INFORMATION BROCHURE

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NATIONAL INSTITUTE OF HYDROLOGY
ROORKEE, INDIA
1992

PREAMBLE

The National Institute of Hydrology is an autonomous Society under the Ministry of Water Resources, Government of India. It is located in Roorkee, Uttar Pradesh. The Institute was established in 1979 by Government of India as a UNDP assisted project. It is the apex body in hydrology for research and development. The Institute has a sanctioned staff strength of 292 at the end of 1991, with 74 scientists.

OBJECTIVES

The main objectives of the Institute are:

- to undertake, aid, promote and co-ordinate systematic and scientific work in all aspects of hydrology,
- to co-operate and collaborate with other national, foreign and international organizations in the field of hydrology,
- to establish and maintain a research and reference library and equip the same with books, reviews, magazines, newspapers and other relevant publications

AUTHORITIES

1.	President of the Society	: Union Minister for Water Resources
2.	Vice-President of Society	: Minister of State for Water Resources
3.	Chairman of the Governing Body	: Secretary (Water Resources),Govt. of India
4.	Chairman of the Technical Advisory Committee	: Chairman, Central Water Commission
5.	Director	: Dr Satish Chandra

SCIENTIFIC DIVISIONS

- Hydrological Design
- Mountain Hydrology
- Surface Water Analysis and Modelling
- Flood Studies
- Ground Water Assessment
- Conjunctive Use
- Drainage
- Drought Studies
- Water Resources Systems
- Environmental Hydrology
- Atmosphere-Land Surface Modelling
- Information System and Data Management
- Remote Sensing Applications
- Hydrological Investigations
- Lake Hydrology
- Hydrology of Hard Rock Areas
- Nuclear Hydrology
- Extension Services with Audio Visual Centre.

Shortly , the Institute is setting up following additional scientific divisions:

- Hydrometeorology
- Hydrologic Instrumentation
- Hydrology of Flat Lands, Coastal Areas including Islands
- Watershed Management

REGIONAL CENTRES

In order to study hydrological problems of various agro-climatic regions of the country, the Institute has established/plans to establish regional centres in following regions:

- Deccan Hard Rock Region

- Eastern Coastal and Deltaic Region
- Western Himalayan Region
- Arid and Semi-arid Region
- North Eastern Region
- Ganga Plains Regions(I)
- Ganga Plains Regions(II)
- Western and Southern Coastal Region

Out of the above, three regional centres were established during 7th plan period, for deccan hard rock region in Belgaum, Karnataka, for north eastern region of Guwahati, Assam and western Himalayan region at Jammu. One regional centre for Ganga plains region has been established at Patna, Bihar, for coastal studies one regional centre is established at Kakinada, Andhra Pradesh. During the eighth plan period remaining regional centres will be established at Udaipur, Goa and Rewa. Studies have been initiated on representative basins which are being instrumented for development of hydrologic models and for use under similar regional situations. These centres are being strengthened by procuring various scientific instruments and PCs.

AREAS OF SCIENTIFIC STUDIES

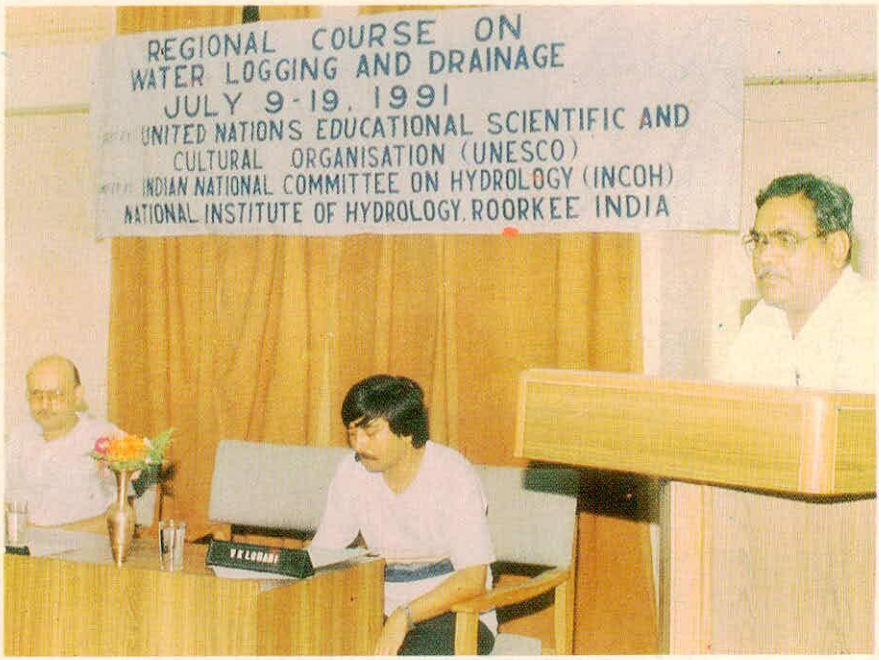
- Hydrometeorology
- Snow Hydrology
- Hydrologic Design
- Hydrology of Limited Data
- Modelling of Surface Water
- Floods
- Groundwater Yield
- Groundwater Modelling
- Drainage
- Hydrology of Hard Rock Areas

- Nuclear Hydrology
- Water Resources Assessment
- System Applications
- Conjunctive Planning
- Water Management
- Atmosphere Land Surface Process Modelling
- Integrated Watershed Planning
- Hydrology of Mountainous Areas
- Arid Zone Hydrology
- Flat Land and Coastal Hydrology
- Limnology
- Drought
- Hydrology of Agricultural Lands
- Urban Hydrology
- Hydrological Investigations
- Man's Influence
- Water Quality
- Hydrology and Environment
- Information System and Data Management
- Remote Sensing
- Hydrological Instrumentation
- Computer Applications in Hydrology
- Hydrology of Small Islands
- Water Resources Planning

TECHNOLOGY TRANSFER

In pursuit of its objectives, the Institute has organised a number of national and international workshops for transferring the technology/methodology developed at the Institute to various user agencies/departments of the country/region. So far 65 workshops have been organised at national level, out of which 25 have been organised at the Institute headquarter at Roorkee and rest 40 in different states including Andhra Pradesh, Assam, Bihar, Jammu and Kashmir, Karntaka, Madhya

Pradesh, Maharashtra, Orissa, Tamilnadu, Uttar Pradesh, and West Bengal. Besides, three international workshops on pertinent topics like water quality modelling, urban hydrology and modelling of hydrologic systems have been organised by the Institute which have been attended by professionals of the South-Central Asian region. The workshops organised at national level were devoted to various fields of hydrology including flood frequency analysis, unit hydrograph techniques, ground water modelling, processing and analysis of precipitation data, design storm and design flood, data storage and retrieval system, reservoir operation, remote sensing application in hydrology and agricultural drainage. More workshops on these and other topics of interest to states will be conducted in various states. The Institute has facilities of a field hostel to provide accommodation to the participants for the workshops organised in Roorkee.



CONSULTATION CAPABILITIES

- Water Yield Studies
- Flood Routing and Forecasting
- Hydrologic Water Balance Computations
- Design Storm and Design Flood Estimation
- Watershed Modelling and Simulation
- Water Quality Modelling
- Reservoir Operation and Integrated Planning
- Groundwater Balance and Assessment of Aquifer Yield
- Synthetic Data Generation
- Ground Water Modelling and Aquifer Response Studies
- Conjunctive Use of Surface and Groundwater
- Remote Sensing Applications
- Drought Management
- Snowmelt Modelling
- Spring Flow
- Surface and Subsurface Drainage
- Watershed Management
- Lake Studies

SPONSORED PROJECTS

As a part of its activities,Institute has taken up studies of various projects sponsored by various State and Central Government agencies. These projects have been on subjects like groundwater modelling, design flood, water availability, computer based data storage and retrieval system, design of well point system, reservoir operation etc. A brief description of the projects completed/under progress is as below:

1. 'Ground water Modelling in Upper Ganga Canal Command Area' sponsored by Water and Power Consultancy Services (WAPCOS), Delhi (completed).

2. 'Design Flood Studies for Narmada Project' sponsored by Narmada P & P Cell, Ministry of Water Resources, Govt. of India (completed).

3. 'Water Availability Studies of Mahanadi Basin' sponsored by National Water Development Agency, Delhi (Completed).

4. 'Design Flood Estimation of Kishau Dam' sponsored by Govt. of U.P. (Completed).

5. 'Software Development for Groundwater Balance' sponsored by Govt. of U.P. (Completed).

6. 'Generalised Computer Based Groundwater Data Storage and Retrieval System' sponsored by Govt. of U.P. (Completed).

7. 'Design of a Well Point System for Dewatering Solani Aquaduct, Upper Ganga Canal Modernisation Project' sponsored by Govt. of U.P. (Completed).

8. 'Preparation of Reservoir Operation Manual for Dharoi Reservoir System, Studies for Sabarmati River' sponsored by Govt. of Gujarat (on-going).

9. 'Preparation of Reservoir Operation Manual for Machhu Reservoir' sponsored by Govt. of Gujarat (on-going).

10. 'Drinking Water in Eight Problem Districts' sponsored by Deptt. of Rural Development, Ministry of Agriculture, Govt. of India (on-going).

11. 'Flash Flood Studies of Bist Doab Region in Punjab' sponsored by Govt. of Punjab (on-going).

12. 'Predictive Model Studies for Water Availability in Sabarmati Basin' sponsored by Deptt. of Rural Development, Ministry of Agriculture, Govt. of India (on-going).

13. 'Study of Interaction of Surface and Groundwater for River Ganga from Narora to Kanpur' sponsored by Irrigation Department Govt. of U.P. (on-going).

14. 'Groundwater Balance for Unnao District in U.P. & Puri District in Orissa sponsored by Planning Commission, Government of India (on-going).

EXTERNAL ASSISTANCE PROJECTS

The Institute which was started as UNDP assisted project is interacting with various international agencies for developing expertise and transfer of technology. Following are some international collaborative projects at the Institute:

1. International Cooperation with the Netherlands. The areas which will be strengthened include Instrumentation, data storage and retrieval system, Remote Sensing, Water Quality, Groundwater Modelling and Drainage (on-going).

2. UNDP Project on Developing Expertise in Frontal areas of Hydrology by strengthening and setting up of laboratories and water balance studies of representative catchments (on going).

3. Scientific and technical cooperation with USSR. The project includes optimization of conjunctive use of surface and groundwater, development of integrated models of interconnection of surface and groundwater and planning optimal distribution of water for irrigation under condition of conjunctive use of surface and groundwater (on-going).

4. Cooperation with Arizona State University, USA and indian organisations for development of technology of paleo floods in the Narmada and head reaches of Krishna with USAID support. (On going).

5. Cooperation with Louisiana State University, USA with Gujarat Government under USAID for development of a hydrological model using geomorphological parameters (On going).

6. Cooperation with US Army Corps of Engineers, Portland, Oregon in the area of snowmelt modelling (likely to start).

7. Cooperation with Lousiania State University, USA for development of mathematical model for quality network modelling of groundwater system(likely to start).

8. Cooperation with Pennsylvania State University, University Park, USA for application of Geographic Information System (GIS) for water resources planning (likely to start).

9. Cooperation with US Geological Survey in the area of double porosity modelling for hard rock areas (likely to start).

10. Cooperation with CEC in the area of soil erosion process and modelling (likely to start).

11. Cooperation with CEC for studies of hydrological balance and eutrophication characteristics of lakes (Likely to start).

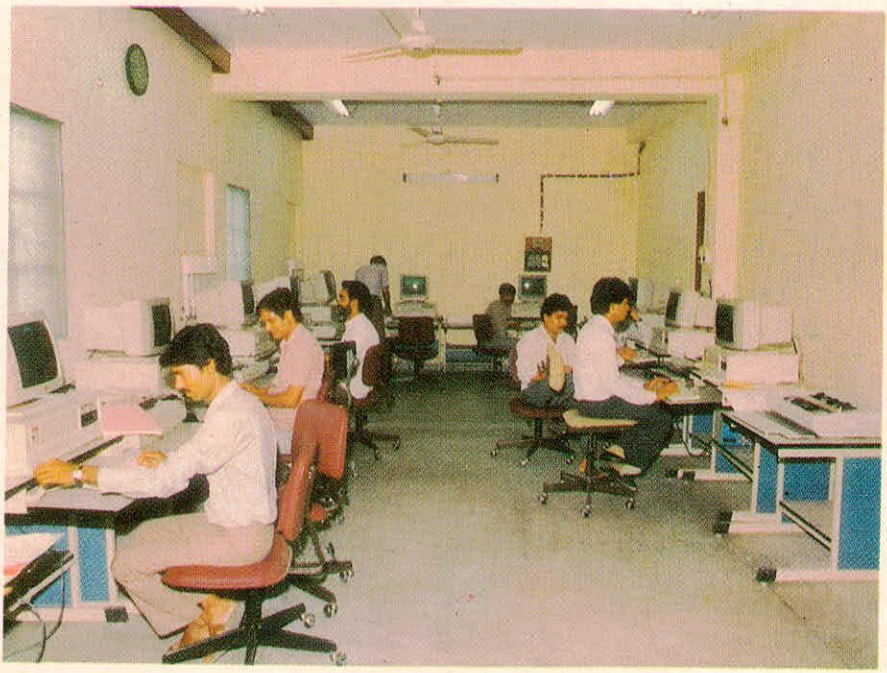
CENTRAL TECHNICAL FACILITIES

Remote Sensing Applications

This laboratory has sophisticated equipment for visual as well as digital analysis of remotely sensed data as an input to the hydrologic studies. Some of the important equipment available at the laboratory include

format optimal enlarger, diazo printer, colour composite printer, stereozoom transferoscope, image processing console comptal vision (1/20), thematic mapping equipment (Procom-2) etc. Besides, C41 colour film processor, densitometer transmission and reflection, DRDAs display system, EPs processor, desk top plotter and digitizer are the equipment to be procured in the near future.

Computer Facility



The Institute has a VAX-11/780 computer of 32 bit architecture based machine with facilities for multiuses, multiprogramming and time sharing. It has 3 megabytes CPU memory and floating point accelerator. The peripherals attached to the system include two RM03 67 megabyte disk drives, one 456 megabyte winchester disk drive, two TE16 magnetic tape drive (9 track, 45 IPS, 800/1600 BIP), ne LA 120 matrix printer,

one 600 LPM line printer, one card reader. 11 terminals, two black and white graphic terminals, one colour graphic terminal Tek - 4027A, a flat bed printer and a calcomp 91480 digitizer. A calcomp colour graphic system, Calcomp-31 which has capabilities for taking hard copies on 35 mm film or 8" x 10" polaroid is also available.

The Institute also has a VAX - 3200 work station and a number of PC/XTs and PC/ATs at its head-quarters and regional centres. They are being used for software development. The comptal vision One/20 for Digital Image Processing Console is also available for conducting the studies on remote sensing application in the field of hydrology. A large number of computer programmes for various hydrologic applications including rainfall-runoff modelling, ground water modelling, flood routing, optimization and simulation and water resources system analysis are also available.

LIBRARY

The Institute maintains a technical library. So far, over 5347 books, 2508 technical reports, 85 indian and foreign periodicals, 975 technical papers have been procured at the library upto March 31, 1991. Besides, 248 standards, 1975 maps, 442 computer programmes and 41 microfiches are also available. The library subscribes to 72 national and international journals in hydrology and other related areas.

LABORATORIES

In order to carry out laboratory oriented studies, the Institute has established following laboratories :

1. Water Quality
2. Soil Water
3. Ground Water

4. Hydrological Investigations
5. Instrumentations
6. Nuclear Applications.

Some of the equipment in the water quality laboratory include UV-VIS spectrophotometer, gas chromatograph, flow injection analysis system and chlorine oxygen demand assembly which are used for the physical, chemical and biological analysis of water. Besides equipment such as atomic absorption spectrometer, high performance liquid chromatograph are proposed to be procured under UNDP/DUTCH projects. The soil water and ground water laboratories are equipped with pressure plate apparatus, E-C probe, ICW permeameter etc. The hydrological investigations laboratory has sophisticated equipment for carrying out hydrological investigations by nuclear and geophysical techniques. Some of these include neutron probe, resistivity meter, echo sounder and water current and direction meter etc. The instrumentation

laboratory has a microprocessor based data acquisition system (DAS) which have been developed under an Indo-Dutch collaborative project WAMA-TRA-II. In the nuclear application laboratory multi channel gamma ray spectrometer is proposed to be procured under UNDP Project.

AUTOMATIC HYDROLOGIC STATION

The Institute has an operational A.H.S. which was procured from Switzerland. It has a number of meteorological and hydrological sensors, viz., rain, air temperature, humidity, wind direction and speed, global radiation, sunshine radiation, air pressure, soil temperature, conductivity, weight of lysimeter, deep percolation, surface runoff etc. The measured data are transmitted through sensor cables to a data acquisition system. This data is received after every 30 minutes and is read from the tape. It is then stored in PC. From PC it is transffered to the main system (VAX).

The main objectives of the installation of the A.H.S., which is equipped with a weighing type lysimeter are:

- precise observation and automatic recording of short interval data for understanding and establishing inter-relationship between different components of hydrologic cycle.
- to develop and validate hydrologic models using short interval data as input to the models.
- testing and development of models for computation of actual evapotranspiration.
- carrying out systematic water budget studies in representative and experimental watersheds.

INTERACTION WITH STATES

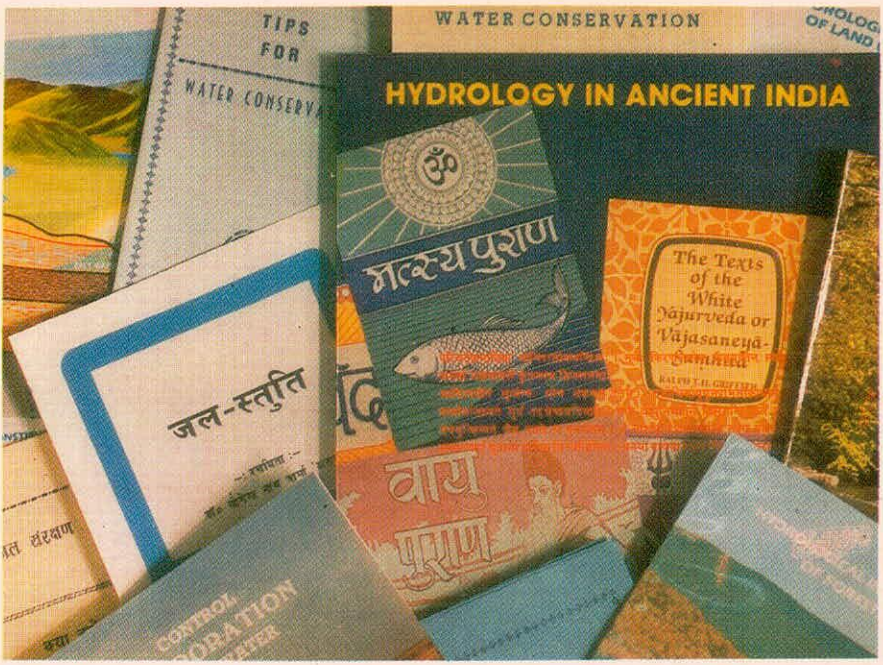
The Institute has established close interaction with water resources organisations and irrigation department of a number of state governments. The states with which such interactions have been active in recent past include Andhra Pradesh, Assam, Bihar, Gujarat, Himachal Pradesh, Jammu & Kashmir, Karnataka, Madhya Pradesh, Rajasthan, Sikkim, Tamilnadu, Orissa, West Bengal, and U.P. The Institute has already completed some studies including rainfall network design in Karnataka and Rajasthan; preparation of hydrological year book in Karnataka. Studies including development of regional flood formulae, various kinds of hydrological studies, hydrological year book etc. are under progress in other states.

REPORTS PUBLISHED

Under the workplan of the Institute, scientific studies are carried out on various aspects of hydrology and water resources. Study reports are published in the

form of Technical Note, Technical Report, Case Study, Status Report, User's Manual, Documentation of Programmes etc. By December 1991 about 400. reports have been published under various categories. The reports are sent to organisations on request.

The important concepts of modern hydrology are contained in the ancient sanskrit literature. Bearing this fact in mind, the Institute has published a report entitled "Hydrology in Ancient India" by compiling informations related to hydrology available in various verses of vedas, Puranas, Meghmala, Mayurchitraka, Vrhat Sanhita and other ancient Indian works. The Institute has also embarked on preparing a report on twenty potential areas related to hydrology on which the development has taken place in India since independence. The report is named as "Development of hydrology in India since Independence".



Water conservation is an important concept. In order to develop awareness for water conservation, the Institute has released five brochures titled as "Control Evaporation Save Water", "Sediment Yield from Different Land Uses", "Hydrological Influences of Forests", "Hydrological Influences of Land Use Changes" and "Natures Wonder - Hydrologic Cycle". The Institute proposes to bring seven more brochures during 1992. The Institute is also publishing hydrological terminology of some 400 words in eight regional languages of India namely Bengali, Gujarati, Hindi, Kanada, Malayalam, Marathi, Tamil and Telugu. In order to create awareness and to educate masses, the Institute is publishing Water Science Educational Series on several topics such as: evapotranspiration, evaporation from lakes and its control, soil moisture and its conservation, infiltration and groundwater recharge, snow and glaciers and their contribution to India's water resources. The Institute is also working on the preparation of a drainage manual which will be published soon. Besides these, the Institute has taken up some studies on priority basis which are snowmelt modelling studies for Sutlej river basin, development of integrated hydrological model as an Indian input, soil moisture forecasting model and low flow forecasting model, etc.

INCOH ACTIVITIES

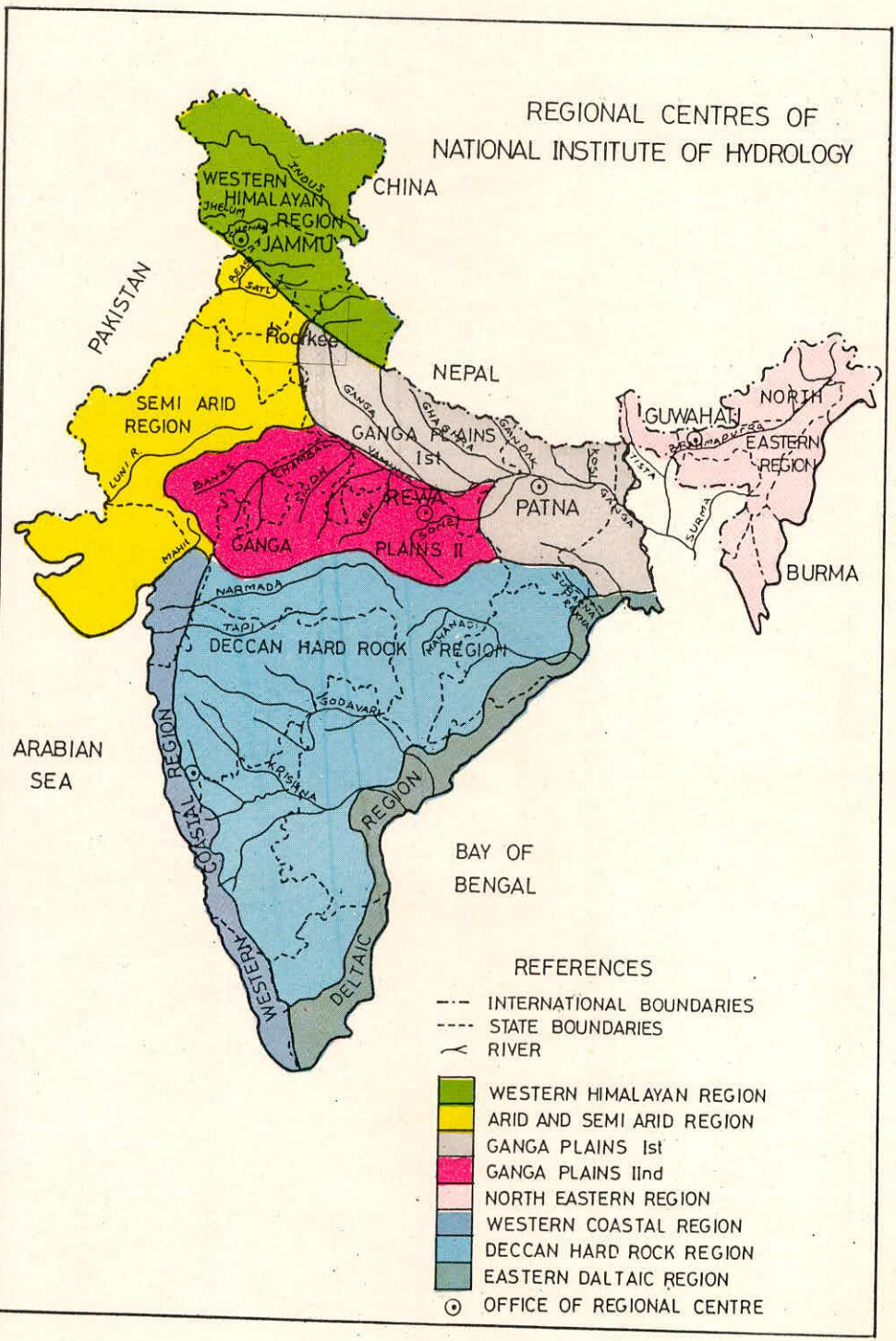
The Institute has been providing Secretariat to the Indian National Committee on Hydrology (INCOH) since August, 1982. Main activities of INCOH include formulation and monitoring of national activities in the area of hydrology and water resources in the country. It has also the responsibility to coordinate India's participation in various international activities of WMO

and UNESCO. Some key activities of INCOH include identification and coordination of India's participation in the IHP-IV of the UNESCO, development of technician training programmes, sponsoring training courses organised by various organisations, setting up of state level committees on hydrology, implementation of national hydrology projects and providing funds for technology transfer and dissemination activities, etc.

This Secretariat also provides Secretariat to an Asian level committee known as Asian Regional Coordinating Committee on Hydrology (ARCCOH). The ARCCOH Secretariat has been actively discharging its responsibilities to coordinate participation of Asian countries in various activities of UNESCO under IHP.

January, 1992

Gram : JALVIGYAN
Telex : 0597-205 NIH IN
FAX : 0091 1332 2123


REGIONAL CENTRES OF
NATIONAL INSTITUTE OF HYDROLOGY
WESTERN HIMALAYAN REGION
JAMMU
CHINA
PAKISTAN
Roorkee
NEPAL
SEMI ARID REGION
GANGA PLAINS Ist
GUWAHATI
NORTH EASTERN REGION
REWA
PATNA
GANGA PLAINS II
BURMA
NARMADA
TAPI
DECCAN HARD ROCK REGION
GODAVARI
KRISHNA
ARABIAN SEA
WESTERN COASTAL REGION
EASTERN DELTAIC REGION
BAY OF BENGAL
REFERENCES
INTERNATIONAL BOUNDARIES
STATE BOUNDARIES
RIVER
WESTERN HIMALAYAN REGION
ARID AND SEMI ARID REGION
GANGA PLAINS Ist
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NORTH EASTERN REGION
WESTERN COASTAL REGION
DECCAN HARD ROCK REGION
EASTERN DALTAIC REGION
OFFICE OF REGIONAL CENTRE