awareness activities and is contributing in 'Jal Shakti Abhiyan' of the Ministry of Jal Shakti (GoI). 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 Resource
- Application of modern techniques to solve hydrological problem

Jal Shakti Mantralaya

Vide cabinet secretariat notification dated 17th June, 2019, a new ministry of Jal Shakti has been established in the Government of India comprising of the two departments:

- Department of Water Resources, River Development and Ganga Rejuvenation
- Department of Drinking Water and Sanitation

The Institute welcomes Sri Gajender Singh Shekhawat as Hon'ble Union Minister and Sri Rattan Lal Kataria as Hon'ble Minister of State, for the newly established Ministry of Jal Shakti (Jal Shakti Mantralya).

Jal Shakti Abhiyan

Jal Shakti Abhiyan (JSA) is a time bound campaign with a mission mode approach intended to improve conditions in around 1500 Blocks that are drought affected, water stressed or over-exploited falling in 254 districts with water conservation related central programme. 23 of these districts are aspirational districts. Designed in the lines of Gram Swarajya Abhiyan, JSA is planned to be carried out between July 1 and September 15, 2019 for all states. For states/UTs with retreating monsoon namely Andhra Pradesh, Tamilnadu, Karnatka, and Punducherry, the campaign shall be carried out between October 2 and November 30, 2019.

जल शक्ति अभियान
संचय जल, बेहतर कल

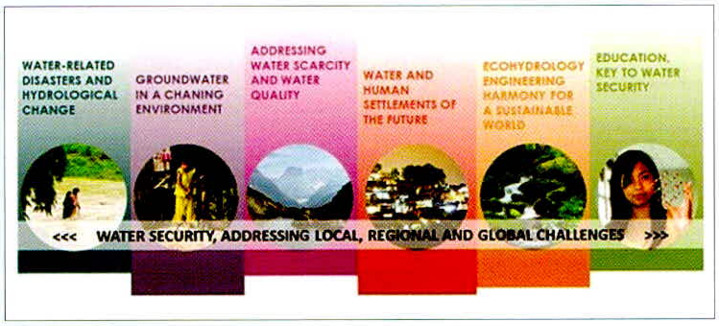
During the campaign, senior officers, groundwater experts and scientists from the Government of India will work together with State and District officials in India's most water-stressed districts. JSA aims at making water conservation and promotion of irrigation efficiency a Jan-Andolan through asset creation and communication campaigns.

More details about this program can be seen at: https://ejalshakti.gov.in/jsa/JSA/Home.aspx

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.

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

Projects Solving Real Life Problems:

1. Water Conservation and Management in Ibrahimpur Masahi village of Haridwar District (Uttarakhand)

A study was undertaken for rejuvenation of village ponds in Ibrahimpur Masahi Village (District: Haridwar, Uttarakhand). The works related to rejuvenation of a severely degraded village pond (viz. de-weeding, de-silting/sludge removal, and establishment of Natural Treatment System-NTS) were carried out at village Ibrahimpur Masahi after signing an agreement with concerned Gram Panchayat. CW is an artificially constructed natural treatment system, using aquatic plants and microbes, for treatment of wastewater laden with organics and nutrients. It is constructed with the locally available material like gravel, brick ballast, and Reed grass & Canna plants etc. It is an eco-friendly, low cost, and chemical free technology.

The system helps in maintaining the healthy aquatic ecosystem by reducing the oxygen need of the wastewater after treatment. Moreover, it also reduces the fecal coliforms present in the domestic wastewater harmful for human health. CW is highly suitable for treating the effluents generated from villages, especially septic tanks constructed under "Swachh Bharat Mission", to avoid the eutrophication of the ponds which are a source of sustainable water supply for the livelihood of the villagers. The pond rejuvenation stages, establishment of NTS and status of pond during pre/post rejuvenation works are shown in Figs. 1a & 1b, respectively. The water quality of the pond was also assessed before and after rejuvenation works. The key results are given below in the table, which indicate good improvement in the water quality of this pond.

Water quality parameters of pond at village Ibrahimpur Masahi (Before and after rejuvenation)

Parameters	Before Rejuvenation (Mar.2014*/Dec. 2015**/Jan.2015)	After Rejuvenation (Jan 2018)
pH	7.37	7.71
Turbidity (NTU)	48	43.1
Alkalinity (mg/l)	578	276
NO_3 (mg/l)	10.2	0.98
PO_4 (mg/l)	8.46	0
DO (mg/l)	0.25**	5.5
FC (MPN/100 ml)	240*	150


Fig. 1a: Constructed Wetland in village pond at Ibrahimpur Masahi


Fig. 1b: A view of pond before and after rejuvenation works at Ibrahimpur Masahi

2. Hydrological Investigation of Natural Water Springs of Baanganga watershed in Jammu & Kashmir State

Baanganga is a small tributary of Chenab river, the legendary river is associated with the miracles and legends of *MataVaishno Devi*. It is considered sacred and as is normal Hindu tradition, devotees like to bathe in it before preceding the journey of the holy shrine *Mata VaishnoDevi*. This river is originated from the Trikuta hills and passes from the side of Katra town. Since, there is no glacier present in the Baanganga catchment; hence springs are the only available sources to fulfill the water demand of the livelihood of the surrounding people and also to maintain the flow of the river Baanganga. However, due to ecological degradation in Trikuta mountain range, the discharge of theses springs has significantly reduced and some of the springs have dried-up. Consequently, people of the area are facing acute shortage of water for their livelihood and there is hardly any water flowing in Baanganga.

Recession curves of Bhoomika Devi Spring and Nawain Spring was analyzed and depletion time of the springs was found to be 6.96 and 6.52 months, respectively. Presently, both the springs can outlast the most extreme dry spell (5.2 months) recorded in Western Himalaya during 1951-2007, but high discharge variability about 200% in Bhumikadevi spring indicates that the spring need to be regularly monitored. Bhoomika Devi spring catchment, whose detailed geological mapping was carried out, is located in the proximity of Main Riasi Thrust and the spring system is located within the Riasi Thrust Zone. Lithology consists of Neoproterozoic Sirban Limestone Formation (dolostones, limestones, shales, breccia and chert) in thrusted contact with Plio-Pleistocene Siwalik Group (sandstones and conglomerates). The rocks are intensely fractured and the carbonates are extensively karstified, with gouged rocks called olistostrome. The fractures are oriented in every direction, and two fracture sets (steep, sub-vertical to vertical and dipping towards SE and SW) are very prominent and present throughout the study area. The fractures are very mobile and dynamic, and respond to the direction and intensity of movement along the active Riasi Thrust. The intense deformation and gauging of the fractures has rendered the sealing of the older fracture sets and at the same time has opened new fractures. Hence, an overall fracture analysis of the entire region is warranted to identify the possible zones that could seal/open in the near future. Other springs in Baanganga catchment possibly has suffered the same fate, but this needs to be investigated further.

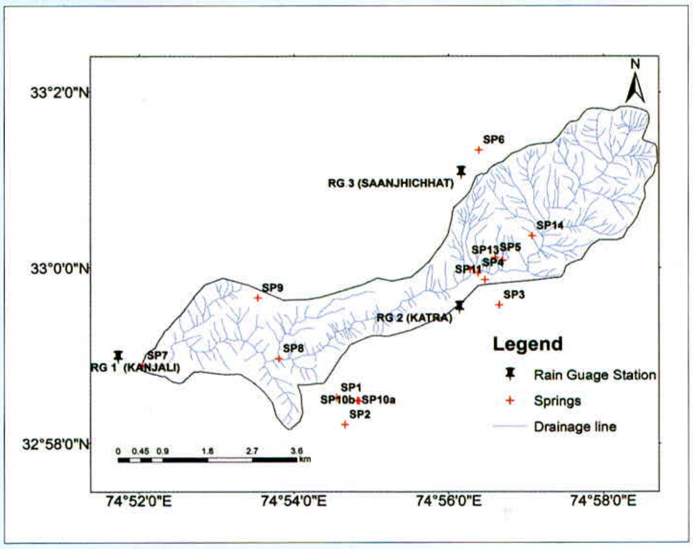


Fig. 2a: Location map of Study area

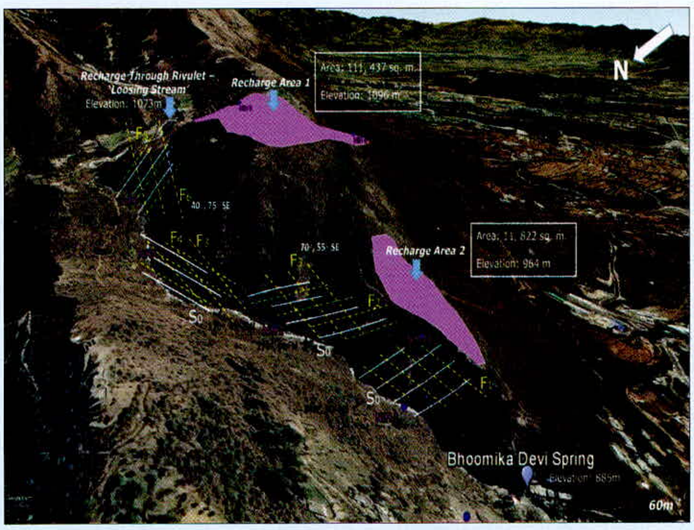


Fig. 2b: Identification of recharge area of Bhumika Devi Spring

3. River shifting analysis and flow modelling study of Ganga river from Rishikesh to Anupshahar

The objectives of study are:

River shifting study: GIS based temporal analysis of satellite data for study of river shifting trends, identification of erosion and sedimentation prone area.

Development of flow model: 1D flow model for the study reach, calibration and validation with observed GD data, Inundation mapping-validation with satellite data, Inundation maps for floods of different return period.

Development of 2D morphological model for the area.

Anupshahar is facing continuous erosion threat on the right bank of river Ganga. Study of geomorphological characteristics is important for planning the river training work for protection of the area. The hydrodynamic (HD) modelling of the river provides the water surface profile needed for design of flood protection works. In addition, 2D morphological modelling of the river stretch helps in understanding the long and short term impact of river training works in the hydraulic regime of the river.

HD Model in MIKE 11: For the flow model study, 103 surveyed river cross sections between Rishikesh to Kachhala Bridge (stretch of 334 km) have been used. Also, from Tehri dam site to Rishikesh (99.7 km

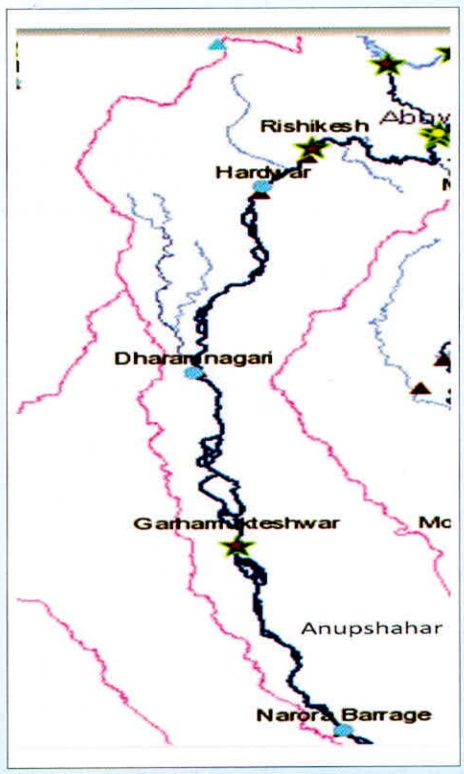


Fig. 3a: Study area

stretch), 14 river cross-sections have been extracted from online Carto DEM (available from Bhuvan website of NRSC). In addition, 30 digital toposheets have been procured from SOI and DEM has been prepared for the river reach. Hydrological data of the four gauging sites viz. Rishikesh, Garhmukteshwar, Narora and Kachhala Bridge have been procured from CWC. Flood frequency analysis has been carried out using the annual maximum flood data of the gauging sites and floods of various return periods have been estimated.

IRS satellite data are being used for geomorphological study and identification of erosion/silting prone area. The entire study stretch is covered in four scenes of LISS III data. At the affected sites, detailed analysis is being carried out using high resolution satellite data (LISS IV). Over the duration of nineteen years from 1997 to 2015 data of five time periods viz. 1997, 2000, 2006, 2011 and 2015 have been procured from NRSC, Hyderabad. Further, silt balance study is also proposed to be carried out between Rishikesh to Kachhala Bridge site.

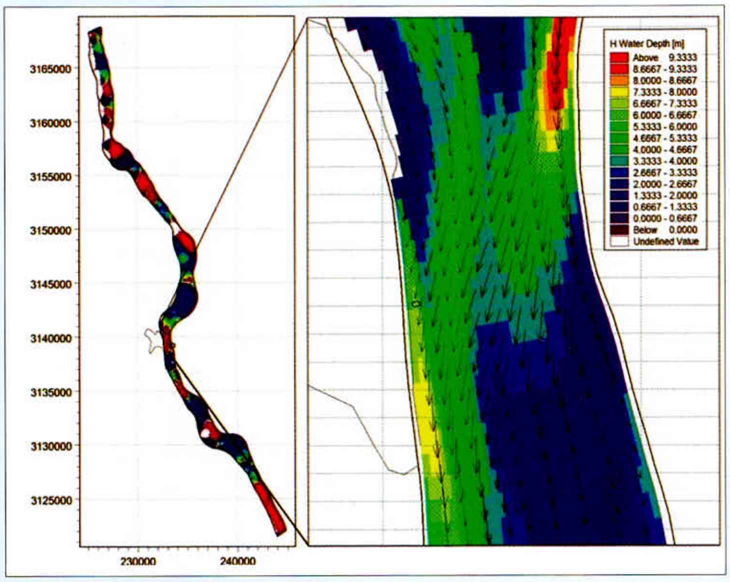


Fig. 3b: Computation of flow depth using MIKE 21C curvilinear model

4. Vulnerability assessment of identified watersheds in Neeranchal Project States

Focus of this study has been on generating Livelihood Vulnerability Index (LVI) by IPCC approach and Composite method for watersheds under NNWP. The IPCC-LVI approach would facilitate the identification of areas, which are vulnerable to climate change and need special attention towards adaptation. The socio-economic, environmental, agriculture, water resource, health, climate and forest indicators of vulnerability will be employed and classified into adaptive capacity (A), sensitivity (S), and exposure (E). The LIV-IPCC approach was applied on block level assessment of vulnerability to climate change in Neeranchal districts. The two districts, Kanker and Jashpur, Chhattisgarh were selected on pilot basis for block level assessment using LVI-IPCC approach.

Vulnerability order of Kanker district:

Antagarh > Charama > Bhanupratappur > Durgkondal > Narharpur > Kanker > Pakhanjur

Vulnerability order of Jashpur district:

Manora > Kansabel > Duldula > Kunkuri > Farsabahar > Pathalgaon > Jashpur > Bagicha

Assessment of micro-watersheds using Composite vulnerability approach was done for Kanker district. The locations of mico-watersheds in both districts are shown in Fig. 4.

The village wise vulnerability order in IWMP-14 is as below:

Kalmuchche > Dhantulsi > Salhebhat > Kirgapati > Tultuli > Barchegondi > Mode > Kurustikur > Mandri

Vulnerability reasoning	
Kanker (Antagarh)	Jashpur (Manora)
✓ Highest % of wasteland ✓ Non-access to drinking water ✓ High level of agricultural dependency ✓ Higher % of child population, marginal workers	✓ Trend of climate shows increasing temperature and decreasing rainfall ✓ High level of agricultural dependency ✓ Non-access to drinking water ✓ Highest % of marginal workers

Vulnerability order of IWMP-15:

Gudphel > Ghotulmunda > Jharripara > Hilchur > Mokha > Pujari Para > Nedgaon > Kodakhurri > Kalangpuri > Goyanda > Taraighotia >Amaguhan > Tarhul > Pedawari > Chhindgaon > Bhursa Tarandul > Seoni > Damkasa

Vulnerability order of IWMP-16:

Otekatta > Nelchang > Guddatola > Godpal > Kodekurse > Karaki > Uikatola > Bhurke > Chaurgaon

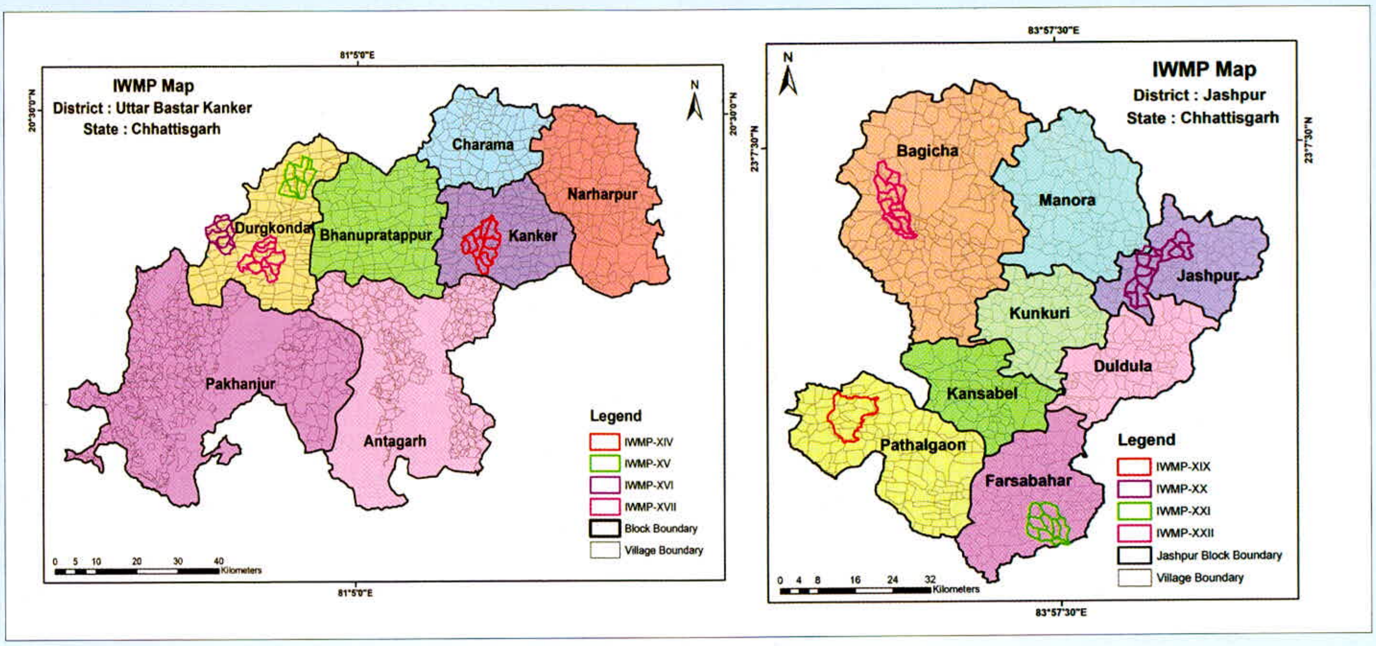


Fig. 4: The locations of micro-watersheds in both districts

Vulnerability reasoning	
IWMP-14 (Kalmuchche)	✓ Non-access to drinking water
IWMP-15 (Gudphel)	✓ Lowest number of ponds, tanks, lakes
IWMP-16 (Otekatta)	✓ Lowest % of forest cover
	✓ Highest % of landless farmers
	✓ Lowest cropping intensity and crop diversification index
	✓ Highest % of wasteland

5. Developments of Water Accounts for Subarnarekha Basin Using Water Accounting Plus (WA+) Framework

The WA Plus (WA+) technique developed by IHE-Delft, in partnership with IWMI, FAO, and the World Water Assessment Program (WWAP), utilises open access remote sensing data in conjunction with open access GIS data and global hydrological model outputs to develop water accounts of a basin at the pixel level, say 250 m * 250 m resolution. WA+ is based on mass balance approach (at the pixel level) and uses Budyko theory (Budyko, 1974) and WATERPIX model (IHE, 2016). WA+ framework specifically classifies land use land cover (LULC) in 80 classes. The aim of this study was to apply WA+ framework on Subarnarekha River basin with the major objective to assess the water consumptions (total and agricultural) using green water and blue water concept, and estimate land and water productivity for food security and make most efficient use of the shrinking water resources in the basin.

The total water consumption in the Subarnarekha basin was estimated with WA+ framework using freely available satellite data of evapo-transpiration (ET) (here ETens: an ET product developed by IHE Delft), Leaf Area Index (LAI), daily precipitation (P), Net primary production (NPP), and Gross primary production (GPP). The data for net dry matter (NDM), number of rainy days, and LULC map was prepared using specific tools of WA+. The total water consumptions in the basin for the wet year (2013-14) is found to be 27.1 km³/year with further partitioning of ET into evaporation (E) from soil & water bodies and transpiration (T) from different LULCs. Sheet-2 indicates about ET management options as per LULC to reduce total water consumption and hence withdrawal in the basin. Sheet-2 also shows that the non-beneficial consumptions in the Subarnarekha basin are 14.1 km³/year, much greater than the beneficial consumptions (12.9 km³/year). This indicates that there is a large scope for water conservation practices to be adopted in the basin to minimize non-beneficial consumptions.

In a similar way, the agricultural water consumptions along with the land productivity and water productivity of different crops in Subarnarekha basin was estimated as shown in Sheet-3 for sustaining land and water resources and food security in the basin using green water and blue water concept.

It can be observed from Sheet-3 that the overall land productivity for the cereals, i.e. mainly rainfed rice in the Subarnarekha basin for the year 2013-14 is 2325 kg/ha (varying from 979 to 2325 kg/ha during 2003-04 to 2013-2014). Similarly, overall water productivity (WP) in Subarnarekha basin for 2013-14 is found to be 0.55 kg/m³ (varying from (0.29 to 0.68 kg/m³during 2003-04 to 2013-14). It can be also observed from Sheet-3 that both, the land and water productivity, have also been segregated by using the green water and blue water. The spatial variations of the land and water productivity for rain-fed rice for Subarnarekha basin in year 2013-14 is shown in Fig. 5c&d. It can be observed from Fig. 5c&d that the yield as well as water productivity is higher in centroid parts as compared to other parts of the basin. The results obtained using WA+ technique has very much resemblance with the findings reported by the NABARD and ICRIER (2018). These maps can be taken as benchmark for evaluating the practices adopted by farmers and can be applied in other parts of basin for increasing the productivity, managing water resources and enhancing food security.

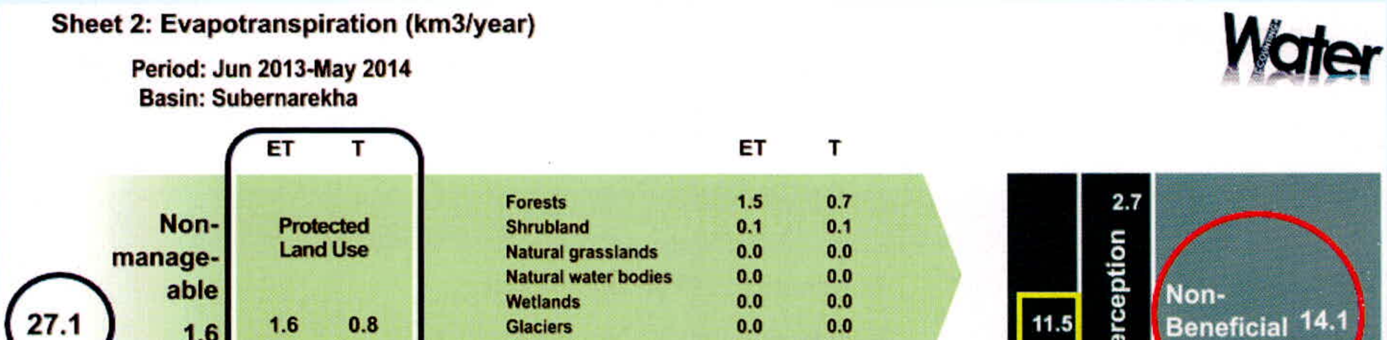


Fig. 5a: Sheet-2 showing the evapo-transpiration estimates from different LULCs

Sheet 3: Agricultural services
Part 2: Land productivity (kg/ha/year) and water productivity (kg/m3)

Basin: Subernarekha
Period: Jun 2013-May

Crop

	Cereals	Non-cereals				Fruit & vegetables			Oil-seeds	Feed crops	Beverage crops	Other crops		
Land productivity	2141	-	-	-	-	18568	-	-	-	10173	-	-	Yield	rainfed
	964	-	-	-	-	-	-	-	-	-	-	-	Yield from rainfall	irrigated
	1361	-	-	-	-	-	-	-	-	-	-	-	Incremental yield	
	2325	-	-	-	-	-	-	-	-	-	-	-	Total yield	
		Root / tuber crops	Leguminous crops	Sugar crops	Merged	Vegetables & melons	Fruits & nuts	Merged						
Water productivity	0.43	-	-	-	-	3.25	-	-	-	1.08	-	-	WP	rainfed
	0.89	-	-	-	-	-	-	-	-	-	-	-	WP from rainfall	irrigated
	0.44	-	-	-	-	-	-	-	-	-	-	-	Incremental WP	
	0.55	-	-	-	-	-	-	-	-	-	-	-	Total WP	

Non-crop

	Livestock		Fish (Aquaculture)	Timber		
Land productivity	-	-	-	-	Yield	rainfed
	-	-	-	-	Yield from rainfall	irrigated
	-	-	-	-	Incremental yield	
	-	-	-	-	Total yield	
	Meat	Milk				
Water productivity	-	-	-	-	WP	rainfed
	-	-	-	-	WP from rainfall	irrigated
	-	-	-	-	Incremental WP	
	-	-	-	-	Total WP	

Fig. 5b: Sheet-3 showing the land and water productivity estimates in cultivated area

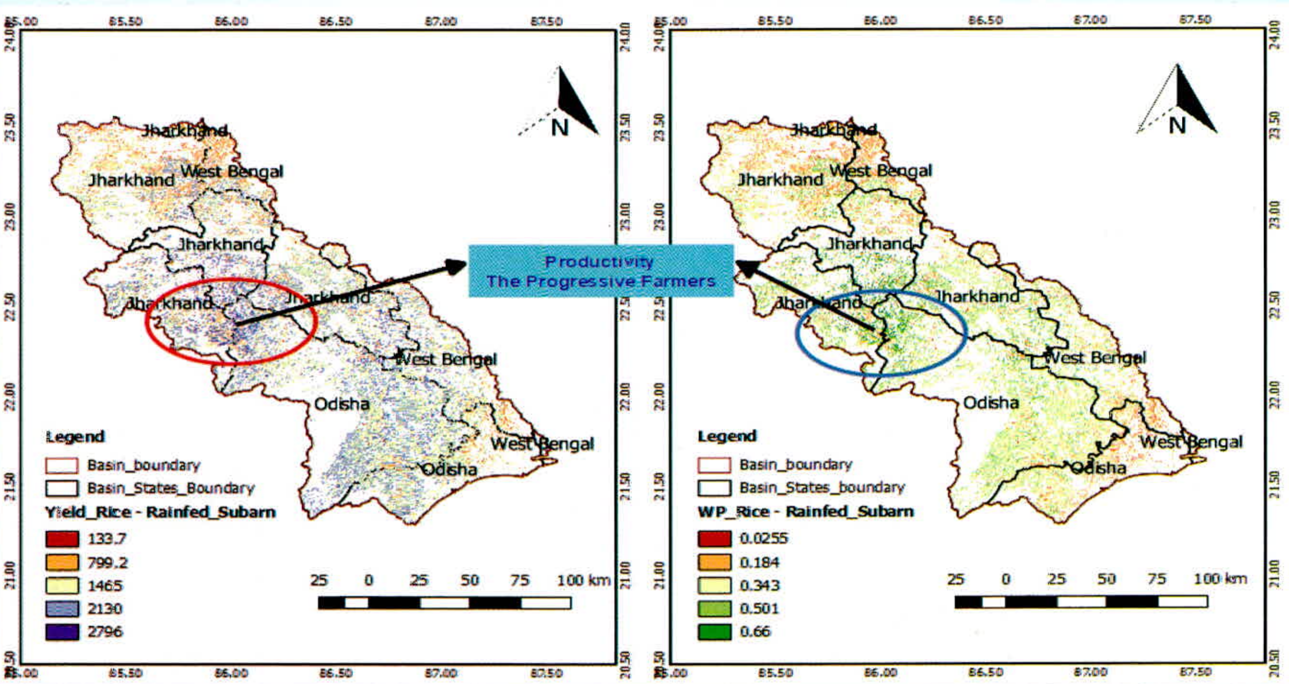


Fig. 5c: Land Productivity (kg/ha)

Fig. 5d: Water Productivity (kg/m^3)

6. Strategic Basin Planning for Ganga River Basin in India(GangaWIS)

Ganga Water Information System (GangaWIS) is a strategic basin planning tool that has been developed recently for the Ganga River basin. The tool has been developed by Deltares, the Netherlands in collaboration with Future Water and AECOM under a World Bank sponsored project and is based on the FEWS (Flood Early Warning System) framework, originally developed by Deltares. A team from National Institute of Hydrology, Central Ground Water Board, and Central Water Commission worked exhaustively on the tool during its development and fine-tuning.

Various components of hydrological processes incorporated in the Ganga WIS include snow/glacier melt, surface runoff, ground water recharge, surface water quality and surface-groundwater interaction. The rainfall-runoff process is simulated using two distributed models: SPHY model (for calculating rainfall-runoff process for mountainous part in the Himalaya region), and WFlow model (for the non-mountainous part of the Ganga Basin). The river discharge calculated by the SPHY model is used as upstream inputs for the WFlow model. The RIBASIM (River Basin Simulation Model) is used for allocation and management of water for fulfilling different demands like domestic, industrial, agriculture and e-flow requirements. Its hydrological input is derived from river flows calculated by WFlow model. RIBASIM uses a schematization of links and nodes to describe the flow of water in the rivers, the storage in reservoirs, the diversion into canals and the use and return flow by different functions. The RIBASIM model is also linked to the groundwater model by prescribing extraction and infiltration rates and for getting the fluxes between the river and groundwater. Water quality is assessed with the DWAQ model by combining RIBASIM simulated flows with pollutant load estimation. Groundwater dynamics in the basin is described by the iMOD-MODFLOW model. This model uses the same calculation grid as the hydrological models, but is only applied to the alluvial part of the basin. The recharge into the groundwater is obtained from WFlow and RIBASIM models. RIBASIM also provides the estimates on water abstractions and river flows. Based on river flows, river water levels are derived and used for the calculation of fluxes between the river and the groundwater. The impact of modelled river flows, water levels and water quality on the ecology and ecosystem services are evaluated using knowledge rules. Fig. 6a shows the schematic interactions between different models.

All model inputs and outputs are stored in the Ganga Water Information System (Ganga WIS).It is used to analyse and visualize various data (temporal/spatial) and model results. It also helps the user to import new input data and run one model or more models in sequence. It is designed to support the understanding of natural and social system of the Ganga Basin. It provides a central place with relevant measured and modelled information and data for various users, e.g. data managers, modellers, policy makers and decision-makers. A snapshot of the GUI of Ganga WIS is presented in Fig. 6b.

Finally, the summary of the model results stored in the Ganga WIS are presented in the dashboard as shown in Fig. 6c. This dashboard depicts various indicators to judge the impact of the different scenarios, such as state of groundwater development, lowest discharge, volume of water stored in reservoirs, agricultural crop production, deficit irrigation and drinking water, surface water quality index, volume of groundwater extracted and ecological, hydrological and socio-economic status.

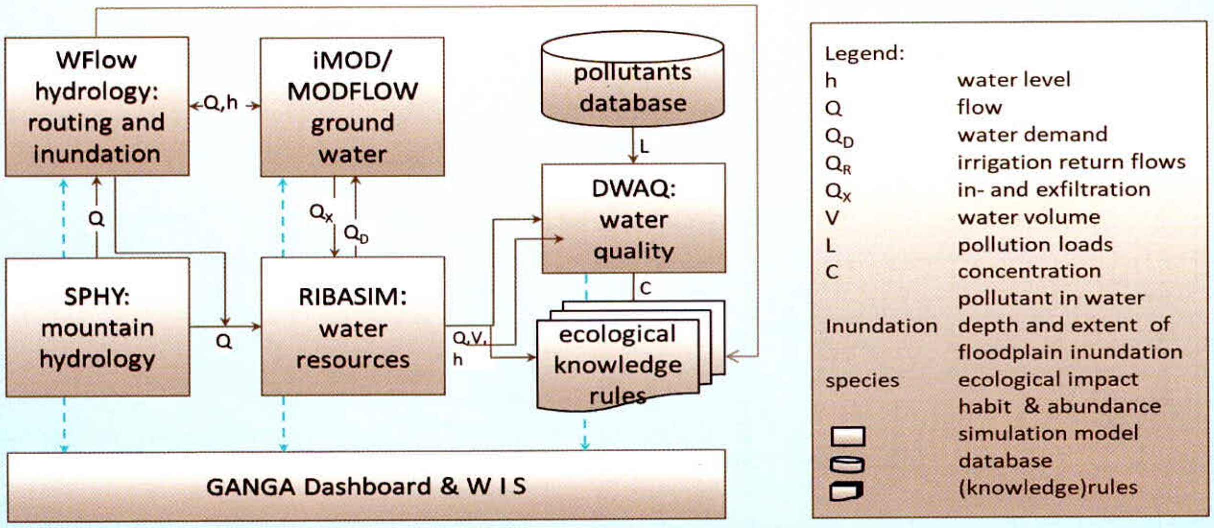


Fig. 6a: Schematic interactions between the models

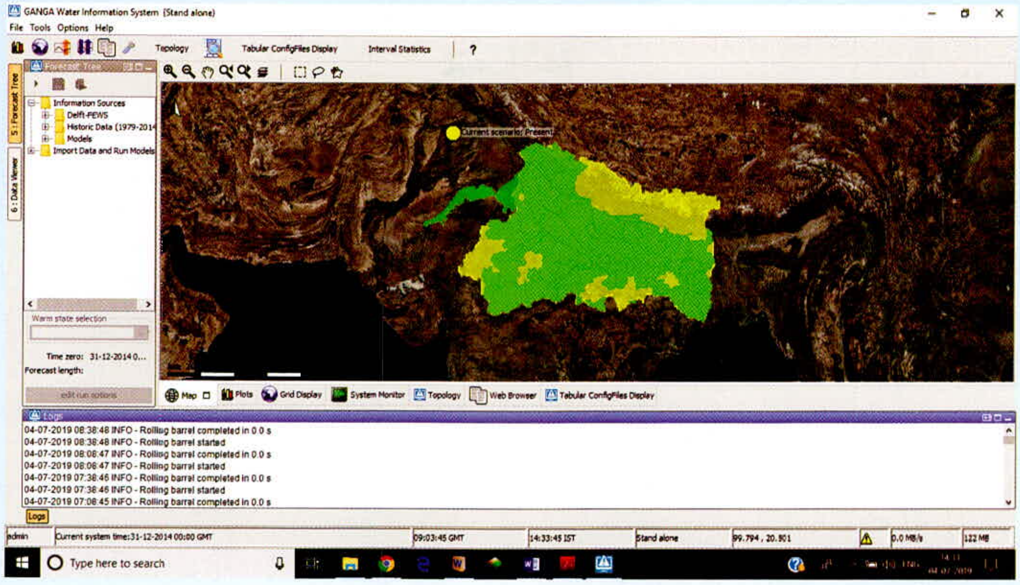


Fig. 6b: Graphical User Interface of GangaWIS

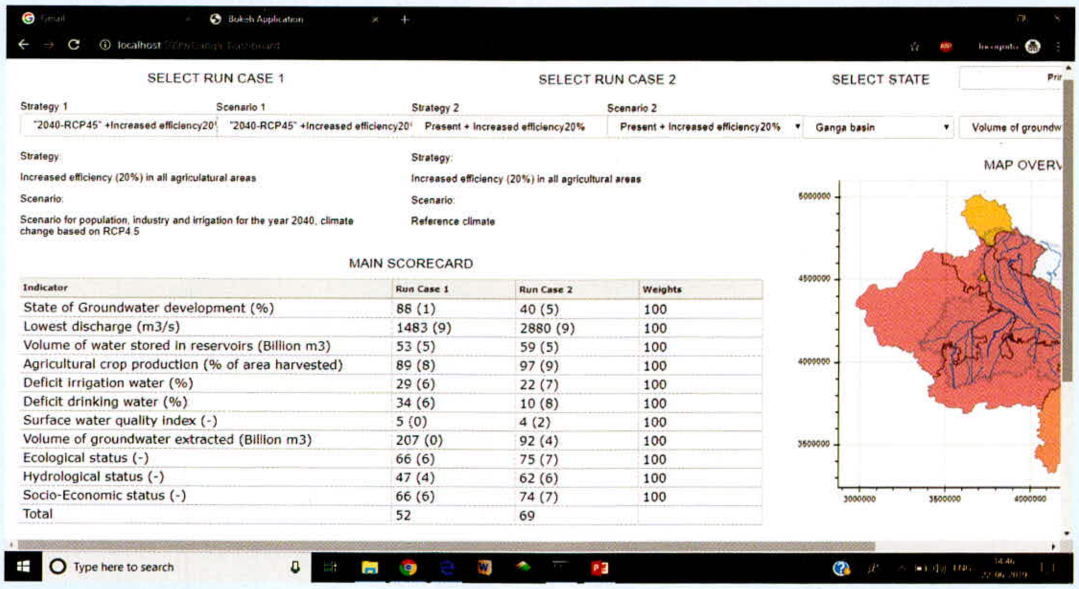


Fig. 6c: Dashboard showing results of scenarios with indicators and scores

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)

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 & Glacial Lake 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

Training courses attended by Scientist /Scientific Staff during Jan.-Jun., 2019

SN	Name of the Training Course	Place	Date & Month
1	Training on 'Communication Skills (WCS-09)"	ISTM, New Delhi	Jan. 07-8, 2019
2	Training Workshop on "Handling of CAT Cases"	ISTM, New Delhi	Jan. 07-9, 2019
3	Training on 'e-office'	ISTM, New Delhi	Jan. 21-22, 2019
4	Financial Management in Government	ISTM, New Delhi	Feb. 18-22, 2019
5	e-Procurement	ISTM, New Delhi	Mar. 18-19, 2019
6	Administrative Vigilance: role of IO/PO	ISTM, New Delhi	Apr. 22-26, 2019
7	DSpace Software for design and development of Institutional Repositories	CSIR-NISCARE, New Delhi	June 24-28, 2019

Training Course on
Conservation & Management of
Lakes, Wetlands and Springs

Training Course on
Hydrologic Modelling Using SWAT

Training Course/ Workshop Organised During Jan.-Jun., 2019

SN	Name of Course	Period	Venue
1	Training Workshop on "River Basin Modelling"	Jan. 07-11, 2019	SIHFW, Jaipur
2	*Three Days Training Course on "Water Conservation: Practices, Security and Sustainability- A Practitioners Approach"*	Jan. 14-16, 2019	NIH, Roorkee
3	Customized Training Course on 'Groundwater Flow Modelling using MODFLOW'	Jan. 14-18, 2019	Kerala
4	Training Course on "Flood and Drought Risk Management"	Jan. 21-25, 2019	NIH, Roorkee
5	Training Course on "Water Security: Best Practices for Conservation, Safety and Sustainability"	Jan. 23-25, 2019	WHRC, Jammu
6	Workshop on "MS-Office, Computer Awareness and Internet Usage for the Institute Staff"	Jan. 28, 2019	NIH, Roorkee
7	On Site training on DSpace Software	Feb.11-15, 2019	NIH Roorkee
8	Training programme on "Water Quality Monitoring of Surface, Ground, Waste Water/ Effluent, Data interpret - ation and Quality Assurance" sponsored by CPCB	Feb. 11-13, 2019	NIH Roorkee
9	Training Course on 'Coastal Zone Water Resources: Challenges, Investigation Techniques and Management'	Feb. 11-15, 2019	NIH, Roorkee
10	Training Course on Conservat ion and Management of Lakes, Wetlands And Springs	Feb. 25- Mar. 1, 2019	NIH Roorkee
11	Training Course on "Sediment Yield and Reservoir Sedimentation"	Feb.25-Mar.1, 2019	NIH Roorkee
12	Training Course on "Advanced Hydrology"	Mar. 5-9, 2019	NIH Roorkee
13	One day Workshop on 'High Performance advanced Septic system (HPAS) for Villages and Roadside Restaurants' under IC-IMPACTS (Indo Canada Project)	Mar. 15, 2019	Kakinada
14	Brain Storming Session on 'Water for All by 2030: Leaving no one behind'	Mar. 22, 2019	NIH, Roorkee
15	Stakeholder Workshop on the PDS under NHP titled "Impact Assessment of the upcoming Irrigation Projects and Climate change on the Drought and Densification Scenario for Chambal Basin in West M.P.	Mar. 27, 2019	State Water Data Cen tre, Bhopal
16	Training Course on 'Hydrologic Modelling using SWAT'	May 20-31, 2019	NIH, Roorkee
17	Training Course on "Groundwater Quality Monitoring and Assessment"	June 3-7, 2019	NIH, Roorkee
18	Training Course on Conservation and Management of Lakes, Wetlands and Springs	June 24-28, 2019	NIH, Roorkee

Mass Awareness Program

SN	Activities	Organised by & Date
1	Mass Awareness Program on ' Water Quality issue of the Coastal regions and functions of Water Quality Lab Equipment' for ASD Women's College, Kakinada	Feb. 5, 2019 at DRC, Kakinada
2	Mass Awareness Program on ' Water Quality and Quantity issues and Water Quality Lab Equipment' for Ideal college of Arts and Sciences, Kakinada	Feb. 28, 2019 at DRC, Kakinada
3	Cleaning of Village Pond under Swachhta Pakhwada 2019	Mar. 17, 2019 at Shankar Puri Village, Roorkee
4	Brain Storming Session (World Water Day) under Swachhta Pakhwada 2019	Mar. 22, 2019 at NIH Roorkee
5	Motivating school children for cleaning activities and plantation under Swachhta Pakhwada 2019	Mar. 25, 2019 at St. Joseph School, Roorkee
6	Drawing/ Poster competition for children and rally under Swachhta Pakhwada 2019	Mar. 26, 2019 at NIH, Roorkee
7	Workshop for women on cleanliness, sanitation and water conservation under Swachhta Pakhwada 2019	Mar. 28, 2019 at Jal Vihar Colony, NIH, Roorkee
8	Swachhata Pakhwada-2019	Mar. 15 – 31, 2019 at WHRC, Jammu

Important Meetings

1. 48th Working Group Meeting 2-3 May, 2019 at NIH, Roorkee
2. 72nd TAC Meeting June 3, 2019 at CWC, New Delhi

Well said about water

All the waters run to the sea and yet the sea is not full, and from the place where they began, thither they return again.	Ecclesiastes
In one drop of water are found all the secrets of all the oceans.	Khalil Gibran
Water is the only substance on earth that is naturally present in three different forms? As a liquid, a solid (ice) and as a gas (water vapour).	Author Unknown
Pure water is the world's first and foremost medicine.	Slovakian Proverb
Thousands have lived without love, not one without water.	W. H. Auden

Interesting Facts about Water

- The General comment on the right to water, adopted by Covenant on Economic, Social and Cultural Rights (CESCR) in November 2002, is a milestone in the history of human rights. For the first time water is explicitly recognized a fundamental human right and the 145 countries that have ratified the International CESCR will now be compelled to progressively ensure that everyone has access to safe and secure drinking water, equitably and without discrimination.
- Freshwater resources are unevenly distributed, with much of the water allocated far from human populations. Many of the world's largest river basins run through thinly populated regions. There are an estimated 263 major international river basins in the world, covering 231059898 km^2 or 45.3% of the earth's surface area (excluding Antarctica).
- Groundwater represents about 90% of the world's readily available freshwater resources; some 1.5 billion people depend upon groundwater for their drinking water.
- Agricultural water use accounts for about 755 of total global consumption, mainly through crop irrigation, while industrial use accounts for about 20%, and the remaining 5% is used for domestic purpose.
- The global water supply and sanitation 2000 Assessment (WHO/UNICEF, 2000) shows that 1.1 billion people lack access to improved water supply and 2.4 billion to improved sanitation.

जल सूक्ति

- बूंद–बूंद से बनता सागर, बूंद–बूंद से भरता सागर।
- पानी बिना जीवन है सूखा, पानी बिना है हर कोई भूखा।
- पानी का संरक्षण, धरती का रक्षण।
- आप पानी को बचाओ, पानी आपको बचायेगा।
- जल है तो धन है, जल है तो जीवन है।
- जल है तो हम हैं, जल है तो कल है।
- जल बचाएं, कल बचाएं।
- यदि देखना है जल की निर्मल धारा, इसे बचाने का प्रयास करो सारा।
- पानी अगर नहीं बचाओगे तो खुद प्यासे रह जाओगे।
- पानी को बचाना है, आने वाली पीढ़ी को कुछ दिखाना है।
- जल बचाओ, धरती बचावो।
- जो पानी को बचाएगा, समझदार वह कहलायेगा।
- बच्चे, बूढ़े और जवान, पानी बचाकर बनें महान।
- राष्ट्रीय हित में काम करो, पानी का सदुपयोग करो।
- पानी ही दौलत है, पानी ही शोहरत है।
- जल का सदुपयोग करो, इसका न दुरूपयेाग करो।
- पानी है गुणों की खान, पानी है धरती की शान।
- पानी है तो हमारा जीवन है।

Hindi Glossary for Hydrological terms

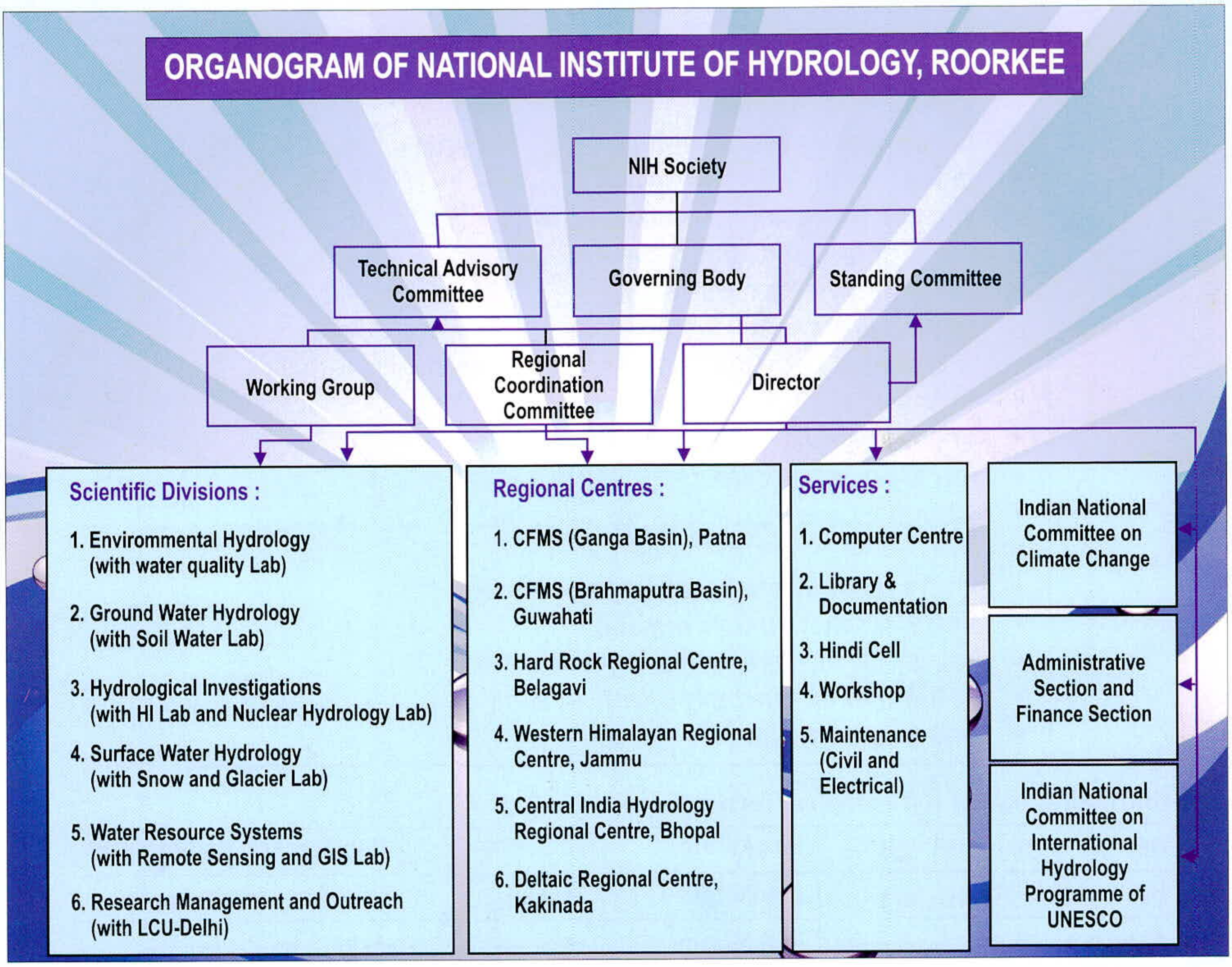
Artesian well	बम्ब कूप	Box Flume	नादं फ्लूम	Bench mark	अंकित ढीहा
Bore well	वेधः कूप	Blanket	आवरण	Outlet	निर्गम
Aeration	वायु संचारण	Bell Mouth	घंटा मुख	Acidic	अम्लीय
Afflux	जलोत्थान	Aggrading river	नदी अभिवृद्धि	Over haul	जीर्णोद्वार
Overflow dam	परिविाह बांध	Absorption loss	अबशोषण हानि	Agriculture	कृषि

इदमापः प्र वहत यत्कि च दुरितं मयि । यद्वाहमभिदुद्रोह यद्वा शेप उतानृतम् ।8।	हे जल, मुझमें जो भी दुष्ट प्रवृत्तियां हैं, कृपया उन्हें दूर करें और मेरे मस्तिष्क में विद्यमान समस्त विकारों को दूर करें और मेरे अंतर्मन में जो भी बुराइयाँ हैं उन्हें दूर करें। O Water, please wash away whatever wicked tendencies are in me, and also wash away the treacheries burning me from within, and any falsehood present in my mind.
आपो अद्यान्वचारिषं रसेन समगस्महि। पयस्वानग्न आ गहि तं मा सं सृज वर्चसा ।9।	हे जल, आप जो उत्साही सार में भरे हुए हैं, मैं आपकी शरण में आया हूँ। मैं आप में गहराई से सम्माहित हूँ, अर्थात् स्नान कर, से घिरा हुआ है, अग्नि सिद्धांत, जो अग्नि. मुझमें चमक पैदा करें। O Water, today to you who is pervaded by fine rasa (invigorating sap) I came, I deeply enter (i.e. bathe) in you who is pervaded by agni (fire principle): may that agni produce lustre in me.

कल की चिंता है अगर, सोच मनुज तू आज।
जल–संरक्षण के बिना, रोए सकल समाज।।

जल ही प्राणाधार है, जल से ही संसार।
जल–संरक्षण सब करें, जल जीवन का सार।।

जल की महिमा है अनंत, जल है ब्रह्म–स्वरुप।
जल की रक्षा कर मनुज, जीवन बने अनूप।।



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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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