



# भारत में जलविज्ञान अनुसंधान के बढ़ते कदम



आपो हिंदा मयोमुवः  
राष्ट्रीय जलविज्ञान संस्थान  
रूड़की (उत्तराखण्ड)  
(जल संसाधन, नदी विकास और  
गंगा संरक्षण मंत्रालय, भारत सरकार)



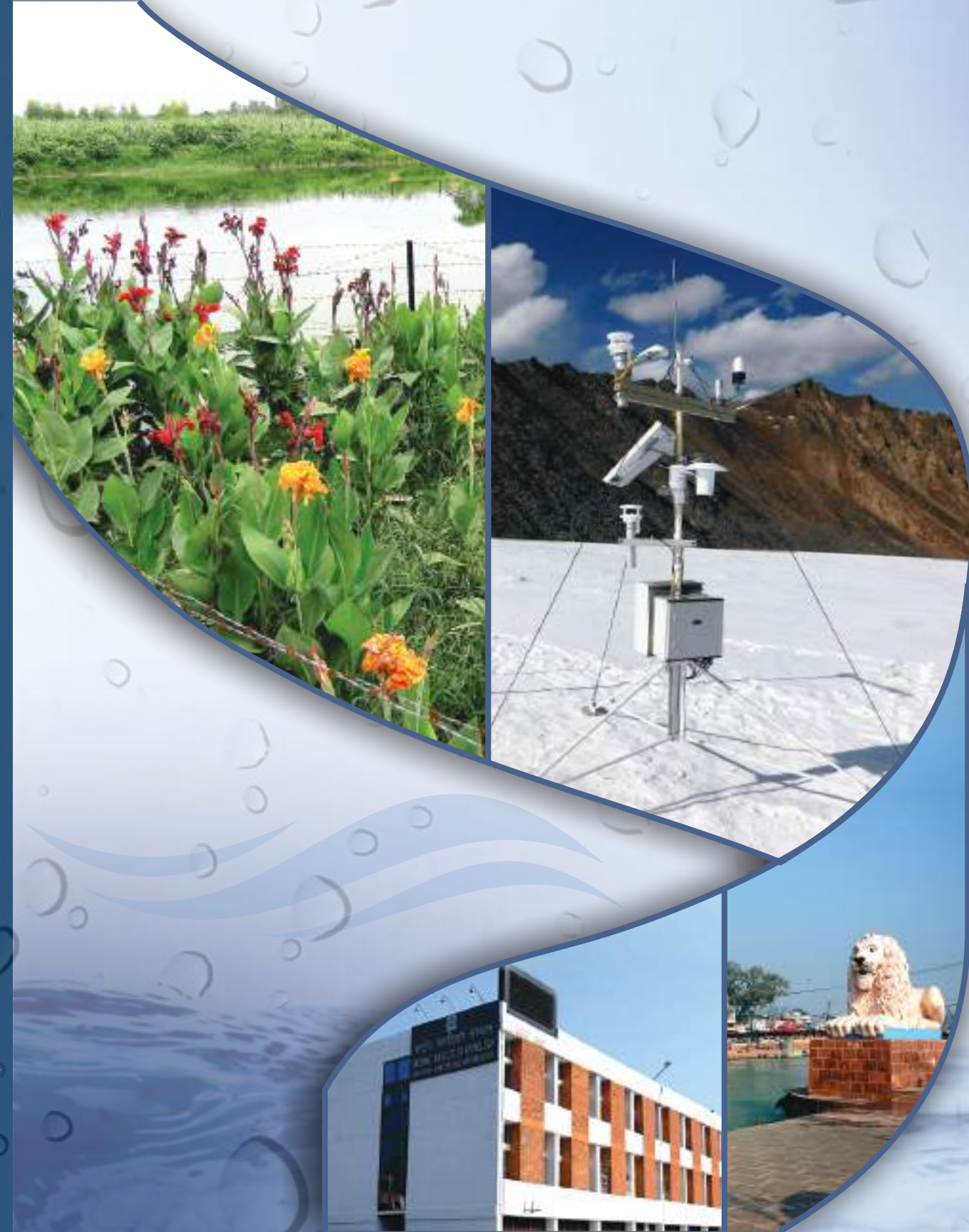
PIONEERING HYDROLOGICAL RESEARCH IN INDIA



# PIONEERING HYDROLOGICAL RESEARCH IN INDIA



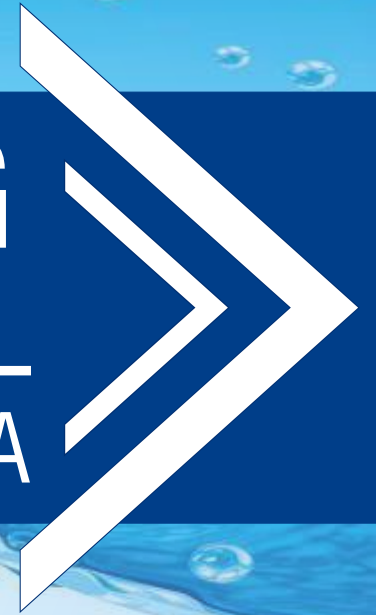
आपो हिंदा मयोमुवः  
NATIONAL INSTITUTE OF HYDROLOGY  
Roorkee (Uttarakhand)  
(Ministry of Water Resources, River Development  
& Ganga Rejuvenation)







PIONEERING  
HYDROLOGICAL  
RESEARCH IN INDIA



**Published by**

National Institute of Hydrology  
(Ministry of Water Resources, RD & GR)  
Roorkee-247667, India  
www.nihroorkee.gov.in

**Compiled and Edited by**

Dr V C Goyal, Dr M K Goel, Dr Renoj Thayyen, Ms Suman Gurjar  
Dr Asha Rani, Mr Subhash Kichlu, Mr Furqan Ullah

**Creative Inputs**

Dr. Sadhana Malhotra, Mindspace, Dehradun

**Acknowledgements**

The Coffee Table Book is the result of collaborative efforts of the employees of National Institute of Hydrology. Photographs used in this publication have been taken by the respective scientists and staff members of various studies/projects, at both the NIH Headquarters and its Regional Centres.

**Design & Print**

Anubhav Printers & Packers  
Roorkee  
M.: 9719004321

All rights reserved. No part of this publication may be reproduced, copied or transmitted in any electronic or mechanical form without prior permission from the publisher.

© National Institute of Hydrology  
First edition published December 2018

# FOREWORD

यू.पी. सिंह, आई.ए.एस.

**U.P. SINGH, IAS**

सचिव

**SECRETARY**

Tel. : 23710305

Fax : 23731553.

E-mail : [secy-mowr@nic.in](mailto:secy-mowr@nic.in)



जल संरक्षण - जीवन संरक्षण  
Conserve water - Save life



भारत सरकार  
जल संसाधन, नदी विकास और गंगा संरक्षण मंत्रालय  
श्रम शक्ति भवन, रफी मार्ग, नई दिल्ली - 110 001

GOVERNMENT OF INDIA  
MINISTRY OF WATER RESOURCES, RIVER DEVELOPMENT &  
GANGA REJUVENATION  
SHRAM SHAKTI BHAWAN, RAFI MARG, NEW DELHI-110 001  
<http://www.mowr.gov.in>

I am pleased to know that the National Institute of Hydrology is celebrating 40<sup>th</sup> anniversary of its foundation day on 16 December 2018. A period of 40 years more or less spans the entire active working life of a human being but it is somewhat smaller epoch for an Institute. Hence, this period can be considered to be the formative stage of NIH.

India is facing numerous challenges in development and management of her water resources. We have to provide food and energy security to our growing population, rejuvenate rivers and environment, and provide safety against water triggered disasters. As the country has taken off on a rising growth trajectory, application of advanced techniques and development of innovative technology for water management is essential to support high growth rate. In this context, the role of a research institute in the field of water resources, such as NIH, becomes very important and relevant. Since water touches life of everyone, we need to very closely work with the various stakeholders for better water management.

I have noted that NIH is bringing out a Coffee Table Book on the occasion of its 40<sup>th</sup> Foundation day, highlighting history of the Institute, tracing its developmental path, and describing a few important studies. I am very pleased with the R & D contributions of NIH and the Ministry is proud of its various achievements.

We are living in the times of rapid changes. I am confident that the NIH would continue to evolve and attaining greater heights in the time to come. On this auspicious occasion, I am delighted to convey my greetings to all the employees of the Institute.

(U.P. Singh)

Secretary (WR, RD & GR) &  
Chairman, Governing Body of NIH





## PREFACE



It is a matter of great pride and honour for me to present the Coffee Table Book of National Institute of Hydrology (NIH) on completion of four decades of establishment of the Institute. Founded on 16 December 1978 with a small office at the University of Roorkee (now IIT Roorkee), it has grown exponentially with its Headquarters in a seven acre campus at Roorkee, and six Regional Centres in different parts of the country.

Research studies related to various areas of hydrology and water resources form the core mandate of the Institute. NIH has acquired a leadership role among the scientific community for its path breaking studies that have been acclaimed nationally and internationally. NIH has also established experimental facilities in catchments across different topographies (some of them in very difficult and arduous terrains) for its field based studies and is working assiduously to provide useful and practical solutions for water related issues to the planners, decision makers and practitioners. The scientists of the Institute and the supporting staff deserve accolades for their diligence, dedication and determination in pursuing research that enables water security for the nation.

The Institute collaborates worldwide with organizations working in the areas of hydrology and water resources. A number of short term hydrology based training programmes are also conducted by the Institute for the officers of water related departments, research scholars, post graduate students, and academicians.

The Coffee Table Book is a treasure trove of interesting information for everyone who wishes to know in greater detail about the Institute's eventful four decade journey. The book is well designed, written in a lucid style, and pictorially very rich. I am sure that the readers will find the book engrossing and insightful.

Jai Hind.

**(Sharad K. Jain)**  
Director



**N**estled at the foothills of the mighty Himalayas, and located on the banks of the Ganga Canal, is the small town of Roorkee, which is home to the headquarters of National Institute of Hydrology (NIH). The Institute was established on 16 December 1978 as an autonomous body registered under the Societies Act, 1860 under the Ministry of Water Resources, River Development and Ganga Rejuvenation (MoWR, RD & GR). NIH is fully funded by the Ministry and is the premier R & D Institute in the country to undertake, aid, promote and coordinate basic, applied and strategic research in all aspects of hydrology and water resources.

The National Institute of Hydrology Society is the apex body of the Institute. It reviews the progress and performance of the Institute and directs the Governing Body and the Institute towards attainment of the objectives enunciated in the Memorandum of Association of the Society. The Director of the Institute is the Principal Executive Officer of the Society.

The Institute's headquarters at Roorkee has six theme-based divisions encompassing all aspects of Hydrology conducting demand driven and user defined strategic studies through collaborations with synergetic national and international organizations. The four Regional Centers at Belgavi, Jammu, Kakinada and Bhopal, and the two Centers for Flood Management Studies at Guwahati and Patna, deal with the field-oriented research and problems endemic to their hydrologic region. The research and other technical activities are monitored and guided by the Technical Advisory Committee and the Working Group at the headquarters, and by the Regional Coordination Committees for the Regional Centres and the Centres for Flood Management Studies.

The Institute acts a centre of excellence for the transfer of

technology, human resource development and institutional development in specialized areas of hydrology. The Institute organizes short duration workshops/training programmes/conferences for transfer of relevant theoretical background as well as methodologies, including computer programmes, to field engineers of Central and State Government organizations, scientists, researchers and NGOs.

The campus is spread across 7 acres of lush green land, with buildings and open spaces providing just the right ambience of working amid nature. The seasonal flowers are always in abundance, and provide a beautiful and refreshing environment aptly suited for the momentous and diligent work undertaken by the Institute's scientists in the core areas of research, consultancy and training.

The Institute has come a long way since its inception and is known nationally and internationally for pioneering projects and research in water resources with emphasis on demand-driven, user-defined, strategic studies, and knowledge dissemination, mass awareness and capacity building programs.

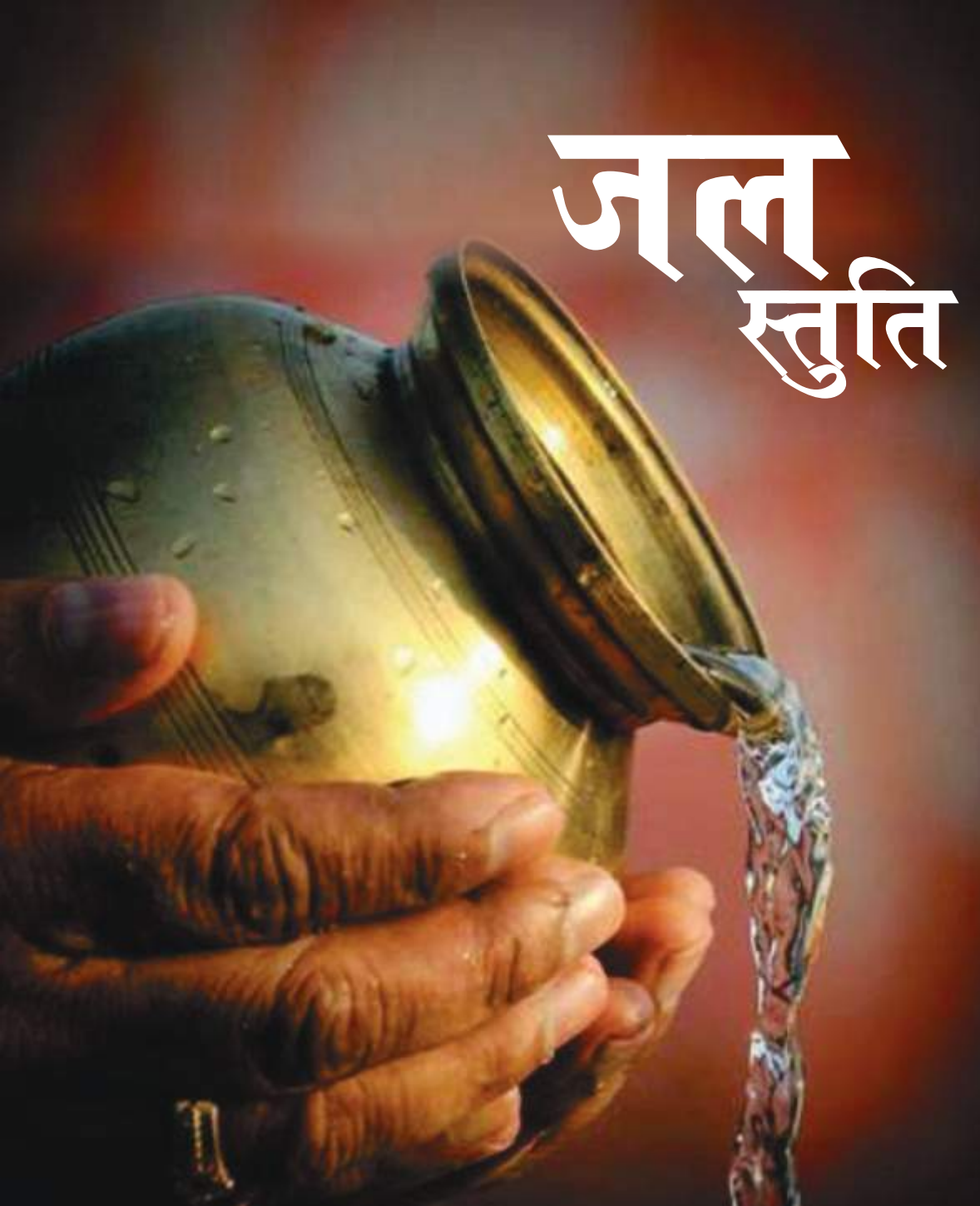
**जल संरक्षण...**

**जरूरत भी**

**और**

**कर्तव्य भी**





# जल स्तुति

बहता छल—छल करता कल—कल,  
जीवन स्रोत बना है जल ।

ब्रह्म यही ब्रह्माण्ड यही है  
जीवन का है तत्व यही  
आदि, मध्य और अन्त यही है  
जल का सिद्ध महत्व यही  
निर्मल निर्मल पावन छल—छल  
सृष्टि स्रोत बना है जल,  
जीवन स्रोत बना है जल  
बहता छल—छल करता कल—कल ।

नदियां की है धार यही जल  
रिमझिम—रिमझिम नभ से बरसे  
धरती को देता नव—जीवन  
कण कण इससे छूकर हरसे ।

जल की धार यही है शीतल  
प्राणों का आधार है जल,  
जीवन स्रोत बना है जल  
बहता छल—छल करता कल—कल ।

जीवन का संदेश यही है, पुष्प—पुष्प में यही खिले  
ब्रह्म समान सर्वव्यापी जल, इससे जग को वृद्धि मिले  
गंगा यमुना पावन कल—कल  
ब्रह्म समान सर्वव्यापी जल, इससे जग को वृद्धि मिले  
ईश्वर का वरदान है जल, जीवन स्रोत बना है जल  
बहता छल—छल करता कल—कल ।







INDIAN INSTITUTE OF TECHNOLOGY ROORKEE, ROORKEE

AMBIENT	INDICES	START MONITORING	STATIONARY AIR POLLUTION
1. Ambient Air Quality Index (AQI)	1. Ambient Air Quality Index (AQI)	1. Ambient Air Quality Index (AQI)	1. Ambient Air Quality Index (AQI)
2. Ambient Air Quality Index (AQI)	2. Ambient Air Quality Index (AQI)	2. Ambient Air Quality Index (AQI)	2. Ambient Air Quality Index (AQI)
3. Ambient Air Quality Index (AQI)	3. Ambient Air Quality Index (AQI)	3. Ambient Air Quality Index (AQI)	3. Ambient Air Quality Index (AQI)
4. Ambient Air Quality Index (AQI)	4. Ambient Air Quality Index (AQI)	4. Ambient Air Quality Index (AQI)	4. Ambient Air Quality Index (AQI)
5. Ambient Air Quality Index (AQI)	5. Ambient Air Quality Index (AQI)	5. Ambient Air Quality Index (AQI)	5. Ambient Air Quality Index (AQI)
6. Ambient Air Quality Index (AQI)	6. Ambient Air Quality Index (AQI)	6. Ambient Air Quality Index (AQI)	6. Ambient Air Quality Index (AQI)
7. Ambient Air Quality Index (AQI)	7. Ambient Air Quality Index (AQI)	7. Ambient Air Quality Index (AQI)	7. Ambient Air Quality Index (AQI)
8. Ambient Air Quality Index (AQI)	8. Ambient Air Quality Index (AQI)	8. Ambient Air Quality Index (AQI)	8. Ambient Air Quality Index (AQI)
9. Ambient Air Quality Index (AQI)	9. Ambient Air Quality Index (AQI)	9. Ambient Air Quality Index (AQI)	9. Ambient Air Quality Index (AQI)
10. Ambient Air Quality Index (AQI)	10. Ambient Air Quality Index (AQI)	10. Ambient Air Quality Index (AQI)	10. Ambient Air Quality Index (AQI)

An ISO-9001:2015 Certified Organization



# Human Resources



The Institute has a total sanctioned strength of 247 personnel, including Group A (85 posts), Group B (76 posts) and Group C (86 posts) as on 31 March, 2018.







NIH has grown from strength to strength due to the sheer brilliance and hard work of its employees who have worked diligently over the years to achieve the organizational mission and goals. The scientists of the Institute are highly qualified and well trained to handle diverse hydrological problems being faced by the country. Most of the scientists have a Ph.D. degree in Engineering and Science and have long research experience. They are ably assisted by the supporting scientific, technical and administrative staff in accomplishing their designated tasks.

NIH appreciates the contribution of its employees in its growth and has initiated several schemes for their welfare.



# Contents

10   Factsheet	Stimulus   12
14   Management Structure	Organogram   15
16   Hydrology as we envision	Directors   17
18   Timeline	Locale   20
22   Scientific Divisions & Regional Centres	Infrastructure   24
40   Thrust Areas of Research	What We Do   41
42   Contribution to Key Areas in Nation Building	Contribution to Key Infrastructure Sectors   44
46   Progression in Hydrological Research	Teaming up for Greater Synergy   48
50   Major R&D Projects	Training Programs   86
88   Reaching Out to People	Nurturing the Future   90
91   Ek Kadam Swachhta Ki Ore	Library & Documentation Services   92
93   Publications	Monitoring & Evaluation   94
96   Fostering Partnership	Conferences & Seminars   98
100   Dignitaries' Blessings	Life at Campus   102
The Future Beckons   104	



10   फैक्टशीट	प्रेरणा   12
14   प्रबंधन ढांचा	संगठन ढांचा   15
16   जलविज्ञान जैसा हम समझते हैं	निदेशक   17
18   समयरेखा	अवस्थिति   20
22   वैज्ञानिक प्रभाग तथा क्षेत्रीय केन्द्र	आधारिक संरचना   24
40   अनुसंधान के महत्वपूर्ण क्षेत्र	हम क्या करते हैं   41
42   राष्ट्र निर्माण में योगदान के मुख्य क्षेत्र	आधारिक संरचना क्षेत्र में योगदान   44
46   जलविज्ञानीय अनुसंधान में प्रगति	अधिक तालमेल के लिए टीमवर्क   48
50   प्रमुख अनुसंधान एवं विकास परियोजनाएं	प्रशिक्षण कार्यक्रम   86
88   जनता तक पहुंचना	भविष्य का पोषण   90
91   एक कदम स्वच्छता की ओर	पुस्तकालय तथा प्रलेखन सुविधाएं   92
93   प्रकाशन	जांचना और परखना   94
96   साझेदारी को बढ़ाना	सेमिनार तथा सम्मेलन   98
100   गणमान्य अतिथियों का आशीर्वाद	कैंपस में जीवन   102
	भविष्य के संकेत   104



# Fact Sheet



आपो हिंसा मयोभुवः

## **NATIONAL INSTITUTE OF HYDROLOGY** (Ministry of Water Resources, RD & GR)

Established as a Society on 16 December 1978  
Recognized as an S&T Institution  
ISO 9001:2015 certified organization

Total sanctioned strength	:	247 (83 Scientists)
<b>Yearly Budget</b>		
Non-scheme	:	~Rs 26 crore
Scheme	:	~Rs 31 crore/year
Research publications	:	4,435
Training courses organized	:	460 (~12,000 participants)
PG dissertation supervised	:	358
PhD thesis supervised	:	23

### **Organization**

- Six Scientific Divisions at the Headquarters (Roorkee, Uttarakhand)
- Six Regional Centres at Jammu, Belgavi, Bhopal, Kakinada, Guwahati, Patna

### **Objectives**

- To undertake, aid, promote and coordinate systematic and scientific work in all aspects of hydrology;
- To cooperate and collaborate with other national, foreign and international organizations in the field of hydrology;
- To establish and maintain a research and reference library in pursuance of the objectives of the Society and equip the same with books, reviews, magazines and other relevant publications; and
- To do all other such things as the Society may consider necessary, incidental or conducive to the attainment of the objectives for which the Institute has been established.

### **Thrust Areas of Research**

- Hydrology of Extremes
- Environmental Hydrology
- Regional Hydrology
- Integrated Water Resources Management (IWRM)
- Hydrology for Watershed Management
- Capacity Building & Outreach Activities



## Key areas of contribution

- Water availability and basin planning
- River bank filtration
- Managed aquifer recharge
- Dam break analysis
- Glacier Lake Outburst Flood (GLOF)
- Coastal aquifer management
- Design flood and flood safety of power plants
- Area drainage studies for power plants
- Drought assessment
- Hydraulic modelling for riverfront development
- Study of glacier systems
- Water quality assessments
- Rejuvenation of village ponds
- Conservation plan for lakes and springs
- IWRM planning for watersheds
- Decision Support Systems
- Capacity building programmes

## Major completed and ongoing projects

- UNDP Projects
- SHE Project
- WAMATRA Project
- Hydrology Project-I & II
- Saph Pani Project (EU funded)
- National Hydrology Project (WB funded)
- Neeranchal National Watershed Project (WB funded)
- NMSHE Project (DST-Gol funded)

## What we do

- Basic and applied research
- Sponsored research
- Demand driven research
- Software development
- Capacity building and training activities
- Awareness and outreach activities
- Advisory services to NGT & courts
- Inputs in policy making

## Clients served

- Gol ministries and departments
- State governments
- Academic and research institutions
- International organizations
- Organizations in SAARC countries
- Public Sector Units
- Indian Army and BRO
- National Green Tribunal
- River Dispute Tribunals

## Our collaborators

- The World Bank
- European Union
- NERC-UK
- UNESCO, UNDP
- IAEA
- ICIMOD
- IWMI
- IHE
- IIASA
- CSIRO
- BGS
- CEH
- FAO, WMO
- CPCB, BARC, NRSC, IIRS, IMD
- ICAR
- MoWR, RD & GR
- MoEF & CC
- MoA & FW
- MoES, DST, DoLR

### Contact

#### National Institute of Hydrology

Jal Vigyan Bhawan, Roorkee-247667, India

Email: [director.nihr@gov.in](mailto:director.nihr@gov.in)

Website: [www.nihrroorkee.gov.in](http://www.nihrroorkee.gov.in)

Ph. : 1332- 272106

Facebook tag : <https://www.facebook.com/nihrroorkee.gov.in/>

Twitter tag : [https://twitter.com/NIH\\_Hydrology](https://twitter.com/NIH_Hydrology)







## Vision

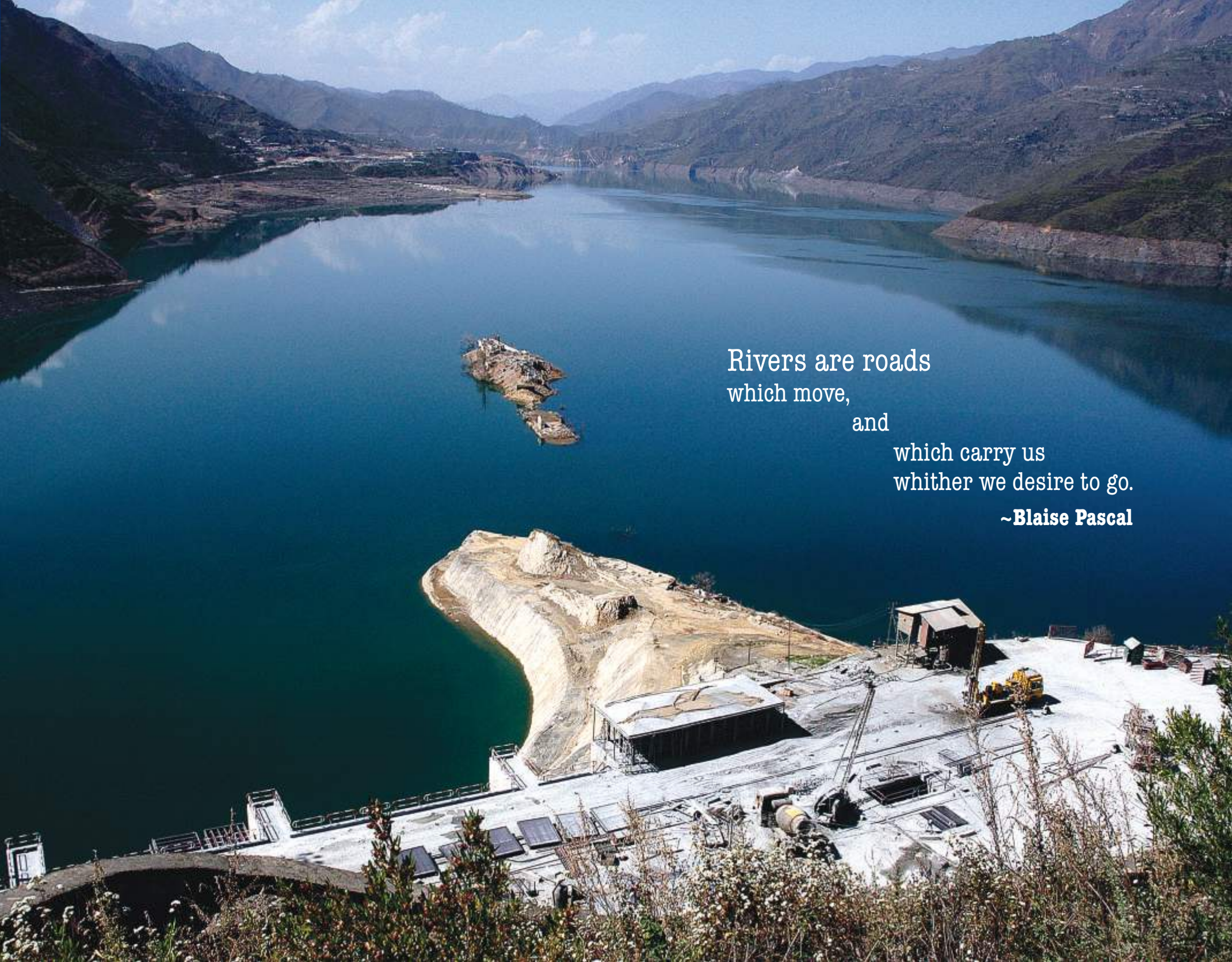
Providing leadership in hydrologic research through effective R&D solutions for achieving sustainable development and self-reliance of the water sector in India.



## Mission

- Develop methodologies for optimum utilization of water resources and environment
- Propagate applications of emerging technologies for water resources development and management
- Find ways to save the society from water-related hazards
- Develop mass awareness for water conservation and optimum utilization

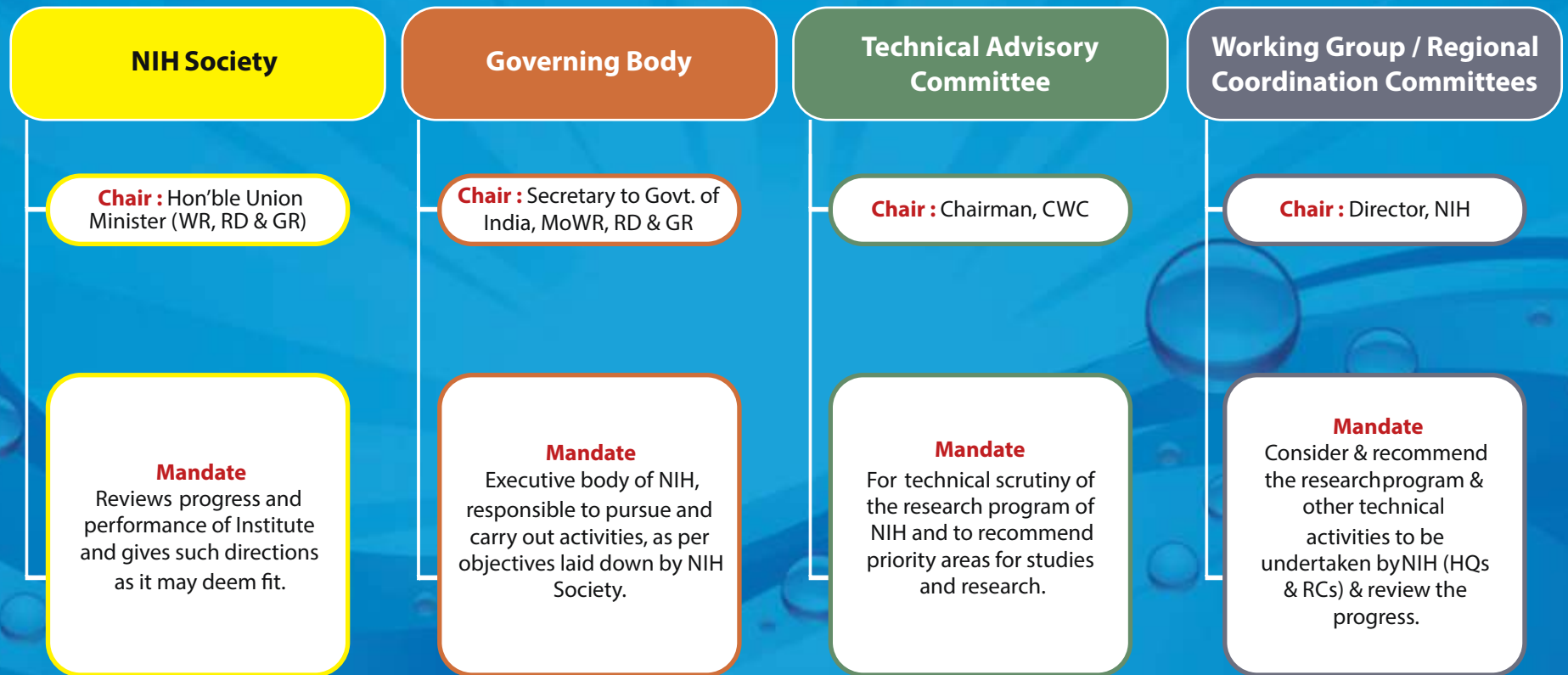




Rivers are roads  
which move,  
and  
which carry us  
whither we desire to go.  
~**Blaise Pascal**

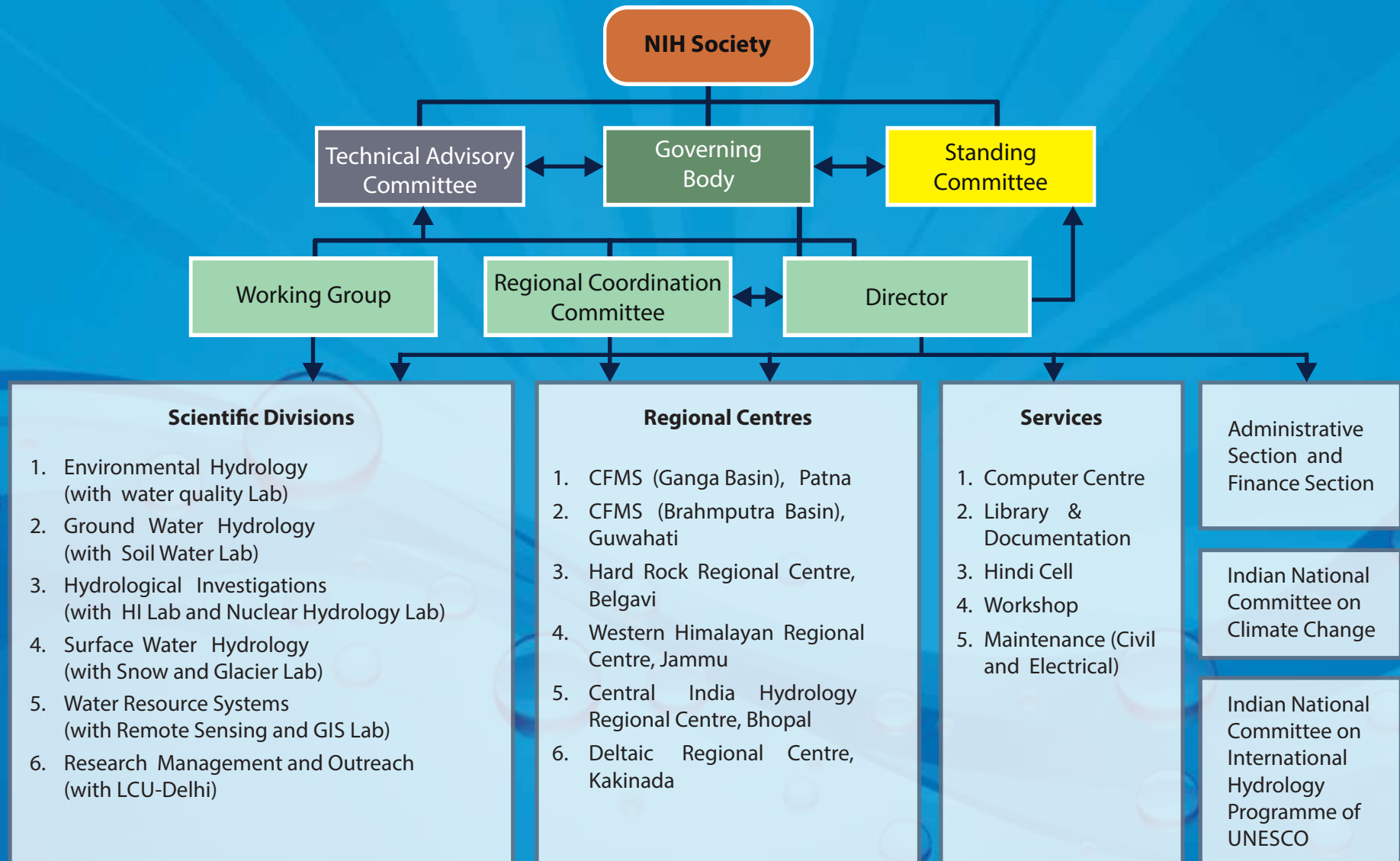


# Management Structure





# Organogram



# Hydrology

as we envision...



The word hydrology is derived from the Greek words *hydor*, which means water, and *logos*, which means science. Thus in this broad sense, **hydrology** is the science which is concerned with all waters on Earth, its occurrence, distribution and circulation, its physical and chemical properties, its effects on the environment and on life of all forms. Hydrology is a broad subject of inter-disciplinary nature drawing support from allied sciences, such as meteorology, geology, statistics, chemistry, physics and fluid mechanics.

The hydrologists play an important role in mitigating water related problem such as quantity, quality and water availability or basin water budgeting through application of proper scientific knowledge and mathematical principles. They also focus on studies dealing with municipal water supply, irrigation water supply and management, mitigation of floods and droughts, integrated watershed management, ground water recharge and reservoir sedimentation problems, and are able to offer solutions that can be implemented to overcome the scarcity of water.





# Directors



**DR. S. RAMASESHAN**  
22.02.1979- 15.7.1983



**DR. SATISH CHANDRA**  
30.05.1984- 31.08.1993



**DR. S. M. SETH**  
1.09.1993- 3.10.2000



**Dr. K.S. RAMASASTRI**  
4.10.2000-30.09.2003



**DR. K. D. SHARMA**  
1.10.2003- 30.04.2008



**ER. R. D. SINGH**  
1.05.2008- 30.06.2017



**DR. SHARAD KUMAR JAIN**  
1.07.2017-

# Timeline



- Established in 1978
- 1<sup>st</sup> Achievement Review Committee (ARC) 1978-1988
- Functioned as UNDP project from Feb 1979 till 1984
- Shifted to Jal Vigyan Bhawan in 1982
- Declared S&T organisation in 1983
- Worked on 8 priority areas under 6 Scientific Divisions till 6<sup>th</sup> plan
- 14 Scientific Divisions during 7<sup>th</sup> Plan (1985-90)
- 18 Scientific Divisions since 8<sup>th</sup> plan
- CEC project on 'SHE Model' during 1987-91
- Established Regional Centres during 1987-1991
- HILTECH Sectt. established in 1982, renamed as INCOH in 1989

1979-1989

1990-1999

- Dutch project 'WAMTARA' during 1990-1992
- UNDP project-II during 1991-96
- UNESCO project 1993-1996
- USAID project 1993-1996
- World Bank funded 'Hydrology Project-I' 1995-2001
- 2<sup>nd</sup> ARC 1994-1999
- 3<sup>rd</sup> ARC 1994-1999
- Assessment Promotion Rules for Scientist
- 4<sup>th</sup> ARC 1999-2004

*Journey of*  
**40**  
*Years*





# Journey of 40 Years

- Silver Jubilee in 2003
- World Bank funded 'Hydrology Project-II 2006-2014
- 5 Scientific Divisions + RCMU since 2004
- 5th ARC 2004-2010
- Climate change Cell under National Water Mission 2009
- Result Framework Document (RFD) initiated in 2009
- Organized International Conference on 'Water, Environment, Energy & Society in 2009

2000-2009



2010-2018

- Citizen's Charter 2010
- Assessment Promotion Scheme for Scientists 2012
- ISO Certification 2012
- Established 'Liaison & Coordination Unit', Delhi 2013
- EU funded project 'Saph Pani' during 2011-2014
- 6th ARC 2010-2017
- Organized 3<sup>rd</sup> World's Large River Int. Conference in 2017
- Organized 7<sup>th</sup> Intl. Groundwater Conference in 2017
- World Bank & GoI funded 'National Hydrology project'- (MoWR, RD&GR) (2016- Ongoing)
- World Bank & GoI funded 'Neeranchal National Watershed Project-' (DoLR), (2016- Ongoing)
- Ministry of Science and Tech, (GoI) funded 'NMSHE' project (2016- Ongoing)



## Locale

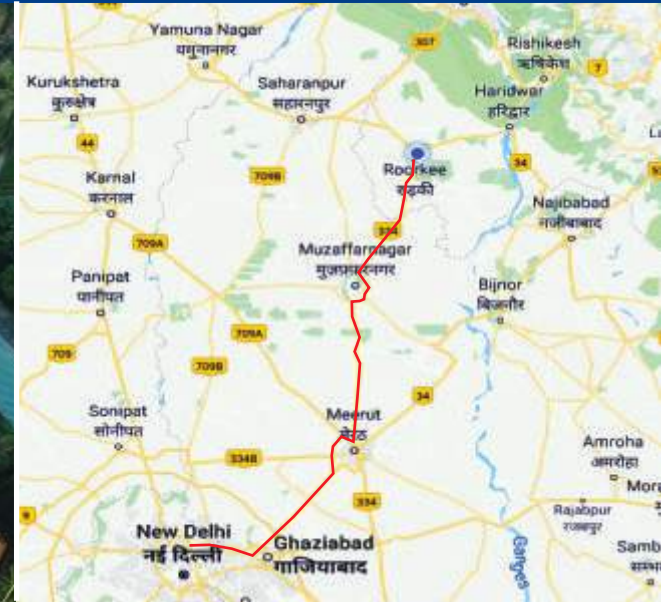
The Institute is situated in Roorkee, a small town 30 km south of the Himalayan range in district Haridwar, in the Uttarakhand state of India. It is located on the banks of the Ganga canal on the national highway between Delhi and Dehradun. It is adjacent to the prestigious Indian Institute of Technology. Banks, shops, restaurants, the bus-stand and the railway station, are within easily accessible distance.

Before 1840, the city was a small village of mud houses on the banks of the Solani river. Digging work on the Upper Ganga Canal began in April 1842. The city's growth started with the inception of 'Roorkee College' in 1845 to train local youth to assist in the civil engineering works in the making of the Upper Ganga Canal. The college was rechristened as 'Thomson College of Engineering', and later upgraded to 'University of Roorkee' in 1949. India's first aqueduct was constructed over the Solani river near Roorkee, which was India's first irrigation work in North India. Though the Railways in India started in 1853, the first steam locomotive was operated in Roorkee in 1851 to carry soil during the construction of aqueduct.





# Hydrology Hub of India



Roorkee town is well-known for its prestigious Institutes and R & D organizations, namely Indian Institute of Technology, Central Building Research Institute, Irrigation Research Institute and Army's Bengal Engineering Group. The setting up of National Institute of Hydrology at Roorkee is another honour for the historically rich and institutionally significant town of Roorkee, which has become the largest hub of hydrologists in India. Roorkee is proud to have hosted hydrologist luminaries such as Dr A N Khosla, Dr R J Garde, and Dr K G Rangaraju.





# Scientific Divisions

The Institute has six theme based divisions encompassing all aspects of Hydrology and is known nationally and internationally for pioneering projects and strategic studies in this field.

The studies are carried out at the headquarters at Roorkee and the four Regional Centres at Belgavi, Jammu, Kakinada and Bhopal, and the two Centres for Flood Management Studies at Guwahati and Patna.

The main focus of the studies at the headquarters is on applied and user defined research, while the Regional Centres deal with the field oriented research areas and problems endemic to the hydrological region in which they are located.



**Surface Water Hydrology**



**Water Resources Systems**



**Environmental Hydrology**



**Groundwater Hydrology**



**Hydrological Investigations**



**Research Management & Outreach**





# Regional Centres

To deal with the specific hydrological problems in different regions of the country and to effectively interact with the States, the Institute has established four Regional Centers and two Centers for Flood Management Studies (CFMS) in different parts of the country.

→ Hard Rock Regional Centre, Belgavi

Central India Hydrology Regional Centre, Bhopal

→ Deltaic Regional Centre, Kakinada

Centre for Flood Management Studies, Patna

→ Western Himalayan Regional Centre, Jammu

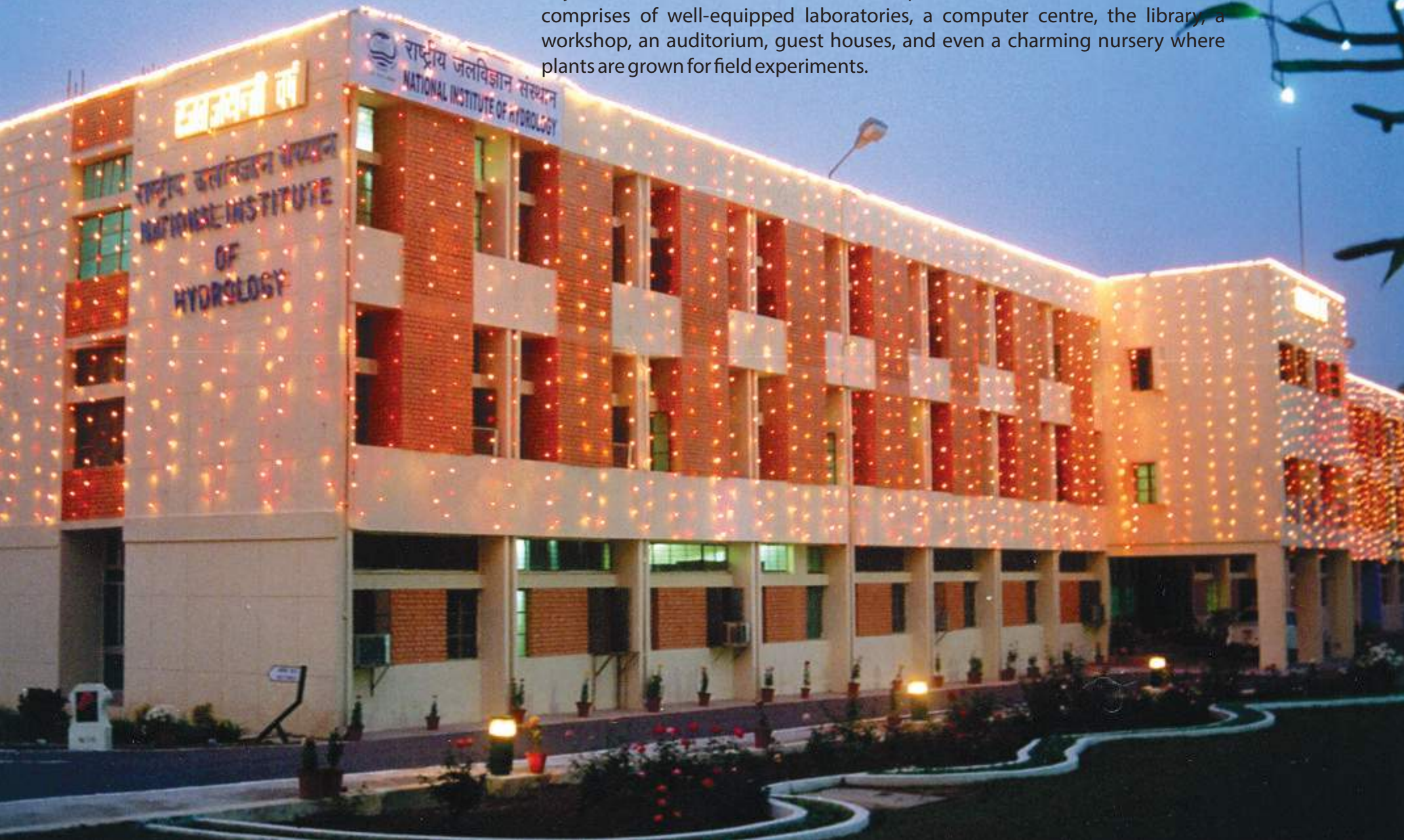
Centre for Flood Management Studies, Guwahati





# Infrastructure

Infrastructure is the bedrock of every progressive and proactive organization to carry out its activities seamlessly. The infrastructure and facilities available at the National Institute of Hydrology are among the very best in the country, and the Institute depends as much upon its advanced infrastructure, as it does upon its qualified and experienced personnel, to achieve the vision, mission, and the objectives with which Institute was set up in 1978. The infrastructure at NIH comprises of well-equipped laboratories, a computer centre, the library, a workshop, an auditorium, guest houses, and even a charming nursery where plants are grown for field experiments.







# Laboratories

*Where ideas shape into reality*

The Institute has six state-of-the-art laboratories with advanced monitoring and analytical instruments, which provide dynamic and broad-based research environment in different areas of hydrology.

The crème de la crème team of scientists, along with the scientific and supporting staff, have conducted experiments at these laboratories over the years, and prolifically brought forth several research studies of national and international importance.

- Hydro-meteorological Observatory
- Hydrological Instrumentation Laboratory
- Nuclear Hydrology Laboratory
- Remote Sensing and GIS Laboratory
- Soil-Water Laboratory
- Water Quality Laboratory





# Hydro- meteorological Observatory



The Observatory everyday records the maximum and minimum temperature, relative humidity, rainfall, evaporation, wind speed and direction, at 8.30 am and supplies the data to various research organizations, state government departments, and research scholars as per their request. The instruments used in the observatory are the ordinary rain gauge, autographic rain gauge, maximum and minimum thermometer, dry and wet bulb thermometer, thermograph, hydrograph, anemometer, and the pan evaporimeter.



# Hydrological Instrumentation Laboratory

Hydrological instrumentation laboratory caters to the hydrological investigations in the field. The laboratory is equipped with conventional as well as modern equipment for various hydrologic measurements some of which include:

- Automatic Weather Station
- Automatic and Self-recording Rain Gauges
- Automatic Snow gauges
- Digital Evaporation Recorder
- Hand- held Anemometer
- Digital Surface Water Level recorders
- Digital Ground Water Level Recorders
- Ocean Flow Meter
- Echo-sounder with DGPS for Bathymetric survey
- Multi-parameter Water Quality Sonde
- Current Meters
- Terrameter
- EM Conductivity Meter
- Suspended sediments Sampler
- Depth Water Sampler
- Soil water Samplers
- Digital Soil Moisture Meter and Recorder
- Guelph Permeameter for Hydraulic Conductivity



# Nuclear Hydrology Laboratory

The Nuclear Hydrology laboratory was established in 1993 under a UNDP project and is now an Isotope Laboratory of International repute. The laboratory is equipped with instruments for measurement of stable and radioisotopes in water and sediments which are used to study soil moisture movement and recharge estimation, surface water and groundwater interaction, sedimentation assessment, groundwater dating, and identification of sources of springs and deeper aquifers.

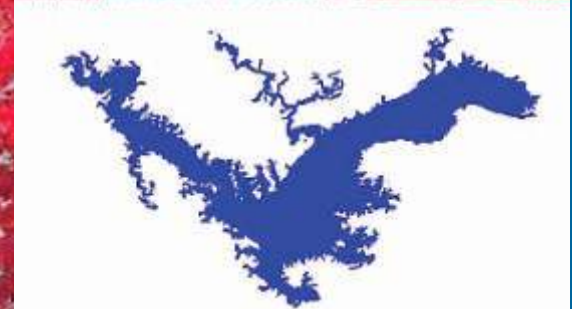
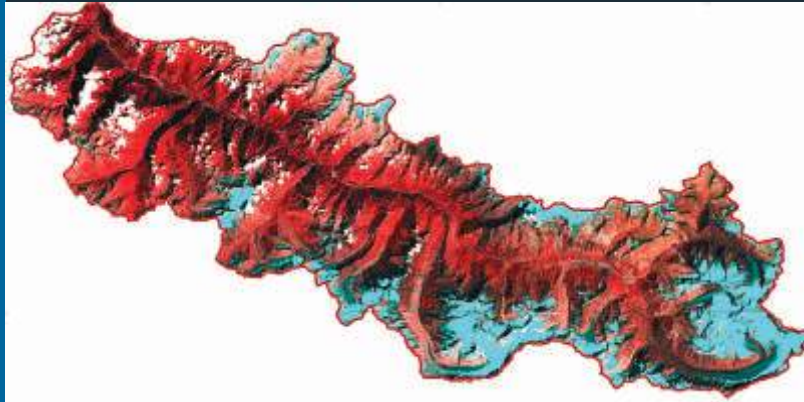
Some of the important equipment in the laboratory include:

- Dual Inlet Isotope Ratio Mass Spectrometer
- Continuous Flow Stable Isotope Ratio Mass Spectrometer
- Isotopic Water Analyzer
- Tritium Enrichment Units
- Ultra-Low Level Liquid Scintillation Spectrometer
- Multichannel Gamma Ray Spectrometer
- Geolog Rate Meter
- Neutron Moisture and Density Probe
- Ultrasonic Depth Indicator
- Ion Chromatograph System-5000





# Remote Sensing and GIS Laboratory



In this laboratory, studies in the area of snow and glaciers, flood inundation, reservoir sedimentation, river migration and web GIS application are being carried out. The processing of remotely sensed data and GIS analysis is done with the help of specialized software, which include Arc GIS, ERDAS Imagine, ILWIS, ENVI, and R2V. The laboratory is also equipped with A0 Colour trac Smart-F Image Scanner, Laser Colour Printer, and A0 size Colour plotter.

The laboratory also maintains a large number of maps published by Survey of India (SoI) and National Bureau of Soil Survey and Land Use Planning (NBSSLUP) of several regions. In addition, satellite remotely sensed images of several parts of the country are also available in the laboratory.



# Soil- Water Laboratory

The main activity of Soil-water Laboratory is to carry out field investigations for in-situ determination of various soil properties such as soil color, pH, electrical conductivity, permeability; vegetation properties such as leaf area index, foliage and other canopy structure; and collection of water samples and multi-depth disturbed/undisturbed soil samples for lab analysis. The field samples are analyzed for properties such as soil texture, soil-water retention capacity, soil porosity, soil moisture, hydraulic conductivity, permeability etc.

Some of the major instruments available in the laboratory include Pressure Plate Apparatus, Soil Particle Size Analyzer, Time Domain Reflectometry (TDR), Guelph In-situ Permeameter, ICW Lab Permeameter, Unsaturated Permeameter, Electromagnetic Sieve Shaker, Mastersizer E-System, Multi-volume Pycnometer, Infiltrometer, Plant Canopy Analyzer, Tensiometer, Soil moisture sensor, Digital pH meter, Conductivity meter, and EC Probe.





# Water Quality Laboratory

The Water Quality Laboratory is well-equipped to identify and quantify physical, chemical and bacteriological parameters in various water bodies like rivers, lakes, reservoirs, wells, aquifers, canals etc. The laboratory has the capability to determine about 100 water quality constituents including major and minor ions, trace elements, pesticides, PAHs and bacteriological parameters.

Some of the major state-of-art equipment at the laboratory include Ion Chromatograph with Auto Titrator and Voltametry, Atomic Absorption Spectrometer, Total Organic Carbon Analyzer, Gas Chromatograph, Flow injection Analyzer, Ion Analyzer, Mercury Analyzer, Flame Photometer, COD Reactor, Portable environment Laboratory, Biosafety Cabinet, Microwave Digester, Ultrapure Water Purification System, Research Microscope, Autoclave etc.





# Guest Houses

*अतिथि देवो भव: !!!*

The Institute has two well-appointed guest houses to accommodate the visiting dignitaries, guests of the Institute, and participants of the training programmes. The Gangotri Guest house has 8 suites, while the Sindhu Guest house has 38 rooms, with dining facilities where sumptuous and wholesome food is served to the guests.







## Auditorium *Celebrations Galore*

The auditorium of the Institute has comfortable seating for 300 people, with state-of-art facilities.







## Seminar & Lecture Halls

*Sharing knowledge and experience*



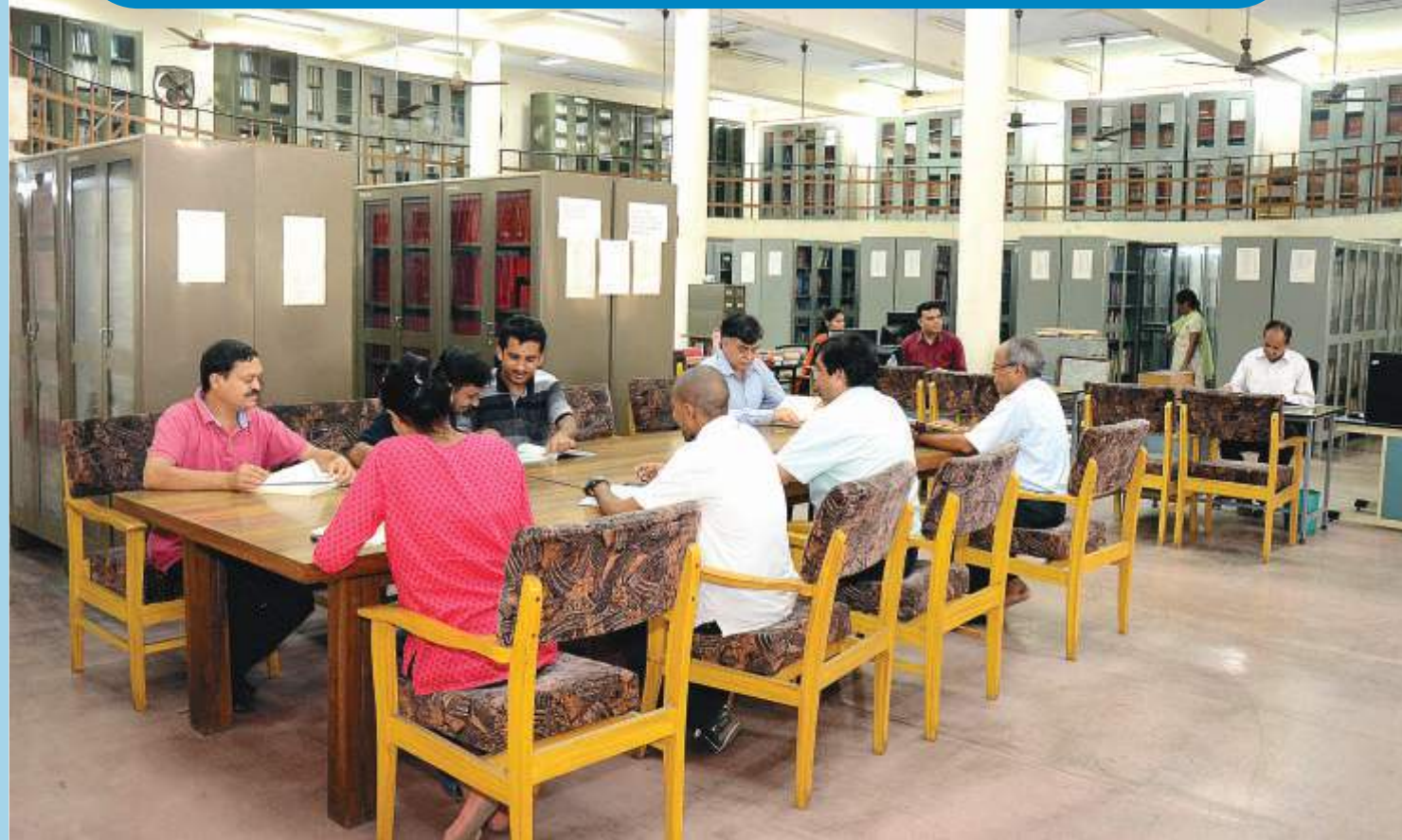


# Library

The Library at NIH was established in 1979 with a small collection of 24 books. It has grown splendidly over the years and now the library's collection is one of the best in the country in the field of hydrology and water resources. The total collection of the library comprises of 24,290 publications with 12,774 books, 3,925 bound periodicals, 6,199 technical reports, 315 Indian and foreign standards, 1,036 technical papers / reprints and 41 microfiches.

The Library is dedicated to serve the information needs of the scientists and researchers of the institute and other organizations like IITs, water resources departments of various universities, and ICAR institutions and is currently subscribing to 31 Indian and 24 foreign periodicals.

For automated management of library's activities and services, latest version of LibSys software with Web OPAC and separate server and client PCs are in operation. For accessing the library's catalogue, web link of the library's Online Public Access Catalogue is available on the Institute's website.





# Computer Centre

The Computer Centre of the Institute provides services for the upkeep of the computers. The Centre has latest configuration computers for conducting complex hydrological analyses and modeling studies. The local area network (LAN) provides inter-connectivity among the computers in different buildings of the campus. The Centre also provides support to the NIH Administration in the operation and maintenance of recently installed Aadhar-based Biometric Attendance System (BAS). The Centre has implemented 1Gbps internet connectivity in the Institute under National Knowledge Network (NKN) framework. A dedicated web server ([www.nihroorkee.gov.in](http://www.nihroorkee.gov.in)) provides a platform for hosting the Institute information, hydrology related information, research publications, important announcements, tender notices, jobs, etc. Wi-Fi arrangement in the Institute is also looked after by this Centre.





# Institute Workshop

*Assisting Research Activities*

The Institute has a workshop for developing and fabricating experimental set-ups and field instruments. Workshop also undertakes the repair and maintenance work of laboratory-, office, and field equipment. It maintains the air-conditioning systems, water purifiers, and water coolers of the Institute on a regular basis. It also provides support to the scientific divisions for field activities. The workshop has a lathe machine, power saw machine, drilling machine, cutting-cum-punching machine, welding machine and various other smaller machines and tools.





# Nursery

## *Nature's Splendor*

The magnificence of nature manifests itself in many ways, and one of its finest examples in our everyday life are the plants and trees around us.

The seasonal flowers that dot the landscape of the campus in myriad hues at all times of the year are also grown here. The campus looks beautiful when the flowers are in full bloom, and it's no surprise that the Institute has won several awards for its flower displays at Flower shows, in and around Roorkee.

Plants are not only aesthetically pleasing but also some plants like the common Reed, Cattails, Cana Lily, and Bulrushes are used in scientific experiments.

The Reed and Cana Lily grown at the Institute's nursery are used for constructing the wetlands for wastewater treatment.







पानी है  
जीवन की आस  
इसे बचाने का  
करो प्रयास



# Thrust Areas of Research

- Hydrology of Extremes
- Environmental Hydrology
- Regional Hydrology
- Integrated Water Resources Management (IWRM)
- Hydrology for Watershed Management
- Hydrological Studies for North-East Region
- Hydrological Studies for Himalayan Region
- Capacity Building and Outreach Activities

*Save Water  
before its too late*



# What We Do ?

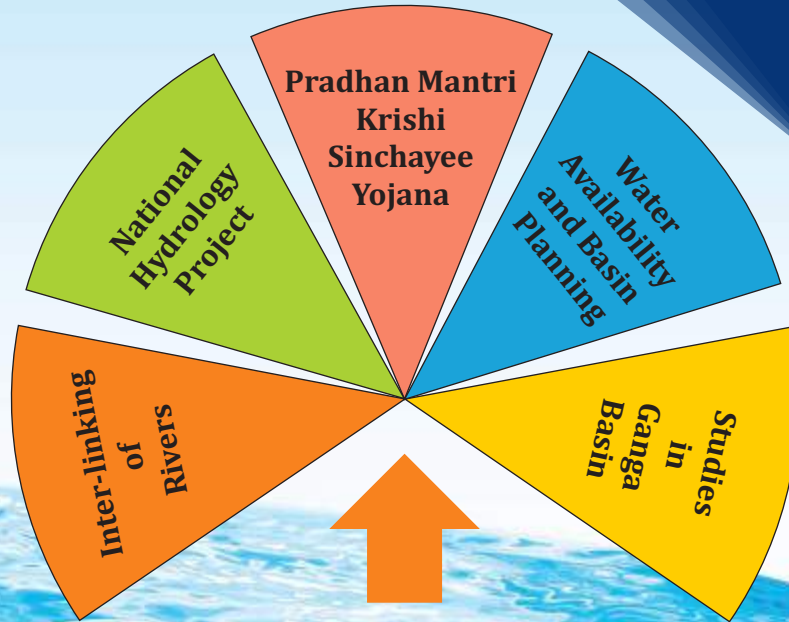
The Institute has come a long way since its inception and is now a centre of excellence for research in hydrology and water resources with emphasis on technology transfer and significant number of demand driven, user defined, and strategic studies to its credit. The Institute is also proactively contributing to knowledge dissemination, mass awareness and capacity building programmes in the water sector.

The Institute is hosting the Secretariat of Indian National Committee on Climate Change (INC-CC). INC-CC supports funding of R&D projects and review sessions on climate change and sponsorship of seminars, symposia, workshops, etc. Also, the Institute hosts the Secretariat of Indian National Committee for International Hydrological Program (INC-IHP) of UNESCO.

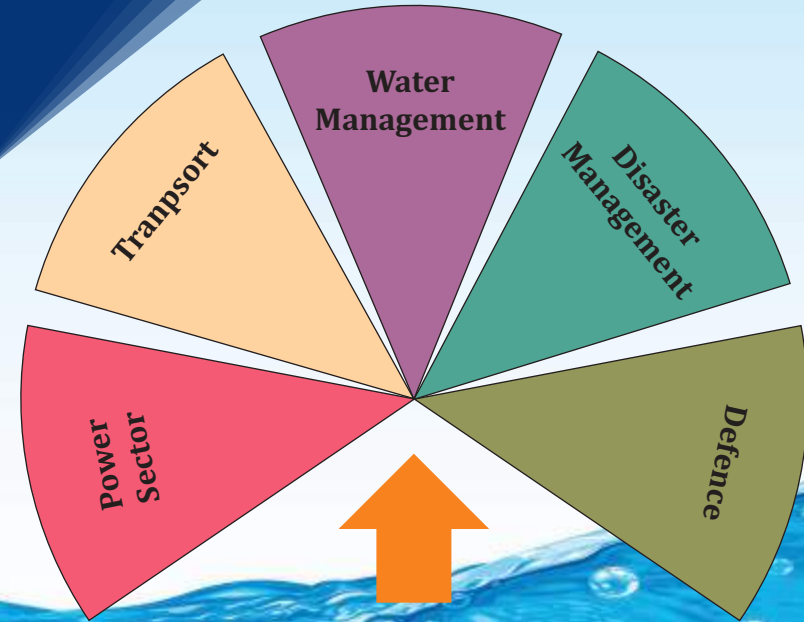
Basic and applied research | Sponsored research | Demand driven research | Software development  
Capacity building and training activities | Awareness and outreach activities | Advisory services to NGT & courts  
Inputs in policy making



# Contributing to Key Areas in Nation Building



**MoWR, RD & GR  
Programs**

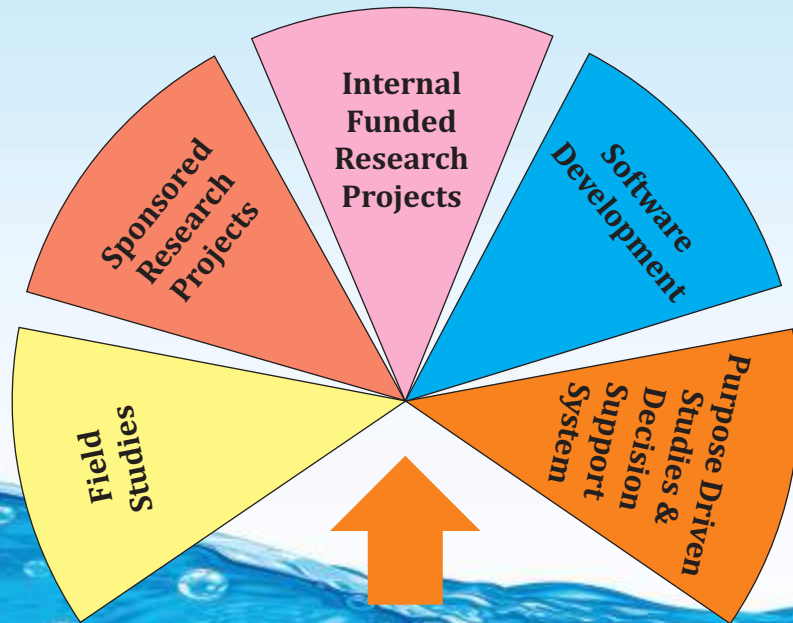


**Key infrastructure sectors  
of the government**



Don't empty the  
**water jar** until the rain falls.

~Philippine proverb



**Applied Research  
&  
Software Development**



**Capacity Building  
&  
Outreach**





# Contribution to Key Infrastructure Sectors

NIH has so far completed more than 230 sponsored research and consultancy projects- the sponsors included Indian Army, PSUs, industries, Planning Commission, National Productivity Council, State Government Departments, and central ministries of Science & Technology, Earth Sciences, Environment & Forests, Agriculture, Rural Development.

## Hydropower Sector

- Carrying capacity studies
- GLOF-Design flood
- Cumulative Impact assessment-Upper Ganga basin
- Environmental Flow Assessment
- Assessment of power potential

## Thermal/Nuclear Power Sector

- Nuclear Plants : Flood safety studies
- Thermal Plants: Area Drainage studies
- Thermal Plants: Impact on Groundwater
- Thermal plants: Hydrogeological studies
- Thermal Plant: Impact of ash disposal

## Defence Sector

- GLOF/Cloudburst Design Flood estimate, Ladakh, BRO
- Discharge monitoring: Shyok River-BRO

## Disaster Preparedness

- Dam Break studies (NTPC & NHPC)
- Emergency action Plan: Hydro-power

## Riverfront Design

- Riverfront development plan (Guwahati & Vadodara cities)

## Transport Sector

- Railway Bridge/Design flood for Chardham Connectivity
- Rishikesh-Karnprayag
- Karnaprayag-Chardham

## Water Management

- Paleochannel Mapping-River Saraswati
- Aquifer mapping
- Deep groundwater recharge zone identification
- Lake conservation-(Nainital, Sukhna)
- Wetland management

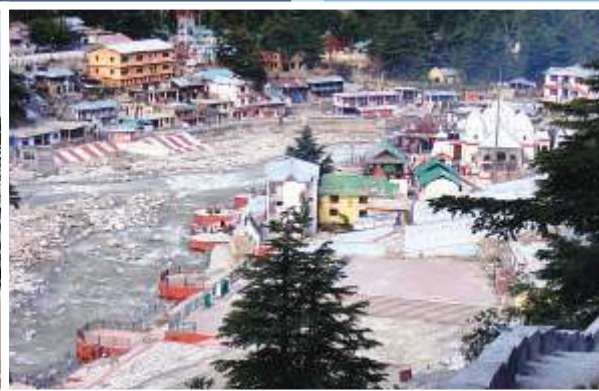


# Inputs in Policy Planning

- National Water Policy
- Vision document on mitigation and remedy of groundwater Arsenic menace in India
- Prepared Policy Document on Salinization of Land in Coastal Areas
- Developed a plan on the use of treated wastewater from STPs in Delhi for groundwater recharge (MAR) at identified locations in NCT Delhi
- Flood Plain Zoning Plans for Haridwar and Uttarkashi (Uttarakhand)
- Contributed in the preparation and review of Standards by Bureau of Indian Standards: NIH has contributed in the preparation of an International standard on 'Measurement of liquid flow in open channels- Stage-Fall-Discharge relationship (ISO 9123)', and contributed in the finalization of a standard on 'Guidelines for measurement and control of sediments in natural lakes'

# Other Salient Contributions to GoI Programs

- Hydraulic modelling for Brahmaputra riverfront development
- Mapping of nallahs contributing pollution to river Ganga
- Benchmarking indicators for watersheds
- Tackling Water Logging Problems in Canal Commands – Saryu Nahar Pariyojna
- Monitoring of potential hazards of Industrial Development in Singrauli Area
- State Specific Action Plan (SSAP) for Water Sector, under NWM
- Contributing to the MoEF, CC program on 'National Mission on Himalayan Studies (NMHS)'
- Under a Ministry of Drinking Water and Sanitation initiative, developed a model curriculum for M.Tech. (Water Management)





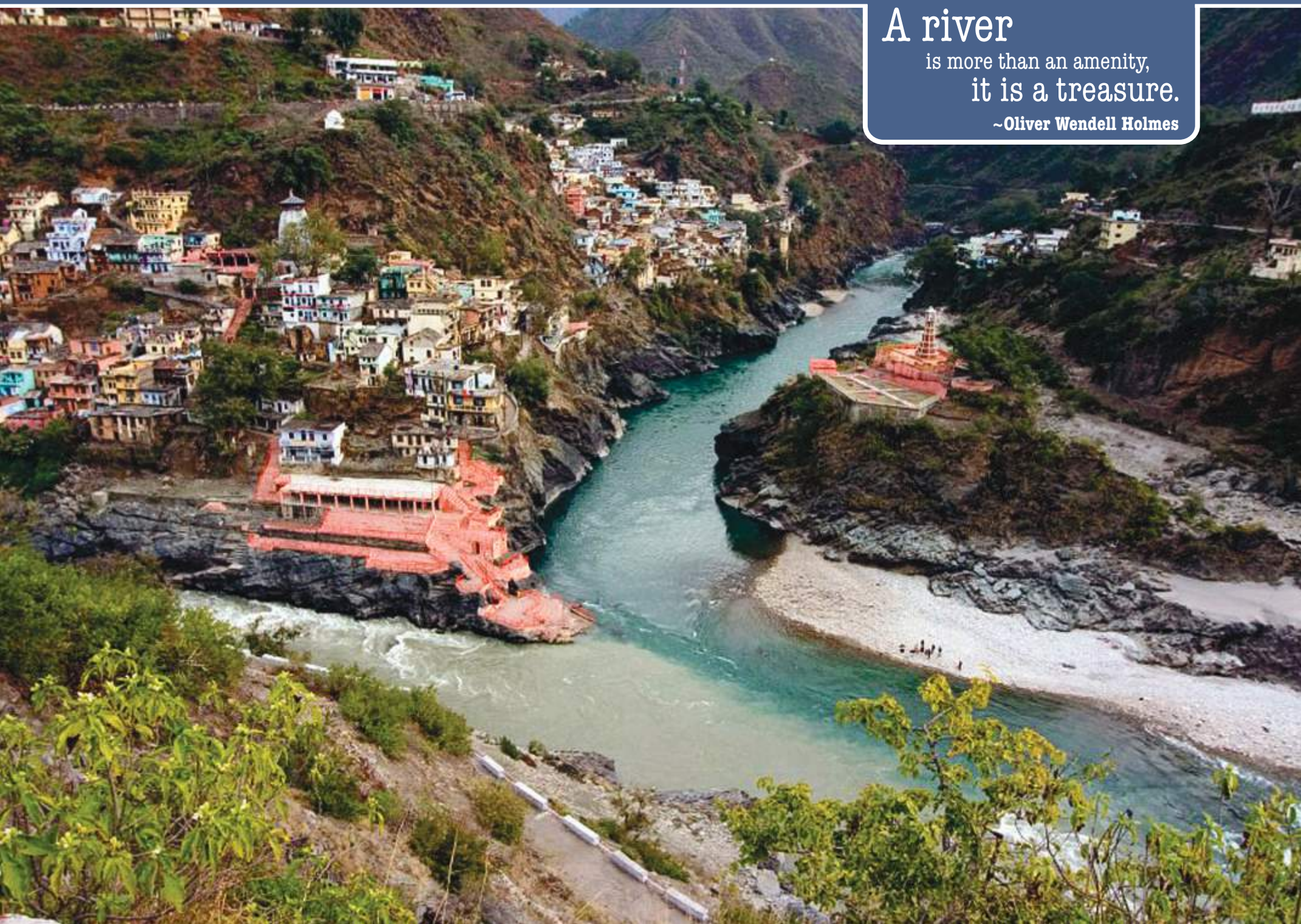
# Progression in Hydrological Research

Until the 1930s, hydrology remained a science filled with empiricism and qualitative descriptions. In the 1970s, digital computers offered hydrologists the opportunity to integrate processes to simulate complicated behavior in a systematic and integrated fashion. The 1980s witnessed several new principles, realizations, concepts, tools, and methodologies shaping modern hydrology. Development of hydrologic models facilitated the understanding of the processes governing the water cycle.

Since the 1990s, remote sensing became the monitoring tool for viewing hydrology with the necessary time and space coverage. Combined with remote sensing, advances in software and hardware, evolved our capabilities of simulation, modeling, and data-gathering activities. The latest tool in the field of hydrologic research is the use of drones in field mapping.







A river

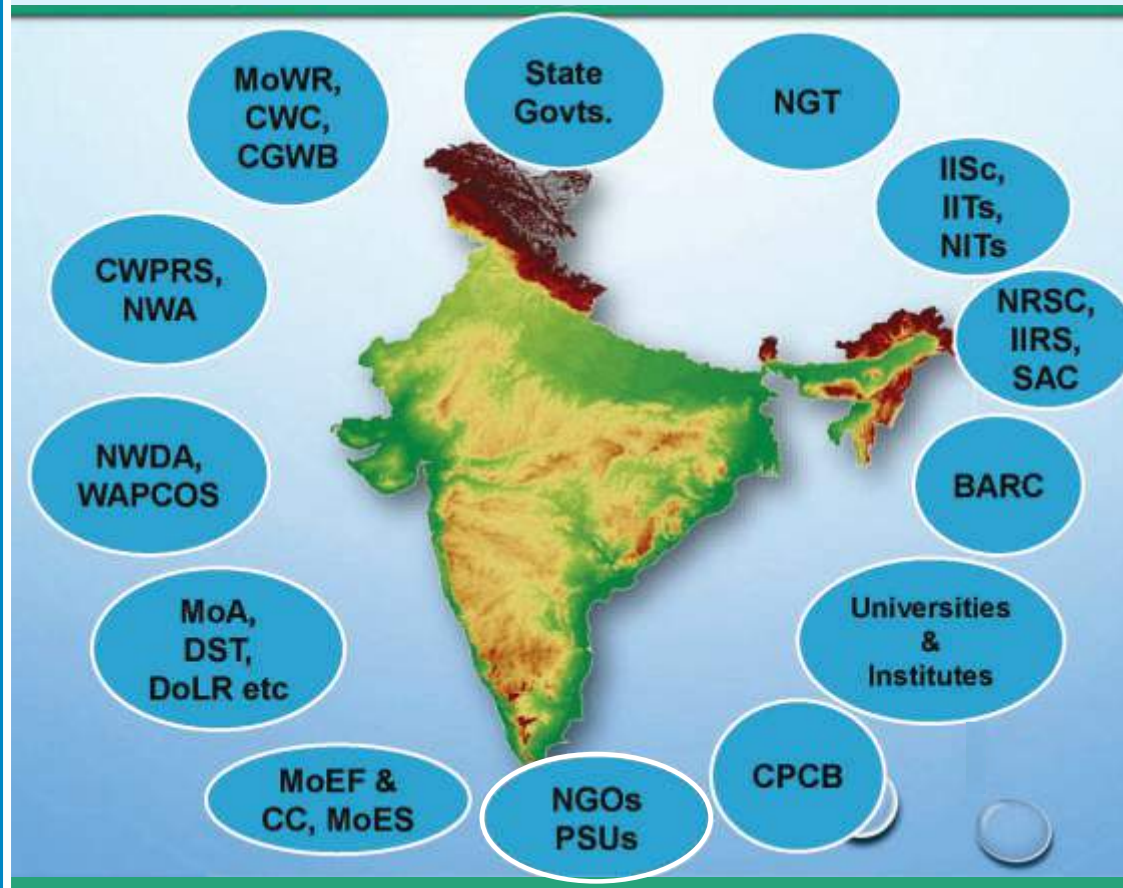
is more than an amenity,  
it is a treasure.

~Oliver Wendell Holmes



# Teaming up for *Greater Synergy*

The Institute has forged collaborations at the national and international levels with Governments, departments, and organizations, with which it has synergies of purpose, operations, and capabilities to achieve outcomes that benefit all the participating entities.



## National Collaborations

- Central Water Commission (CWC)
- Central Ground Water Board (CGWB)
- National Water Academy (NWA)
- National Water Development Agency (NWDA)
- Central Water and Power Res. Station (CWPRS)
- National Remote Sensing Centre (NRSC)
- Indian Institute of Remote Sensing (IIRS)
- Space Application Centre (SAC)
- Bhabha Atomic Research Centre (BARC)
- Central Pollution Control Board (CPCB)
- Indian Council of Agri. Research (ICAR)
- National Env. Engg. Res. Institute (NEERI)
- National Geophysical Research Institute (NGRI)
- Indian Institute of Science (IISc)
- Indian Institutes of Technology (IITs)
- National Institutes of Technology (NITs)
- Ministry of Water Resources, RD & GR (MoWR)
- Min. of Env., Forests and Climate Change (MoEF)
- Ministry of Earth Sciences (MoES)
- Ministry of Agriculture & Farmers Welfare (MoA)
- Department of Science and Technology (DST)
- Department of Land Resources (DoLR)
- India Meteorological Department (IMD)
- National Green Tribunal (NGT)
- WAPCOS, NPCC
- NGOs and PSUs

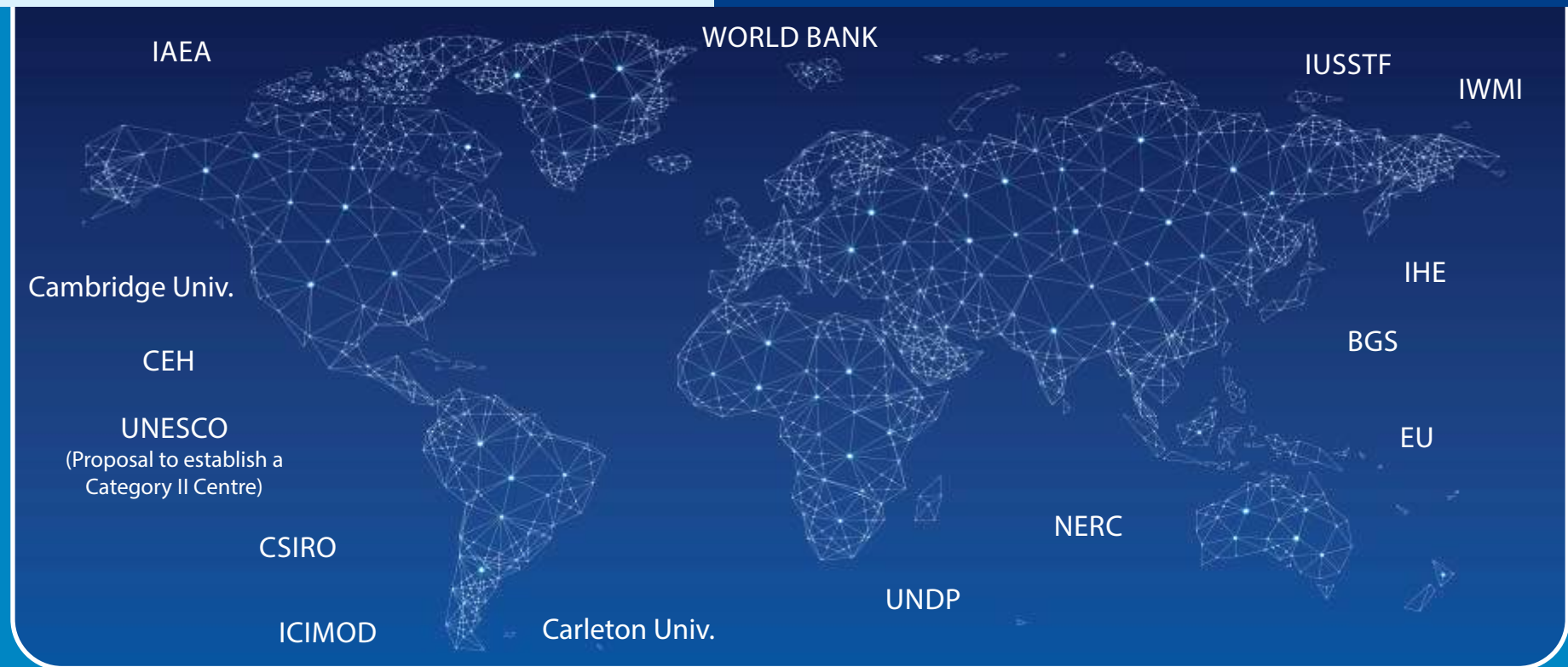




# International Collaborations

- International Atomic Energy Agency (IAEA)
- The World Bank
- Indo-US Science & Technology Forum (IUSSTF)
- International Water Management Institute (IWMI)
- Int. Institute for Hydraulic and Environmental Engg. (IHE)
- British Geological Survey (BGS)
- European Union (EU)
- Natural Environment Research Council (NERC)
- International Institute for Applied Systems Analysis (IIASA)

- United Nations Development Programme (UNDP)
- Carleton University, Cambridge University
- International Centre for Integrated Mountain Development (ICIMOD)
- Commonwealth Scientific and Industrial Research Organization (CSIRO)
- United National Scientific, Educational and Cultural Organization (UNESCO)
- Centre for Ecology and Hydrology (CEH)
- SMHI
- WMO
- FAO





# Major R&D Projects

## *Contributing to Water Security*

NIH was established as an UNDP assisted project. Over the years, it has received several R&D projects from various funding agencies, both national and international, to carry out the mandated activities.

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 now participating in the National Hydrology Project (NHP) and carrying out various Purpose Driven Studies (PDS) besides conducting a number of capacity building programmes. Department of Land Resources (DoLR, GoI) has identified NIH as an Implementing Agency for the World Bank funded 'Neeranchal National Watershed Project', to develop a DSS-Hydrology for watershed development activities in nine States of the country. The Institute is participating in a Ministry of Science & Technology (GoI) funded project entitled "*Integrated Hydrological Studies for Upper Ganga Basin up to Rishikesh*". This project focuses on addressing the issue of comprehensive integrated hydrological studies for upper Ganga basin up to Rishikesh.



- Neeranchal National Watershed Project 2016 - ongoing
- NMSHE Project 2016 - ongoing
- National Hydrology Project 2016 - ongoing
- EU Project 'Saph Pani' 2011-2014
- Hydrology Project-II 2006-2014
- Hydrology Project-I 1995-2001
- UNESCO Project 1993-1996
- USAID Project 1993-1996
- UNDP Project-II 1991-1996
- Indo-Dutch Project 'WAMATRA' 1990-1992
- CEC Project 'SHE' 1987-91
- UNDP Project-I 1979-1984





जल है  
तो कल है  
जल है  
तो हम हैं



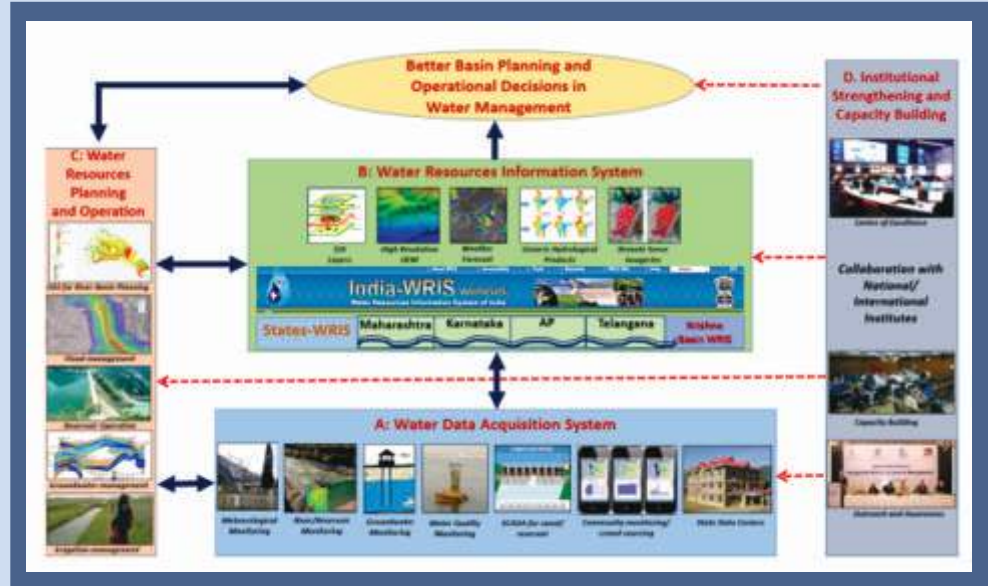


# National Hydrology Project



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.

Under HP-I, more than 40 training courses were organized on various topics in hydrological data processing and analysis at NIH and States, and a number of R & D projects were undertaken. Under HP-II, NIH organized 100 training programs and trained 2829 engineers/ officers on SWDES, and carried out 11 purpose driven studies. The Institute was the nodal agency for the development of Decision Support System (Planning) for Integrated Water Resources Development and Management for implementation in six Central agencies and nine States.



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

## Role of NIH in NHP

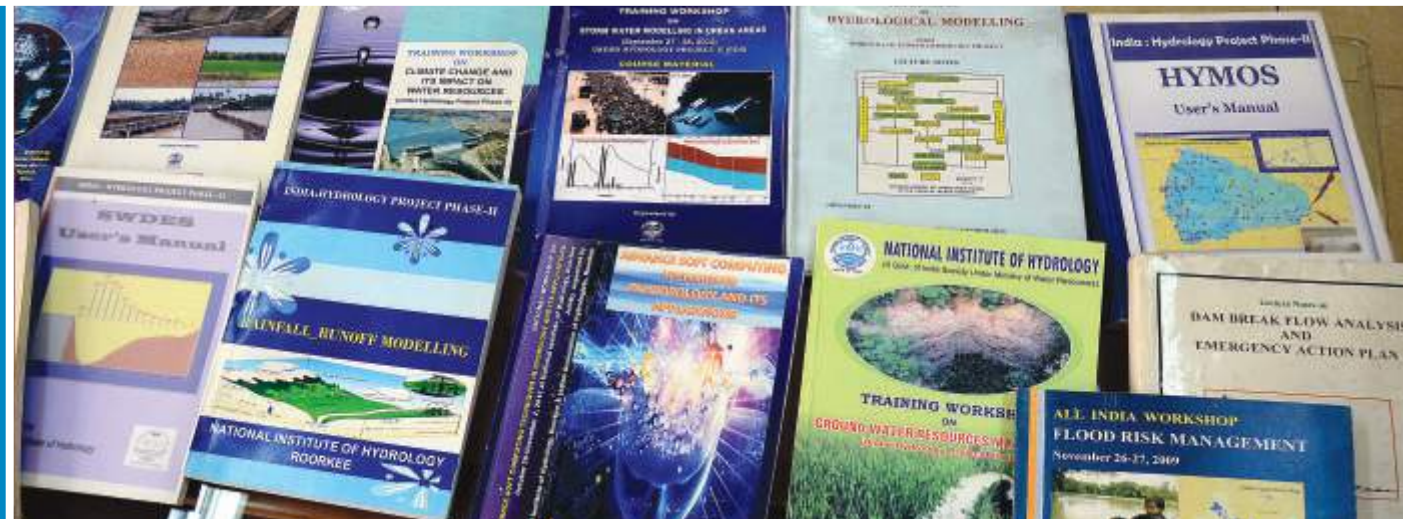
- Nodal Agency for Demand Driven Research
- Nodal Agency for Training and Capacity building:
- Training courses on hydrological topics
- Training/Meetings and multi-media distance learning
- Centre of Excellence for Hydrological Modeling
- Decision Support System (DSS)







# Activities under National Hydrology Project





# National Mission for Sustaining Himalayan Ecosystem (NMSHE)

(Funded by Ministry of Science & Technology, GoI)



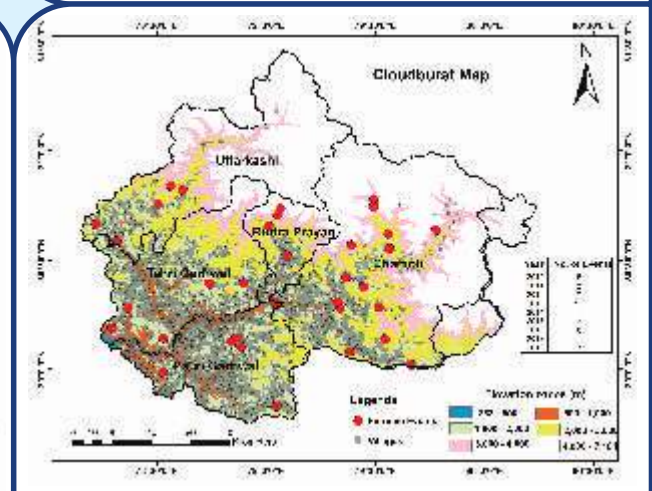
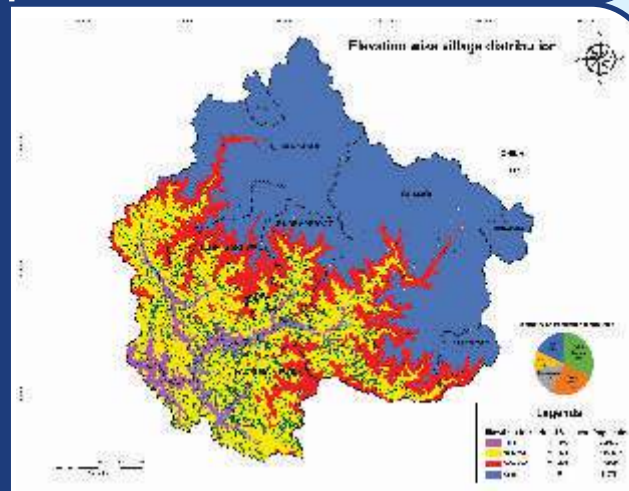
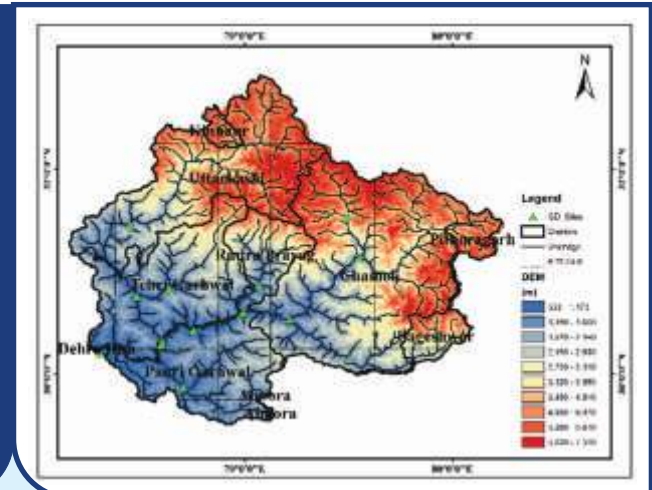
## Project: Integrated Hydrological Studies for Upper Ganga Basin up to Rishikesh DST Task Force-II (Water, Ice, and Snow including Glacier)



### 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





# Activities under NMSHE Project







# Neeranchal National Watershed Project (NNWP)

(World Bank funded, Under PMKSY component of DoLR)



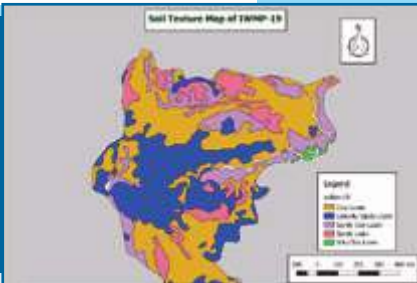
- Develop and pilot a DSS-Hydrology to implement Watershed Component of PMKSY at 18 demonstration watersheds in 9 States
- Develop tools and systems to help all stakeholders to make better water management decisions during watershed planning (DPR) and post implementation (Impact Assessment)
- Conduct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

## DSS-Hydrology for Neeranchal National Watershed Project



### 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.



### PLANNING

Planning for drinking water, livestock, industry and crops, Database generation, Design storage estimation, water balance estimation, pre project Water use efficiency, crop productivity/production and soil health condition



### SITES AND STRUCTURES

Identification of suitable site for water harvesting structures, selecting appropriate structures for water conservation, soil conservation, Ground water recharge, catchment and command area of structures, estimation of number of structures feasible in the watershed.



### IMPACT ASSESSMENT

Estimation of runoff with change in Land Use, computation of water quality index, NDVI and NDWI, estimation of change in ground water table, soil moisture and soil erosion, post project crop production and water use efficiency, social vulnerability analysis.



### DPR INPUTS

The DSS-H will provide the basic project information, geography and geohydrology of watershed, socio-economic profile of watershed, drinking water requirement, detail of crop area and yield, ground water table information in the watershed area.







# Activities under NNWP Project

DSS - Hydrology







# 'SAPH PANI' PROJECT

(SPONSORED BY EUROPEAN UNION)



Enhancement of Natural Water Systems and Treatment Methods  
for Safe and Sustainable Water Supply in India (10/2011 to 9/2014)

## Project Partners

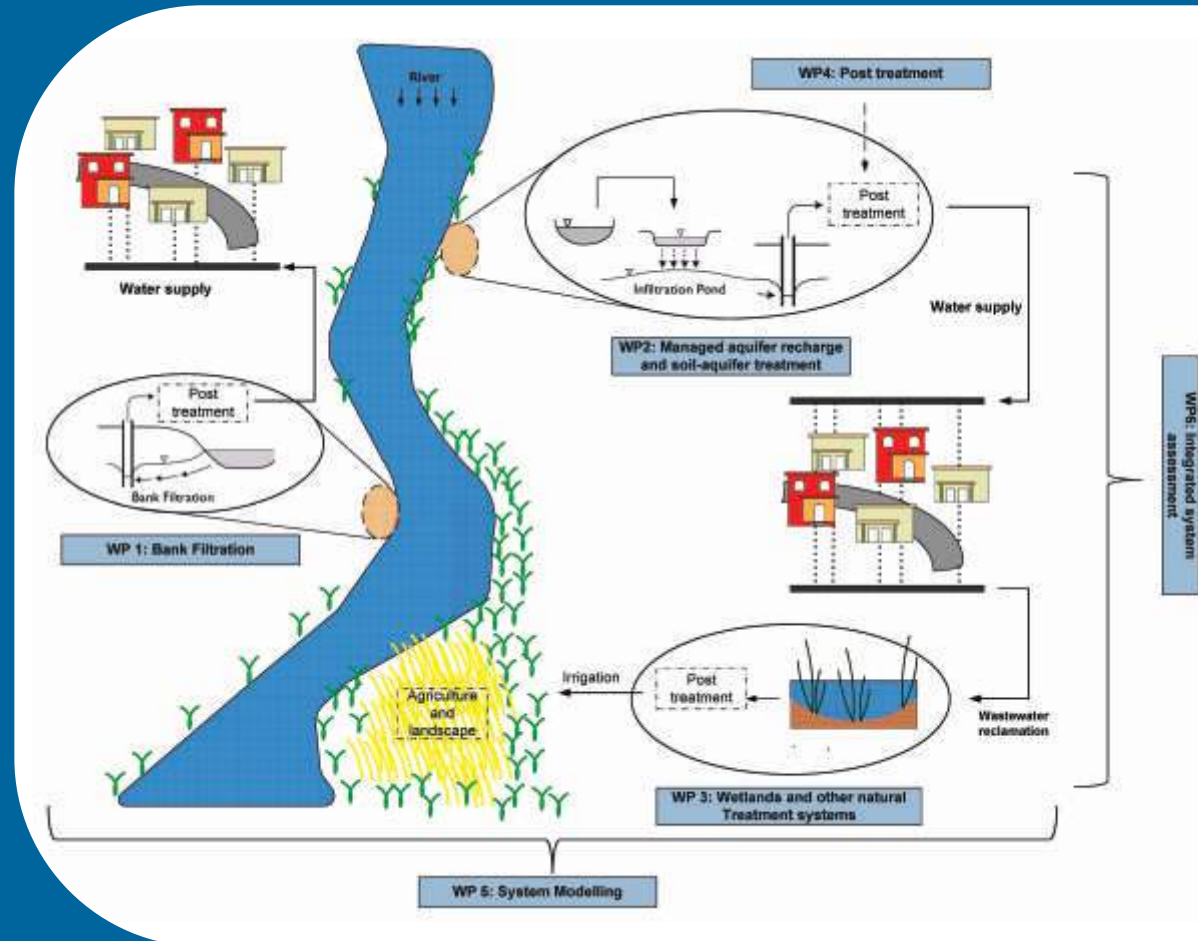
20 partners from 8 Countries (Switzerland, France, Germany, Austria, Netherlands, India, Sri Lanka, and Australia)

## Main Objectives

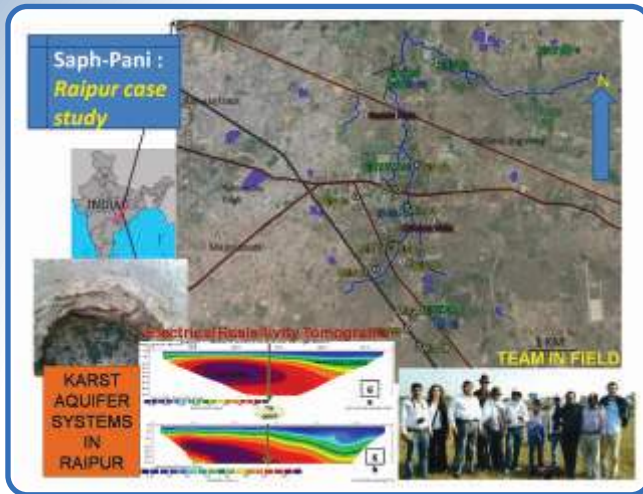
The project aimed to study and improve natural water treatment systems such as river bank filtration (RBF), managed aquifer recharge (MAR) and wetlands in India building local and European expertise in this field.

## Major achievements

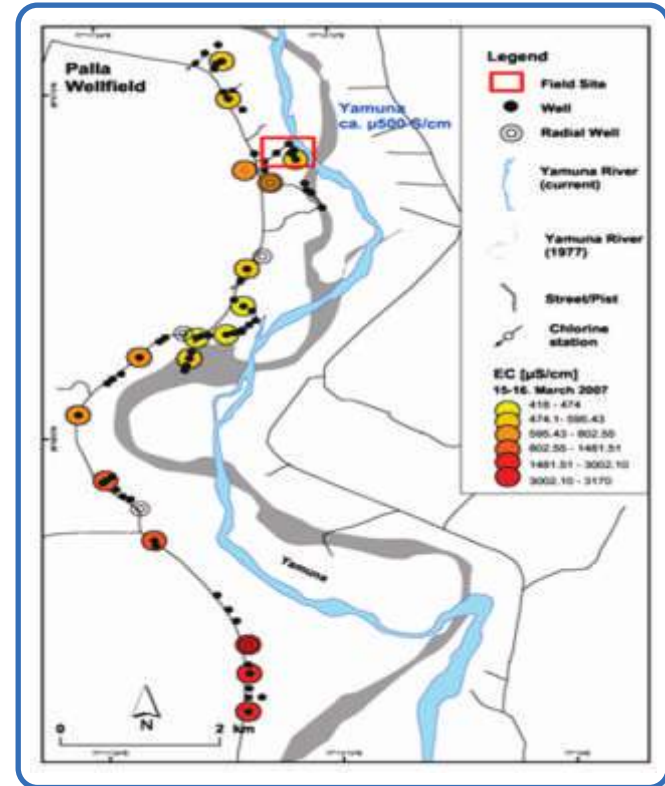
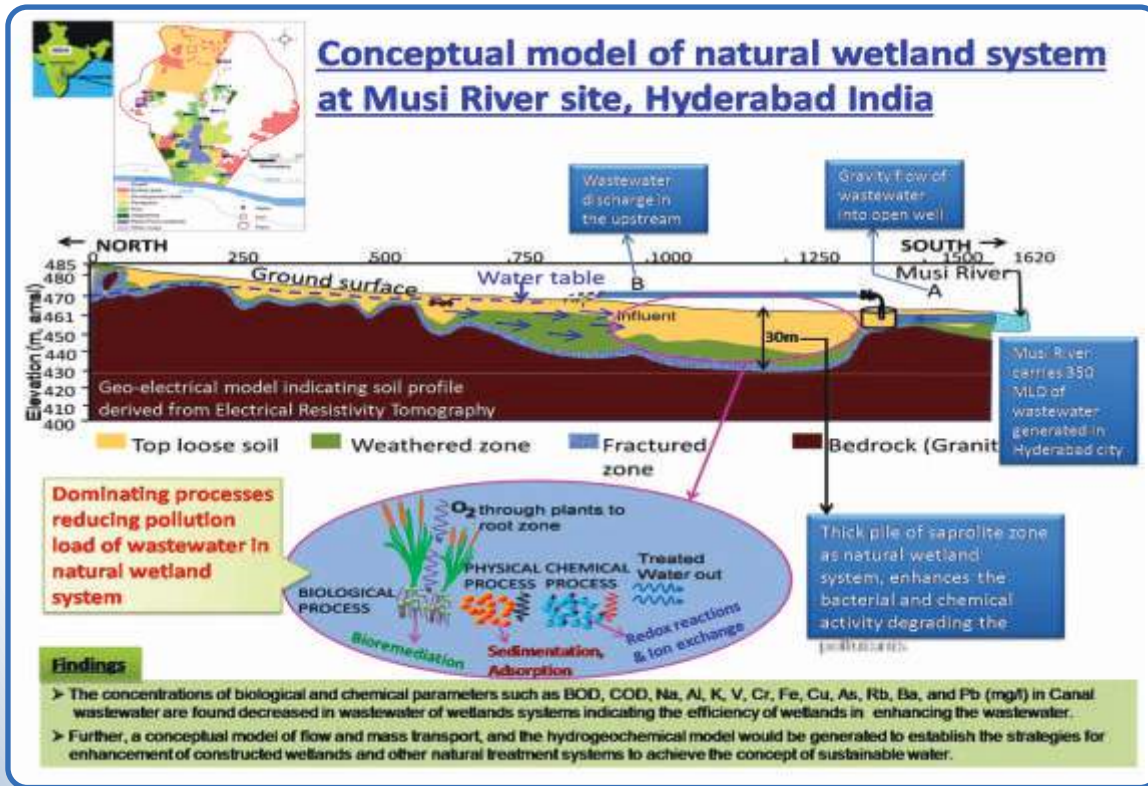
- ❖ Natural treatment technologies of River Bank Filtration (RBF), Managed Aquifer Recharge (MAR) and Constructed Wetlands (CW) were developed and tested under Indian conditions at identified sites.
- ❖ A handbook on 'Natural Water Treatment Systems for Safe and Sustainable Water Supply in the Indian Context: Saph Pani' is prepared for field users and researchers.
- ❖ Policy recommendations were submitted to the Indian Ministries of Water Resources, RD & GR, and Drinking Water and Sanitation.







# Activities under 'Saph Pani' Project





# Managing Hydrological Extremes

Hydrological extremes, i.e. floods (including glacial lake outburst floods), stormwater flooding, and droughts are globally significant natural hazards. These extremes with extreme consequences result from the superposition of various processes at different space- and time scales. NIH has been working at answering the research questions related to these events, and offered feasible solutions to the field practitioners.



## Flood and GLOF

- Hydrodynamic Modelling of River Vishwamitri for preparation of flood mitigation plan for Vadodara city
- Flood Zoning / Mapping for River Bhagirathi at Uttarkashi and River Ganga from Haridwar to Laksar
- Development of flood forecasting system based on rainfall estimates obtained from satellite data
- Dam break flood simulation for Maithon and Panchet dams
- Flood Hazard Mapping and flood risk zoning for a river reach (Ganga between Buxar and Rajendra bridge)
- Prepared Flood plain zoning plans for Haridwar and Uttarkashi (Uttarakhand)
- Prepared Urban Flood Management Plan for parts of Chennai



## Drought

- Developed hydrological indices for drought management and contributed in the preparation of Manual for Drought Management, published by the Ministry of Agriculture and Farmers Welfare
- Developed drought management plan for identified watersheds in Bundelkhand region

## Stormwater

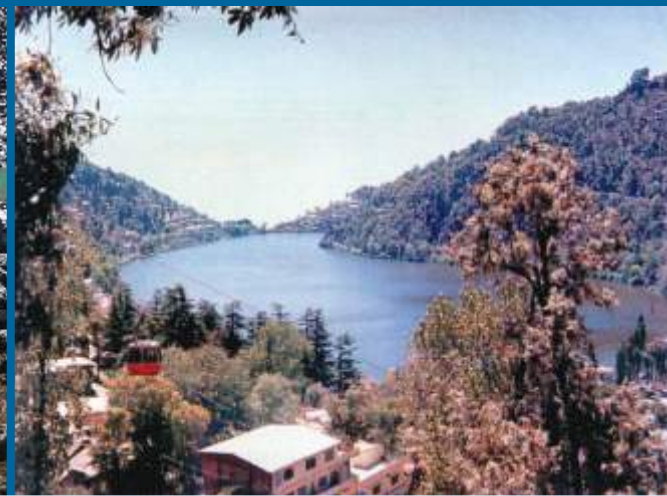
- Urban Hydrology of Patna town
- Stormwater Management in Otter Nullah Watershed, Chennai Corporation, Tamilnadu





# Hydrology of Lakes

NIH has carried out hydrological investigations for various lakes such as Naini (Uttarakhand), Bhopal, Sukhna (Chandigarh), Pichola (Rajasthan), Renuka (HP), Mansar & Surinsar (J&K), Ramgarh Tal (UP). Using results from bathymetry survey, water quality and isotopic analyses, etc., management plans were prepared for these lakes.





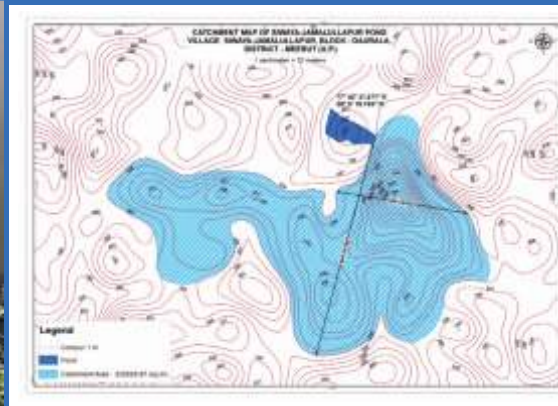






## Investigation of Village Ponds

Village ponds are considered to be the lifeline of rural areas in India. Ponds in the Kandi belt of J&K and in the Bundelkhand region were mapped in detail for their water storage capacity and water quality status. Twenty two ponds are being rejuvenated in the identified districts of UP. Under a DST project, two ponds have been selected for restoration in Sahawan and Chilpahadi villages in Banda Block of Sagar district.



*पानी जीवन का अमूल्य रत्न  
इसे बचाने का करें प्रयत्न*





## Rejuvenating a pond in Ibrahimpur-Masahi Village

Villages in India are facing stagnation of drains and choked ponds, which are in dire need of renovation so that the ponds are effectively utilized as a source of water security and groundwater recharge in the area. On the request of the Gram Panchayat of Ibrahimpur-Masahi village in Haridwar district (Uttarakhand), a defunct village pond was rejuvenated. In a formal resolution, the GP authorized NIH to execute the work and assured their cooperation in this effort. NIH renovated the pond in a retrofitting mode with the use of a phyto-remediation technology called "Constructed Wetland (CW)". CW is a Natural Wastewater Treatment system and it exploits the nature's potential for treatment of wastewater using pebbles, plants, enzymes and nutrients. The benefits of pond rejuvenation included improvement in the pond water quality as well as enhanced groundwater recharge, and improvement in the quality of groundwater, which is the main source of drinking water, reducing the chances of water-borne diseases.





# Developing IWRM Plan for Watersheds in Bundelkhand

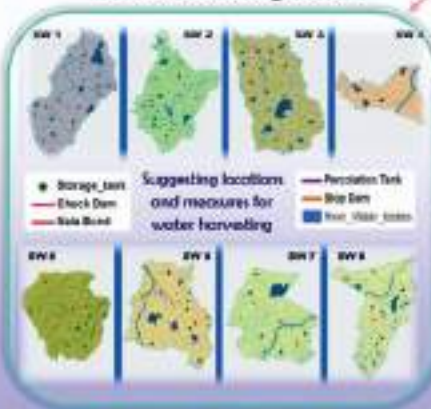
IWRM Plan for Ur River watershed in Tikamgarh district of Madhya Pradesh

**Integrated  
Water  
Resources  
Management  
PLAN**

A process of promoting coordinated development and management of water, land and related resources to sustainably maximize the economic and social welfare



## 1. Water Management

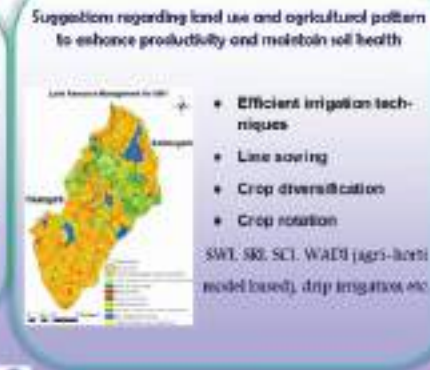


## 3. Livelihood Management

Identification of the most vulnerable areas and suggesting measures to improve their livelihood

- Promoting Wadi farming through capacity building programs
- Promoting off-farm and non-farm occupations (eg. Poultry farming, pisciculture, bee keeping, handicrafts etc.)
- Raising awareness on climate change

## 2. Land Management



National Institute of Hydrology, Roorkee

IWRM creates a framework for water management options to be introduced into broader national development planning in a structured way. An IWRM Plan considers effective utilization of land, water and other available natural resources linked to the vulnerabilities and livelihood opportunities in the geographical area. Scientists have found IWRM being useful in the Indian context also where a coordinated development of water and land resources is sought as part of complete economic, social and environmental welfare.

Under a project funded by the MoWR, RD & GR (GoI), NIH developed IWRM Plan for identified watersheds in four districts of Bundelkhand region (Jhansi & Lalitpur of UP, Chhatarpur & Tikamgarh of MP), which provided useful inputs for the District Irrigation Plan (DIP) of the Governments of UP and MP. The IWRM Plan intends to promote the component of water demand management in the district level planning and is envisioned to be an 'implementable' planning document for the district level government.



# Activities under IWRM Project in Bundelkhand



जल संसाधन, नदी विकास और गंगा संरक्षण मंत्रालय (भारत सरकार)  
द्वारा प्रायोजित  
एकीकृत जल प्रबंधन, बुन्देलखण्ड जल सुरक्षा परियोजना  
आयोजक

राष्ट्रीय जल विज्ञान संस्थान, रुड़की (जल संसाधन मंत्रालय, भारत सरकार) म. प्र. विज्ञान एवं प्रौद्योगिकी परिषद, भोपाल (विज्ञान एवं प्रौद्योगिकी विभाग म. प्र. शासन)

**प्रौद्योगिकी प्रदर्शन कार्यक्रम अन्तर्गत**  
**रुफ वाटर हार्वेस्टिंग सिस्टम की स्थापना**  
क्षेत्रीय वर्षाजल संचय के अवयव

घत  
फिल्टर





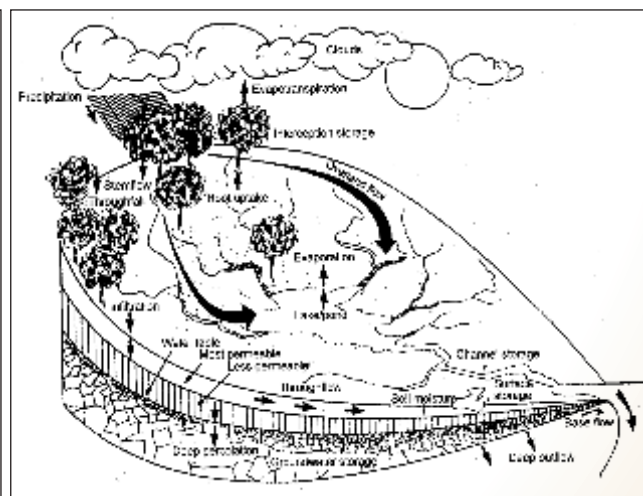
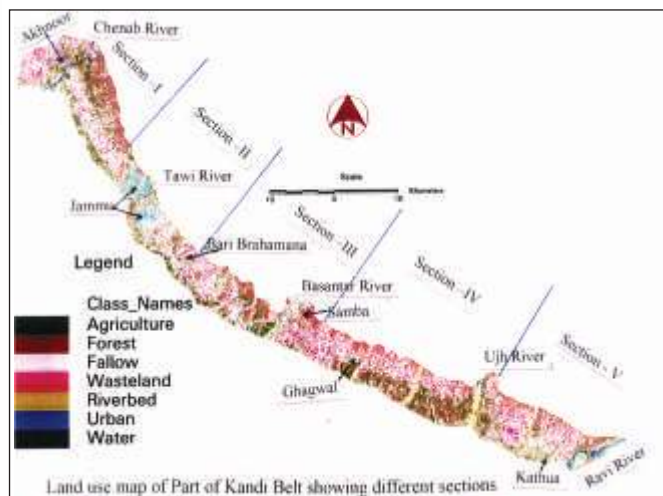
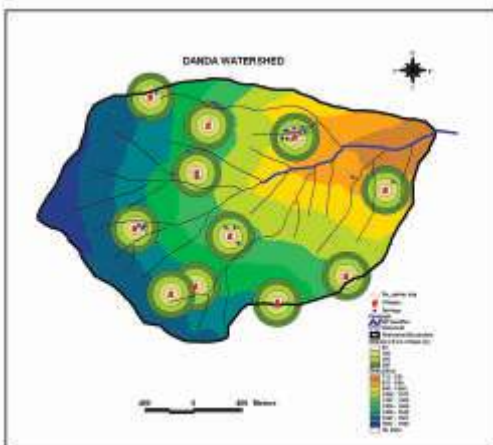
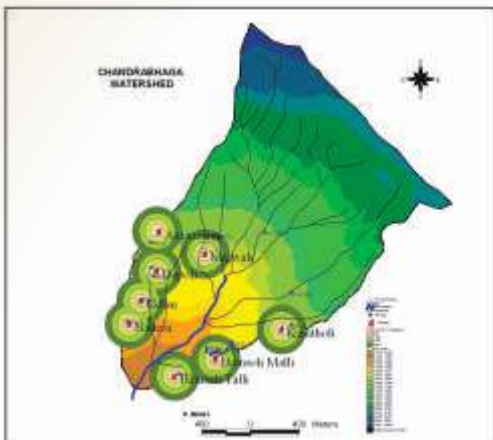
# Hydrology for Watershed Management

Watersheds are recognised as useful vehicles for research on complex ecological systems. The hydrologic response of a watershed integrates the effect of several complex processes through its interaction involving land with soil features, water, climate, vegetation characteristics, impacts of climate change and anthropogenic changes, etc.

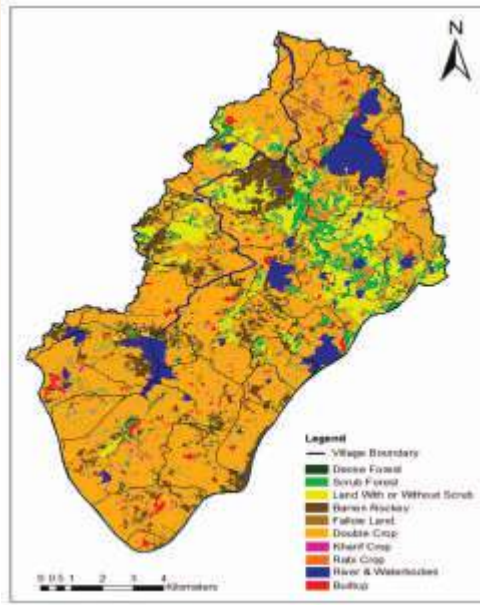
NIH has been long involved in the study of watershed management using a multidisciplinary approach. In such studies, hydrological aspects of springflows, impact of forests, landuse and land cover, vulnerability of natural resources, etc. have been assessed and analyzed using field and laboratory investigations, including advanced isotopic and geophysical techniques and GIS mapping. For the first time in India, a 'watershed score card' was developed. Some

of the studies on this aspect include:

- Hydrological studies in a forested watershed in Uttarakhand
- Customization of WEAP model in Ur river watershed in Tikamgarh district (MP)
- Hydrological impacts of landcover changes in Sahayadri mountains
- Comprehensive watershed management plan in Bundelkhand region of MP
- Participated in the network project sponsored by the DST (GoI) on 'Hydrology of small watersheds'
- Spring rejuvenation study for Ban Ganga in J&K, and Chandrabhaga and Danda in Uttarakhand







Page 3 : Ur River Watershed Scorecard

Index	Indicators	Grade	Trend	Indicator Description
Surface Water Quality	pH, Turbidity, NO <sub>3</sub> , DO, TDS, Hardness, Cl, Alkalinity, EC	C	**	Ponds, Lakes, Streams are the circulatory system of a watershed. It is a key component of the environment, impacting human health, flora & fauna & economy.
	Average Grade	C	**	Poor ecosystem conditions
Ground water Quality	pH, Turbidity, NO <sub>3</sub> , F, TDS, Hardness, Cl, Fe	B	↓	The ground water quality is assessed to analyze the suitability of ground water for drinking purpose and other applications.
	Average Grade	B	↓	Good ecosystem conditions
Forest Condition	% Forest Cover	C	↓	It estimates the area of more than 1 ha in extent and having tree canopy density of 10% & above.
	Average Grade	D	↓	Very poor ecosystem conditions
Agricultural Condition	Cropping Intensity Index	A	↑	It assesses farmers actual land use in area and time relationship for each crop compared to the total available land area.
	Crop Diversification Index	A	↑	It analyses rising of different varieties of crops in the arable land.
	Average Grade	A	↑	Excellent ecosystem conditions
Soil Condition	Land Capability Class	B	↓	It provides a ranking of the ability of an area to support agriculture on a sustainable basis.
	Land and Soil Irrigability Class	C	↔	It is grouping of soils based on physical and socio-economic factors.
	Soil Depth	C	↓	It is the vertical distance into the soil from the surface to a layer that essentially stops the downward growth of plant roots.
	Capability index for Irrigated Agriculture	C	**	It evaluates both the capability for irrigated agriculture in general and the suitability for specific crops under rain-fed conditions.
	Average Grade	C	↓	Poor ecosystem conditions

↑ Improved Conditions    ↓ Declined Conditions    ↔ Same Conditions  
 \*\* Insufficient Data to establish trends

## UR RIVER WATERSHED SCORECARD 2016

**Who we are?**  
The National Institute of Hydrology is a premier institution that specializes in water resources and related aspects in the field of hydrology.

**Project Goal**  
To design a watershed scorecard to evaluate and analyse the health of the Ur River watershed in Tikamgarh District, Madhya Pradesh.

**What does this Scorecard Card Measure?**

Surface Water Quality

Groundwater Quality

Forest Condition

Soil Condition

Agricultural Condition

**Why Measure?**  
Measuring helps in understanding the watershed better. It helps us to focus our efforts where they are needed most and also to identify ecologically important areas that require protection or enhancement.

### Final Report 2017

**Integrating hydrology, climate change and IWRM with livelihood issues: Development of methodology and a DSS for water-scarce Bundelkhand region in India**

Under NASA - India Programme of TIFAC

MP Council of Science and Technology, Bhopal    National Institute of Hydrology, Roorkee    Development Alternatives, New Delhi









By means of water,  
we give life to everything.  
~ **Koran, 21:30**





# Hydrological Studies for Inter Linking of Rivers

## Hydrologic Studies for Ken-Betwa Link Project

Ken-Betwa link project envisages diversion of 1074 MCM of Ken water to Betwa basin after meeting all the projected in-basin requirements in ultimate stage of development. The project is expected to create additional irrigation potential of 6.35 lakh ha in M.P. and U.P. States. On the request of National Water Development Agency (NWDA), NIH carried out detailed hydrological studies, including water yield and balance, design and diversion floods, evaporation loss, sedimentation, hydrodynamic modeling and simulation studies for Daudhan reservoir, and multi-reservoir simulation studies.

## Hydrological studies and multi-reservoir simulation for Mahanadi-Godavari Link

The Mahanadi-Godavari is planned to take off from proposed Barmul dam on Mahanadi River for transfer of 6500 MCM of water through 842 km long link canal to

Godavari River upstream of Dowlaiswaram barrage. NIH carried out the following studies:

- Water availability and water balance studies at seven project sites
- Estimation of revised elevation-area-capacity curves for projects after 50 years of operation
- Integrated multi-reservoir simulation study of the system to determine storage capacities and reliabilities.


## Assessment of Water Availability at Proposed Barrages of Sankh-South Koel Link and South Koel-Subarnarekha Link Project in Brahmani Basin

Sankh-South Koel Link envisages diversion of 498 MCM of Sankh river water to add 403 MCM water to South Koel river. South Koel-Subarnarekha Link envisages diversion of 1,792 MCM of South Koel river water to add 1,684 MCM water to Subarnarekha river for navigational and industrial requirements. NIH carried out the following studies:

- Water yield and water balance studies at the diversion sites of both Sankh-South Koel and South Koel-Subarnarekha links.
- Reservoir simulation on 10 daily basis to ascertain the storage capacity and fulfillment of various downstream requirements below the proposed barrages.







## Hydrology of Major River Basins

NIH has been conducting hydrological studies on some of the major river basins of India. These studies have provided the much needed baseline data and information for water availability assessment and for developing water management policies in the river basins. Through simulation modeling techniques, the impact of climate change on the hydrology of river basins are studied.

- Provided inputs for Ganga River Basin Environment Management Plan (GRBEMP).
- Conducted isotope studies for the identification of different aquifer groups and their dynamics in Upper Yamuna river plains.
- Assessment of climate change impact on hydrology for Mahanadi basin
- Comprehensive hydrological studies of Narmada basin.
- Conducted a study on water availability and reservoir operation for Krishna Basin. Water availability was assessed at all major projects and important gauging sites in the Krishna basin. Multi reservoir simulation was carried out for developing procedures for operation of reservoirs so that each party state gets their share as per the tribunal award.
- Contributed to the Report on World Class Protocol for Water Resources Assessment (WRA), prepared by a committee constituted by MoWR, RD & GR.
- Participating in the Water Accounting+ initiative of MOWR: using advanced techniques for water accounting and computing various indices.





# Water Quality

*Purity is the priority*

A comprehensive understanding of the various hydrologic processes associated with the environmental systems is a pre-requisite for better planning, development and management of the water resources. NIH undertakes applied and strategic research in the area of environmental hydrology, which include: (i) surface, ground and waste water quality monitoring and modeling, (ii) natural and organic contaminants transport modeling, (iii) integrated hydrological studies of lake ecosystems, (iv) erosion and sedimentation studies, (v) point and non-point source pollution, (vi) Low cost treatment/remedial technologies, (vii) environmental flow requirement studies.









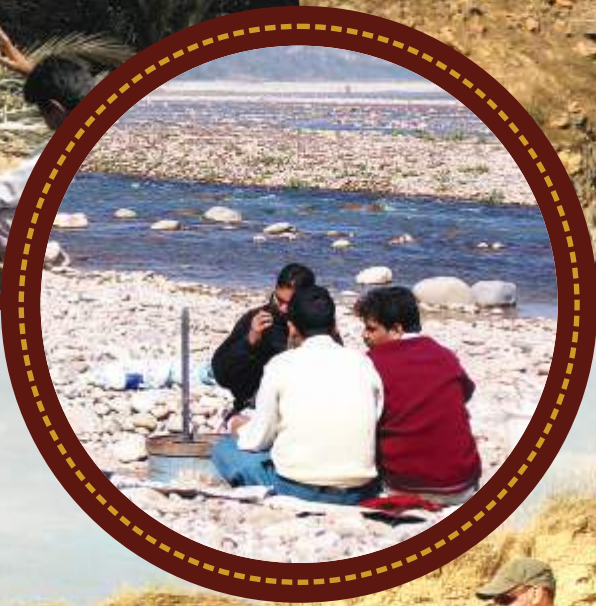
# Exploring Groundwater

Groundwater hydrology has always been a focus of research at NIH. Both basic and applied research are carried out for sustainable development and management of groundwater on a wide array of subjects such as aquifer parameters estimation; aquifer response to untoward stresses; groundwater assessment; modeling and management of groundwater system; coastal groundwater dynamics and modeling; surface-ground water interaction; contaminant transport modeling and management; managed aquifer recharge; bank filtration; soil hydraulic parameter estimation; vadose zone modeling; impact of climate change on groundwater resources, etc. Some of the recent completed studies include:

- Rising groundwater table in Jodhpur city and a management plan for containing the rising trend
- Coastal Groundwater Dynamics and Management in the Saurashtra Region, Gujarat
- Freshwater-Salinewater Inter-relationships in the Multi-Aquifer System of Krishna Delta, Coastal Andhra Pradesh
- Groundwater Prospects in the Canal Command of Saryu Nahar Pariyojna and Possible Measures to Contain Rise of Groundwater level
- Identification of Groundwater Recharge Zones In Vaippar Basin of Tamilnadu Using Remote Sensing and GIS Technique









# River Bank Filtration *for* Drinking Water Supply

Bank filtration (BF) or riverbank filtration (RBF) is a process in which the subsurface at a river or lake bank serves as a natural filter and biochemically removes potential contaminants present in the surface water. This technology was extensively explored during the recently completed 'Saph Pani' project.

Six schemes to demonstrate effectiveness of RBF for sustainable drinking water supply in different hydro-geological settings are being developed at:

- Uttar Pradesh (Mathura and Agra along the Yamuna river)
- Bihar (Arrah site in Bhojpur along the Ganga river)
- Andhra Pradesh (Visakhapatnam area)
- Uttarakhand (Laksar on the Solani river)
- Jharkhand (Sahebganj along the Ganga river)

An Indo-German Competence Centre is established in NIH to conduct research on Riverbank Filtration.



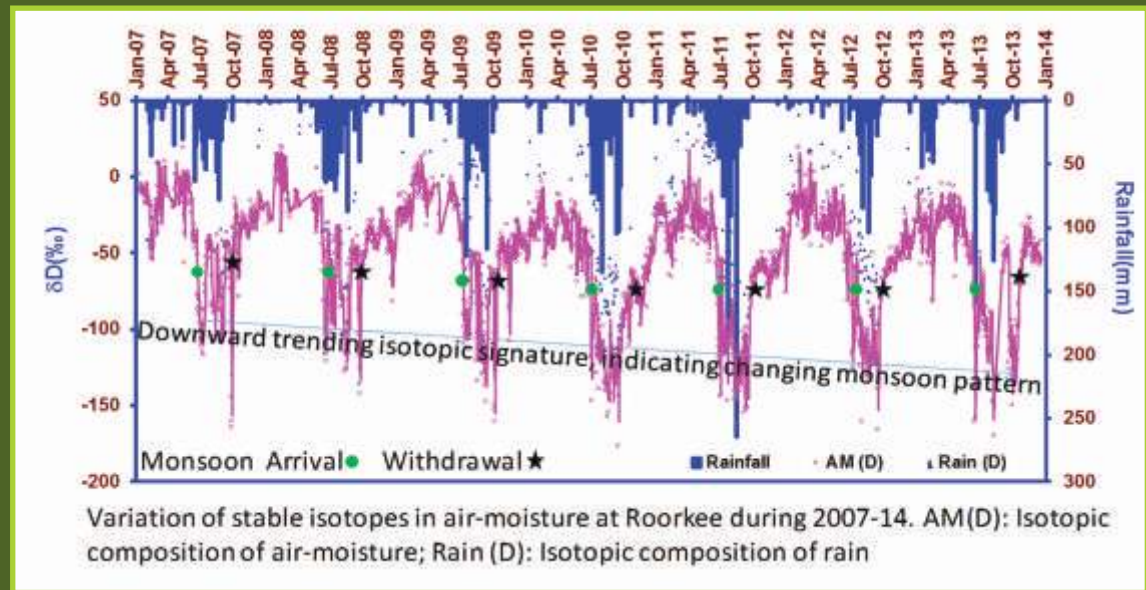
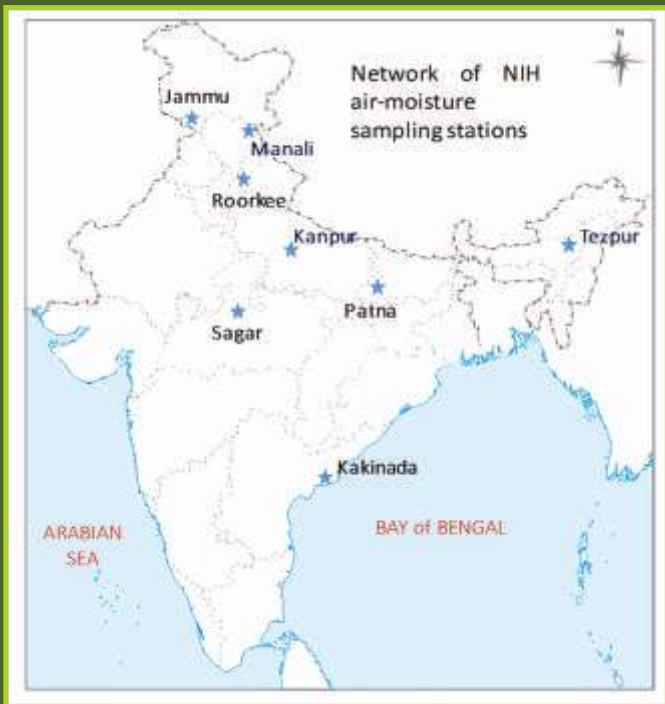




Air-moisture condensing unit at Meteorological Observatory at Regional Centre, Patna

## National Programme on Isotope Fingerprinting of Waters of India (IWIN)

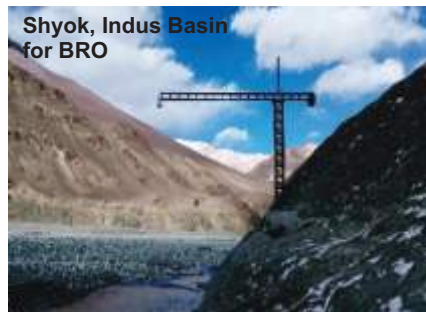
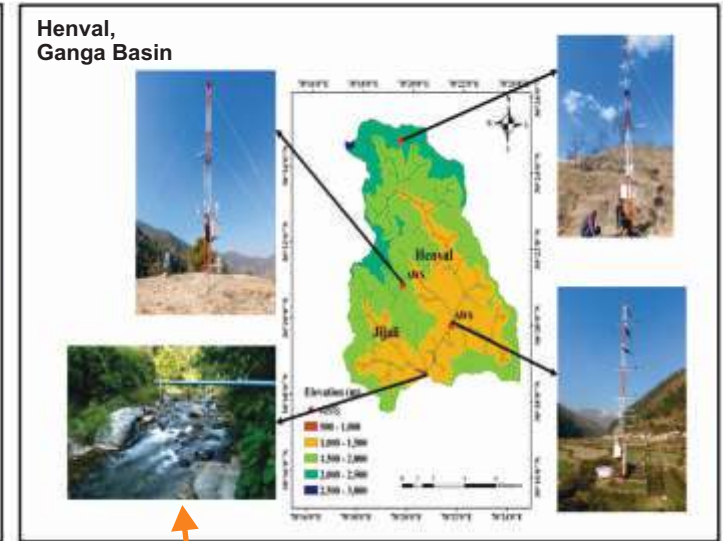
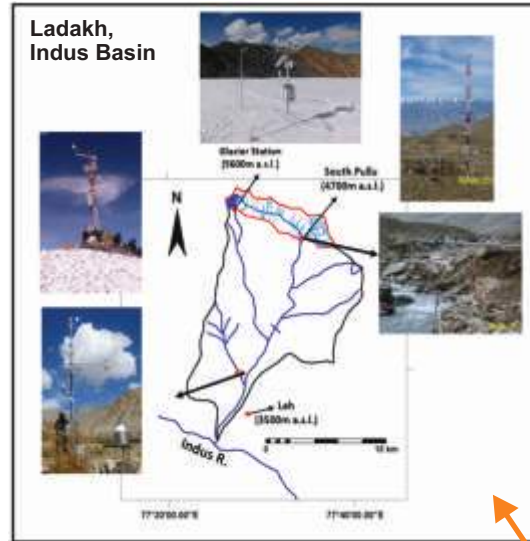
With a view to characterize and understand waters in different hydrological components in Indian hydrological system, a multi-institutional collaborative National Programme on Isotope Fingerprinting of Waters of India (IWIN) funded by the Department of Science and Technology (DST), New Delhi was conducted during 2007-2013. Fourteen research and academic institutions and central agencies participated in the IWIN programme. One of the important study that NIH conducted in the project was to examine isotopes in air-moisture on daily basis from a network of 8 stations at Roorkee, Sagar, Jammu, Kakinada, Tezpur, Kanpur, Manali and Patna over a period of 5 years. Pattern of daily isotopic data of air moisture has provided the first ever evidence of isotopes as a tool to detect source of air moisture on Indian Sub-continent. The study also provided new insights into isotopic pattern to reveal onset and withdrawal timings of monsoon pattern and recent changes in monsoon pattern. Thus, isotopes indicate the recent climate change pattern. This is the first ever data generated by any institution for the Indian sub-continent.



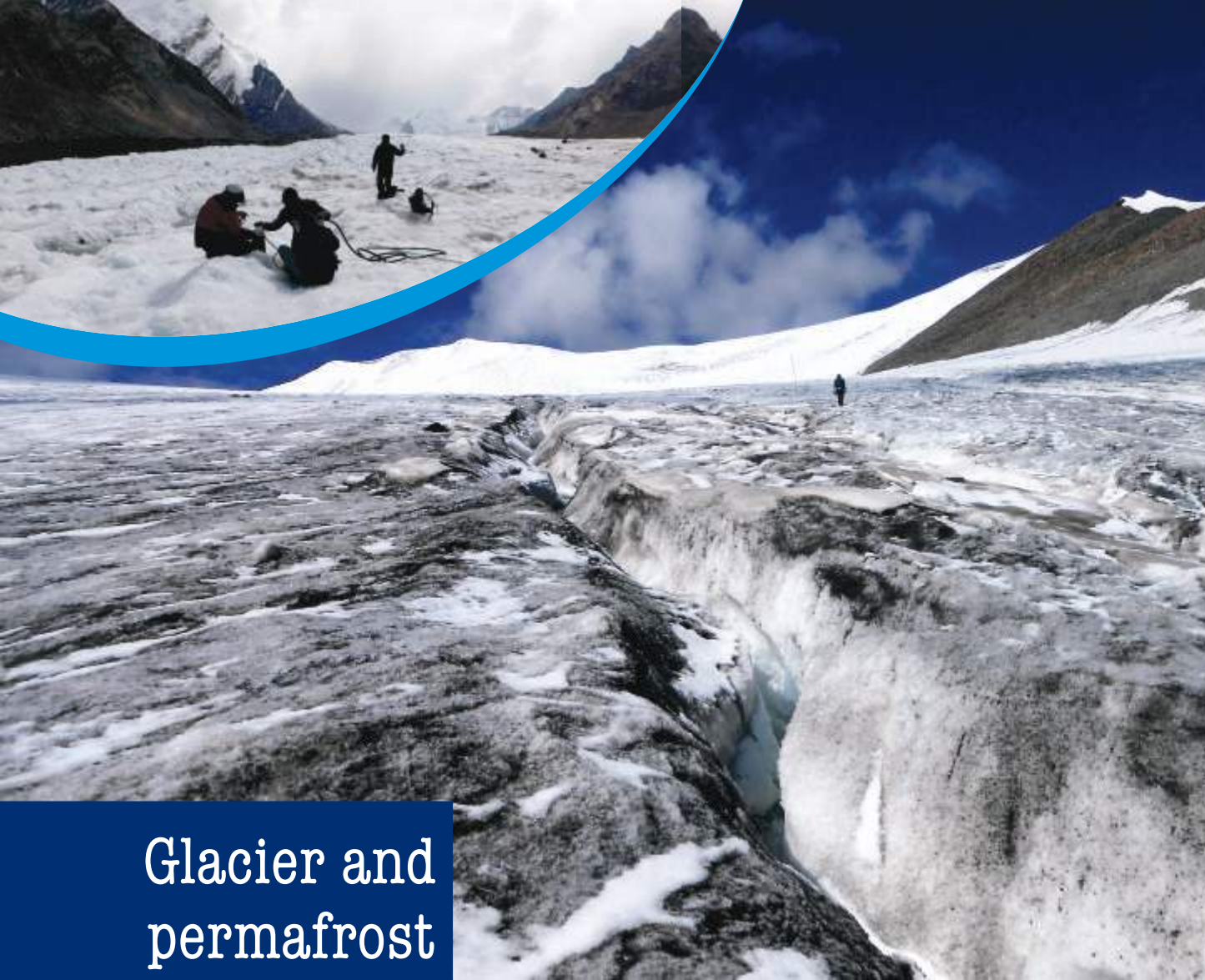


# Research Stations in the Himalayas

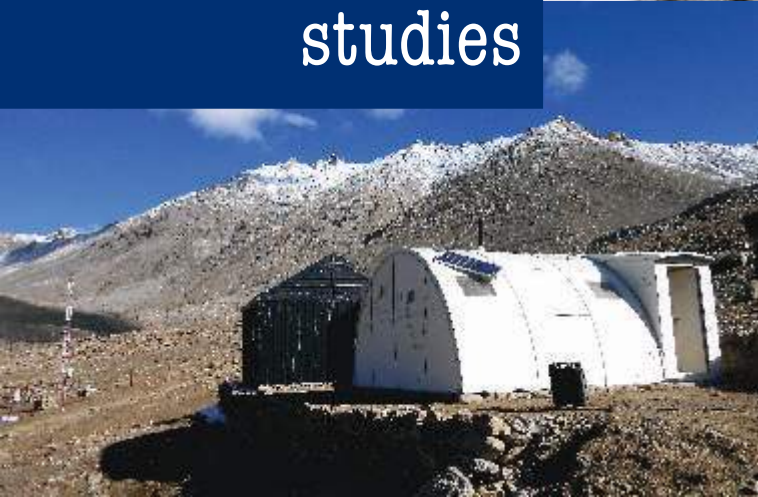
- Conducting experimental research in Indus basin at Ladakh and Shyok (for BRO), and at Gangotri Glacier
- Established an experimental catchment on HenvaI river near Tehri Dam for detailed study of hydrological processes. Besides hydromet instruments, in collaboration with Centre for Ecology and Hydrology (CEH), Wallingford (UK), a Cosmic-ray based Soil Moisture Sensor (COSMOS) is also installed at this site for in-situ measurement of soil moisture
- Collaborated with Carleton University, Canada for Permafrost research in the Himalayas







Glacier and  
permafrost  
studies





# Hydrological Contribution for the *'Seven Sisters'*




The North-Eastern region is bestowed with ample water resources, which need to be managed efficiently and judiciously. Through its North Eastern Regional Centre (NERC), Guwahati, NIH conducts research in the seven N-E States, Sikkim and parts of West Bengal (Teesta Basin) for various water resources problems of the region. The thrust areas of research covered so far include flood estimation and routing, integrated watershed management for flood control, drainage congestion and erosion problems, and water quality problems. Some of the



completed studies include:

- Hydraulic modeling of Brahmaputra riverfront development project for Guwahati city
- Dam break flood wave simulation and preparation of Emergency Action Plans (EAPs): Teesta-V; Rangit; Teesta Lower dam; and Lachung dam, Sikkim
- Developed regional flood frequency relationships for estimation of floods of various return periods for gauged and ungauged catchments of North Brahmaputra and South Brahmaputra Subzones
- Ground water quality and risk assessment of metal pollution in Kulsi river basin
- Arsenic contamination in groundwater of Nalbari and Barpeta districts, Assam





If there is magic on the Planet,  
it is contained in the water.  
~ **Loren Easley**





# Software Developed



- NIH\_ReSyP (NIH\_Reservoir Systems Package)
- SNOMOD (Model for Snow-melt Modeling)
- Web enabled "Conjunctive use management model using concept of MAR and ASR"
- WEGREM- Web-enabled groundwater recharge estimation model

## WE-GREM

### Web Enabled Ground Water Recharge Estimation Model

INTRODUCTION	WE-GREM	HELP MODULE	FEEDBACK & CONTACT US
<p>The utility of a Web Enabled-Groundwater Recharge Estimation Model, named as WE-GREM bring all the groundwater recharge related information to the groundwater professionals in a simple way. Groundwater in India is a critical resource. However, an increasing number of aquifers are reaching unsustainable levels of exploitation WEGREM aims to take the data related to groundwater as input and generate results from processing and present them to the users so they may get benefit from it. The various levels at which such information will come into use can be:</p> <ul style="list-style-type: none"> <li>• The common man can also have an overview of the groundwater recharge estimation model and can actually know what are the requirements and how it is calculated.</li> <li>• Groundwater professionals can use it as a tool to analyse the situations and can take decision for the field improvements. It may also come in as an aid in resolving important issues related with groundwater management.</li> </ul> <p>WEGREM, represents a process based time varying semi-analytical groundwater recharge rate and depth of water estimate model from in a recharge basin of varying size and shape. The model is based on the water balance of the recharge basin, and the physical processes considered are: runoff estimation from the basin catchment using SC6-CN model, water surface evaporation from the basin using option of three methods, PAN Evaporation, Mass Transfer and Pratsly-Taylor and Penman Combination method. The groundwater recharge component estimation is based on the Hantush's (1967) approximate analytical equations for the rise of water table in a homogeneous and isotropic unconfined aquifer of infinite areal extent due to uniform percolation of water from a spreading basin in absence of a pumping well.</p>		<p>Visitor Numbers : <b>02/1/99</b></p>	





It is wise to bring some water,  
when one goes out to look for water.  
~Arab Proverb





# Training Programmes

The Institute vigorously pursues capacity development activities by organizing training programmes for field engineers, scientists, researchers, students and NGOs.











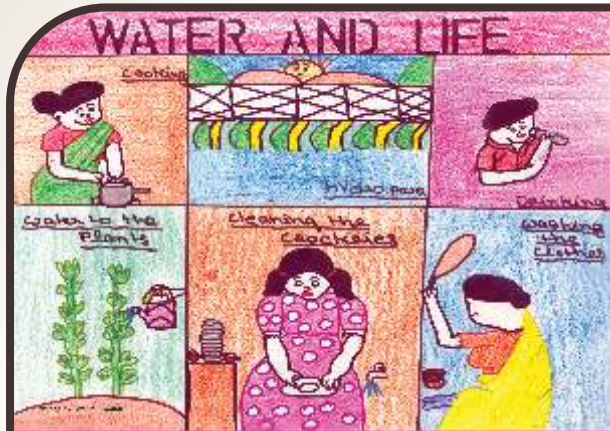
Reaching out to People : *Connect with a Purpose*















इब्राहिमपुर-मसाही ग्राम पंचायत

जल प्रबंधन और स्वच्छता

- पानी का प्रदूषण नहीं
- पानी की कमी नहीं
- हवा का प्रदूषण नहीं
- नुस्खारीपन ज्यादा
- कूड़ेदान का इस्तेमाल
- जिम्मेदार नागरिक बनें

**"स्वच्छ मेरा तन, स्वच्छ मेरा मन,  
स्वच्छ मेरा गांव, स्वच्छ मेरा भारत"**

प्रेरणा और सहयोग: राष्ट्रीय जलयोजना संस्थान, रुड़की  
(जल संसाधन, नदी विकास एवं गंगा संरक्षण मंत्रालय, भारत सरकार)  
सम्पर्क : अनुसंधान प्रकल्प एवं प्रसार विभाग, टेलीफोन : 01332-249225



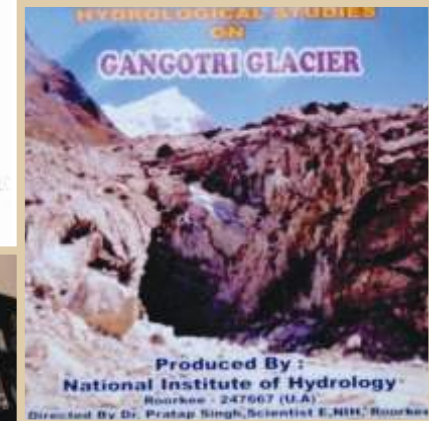
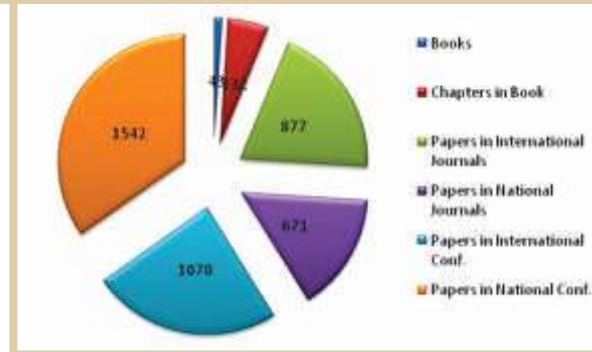


# Library & Documentation Services

NIH Library maintains the world's most comprehensive collection of technical hydrology literature, which is linked to the world's scientists. This consists of published and unpublished documents, in print and electronic formats, by scientists working in many parts of the globe. Also, NIH has a well-rounded collection of materials (print, electronic, or other formats), dealing with other related subjects.

NIH is providing Library and Documentation Services through a process of reproducing any available material and making it available to readers. It includes the periodicals and journals, documents and reprographical service.

An Institutional Digital Repository (IDR) is an online locus for collecting, preserving, and disseminating the intellectual output of an institution in digital form. NIH has recently established an IDR, hosting all NIH publications at one place.





# Publications

The Scientists of the Institute have been engaged in conducting research in different aspects of Hydrology and have commendable work to their credit in this field. NIH publishes its research output in the form of various type of reports, books, chapters in books, international and national peer reviewed journals; and in international and national conferences/ symposium, seminars, workshops, etc. The Institute has an impressive repertoire of published research work. NIH has produced more than 4,400 research publications since its inception and the list is only growing.





# Monitoring & Evaluation

The NIH Society reviews the technical activities of the Institute vis-à-vis their relevance for water resources sector in general. The program and activities of the Institute are approved by the Governing Body of NIH.

The President of the NIH Society and the Union Minister for Water Resources, RD & GR constitutes an Achievement Review Committee (ARC) for reviewing the performance of the Institute for the five year period. Since inception, seven ARC evaluations have been completed for NIH.









# Fostering Partnerships

## National MOUs

- NEERI, Nagpur
- CWRDM, Trivendrum
- Karnaya University, Coimbatore
- MNIT, Jaipur
- DoLR (GoI), New Delhi
- National Water Mission (GoI)
- Ibrahimpur-Masahi Gram Panchayat

## International MOUs

- University of Applied Sciences, (HTWD), Dresden (Germany)
- Carleton University, Ottawa (Canada)
- Centre for Ecology & Hydrology (CEH), Wallingford (UK)
- IAEA, Viena (Austria)







“Water is life's mater and matrix,  
mother and medium.  
There is no life without water.”

~ **Albert Szent-Gyorgyi**  
(Hungarian Biochemist, Nobel Laureate)





## Conferences, Seminars and Symposia











President of India, Hon'ble Shri R. Venkataraman visited NIH Exhibition Organised at B.E.G. Campus During 12 January 1989



# Dignitaries' Blessings











# Life at Campus *Joie de Vivre*

The Institute organizes events like picnics, flower shows, cultural fests, Deepawali mela, sports, Yoga, and other recreational activities for the employees from time to time. It provides the much needed break from their rigorous routine and motivates them to perform better when they return to work.









# The Future Beckons . . .

'The journey of a thousand miles begins with the first step' said the Chinese philosopher Lao Tzu. NIH embarked on its momentous journey on 16 December 1978 when it took its first step of conducting hydrological research in India. Since then, NIH has been conducting basic, applied and strategic research in the fields of hydrology and water resources development. The Institute has tried to fulfill the expectations of the country by providing solution to a variety of water-related problems and issues.

Over the years, the Institute has established state-of-art laboratory and field capabilities, and developed excellent expertise in computational hydrology. NIH is now known for successfully carrying out sponsored R&D projects from national and international funding agencies, and for providing useful inputs to the decision makers, inter-state river water dispute tribunals, courts, NGT, BIS, etc. In the backdrop of emerging water management related issues, the Institute is attempting to contribute effectively to the government's flagship schemes and programs. The Institute is committed to reinvigorating the water sector in India by providing new research insights and innovative solutions to the emerging water-related disasters (e.g. flash floods, glacial lake outburst floods, urban stormwater congestion, droughts), declining groundwater situations, wastewater treatment and reuse, water-efficient irrigation techniques, climate change generated and anthropogenic complexities, drying up of springs, pond and wetland management, etc. Also, the NITI Aayog, MoWR, RD & GR and other ministries of the Government of India and the State Governments expect the Institute to be involved in action research activities.

In order to gear up for the aforesaid challenges, the Institute plans to reorient its resources so as to focus on multidisciplinary working through alliance with collaborators, which will facilitate delivering more action oriented research with inbuilt outreach and awareness activities. As the country's focal point for UNESCO-IHP program, NIH will take a leadership role in helping the neighboring countries, especially SAARC countries, to strengthen hydrological research in these countries. It plans to organize a number of capacity building programs for participants from these countries. Also, the Institute will strive more to enhance revenue generation through sponsored research and consultancy.

Four decades of excellence and accomplishments in Hydrology is just the beginning of an eventful and purposeful odyssey for NIH. Not the one to rest on its laurels, it continues to forge ahead with zest and vision to contribute towards water security for the nation. The Institute envisions to become the benchmark among the institutions and organizations working in the area of hydrological research. The future is filled with hope and enthusiasm and NIH is fully geared towards actualizing its potential. The best is yet to come.

**पानी से ही स्वस्थ है मानव,  
पानी है धरती की शान  
पानी बिना न जीवन संभव,  
पानी है मानव का प्राण**





# The Future Beckons . . .

- **Research in emerging areas**
  - Integrated assessment of water availability in river basins
  - Hydrologic extremes
  - Coastal groundwater dynamics
  - Water and food security assessment- contribution to SDGs
  - Understanding hydrological processes in the Himalayas
  - Emerging contaminants, micro-pollutants, geogenic contaminants and their impacts on water resources
  - Impact of climate change on water resources
  - Urban floods and stormwater management
- **Action research**
  - River Bank Filtration (RBF)
  - Managed Aquifer Recharge (MAR)
  - Pond rejuvenation
  - Lake/wetland rejuvenation
  - IWRM Plan for watersheds
  - Flood early warning systems
  - Spring rejuvenation
- **Working with Hydrology Models**
  - Water Accounting Plus
  - NIH Hydrology Model 'BASIN'
  - Developing a comprehensive hydrological model under NHP in collaboration with IITs
- **Use of advanced techniques and tools**
  - Hydrologic analysis and design using soft computing, artificial intelligence, big data, virtual water, Internet of Things (IoT)
  - Application of isotopic investigations
  - Use of satellite data for estimation of hydrological variables
  - Decision Support Systems
  - Use of electronic sensors and data loggers at experimental catchments
  - Web-based water resources information system
- **Development of new infrastructure**
  - Centre of Excellence for Hydrological Modeling
  - Water Innovation Centre for 'Eco-prudent wastewater solutions'
  - Soil Moisture Network and COSMOS National Data Centre
  - UNESCO Category-II Centre on 'Water & Environment for South Asia'
- **Scientific inputs for water governance**
- **Outreach and mass awareness activities**
- **Conducting PG-level courses on identified topics**



Representative 40 Studies

Hydrodynamic Modelling of River Vishwamitri for preparation of flood mitigation plan for Vadodara city

Estimation of Design Basis Flood and Safe Grade Elevation for Nuclear Power Project at Gorakhpur, Haryana

Hydrological Studies in a Forested Watershed - A Case Study on Natural Regeneration of Sal Forest in Uttarakhand

Hydrological Study for Rural Drinking Water Supply Options in part of Bundelkhand Region of Uttar Pradesh

Hydraulic Modelling for Brahmaputra Riverfront Development Project for Guwahati

NIH\_ReSyP - Reservoir Systems Package

Hydrological and Multi-reservoir Simulation Studies for DPR of Ken - Betwa Link

Project-wise Water Availability and Integrated Operation Analysis in Krishna Basin

Assessment of sedimentation rate of reservoirs using remote sensing techniques

Flood Zoning / Mapping for River Bhagirathi at Uttarkashi and River Ganga from Haridwar to Laksar

Monitoring and modelling of Gangotri Glacier

Glaciological studies of Phuque Glacier of the Ladakh Range

Mitigation and Remedy of Groundwater Arsenic Menace in India

Coastal Groundwater Dynamics and Management in the Saurashtra Region, Gujarat

Freshwater-Salinewater Inter-relationships in the Multi-Aquifer System of Krishna Delta, Coastal Andhra Pradesh

Adsorption of Cadmium on Bed Sediments of River Ganga

Web Enabled "Conjunctive Use Model for Management of Surface and Ground Water using concept of MAR and ASR

SAPH PANI-Enhancement of natural water systems and treatment methods for safe and sustainable water supply in India

Feasibility and Scope of Managed Aquifer Recharge for Groundwater Augmentation in NCT, Delhi

Groundwater Prospects in the Canal Command of Saryu Nahar Pariyojna and Possible Measures to Contain Rise of Groundwater level





Metal Pollution Assessment through Aquatic Sediments: A Case Study of River Yamuna

Ground Water Quality Monitoring and Assessment in Metropolitan Cities of the country

Integrated Hydrological Studies of Lake Nainital, Kumaun Himalayas, Uttarakhand Using Conventional and Isotope Techniques

National Programme on Isotope Fingerprinting of Waters of India (IWIN)

The Structure and Dynamics of Groundwater Systems in Northwestern India Under Past, Present and Future Climates

Water conservation and management in Ibrahimpur Masahi village of Haridwar district (Uttarakhand)

IWRM based development plan for water security in four districts of Bundelkhand region in India

Urban Hydrology of Patna town

Effect of Sand Mining on River and Groundwater Regime in Hard Rock Areas- A Case Study

Comprehensive Watershed Management Plan for a Degraded Watershed in Bundelkhand Region of Madhya Pradesh

Flood Hazard Mapping and flood risk zoning for a river reach (Ganga between Buxar and Rajendra bridge)

Hydrological Evaluation of an Artificial Lake

Change detection of selected glaciers in Western Himalayan Region

Stormwater Management in Otteri Nullah Watershed, Chennai Corporation, Tamilnadu

Assessment of groundwater quality and nitrate transport modelling for the coastal aquifer of Kakinada, Andhra Pradesh

Identification of Groundwater Recharge Zones In Vaippar Basin of Tamil Nadu Using Remote Sensing and GIS Technique

Statistical Downscaling and assessment of climate change impact on hydrology for Mahanadi basin

Hydrological Impacts of Land Cover Changes in Humid Tropical Watersheds Located in The Sahayadri Mountains, India

Dam break flood simulation for Maithon and Panchet dams using NWS DAMBRK model and inundation mapping

Reservoir Sedimentation, Impact Assessment and Development of Catchment Area Treatment Plan for Kodar Reservoir in Chattisgarh State

Representative 40 Studies









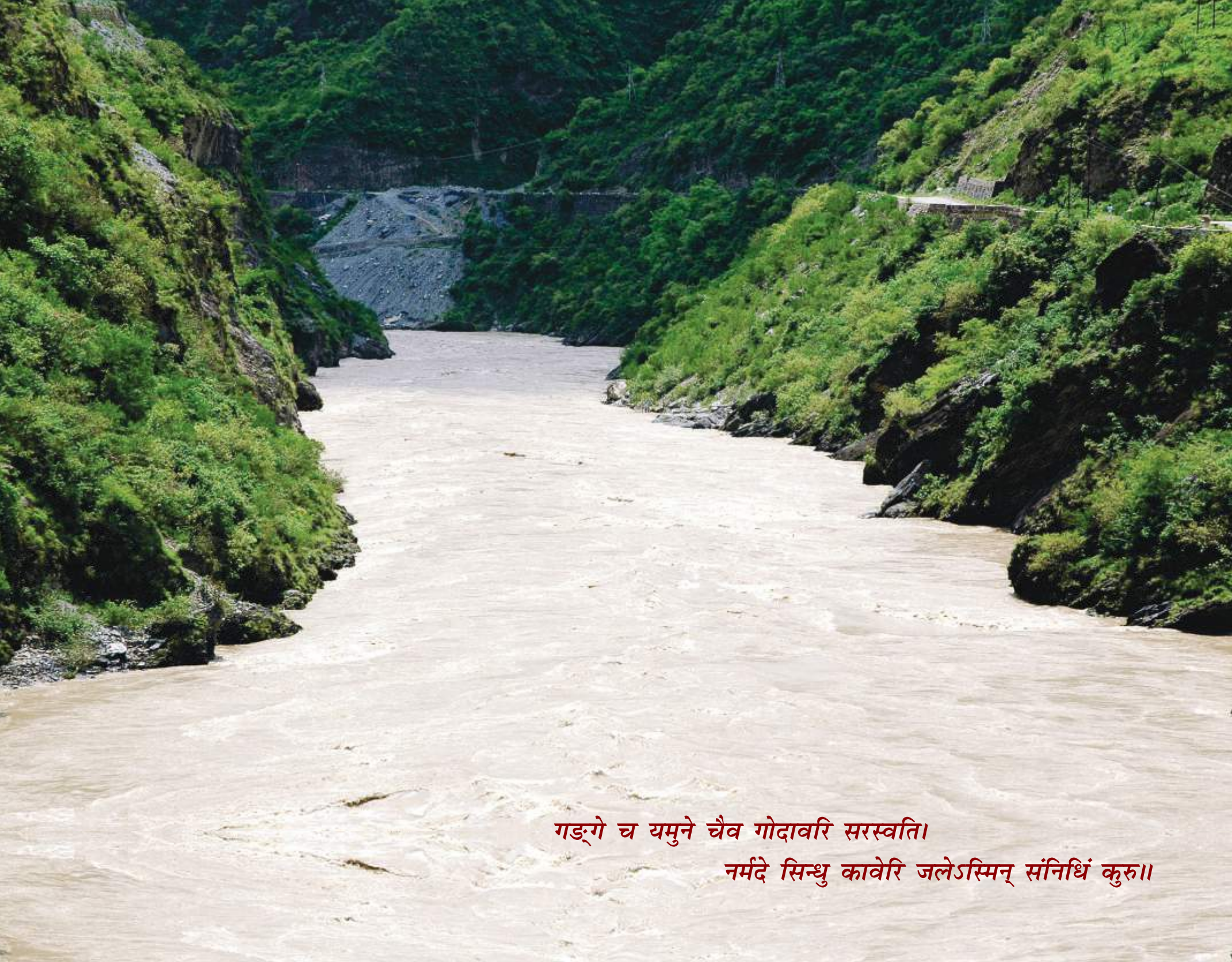


SCIENTIFIC NAME: FICUS PINKATA  
COMMON NAME: COMMON FIG  
FAMILY: MORACEAE  
ORIGIN: INDIA  
AGE: ABOUT 85 YEARS  
USES: FRUIT FOR EATING, WOOD FOR AFFLICTIONS

NO PARKING

the speaking tree...  
*Inspiring Resilience*





गङ्गे च यमुने चैव गोदावरि सरस्वति।

नर्मदे सिन्धु कावेरि जलेऽस्मिन् संनिधिं कुरु॥