

Information Brochure



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NATIONAL INSTITUTE OF HYDROLOGY

ROORKEE - 247 667, UTTARAKHAND, INDIA

Major Ongoing Projects

National Hydrology Project (NHP) (World Bank funded)

The Ministry of Water Resources, River Development and Ganga Rejuvenation (MoWR, RD & GR), Government of India (GoI) has initiated the National Hydrology Project (NHP) as a follow-on to the earlier Hydrology Projects (HP-I and HP-II). The objectives of NHP are to improve the extent, quality and accessibility of water resources information, and to strengthen the capacity of water resources management institutions in India. NHP will improve and expand hydrology data and information systems, strengthen water resources operation and planning systems, and enhance institutional capacity for water resources management.

NIH is involved in the following activities of NHP:

- Demand driven research through Purpose Driven Studies (PDS)
- Capacity building:
 - Class room Training/Meetings and multi-media distance learning
 - Courses on different topics of different durations
- Centre of Excellence for Hydrological modeling (CEHM)
- DSS Planning

Integrated Hydrological Studies for Upper Ganga Basin up to Rishikesh

Task Force-II on Water, Ice and Snow including Glaciers, under National Mission on Sustainable Himalayan Ecosystem (NMSHE)]

The Department of Science & Technology (GoI) has been entrusted with the responsibility of coordinating National Mission for Sustaining Himalayan Ecosystem (NMSHE) under the National Action Plan on Climate Change (NAPCC). The broad objectives of NMSHE include - understanding of the complex processes affecting the Himalayan Ecosystem and evolve suitable management and policy measures for sustaining and safeguarding the Himalayan eco-system, creating and building capacities in different domains, networking of knowledge institutions engaged in research and development of a coherent database on Himalayan ecosystem.

This project proposes to focus on the following research objectives:

- Development of a project website, Real-time snow cover information system, Glacial inventory and GLOF study
- Observation and modeling of various hydrological processes in a small watershed, and understanding hydrological processes using isotope techniques
- Hydrological modeling in Alaknanda and Bhagirathi basins and assessment of climate change impact
- Study of river-aquifer interactions and groundwater potential upto Dabrani
- Environmental assessment of aquatic ecosystem Water census and hotspot analysis in selected villages in Upper Ganga basin

Neeranchal National Watershed Project (NNWP) (World Bank funded under PMKSY of DoLR, GoI)

The major role of NIH in the Neeranchal Project is in developing a DSS to provide the hydrology inputs for watershed management, and building the capacities of the DoLR/State authorities for integration into the IWMP. The assignment also includes conducting trainings of stakeholders, awareness activities, and providing technical backup to the State level nodal agencies during handling of their Neeranchal and IWMP activities in the 9 rainfed States of Telangana, A.P., M.P., Chattisgarh, Gujarat, Rajasthan, Jharkhand, Maharashtra and Odisha.

Objectives

Objectives of Institute are to undertake, aid, promote and coordinate systematic and scientific work in all aspects of hydrology; and to cooperate and collaborate with other national, foreign and international organizations in the field of hydrology.



Vision

To provide leadership in hydrologic research through effective scientific solutions for achieving sustainable development and self-reliance of the water sector in India.

MISSION AND GUIDING PRINCIPLES

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



- Water resources planning and management
- Ground water modeling and management
- Flood and drought prediction and management
- Snow and glacier melt runoff estimation
- Prediction in ungauged basins
- Water quality assessment and modelling in rivers
- Groundwater hydrology of arid, semi-arid, coastal & deltaic areas



International Cooperation

The Institute has successfully completed a number of projects with financial assistance from UNDP, European Economic Commission, Indo-Dutch Cooperation, USAID, UNESCO, IAEA and World Bank.

Recently Completed /Currently going on projects are :

- World Bank funded "National Hydrology Project"
- World Bank funded "Neranchal National Watershed Project"
- European Union funded "Saph Pani – Enhancement of Natural Water Systems and Treatment methods for Safe and Sustainable Water Supply in India"
- IAEA funded Coordinated Research Projects
- Centre for Ecology and Hydrology (CEH), UK collaborative projects.

- Collaborative projects with Swedish Meteorological; and Hydrologic Institute; Cambridge University (UK); Carleton University (Canada)
- Study on Ganga Water Machine with International Water Management Institute (Srilanka)

Participating in UK - India Collaborative programme on "Change in Water Cycle" in the project "The structure and dynamics of groundwater systems in northwestern India under past, present and future climates"



Collaborative Research

- NIH has been conducting research through consultancy and sponsored projects for more than 30 years. The Institute has so far completed more than 180 sponsored research and consultancy projects. Main sponsors of the projects are
- Ministry of Science and Technology
- Ministry of Earth Sciences
- Ministry of Environment and Forest, cc
- Ministry of Agriculture
- Ministry of Rural Development
- Ministry of Water Resources, RD&GR
- Planning Commission
- National Productivity Council
- Indian Army
- National Thermal Power Corporation
- National Hydro Power Corporation
- National Atomic Power Corporation
- Department of Atomic Energy
- Nuclear Power Corporation of India Ltd.
- Tehri Hydro Power Limited
- Coal India Limited
- Central Ground Water Board
- Central Water Commission



R&D Contributions

A. DEVELOPMENT OF SCIENCE

- Regional flood formulae for small catchments
- Operation of multi-purpose and multi-reservoir systems
- Procedures for hydrologic analysis
- Hydrologic design of radial collector wells
- Development of hydrological instruments
- Adsorption phenomena and sediment dynamics
- Impact of climate change on water resources, both surface water and groundwater

B. SCIENCE FOR SOCIETY

- Dam break flood analysis for major dams in India
- Water yield from ungauged basins in the Himalayan region
- Sedimentation analysis of major reservoirs
- Water availability and soil erosion from small watersheds
- Hydrological analysis of Himalayan glaciers
- Hydrological study of interlinking of rivers
- Drought management and mitigation studies
- Assessment of sedimentation rate in lakes
- Groundwater recharge and irrigation return flow
- Seawater intrusion and coastal groundwater management
- Sources of arsenic and fluoride contamination
- Hydrology of degraded watersheds
- IWRM Planning for Watersheds in Bundelkhand
- Design of riverfront development projects
- Design of the bridges for Indian Railways
- Rejuvenation of village ponds



C. SCIENCE FOR DECISION MAKERS

- Standards development for the Bureau of Indian Standards
- Water quality assessment in metropolitan cities
- Seepage estimation and cause of groundwater rise
- Ground water availability
- Groundwater recharge and groundwater augmentation
- Interlinking of river projects
- National Programme on Isotope finger printing of waters of India
- Assessment of groundwater resources and development potential of River Floodplain
- Glaciological studies of Ladakh range
- Water balance studies of forested watershed, Western Ghats, India
- Impact of assessment of land use on the hydrologic regime in some micro watersheds in lesser Himalayas, Uttarakhand
- Natural purification of water through bank filtration (Saph Pani)



D. SCIENCE FOR INDUSTRY AND STAKEHOLDERS

- Integrated hydrological study for sustainable development of hilly watersheds in Lesser Himalayas.
- Area drainage and hydrogeological study for coal based thermal power plants
- Environmental flow study for hydro-electric projects
- Feasibility study of surface water and groundwater availability including identification of potential groundwater recharge sites
- Hydrogeological and Rain Water Harvesting Design for coal based Thermal Power Plant
- Impact of Mining on groundwater regime in coastal area
- Glacial Lake Outburst Flood Studies for hydropower projects
- Estimation of Design Basis Flood and Safe Grade Elevation for Nuclear Power Projects
- Hydrological Investigations and drainage pattern study for Coal Based Power Projects
- Hydrogeological study of Jhamarkotra Mines, Udaipur, Rajasthan
- Hydrological Investigations of lakes for water Conservation and Management
- Development of Spring Sanctuaries in Urban and Rural Watershed Himalayan Region

Academic Activities

The Institute is recognized by several IITs, IISc, Universities and other academic organizations for carrying out research leading to the award of post-graduate and Ph.D. degrees in hydrology and related subjects. Scientists of the Institute have guided number of research scholars for Ph.D. degree and M.E./M.Tech./ M.Sc. thesis. The scientists also provide their inputs to the academic programs through lectures as guest/visiting faculty, and working as examiners of Ph.D. and M.E./M.Tech. thesis, and members of various committees as experts.

Scientific Divisions



ENVIRONMENTAL HYDROLOGY

- Environmental monitoring including natural contaminants
- Point and non-point source pollution
- Adsorption kinetics and Water sediment systems
- Transport and sedimentation of pollutants
- Contaminant transport modelling
- Metal speciation/fractionation
- Ground water quality and aquifer contamination
- Low cost treatment/remediation technologies
- Water quality and human health
- Environmental Modelling
- Water quality and climate change
- Geo-microbial pollution
- Lake ecosystems
- River bank filtration for sustainable water supply

GROUNDWATER HYDROLOGY

- Coastal aquifer dynamics, modeling and management with special reference to impact of climate change.
- Groundwater modeling and management



- Hard-rock and Karst hydrology.
- Surface water-Groundwater interaction
- Groundwater storage and resource estimate and management.
- Aquifer contamination, modeling and remediation
- Referred demand driven studies related to groundwater.

HYDROLOGICAL INVESTIGATIONS

- Hydrology of Mountainous Areas
- Surface Water and Groundwater Interaction
- Groundwater Management
- Lake Hydrology
- Hydrological Instrumentation





SURFACE WATER HYDROLOGY

- Hydrological modeling
- Water availability studies
- Regional hydrology
- Dam break flood wave simulation
- Flood estimation & management
- Snow & glacier melt runoff modeling
- Glacier lake outburst flood studies
- Watershed Management
- Assessment of impact of climate change
- Drought mitigation & management
- Forest hydrology
- Urban hydrology

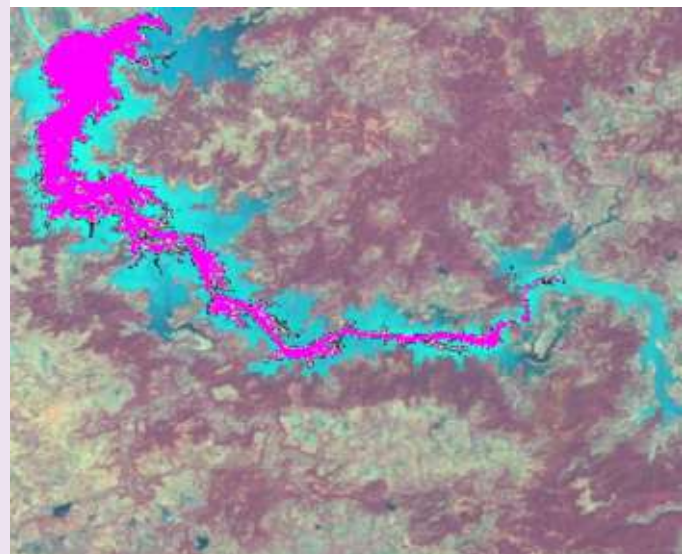
WATER RESOURCES SYSTEMS

- Integrated river basin planning and management
- Reservoir operation and sedimentation
- Inter-basin water transfer
- Hydrologic modeling including study of ungauged basins
- Impact of climatic change on water resources
- Software development
- Development of web-based applications and information dissemination
- Development and application of advanced tools such as remote sensing, GIS, ANN, Fuzzy logic etc. for solving water resources problems
- Water governance



RESEARCH MANAGEMENT AND OUTREACH

- Thematic consultations and lectures
- Policy papers, policy briefs, science-policy-community interface
- Outreach activities and capacity building programmes
- S&T dissemination
- Technology commercialization and IPR issues
- ISO certification
- Publication of NIH newsletter, calendar
- Technical/scientific meetings (TAC, WG)
- Collaboration with research/academic institutions
- Promotion of international cooperation
- Preparation of documents (e.g. annual action plan, outcome budget, performance budget, Result Framework Document (RFD), EFC Memo)



Laboratories

HYDROLOGICAL INSTRUMENTATION LABORATORY / HYDRO-METEOROLOGICAL OBSERVATORY

Capabilities

Measurement of hydro-meteorological parameters and field investigations

Major Equipment

- Automatic Weather Station
- Automatic water level recorders
- Terrameter (SAS 4000)
- EM conductivity meter
- Soil moisture probes and tensiometers

NUCLEAR HYDROLOGY LABORATORY

Capabilities

Estimation of groundwater recharge, surface water and ground water interaction, lake dynamics, groundwater and sediment dating and identification of recharge sources and zones, etc.

Major Equipment

- Mass spectrometers (DI-IRMS, CF-IRMS) with elemental analyser
- Laser water isotope analyser
- Ultra Low Level Scintillation Counter
- Multi Channel Alpha Spectroscopy
- Neutron Moisture Density Probes
- Multi Channel Gamma Ray Spectrometer
- Ion Chromatograph



SOIL WATER LABORATORY

Capabilities

Measurement of soil hydrological parameters, e.g. grain size analysis, coefficient of permeability, infiltration rates, soil density, soil moisture retention characteristics, in-situ saturated hydraulic conductivity, sorptivity and matrix flux potential of soil

Major Equipment

- Laser Particle Size Analyser
- Time Domain Reflectometer
- Pressure Plate Apparatus
- Guelph Permeameter
- ICW Permeameter, Pycnometers, Electro-mechanical Sieve Shaker, etc.



SNOW AND GLACIER LABORATORY

Capabilities

Excellent computational facilities for analysis and modeling of snow and glacier melt runoff

The laboratory displays glaciological research exhibition facility, consisting of mountaineering equipment used in the field, hydrological equipment used in the field, sediment samples collected from different parts of the glaciers, display of results related to hydrological aspects of different glaciers, problems of the high altitude region of the Himalayas. It maintains

- Insulated Hut
- Automatic Weather Station
- High altitude Meteorological Observatory
- Automatic Water Level Recorder



REMOTE SENSING AND GIS LABORATORY

Capabilities

Digital Image processing and Geographic Information System
Major Software and hardware available in the laboratory includes

- ERDAS 9.3
- ILWIS 3.3
- ArcGIS 9.3
- ENVI
- A0 size scanner
- A0 size colour plotter



WATER QUALITY LABORATORY

Capabilities

Identification and quantification of physical, chemical (major and minor ions and trace elements), pesticides, hydrocarbons and other organic compounds and bacteriological parameters in different water bodies like rivers, lakes, reservoirs, wells, aquifers, canals etc.

Major Equipment

- Ion Chromatograph Ion Free System
- Atomic Absorption Spectrometer
- Gas Chromatograph with ECD, NPD, FID and TCD detectors
- Mercury Analyser
- Micro Processor based Flame photometer
- Ultra Pure Water Purification System



NUMERICAL GROUNDWATER MODELING UNIT

Capabilities

Excellent computational facilities to deal with issues related to groundwater modeling and analysis.

Major Software

- Groundwater modeling software: Visual MODFLOW with 3D Builder, FEFLOW, MikeSHE-11, Hydro Geoanalysis, Unsat Suite Plus, Aquachem, AquiferTest Pro
- GIS Software: ArcGIS, TNT-Mips Integrated GIS and Remote Sensing Software, Surfer
- Statistical software: Systat, Sigmaplot

Contributions to the Society

- Conducting user defined demand-driven research through collaboration with national and international organizations to provide solution to the field problems relevant to the society
- Transfer of technology / knowledge dissemination by organizing training courses, workshops, seminars, symposia, conferences etc. so as to empower the field engineers, researchers and students in the area of hydrology and water resources.
- Water conservation awareness, adoption of appropriate technology, revival of traditional systems, conjunctive use of surface and ground water, rain water harvesting, recharging of drinking water sources etc.
- Developing expert trainers for dissemination of advanced knowledge for benefit of the society.



Software Development

Institute is engaged in development of software to solve various hydrological problems. Some of the software are

- Unit Hydrograph Applications for Flood Estimation Package (UHPACK)
- Flood Estimation of Large Catchments using Deterministic Approach Package (FLPACK)
- NIH_ReSyP : Software for Reservoir Analysis

NIH_Reservoir Systems Package

NIH_ReSyP

Inflow Estimation

Reservoir Sedimentation

Capacity Computation

Spillway Regulation

Flood Operation

Reservoir Routing

Conservation Operation

HydroPower Analysis

Developed By :
Water Resources Systems Division
NATIONAL INSTITUTE OF HYDROLOGY
Jalvigyan Bhawan
Roorkee -247667 (Uttaranchal)
India

Start ReSyP

Quit ReSyP

Web Based Software and Information System

- Estimation of groundwater recharge
- Web GIS for Dams and Diversions in India
- Information System for Major and Important Lakes in India
- Snow Cover Information System for Himalayas
- Learning Package for Hydrology
- Software for Computation of Evapotranspiration

Capacity Building/ Technology Transfer

The Institute vigorously pursues capacity development by way of organizing specialized training programs on different aspects of hydrology. NIH has

- Trained field engineers, scientists, researchers, and students
- Conducted training courses in different States
- Organized International Seminars/Conferences /Workshops
- Organised National Seminars/ Symposia/ Workshops, and
- Organised Interaction Workshops/ Mass Awareness Programs.



Indian National Committees

The Institute is the Secretariat of the Indian National Committee on Climate Change (INCCC) under National Water Mission, and Indian National Committee for International Hydrological Program (INCIHP) of UNESCO constituted by the Ministry of Water Resources, Govt. of India.

Research Publications



The research output of the Institute is disseminated in the form of technical reports, papers in peer reviewed journals, seminars/symposia etc. So Far following publications have been brought out.

- Technical Reports - 1050
- Research Papers – more than 3300
- Water Science Series – 7
- Books published by Scientists - 37
- TOT manual on "Water Conservation awareness"

Infrastructure

LIBRARY

Library has about 12,000 books and 3,000 periodicals, 6,000 technical reports, 308 Indian and foreign Standards. The Library is currently subscribing 50 periodicals.

CONFERENCE / LECTURE HALLS

NIH has excellent infrastructural facilities for organizing seminars, symposia, conferences, training programs, lectures and meetings. These include an Auditorium with seating capacity of 300 persons, 3 Lecture Halls with seating capacity of 40 to 48 persons and a Committee Room and Multi-purpose Hall with a capacity of 65 persons. All the Conference/ Lecture Halls are fully air conditioned and are equipped with latest projection facilities.

GUEST HOUSES

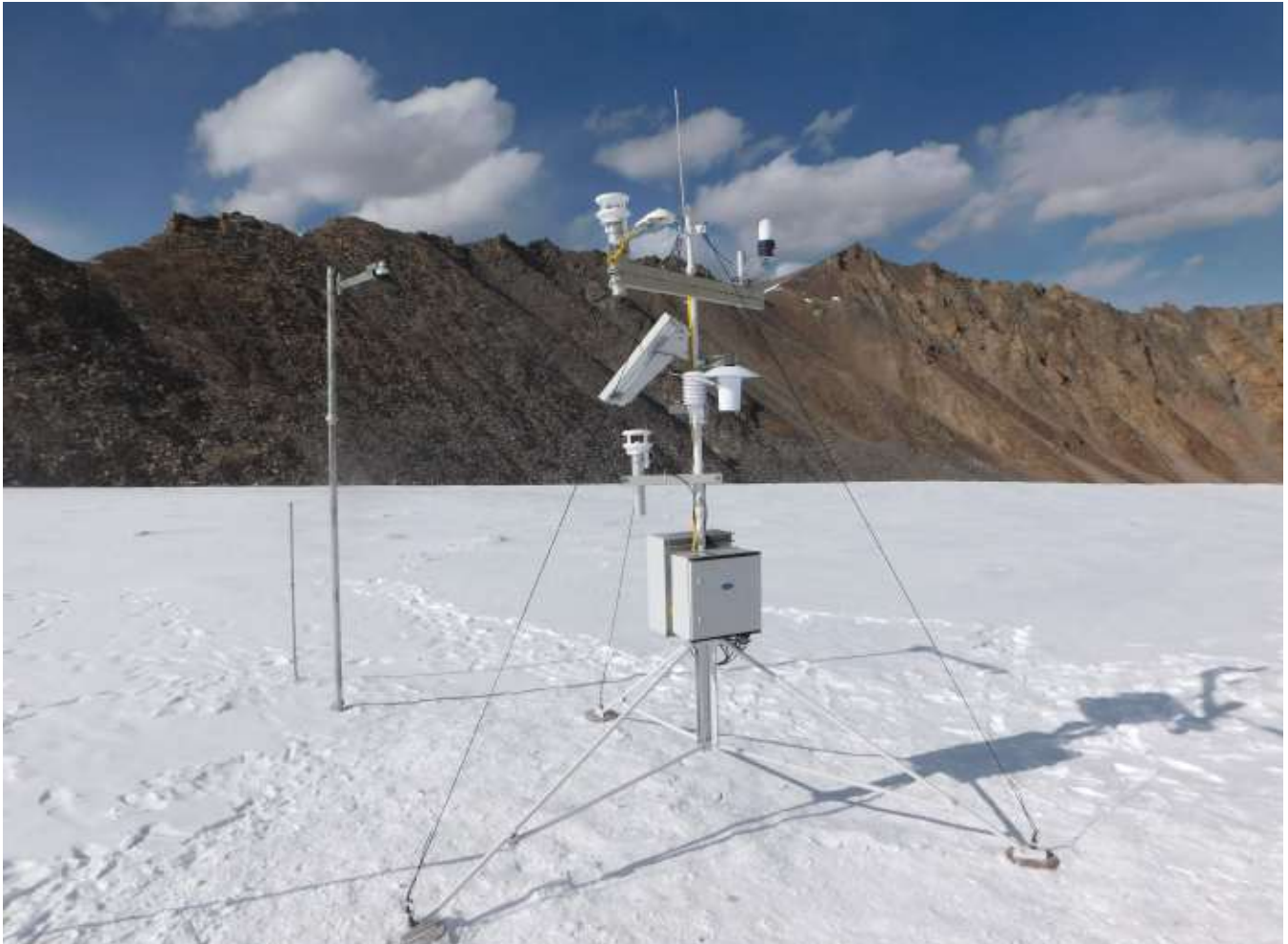
There are two Guest Houses located within the NIH Campus to accommodate 73 guests/ participants for conferences, training courses, workshops, etc.



Public Awareness

- Pamphlets and brochures
- Water science educational series
- Interactive workshops
- NIH newsletter 'Hydrology for People'
- Jal Chetna
- Video films
- Exhibitions in IITF, IWW, ISC

Experimental Facilities in the Himalayas



REGIONAL CENTRES OF NATIONAL INSTITUTE OF HYDROLOGY



For further information please contact :

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REGIONAL CENTRES

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Western Himalayan Regional Centre

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 Satwari, Jammu Cantt-180003 (J & K)
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Centre for Flood Management Studies (Brahmaputra Basin)

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