ANNUAL REPORT

1994-95

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NATIONAL INSTITUTE OF HYDROLOGY

ROORKEE

PREFACE

The National Water Policy states that 'Resource planning in case of water has to be done for a hydrologic unit such as a drainage basin as a whole or a sub basin.' This calls for an integrated approach for basin planning. With this long term objective in view the institute on the advise of the Technical Advisory Committee the institute has taken up comprehensive hydrological studies of a selected river basin as one of the main areas of its work. With this aim, during 1994-95 each of the scientific divisions in the institute have carried out atleast one study for the Narmada basin.

The proposal for National Hydrology Project was revived under the over all coordination of the Central Water Commission. Based on the suggestions of the World Bank team of experts the project document has been finalised. The World Bank has agreed in principle to assist the project and it is expected to start during the early part of 1995-96. Under this project the institute would be actively involved in technology transfer and imparting training to the personnel of the seven participating states.

During the year 1994-95, the institute has conducted studies and research covering various aspects of hydrology as per the approved work programme under 17 scientific divisions at the headquarters. The five regional centres at Belgaum, Guwahati, Jammu, Kakinada and Patna functioned effectively and studies involving use of computers as well as field investigations and laboratory analysis were conducted. Based on the studies, the institute brought out 55 technical and scientific reports in the form of technical reports, case studies, status reports, user's manuals and training reports. These reports are being widely circulated to Central and State Government organisations, academic and research institutions and individual experts.

Besides conducting studies and research in various areas identified by the working groups and recommended/approved by the TAC and Governing body, the institute has also conducted research under sponsored projects and consultancy projects having Research & Development potential. These were sponsored and referred by various central and state organisations and Public sector undertakings.

The institute has continued the activities related with indigenous development of instruments and new procedures as well as preparation of guide lines and manuals. Some of these include: (i) Geomorphological Instantaneous Unit Hydrograph based Clark's model, (ii) Software for simulation of a multi-purpose multi- reservoir system, (iii) Software for modelling

snowmelt runoff, (iv) model for identification of aquifer parameters and (v) methodology for determination of aquifer diffusivity and stream resistance.

The scientists and scientific staff of the institute were encouraged to contribute papers and participate in seminars and symposia. They have also contributed to technical literature through publication of findings of research and studies in national and international journals. During the year under report, 96 papers have been published or sent for publication.

The project on "Development of Capabilities for Hydrological Studies in Frontal Areas" assisted by UNDP has been under operation in the institute for the last four years. It provides financial assistance for activities to develop facilities and capabilities in the frontal areas of hydrology through equipment, visits of consultants and training of scientists of the institute at reputed institutions abroad.

The institute organised a two day National workshop on Advances in Hydrological Instrumentation at Roorkee on 25-26 October 1994 with the objective of bringing together the manufacturers, users and other technical personnel interested in hydrological instrumentation on to a common platform.

The institute has been actively involved in technology transfer during the year by organising short duration workshops on various topics of hydrology at Roorkee and in the states. The emphasis has been on appropriate methodologies involving the use of computers and the software for the techniques involved.

The institute thus continued to progress towards the fulfillment of the objectives - to undertake, aid,promote and coordinate studies in various aspects of hydrology. It is the institute's endeavour to further strengthen and consolidate the achievements to take up further studies and research and other activities under the directions and guidance of the Society of National Institute of Hydrology.

S M Seth
Director

AT A GLANCE

1. Studies and research were carried out under seventeen scientific divisions at Roorkee and at the respective regional centres as per approved work programme.

2. New procedures for hydrological analysis and related computer software have been developed.

3. Development of automated indigenous equipment for measurement of rainfall, snow etc was completed and testing under field conditions is in progress.

4. Various field oriented studies regarding surface and ground water quality, representative basin studies, ground water balance, infiltration studies, soil classification studies were undertaken by the Institute at its Regional Centres.

5. 55 technical reports were prepared and 96 technical papers were published or sent for publication. Out of these 46 papers were published in journals or sent to journals.

6. Twelve consultancy and sponsored projects were in progress during the year.

7. As part of the Technology Transfer Programme nine workshops were organised at Roorkee and in the States.

8. Four scientists were trained abroad under the UNDP project. Two visits of consultants were made during the year. Project Director, Project Coordinator and senior scientists made four study tours.

9. The Achievements Review Committee constituted by the Ministry of Water Resources held four meetings during the year and submitted its report.

10. Laboratories at Headquarters and Regional Centres were strengthened by procuring equipment through UNDP Project and Institute funds received under Government of India grants. These equipment are being used for carrying out useful studies as per work programme.

11. A two day National Workshop on 'Advances in Hydrological Instrumentation' was organised at Roorkee.

12. National Hydrology Awards for the years 1992 and 1993 and Bharat Singh Award for the year 1993 were decided.

13. Construction of extension of the second laboratory block was completed. Construction of five blocks of residences in the Staff Colony has started.

ANNUAL REPORT 1994-95

1.0 INTRODUCTION

1.1 General

The National Institute of Hydrology has been functioning as an apex Institute in the area of hydrology in the country since December 1979. It was established with Headquarters at Roorkee by the Government of India as an autonomous society fully aided by the Ministry of Water Resources, Government of India.

The Union Minister of Water Resources is the President of the NIH Society and the Union Minister of State for Water Resources is its Vice-President. The Ministers-in-charge of Irrigation in the States (for ten States to be nominated by the President of the Society), the Secretaries of different Ministries in the Govt. of India concerned with water and related areas and experts in hydrology and water resources are members of the Society. The Secretary, Ministry of Water Resources, Govt. of India is the Chairman of the Governing Body. The Institute's research and other technical activities are monitored and guided by the Technical Advisory Committee (TAC). The Chairman, Central Water Commission is the Chairman of the TAC.

In order to deal with the specific hydrological problems of different regions of the country and for providing effective interaction with the states, the Institute started setting up Regional Centres since 1987. The Regional Centres for Hard Rock region, North Eastern region and Western Himalayan region were established at Belgaum, Guwahati and Jammu respectively during the seventh plan period. During 1991, one Regional Centre for Ganga Plains at Patna in Bihar and one for Deltaic and East Coast region at Kakinada in Andhra Pradesh were set up. It is proposed to set up one more Centre for Ganga Plains at Sagar in Madhya Pradesh during 1995-96.

Keeping in view the requirements for hydrological research in the country in the coming five years the TAC and Governing body of NIH have approved the areas of study and research for the Institute for the period 1994-99.

Director of the Institute is appointed by the Government of India and is the Principal Executive Officer of the Society. The staff of the Institute comprises of Scientists, supporting scientific and technical staff and administrative staff. Out of the 60 scientists in position in the Institute and its regional centres, there are 14 with Ph.D.; 46 with ME/M.Tech. qualification.

The Scientists of the Institute are actively interacting at the national and international level by way of publication and circulation of reports on studies and research as well as by contributing technical papers in the international journals. Sponsored consultancy research as well as technology transfer through organisation of workshops are also major activities. The scientists and scientific staff have also participated in seminars, symposia, workshops and training courses organised in India and abroad.

1.2 Objectives

The main objectives for which the National Institute of Hydrology has been established are:

i. to undertake, aid, promote and coordinate systematic and scientific work in all aspects of hydrology;

ii. to cooperate and collaborate with other national, foreign and international organisations in the field of hydrology;

iii. 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

iv. 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.

As per the mandate given to NIH, the time devoted for basic and applied research activities should be not less than 60%, consultancy not more than 20% and technology transfer activities not more than 20% of the total time of scientists and scientific staff.

1.3 Activities During the Year

The Institute's activities are being carried out from the Headquarters and the Regional Centres. During the year, the scientists and scientific staff of the Institute have published a number of technical papers in international and Indian journals and proceedings of international and national seminars and symposia. Research reports on several topics such as distributed watershed modelling, representative basin studies, reservoir operation, water quality modelling and snow and glacial melt have been prepared.

Work on development of indigenous hydrological instruments with automated data acquisition facility is continuing. Four automated instruments, viz. recording raingauge, weighing type snow water equivalent sensor, water level recorder and infiltrometer were developed as part of this activity.

Under the technology transfer programme, the Institute organised five day workshops on Project Hydrology, Catchment Hydrology, Processing and Analysis of Precipitation Data, Remote Sensing Applications and Reservoir Operation at Roorkee and in the States.

The Institute is also assisting several organisations in the country for solving various complex field problems through sponsored projects and consultancy projects. During the year 1994-95 apart from continuing the work on the ongoing projects, the Institute has taken up new sponsored/ consultancy projects such as "Hydrological Study at Jhamrakotra mines in Udaipur District"; "Hydrological Studies for Dokriani Glacier" and "Hydrostatic Pressure Imbalance Study for Kayamkulam Gas Power Project".

A two day National Workshop on 'Advances in Hydrological Instrumentation' was organised at Roorkee on 25-26 October 1994 with the objective of bringing together not only representatives of the technical community but also manufacturers and users of hydrological instruments on a common platform to discuss the latest developments and assess the status and state-of-art technology in the area of instrumentation development indigenously.

The Achievements Review Committee constituted by the Ministry of Water Resources to review the achievements of the Institute during the period 1989 to 1994 held six meetings during 1993 and 1994. The Committee submitted its final report in September 1994.

The National Hydrology Project for peninsular rivers was finalised by Ministry of Water Resources for funding by the World Bank. The Institute has been entrusted with the responsibility of training which is one of the important components of the project. The project under the title 'Hydrology Project' will be implemented by five Central Govt. organisations and Irrigation Departments of seven peninsular States and is likely to start during the later part of 1995.

2.0 COMMITTEES AND THEIR ACTIVITIES

2.1 Society

The National Institute of Hydrology Society is the apex body of the Institute and meets at least once a year. It reviews the progress and performance of the Institute and gives such directions as it may deem fit to the Governing Body and the Institute towards the attainment of the objectives enunciated in the Memorandum of Association of the Society. The membership of the Society is given in Appendix I.

The 15th Annual General Meeting of the Society was held at New Delhi on 16th November 1994. The Society reviewed the work carried out by the Institute during 1994-95 (upto Nov. 1994), approved the annual report and audited accounts for the year 1993-94 and approved the budget for the year 1995-96.

2.2 Governing Body

The Governing Body is the executive body of the Institute to generally pursue and carry out the activities as per objectives of the Society and implement the policy/directions and guidelines laid down by the Society. The Governing Body exercises all executive and financial powers of the Society. The Governing Body is expected to meet at least twice in a financial year. The membership of the Governing Body is given in Appendix II.

During the year 1994-95, the 45th and 46th meetings of the Governing Body were held at New Delhi on 1st September 1994 and 17th February 1995 respectively. Several decisions concerning administrative and financial matters of the Institute were taken. Annual report and audited accounts for the year 1993-94 were considered and recommended for approval. The revised budget for 1994-95 and budget proposals for 1995-96 were also considered and recommended.

2.3 Standing Committee

The Governing Body constituted a Standing Committee under the Chairmanship of the Additional Secretary (Water Resources), Government of India, to consider the financial and administrative matters pertaining to NIH. The Standing Committee has the powers to approve the matters referred to it on behalf of the Governing Body and the decisions of the committee are reported to the Governing Body.

The 20th meeting of the Standing Committee was held at New Delhi on January 18, 1995. A number of issues pertaining to administrative and financial matters and career prospects of staff were discussed and decisions were taken.

2.4 Coordination Committee

The Coordination Committee with the Vice-Chancellor, University of Roorkee as its Chairman looks into matters regarding effective coordination between University of Roorkee and the National Institute of Hydrology.

The eighteenth meeting of the Coordination Committee of NIH/UOR was held on 5th May 1994. The important items discussed included scientific interaction between NIH and University of Roorkee and construction activities taken up by UOR as deposit work for NIH main (Institute) campus and staff colony. The construction activity was also closely monitored by periodical meetings of concerned officers from NIH and University of Roorkee.

2.5 Achievements Review Committee

As per the provisions under the Memorandum of Association of the Institute, the Achievements Review Committee is to be constituted by the Ministry of Water Resources with the following objectives;

i. to review the achievements of the National Institute of Hydrology vis-a-vis the objectives outlined in clause 3 of the Memorandum of Association

ii. to review the organizational structure of the Institute and suggest necessary modifications to improve the capability of the organisation for achieving the objectives;

iii. to identify and assess the factors which facilitated or impeded the achievements of the objectives;

iv. to consider the role of different bodies such as Technical Advisory Committee (constituted under clause 47 of the Society's Rules and Regulations), Coordination Committee (constituted under Rule 51 of the Society's Rules and Regulations) and Working Groups constituted by Governing Body of NIH towards fulfillment of the objectives and suggest modifications in the working procedures of the Institute, if called for;

v. to make any other recommendations which the Committee might consider in the interest of the Institute for enabling it to achieve its objectives; and

vi. to consider any other specific item that may be entrusted to the Committee by the Governing Body of the Institute.

The 2nd Achievements Review Committee of the NIH was constituted by the Ministry of Water Resources to consider the achievements of NIH during the period 1.4.89 to 31.3.94. The Committee comprised of the following:

1.	Shri J F Mistry Former Secretary(Irrigation) Govt of Gujarat Ahmedabad	Chairman
2.	Shri M S Billore Former Secretary (Water Resources) Govt of Madhya Pradesh Bhopal	Member
3.	Shri S S Ganguli Former Secretary (Irrigation & Waterways Department) Govt of West Bengal Calcutta	Member
4.	Prof.V V Jagannadha Sarma Secretary, Association of Hydrologists of India Visakhapatnam	Member

Dr G C Mishra, Scientist F, NIH acted as the Secretary to the Committee and provided all secretariat help to the Committee. The Committee held six meetings at Roorkee during 30th Nov. 93 to 16th Sept. 94 and submitted its final report to the Ministry of Water Resources in September 1994.

The Committee made a review of basic and applied research under different thrust areas that is being carried out in the Institute. It has also assessed the consultancy work undertaken by the Institute and recommended provision of appropriate rules for consultancy on the lines as are applicable for other R&D institutions in the country.

The administrative review of the Committee includes suggestions for stream-lining in research and developmental programmes of the Institute, and recommendations for possible and fruitful coordination between the Institute and other organisations working in similar fields.

The working of the various committees of the Institute were also reviewed and recommendations were made to improve their functioning. A review of the INCOH, with its secretariat at NIH, Roorkee was also made. The various publication programmes of the Institute were scrutinised. The Committee has made recommendations for future direction of growth of Institute and also for an effective impact on other hydrological institutions and water sector organisations in the country.

2.6 Technical Advisory Committee

The Technical Advisory Committee (TAC) carries out technical scrutiny of research programmes of the Institute and recommends priorities. It is also responsible for carrying out technical scrutiny of plans drawn up for five years and the individual schemes submitted for external assistance and expansion of the Institute. The constitution of TAC is given in Appendix III. The tenure of the members to be nominated by Chairman, Governing Body is three years.

The 32nd and 33rd meetings of TAC were held on 29th Dec.1994 and 27 March 1995 at New Delhi and Roorkee respectively. The progress of work programme of the Institute for the year 1994-95 was reviewed and work programme for the year 1995-96 was considered and approved.

2.7 Working Groups

The Working Groups scrutinize and advise the Institute on the programme of studies to be taken up by the various scientific divisions and review the progress of work. The reports prepared by the scientists are sent to the Working Group members for their comments and suggestions before they are printed for circulation. Experts in specialised fields from various field organisations (from Central and State Governments) and academic institutions are members of the Working Groups. Three Working Groups were constituted for three groups namely, Surface Water Group; Ground Water Group; and Hydrological Observation and Instrumentation Group. The constitution of the Working Groups is given in Appendix IV.

The meetings of the Working Group for Surface Water Group of Divisions were held on 5 October 1994 and 7th March 1995 at Roorkee. The meetings of the Working Group for Ground Water Group were held on

3rd October 1994 and 9th March 1995. The meetings of the Working Group for Hydrological Observation and Instrumentation were held on 7th October 1994 and 2nd March 1995. During these meetings the Working Group members reviewed the progress of studies and research under the work programme of each of the divisions under the group for the year 1994-95, scrutinised the work programme of the Institute for the year 1995-96 and made recommendations for approval by the Technical Advisory Committee.

2.8 Regional Coordination Committees

Regional Coordination Committees for each of the five Regional Centres of the Institute at Belgaum, Guwahati, Jammu, Kakinada and Patna were constituted to advise the Regional Centres on the programmes of studies and research to be taken up and to ensure effective coordination between the Regional Centre and the various academic and field organizations in the region engaged in water resources research and development. Experts from field organisations and academic Institutes of the region covered by the Regional Centre are members of the Regional Coordination Committees.

The 6th meeting of Regional Coordination Committee (RCC) for Deccan Hard Rock Regional Centre,Belgaum was held on 13 September 1994 at Coimbatore; the 4th meeting of RCC for North East Regional Centre, Guwahati was held on 7 October 1994 at Guwahati; the 5th meeting of RCC for Western Himalayan Regional Centre ,Jammu was held on 23 August 1994 at Jammu; the 4th meeting of RCC for Deltaic Regional Centre at Kakinada was held on 26 August 1994 at Hyderabad; and the 4th meeting of RCC for Ganga Plains Regional Centre at Patna was held on 20 Feb. 1995 at Patna. The membership of the Regional Coordination Committees is given in Appendix V.

2.9 Indian National Committee on Hydrology (INCOH)

International Hydrological Decade (IHD) programme of UNESCO, period 1965-74, was launched to intensify the study on all aspects of hydrology by improving observational network and to assess national water resources more scientifically for national planning. The Govt. of India constituted a National Committee for IHD and entrusted secretarial work to Council of Scientific and Industrial Research (CSIR) to carry out the programme. In 1974 at the expiry of IHD, UNESCO continued the activities under a long term International Hydrological Programme (IHP). Accordingly, Government of India converted the National Committee for IHD into a permanent national committee for IHP and secretariat was provided by Department of Science and Technology (DST). The National Committee

of IHP was named as Hydrology Committee (HYDCOM) which viewed its responsibility both in the limited context of participation in IHP/IHD as also in the wider perspective of strengthening the programme.

In 1982, Hydrology Committee for IHP was transferred to the Ministry of Irrigation,Government of India. The Ministry of Irrigation constituted High Level Technical Committee on Hydrology (HILTECH) replacing National Committee for IHP. The terms of reference of this Committee were made broader in functions/activities in the country. Main functions of this Committee were to identify the areas of hydrology which need immediate attention, encourage national institutions to take up research, sponsor research, promote educational and training programmes, foster collaborations with other countries and coordinate effective participation by India in International Hydrological Programme of UNESCO and Operational Hydrology Programme of WMO. The secretariat of HILTECH was placed under administrative control of National Institute of Hydrology.

With a view to coping up the extended and wider activities of HILTECH, Ministry of Water Resources has re-named the High Level Technical Committee on Hydrology (HILTECH) as Indian National Committee on Hydrology (INCOH). The Ministry of Water Resources, Government of India, has reconstituted the Indian National Committee on Hydrology in 1994 comprising of 21 members including Chairman and Member-Secretary.

The INCOH is an apex body with the responsibility of coordinating the various activities concerning hydrology in the country. The committee gets feed back from the states and coordinates the activities at the state level through the state coordinators. The Secretariat of the INCOH is with NIH. The committee has performed its functions successfully during the last twelve years. The committee has two expert panels on various aspects of hydrology mainly assisting the committee in preparation of state-of-art reports in thrust areas of research in hydrology and in identifying thrust areas of research for taking up systematic studies under grant in aid of Ministry of Water Resources. The Committee also has three sub-committees for publications of INCOH, providing funding, and for initiating, considering, coordinating and monitoring of research schemes of MOWR.

During the year, the INCOH held one meeting on 29th Dec. 1994 at New Delhi and took important decisions relating to constitution of the state level committees on hydrology in the various states, finalizing the annual report for the year 1993-94 and advancing the cause of research in hydrology.

The Committee sponsored 6 seminars/symposia and 2 courses during the year. Out of these 2 activities were of international nature. The Sixth National Symposium on Hydrology was organised at Shillong during April 1994. One meeting of Research Committee and one meeting of Steering Committee were held during the year wherein decisions were taken to finalize funding of courses, seminars as well as to consider research projects for funding by MOWR.

2.10 Asian Regional Coordinating Committee on Hydrology (ARCCOH)

The INCOH Secretariat also performs the functions of the Secretariat of the Asian Regional Coordinating Committee on Hydrology (ARCCOH). The Secretariat has been bringing out a quarterly newsletter for the last 8 years. The newsletter includes the news concerning the hydrological activities in the region and also includes the activities performed by the member countries. The newsletter also carries information about the various International Conferences/Seminars/Symposia and Courses etc. To a limited extent new developments and new publications brought out in hydrology are also listed. The newsletter is circulated to the National Committees of Hydrology in all the member countries in the region (Indonesia, Japan, The Republic of Korea, Democratic People's Republic of Korea, China, Malaysia, Papua New Guinea, Philippines, Thailand, Bangladesh, Burma, Afghanistan, Islamic Republic of Iran, Republic of Maldives, India, Nepal, Mangolia, Sri Lanka, Pakistan, Bhutan,) and to about 600 other addresses in the country and abroad.

Sri P.K. Thungon Minister of State for Water Resources and Vice President NIH Society Addressing members of the Society at the 15th Annual General Meeting

Members of the NIH Society at the 15th Annual General Meeting

Sri A.B. Joshi, Chairman, Central Water Commission and Chairman Technical Advisory Committee of NIH Addressing Members of the TAC

Members of the Achievements Review Committee During Discussion with Director, NIH

3.0 RESEARCH AND DEVELOPMENT ACTIVITIES

3.1 Research Activities

During the year under report, studies and research were carried out under the 17 problem oriented scientific divisions at the Headquarters, Roorkee and at the five Regional Centres of the Institute. The 17 Scientific Divisions are:

- Hydrologic Design
- Surface Water Analysis and Modelling
- Flood Studies
- Mountain Hydrology
- Ground Water Assessment
- Ground Water Modelling and Conjunctive Use
- Drought Studies
- Drainage
- Water Resources System
- Environmental Hydrology
- Atmospheric Land Surface Process Modelling
- Lake Hydrology
- Nuclear Hydrology
- Hydrological Investigation
- Hydrological Instrumentation
- Hydrological Information System
- Remote Sensing Applications

The programme of studies and research for each of the divisions for the year 1994-95 was first considered by the working groups and then considered and approved by the TAC at its 31st meeting held at Roorkee on 21st March 1994. Some of the important areas of studies and research carried out during 1994-95 were:

- Application of hydrological data management system
- Geomorphological characteristics of catchments
- Development of flow forecasting models
- Dam break flood studies.
- Flood routing using Kinematic and dynamic approaches

- Development of regional flood formulae
- Estimation of snow and glacier melt contributions
- Precipitation distribution in mountainous areas
- Hydrological modelling using disaggregation approaches
- Sensitivity studies for effect of climate change on hydrological parameters
- Reservoir regulation for conservation and flood control
- Real time flood forecasting system
- Statistical analysis of surface water quality data
- Application of surface water quality models
- Adsorption characteristics of sediments
- Groundwater quality evaluation
- Groundwater-lake interaction
- Thermal regime of a lake
- Groundwater observation network design
- Recharge from partially penetrating influent stream
- Effect of water table depth on rainfall recharge
- Reach transmissivity and storage coefficient determination
- Determination of Hydrological soil properties
- Impact of urbanisation on hydrological parameters.
- Hydrological analysis and design using statistical and stochastic approaches.
- Evaporation losses from reservoirs
- Infiltration studies in river catchments
- Use of isotopes for study of stream aquifer interaction
- Development of snow water equivalent sensor

A brief description of some of the important studies is given as follows:

Remote Sensing Applications

Studies on remote sensing applications to various hydrological problems are being done at the Headquarters Roorkee and the regional centres. Geographical Information System (GIS) software like ERDAS and ILWIS have been procured and are being used for hydrological applications. Some of the studies for which remote sensing is being applied are:

* monitoring seasonal snow cover
* land use mapping
* sedimentation in rivers and reservoirs
* flood plain mapping
* identification of water logged areas
* identification of land slide prone areas

Software Development for Hydrological Applications

The Institute has developed an integrated interactive software incorporating the following aspects of rainfall data processing:

* validation
* filling of gaps
* consistency checks
* areal estimation
* compilation of rainfall time series for different time intervals
* basic statistics

Hydrology of Lakes

The Institute has also taken up studies related with the hydrology of lakes. Hydrological studies on Lake Naini (Nainital) in Uttar Pradesh were being carried out for the last 2 yeas under a research project sponsored by Department of Environment, UP. Hydrological investigations for studies on water balance of lake Khajjiar in Himachal Pradesh and Loktak lake in the North Eastern region have also been initiated.

Waterlogging in Canal Command Area of IGNP Stage II:

Waterlogging conditions have severely affected the canal command area of Indira Gandhi Canal Stage II near RD838. The Institute has identified the cause of water logging by carrying out the subsurface drainage investigations and designed a suitable drainage system to control the water logging in that area, on a request by the Command Area Development (CAD), IGNP, Bikaner. The findings of this study would be useful for similar semi-arid regions.

Hydrological Network Design

The Institute carried out studies to check the adequacy of existing network for observation of ground water table. For the study, Jabalpur district, falling under Narmada basin was chosen to check the adequacy of observation wells using statistical methods. Data of 92 shallow observation wells was available for the district. The study showed that number of observation wells in the district is large considering the variation in the water table position and only 36 wells need to be monitored to provide good estimate of water table changes with an error of 2%.

Hydrological Problems of Snow Covered Areas and Glaciers.

Snow and glaciers contribute significantly to the flows in Himalayan rivers. Realizing the importance of snow and glacier melt in Chenab and Ganga rivers, the Institute was asked to provide reasonable estimate of the average snowmelt contribution in the annual flows of river Chenab at Akhnoor and Ganga at Deoprayag, under a research project from the Ministry of Water Resources, Government of India. The methodology and findings of this study would be helpful in providing estimates of snow and glacier melts in different basins.

The participation in expeditions to various glaciers in the Himalayas, and conducting measurements of gauge and discharge and other required meteorological parameters, under extremely difficult conditions is a significant achievement of the Institute. This has helped not only the estimation of the water balance but also provided an invaluable data base on these glaciers which can also be utilized for future studies.

Studies on snow and glacier hydrology are being carried out by Mountain Hydrology Division of the Institute. One snow bound sub-catchment in the Ravi basin in Western Himalayas was identified for Representative Basin Studies and the hydrological investigations in the sub-catchment are being carried out. Equipment has been installed in the catchment for automated collection of hydrometeorological data.

During the year the precipitation distribution at different elevations in Sutlej and Beas basins has been studied . Also, the University of British Columbia (UBC) snowmelt model has been applied for simulation of flows in Sutlej catchment in Western Himalayas. The calibrated model when used in the forecasting mode would be useful for forecasting the flows into the Bhakra reservoir.

Hydrological Aspects of Droughts

The Institute has developed a drought index based on reservoir levels through analysis of the reservoir inflows into the Malaprabha (Naviluteerth) and Ghataprabha (Hidkal) reservoirs in Belgaum district of Karnataka. The analysis includes the streamflows departure analysis, analysis of maximum drought volume/storage volume, analysis of water available days and mean monthly available storage. The results of the analysis are presented in the form of nomograms for the identification of drought based on the existing reservoir level at different demands. Another drought index is presented, as mean reservoir level minus half of standard deviation and mean reservoir level minus standard deviation for identification of mild and moderate droughts respectively.

Data Base Management System

The Institute, with the objective to develop a data base management system for hydrological studies has been engaged in preparation of hydrological data books for representative basins.

During the year 1994-95, the Institute has prepared a hydrological data book for Narmada basin (upto Bargi dam) incorporating the available hydrometeorological data, surface water and ground water data of 1981-90. In another study, processing of ground water data (1974-93) available for the Jabalpur district in Narmada basin has been done and the groundwater table maps, groundwater depth maps and ground water fluctuation maps have been drawn.

The Institute has received a copy of the software package HYMOS under the bilateral Indo-Dutch Training Programme on Water Management (WAMATRA), which is used for storage, processing and retrieval of hydrometeorological data. A study has been carried out to illustrate the capabilities of HYMOS for Indian data, taking the real data of Narmada basin upto Manot gauge discharge site.

NIH has also carried out a survey of softwares being used for computerization of technical literature in the library by comparing their relative performances. The software CDS/ISIS has been selected as per the need of Institute library for information storage and retrieval system of technical books

Real Time Operation of Reservoirs

The conservation and flood regulation policies for Bargi dam in the Narmada basin have been developed and the simulation approach has been used to derive the final rule curves. The operation policy for flood regulation of Dharoi reservoir in the Sabarmati basin, using flood routing and simulation methodology has also been developed.

A software has been developed for simulation of multi-purpose multi-reservoir system for conservation purposes, which caters to various conservation purposes such as irrigation water supply, hydropower generation and minimum flow required in the river.

Water Quality Modelling of Surface Water and Ground Water

Field investigations were carried out for generating data on water quality of surface and ground water. Studies were carried out using DOSAG I, QUAL II E and QUAL II EU models, stochastic models and WASP for surface water quality. The SUTRA model has been made PC compatible by the RC Belgaum and used for the ground water quality studies in upper Palar basin in Tamilnadu. Systematic methodologies have been developed to model water quality in rivers and are being used for Kali, Yamuna and Krishna. Studies were also carried out on adsorption of metal ions on sediments of river Kali.

Nuclear Hydrology

Nuclear techniques using isotopes are being used for lake studies in Nainital. Studies have also been initiated on surface water and ground water interaction along river Ganga between Hardwar and Narora, and soil moisture and recharge to groundwater in Narmada catchment using isotope techniques.

Flood Studies

Analytical studies were carried out on effect of downstream boundary conditions on the propagation characteristics of the dam break flood waves. A preliminary analysis of the hypothetical dam break of Bargi dam was also carried out. The Institute also worked on flood frequency analysis for upper Narmada and Tapi region sub-zone 3(c) using regional approaches.

Effect of Urbanisation on Hydrological Regime

Urban hydrology studies were undertaken in the Drainage Division. During the year 1994-95 Drainage Division has prepared a report on "Effect of Urbanisation on Runoff Hydrograph". In this study an attempt is made to find out the effect of change in impervious area on the runoff peak and time to peak using a deterministic model Kingen for the Palem Urban Drainage Basin, a subbasin of Nazafgarh drainage basin.

3.2 Development Activities

Development of New Procedures

The Institute carries out basic and applied research on various aspects of hydrology. The studies and research thus not only relate to application of available methodologies with necessary modifications but also development of new procedures. Some of the studies and research in which new procedures have been developed and used are:

- Geomorphological Instantaneous Unit Hydrograph (GIUH) based Clark model has been developed and tested on Kolar and Manot sub-basins of River Narmada.
- Software for simulation of a multi-purpose multireservoir system for conservation purposes.
- A data base system (software package) has been developed for storage and retrieval of the information about hydrological instruments
- Post word processing software
- Data transfer of part or full IRS LISS I CCT in VAX-11/780 computer system
- A computer program in Fortran language for evaluation of different parameters in evaluation of existing raingauge network has been developed using optimal network design technique; and spatial correlation analysis technique.
- A software has been developed for modelling snowmelt runoff.
- A methodology has been developed for the determination of aquifer-diffusivity and stream-resistance utilising the water table fluctuations induced due to stage-variations in a semi-pervious stream.
- A model has been developed for identification of aquifer parameters T and ϕ utilizing the drawdown observations in a confined aquifer due to pumping a tube-well at a variable rate.

- A model has been developed for determination of aquifer parameters for constant rate of pumping. The model uses the explicit expressions for T and ϕ based on the least square regression and the Theis equation. The advantages of this method are i) the well loss is accounted automatically ii) initial guess of parameters are not required, iii) calculations are simple and can be performed on calculator.

Development of Indigenous Automated Instruments

Microprocessor Based Electronic Infiltrometer

A micro processor based electronic infiltrometer alongwith water level sensor has been developed which is portable and capable to measure infiltration rate in field with 1 mm accuracy. The equipment is programable in order to store the infiltration rate data at an interval of 1 minute to 99 minutes. Maximum 1000 observations infiltration rate i.e. water level with time can be stored in the memory module which can be later on retrieved with the help of Personal Computer. The equipment is almost ready for possible large scale manufacturing for use in infiltration rate studies by field organisations.

Automatic Rainfall Sensor

An automatic rainfall sensor has been developed based on the dual mechanism incorporating both tipping bucket and weighing mechanisms. The solenoid valve has been used to drain out the water. The sensor is used with a data logger which controls all the required operations automatically.

SUSPENDED SEDIMENT SENSOR

This sensor is based on the principle of attenuation of infra-red-radiation due to the suspended sediment particles in the water. The sensor has been designed in such a way that it also provides the information of flow velocity alongwith the suspended sediment concentration. The sensor is designed to be used with a 8051 microcontroller based data logger. In order to remove the deposition of sediments on the sensor surface, a unique device has been provided which regularly cleans the sensor surface.

WEIGHING TYPE RAIN GAUGE

The Institute has also developed prototype of an automated weighing type raingauge using components and systems available indigenously for use in remote locations in unattended mode. The instrument is based on weighing mechanism. A load cell is used to weigh the accumulated rainfall. The accumulated rain water, after a preset level, is drained out using a solenoid valve. A micro-controller based data logger controls the sampling and data storage frequency, operation of the solenoid valve, and stores the measured data alongwith the date and time in on-board memory.

WEIGHING TYPE SENSOR FOR SNOW WATER EQUIVALENT MEASUREMENT

An instrument has been developed for automated measurement of snow water equivalent at remote locations, with provision for unattended data collection and storage for about four months. The instrument is based on a weighing mechanism, and presently designed for a total maximum snowfall of about 3 m height. A load cell is used to weigh the accumulated snow. A micro-controller based data logger controls the sampling and data storage frequency, and stores the measured data in on-board memory.

A prototype of the instrument was installed at a Central Water Commission's Observatory site in J&K state in February 1994 for testing under site conditions.

3.3 Interaction with States

Since the establishment of the Institute considerable emphasis has been laid on the interaction with the hydrology and water resources organisations in the states. The Director and senior scientists have made special efforts to visit the states to have a first hand idea of the problems typical of the respective states. These visits have provided possibilities of interaction and to work out the programmes of mutual interest. The studies carried out by the Institute for the various states are given in Appendix VI.

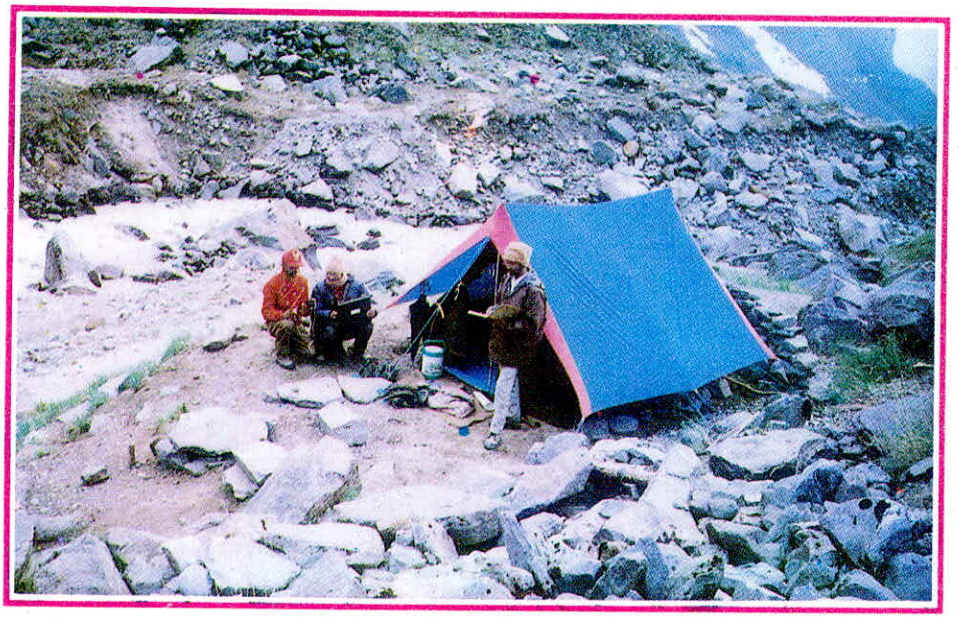
3.4 Technical Publications

Reports and Papers

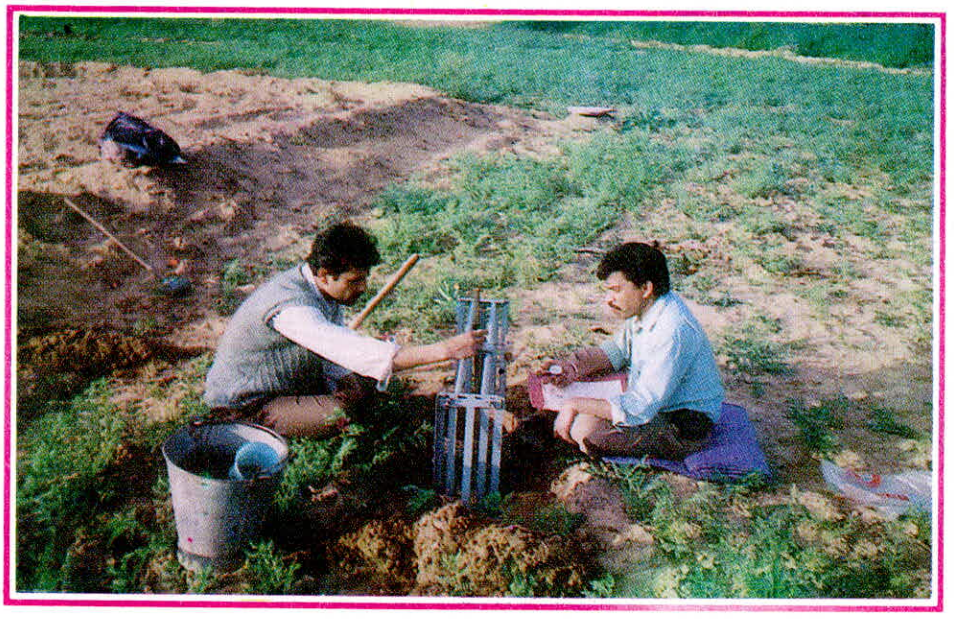
Based on the studies and research conducted by the various scientific divisions at Headquarters and at the Regional Centres a number of reports

have been published under different categories. A number of individuals and organisations have been provided with the reports on request. The list of the organizations is given in Appendix VII. The list of scientific and technical reports prepared during 1994-95 is given in Appendix VIII.

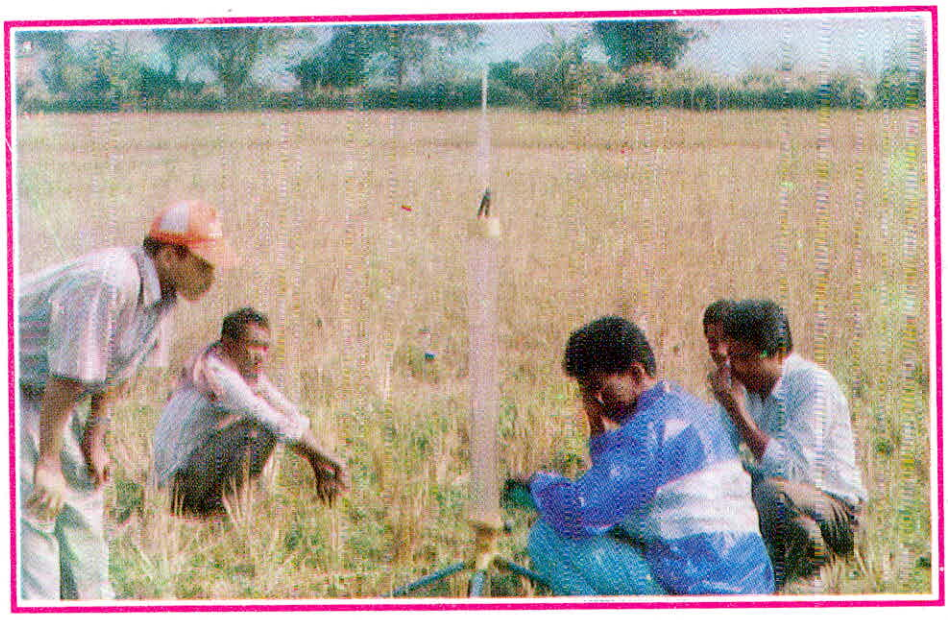
The scientists and the scientific staff of the Institute have published a number of technical papers in English and Hindi in the national and international journals. The scientists have also published papers in the proceedings of the national and international seminars and symposia organised in India and abroad. The list of papers published or sent for publication during the year 1994-95 is given in Appendix IX.



Hydrological Investigations on Dokriani Glacier Melt Stream



Investigations in IGNP Stage II RD 838 Command Area



Infiltration studies in Dudhnai catchment
(Meghalaya - Assam)

Groundwater quality monitoring in Jammu
Region (Jammu & Kashmir)

4.0 REGIONAL CENTRES

The hydrological problems of different regions in the country are unique to each region because of differences in topography, climate, geology, soils, drainage characteristics, land use and vegetal cover. As such,the same methodologies and approaches cannot be applied uniformly for the solution of hydrological problems of different regions. Keeping this in view the Institute has divided the country into seven hydrologically homogeneous regions. These are:

i. Deccan Hard Rock Region
ii. Deltaic Region
iii. West Coast Region
iv. Ganga Plains
v. Western Himalayan Region
vi. North Eastern Region
vii. Arid and Semi Arid Region

During the 7th plan period three Regional Centres were established for Deccan Hard Rock Region at Belgaum, North Eastern Region at Guwahati and Western Himalayan Region at Jammu. During the eighth plan Regional Centres for the Ganga Plains Region was established in June 1991 at Patna and Deltaic Region was established in September 1991 at Kakinada (Andhra Pradesh). During the remaining part of eighth plan period one more Regional Centre for the southern part of Ganga plains is proposed to be established at Sagar. A brief description of the activities at the five Regional Centres during the year is given below:

4.1 Deccan Hard Rock Regional Centre (Belgaum)

During the year the Regional Centre has carried out the following studies:

i. Conjunctive Use Studies of Sri Ram Sagar Project

The coordinated operation of surface and groundwater supplies is required to regulate the local and imported water supplies. In the part I of this study, the surface water availability, groundwater availability and the crop water requirement for the study area have been worked out. It is proposed to find the optimal cropping pattern in the area using a linear programming model. In the present study, the analysis of geohydrological data has been presented and effort has been

made to find the extent of waterlogging in the command area of distributary 29 of Sri Ram Sagar Project.

ii. Study of Failure of Open Wells in Hukkeri Taluka (Karnataka)

As the failure of open wells from many places in Karnataka was reported, a study for Hukkeri Taluka of Belgaum district was carried out. Present situation is assessed through various analysis including pumping wand recovery tests which were carried out in a test plot, in a location where most of the failed wells have been noticed. Kumaraswamy's method of calculating well rock permeability has been preferred as against transmissivity and storativity. Permeability values range from 0.08 m/hr to 0.346 m/hr.

iii. Infiltration Study of Ghataprabha and Malaprabha Command

Infiltration rates for different regions (based on soil geology and landuse) of command area of Ghataprabha was taken up. Command area covers three districts of Karnataka, viz.,Belgaum, Dharwad and Bijapur. About 16 regions were selected in the command area based on soil type and geology. Infiltration and permeability tests were carried out in Bagalkot, Biligi,Jamkhandi, and Mudhol area.

iv. Representative Basin Studies - Part II (Estimation of Ground Water Balance of Ghataprabha Representative Basin)

Two catchments i.e. Malaprabha upto Khanapur and Ghataprabha upto Daddi, were selected for the representative basin studies. In the first part of the report the concept of representative basin and a detailed account of current status of two basins were explained. During the year, the study for estimation of groundwater potential of Ghataprabha representative basin has been conducted using water level fluctuation method, involving use of the data of 12 observation wells, for a period of 5 years.

V. Groundwater Quality Evaluation in the Malaprabha Subbasin of Krishna basin:

Quality of groundwater is an important factor in classifying the water for various purposes such as domestic, irrigation or industrial purposes. Main objective of the study will be to see the suitability of water for various uses. For the above study 10 stations have been selected within the Malaprabha reservoir catchment (Kanakumbi, Jamboti, Khanapur, Bidi, M K Hubli, Bailhongal, Belavadi, Soundatti, Naviluteerth,Desur). Some samples from the river basin have been collected for studying the quality

of groundwater. This sampling will be continued during post-monsoon and pre-monsoon periods. Trace element analysis will be carried out as the trace elements are the actual carriers of pollution.

vi. Evaluating the Impact of Forest Rehabilitation Strategies (Unesco assisted project):

Mr Bert Vos, UNESCO consultant visited the Regional Centre during 1st week of November 1994 for discussions regarding UNESCO aided Karnataka Forest Department Project. The Regional Centre would help for carrying out hydrological studies for assessing the effect of afforestation on hydrological regime.

4.2 North Eastern Regional Centre (Guwahati)

During the year the Regional Centre has carried out the following studies:

i. Representative Basin Studies at Dudhnai Sub-basin,

The Dudhnai sub-basin, a south bank tributary of the river Brahmaputra has vast potential of water resources development and calls for comprehensive hydrological studies. Dudhnai sub-basin of about 500 sq km in Assam and Meghalaya was selected for representative basin and investigations initiated. Relevant details have been collected for the hydrometeorological factors of the sub-basin and some investigation results have been discussed so as to provide for a reference base for other studies to continue.

Automatic Weather Station received under UNDP Project is being installed at Dudhnai subbasin.

In requirement of the long term representative basin studies taken up at Dudhnai sub-basin field infiltration tests were carried out in it with double ring cylinder infiltrometer at 23 locations under different soil and land uses. Results are analysed and infiltration curves have been developed reflecting land use, soil type and to some extent water quality.

The geomorphological characteristics of Dudhnai sub-basin have also been estimated using data from relevant toposheets.

ii. Network Design of Raingauge Stations for Nagaland

Certain statistical techniques for network design require a prior knowledge of variation of the hydrological parameters to be observed. These have been obtained from available data, and results discussed.

4.3 Western Himalayan Regional Centre (Jammu)

During the year the Regional Centre has carried out the following studies:

i. A Monthly Runoff Model for Snow Dominated Catchments in Upper Himalayas

The catchments located in upper Himalayas have a significant part under permanent snow cover and glaciers. Modelling runoff becomes difficult with almost no data from these parts. Even in the temporary snow covered zones, the network is generally inadequate. A simple runoff model is proposed on a monthly basis to take advantage of above mentioned characteristics, using the degree day method. The model uses monthly rain, snow (SWE), mean temperature and snowline elevation as primary inputs.

The model was applied on two subcatchments of Chenab basin to illustrate model capability. The results are encouraging.

ii. An Evaluation of Flood of Sept 1988 Using HEC-2 Model for River Tawi near Jammu (J&K)

The Tawi river in the Jammu province is prone to floods in the Monsoon season. During Sept 1988, an unprecedented flood estimated at 12000 cumecs (4.2 lac cusecs) passed through Jammu, breaching and overtopping the right bank upstream of the city bridge, submerging low lying areas in the old city. The flood affected reach of 1.5 km was studied to analyse the river hydraulics, estimate the flood, its profile and flood plain using HEC-2 model of the US Army Corps of Engineers. A model developed rating curve at the bridge gauge site, maintained by CWC and State Irrigation and Flood Control Dept is presented. Bank protection and channel improvement methods are suggested.

iii. Water Quality Monitoring and Evaluation for Surinsar Lake in Jammu Region

Surinsar lake is a historical and ecological asset of Jammu region. Rapid growth of human activities in the catchment area are also responsible for deterioration of its water quality. The study involving water

quality monitoring of the lake during September, October (1994), January and March (1995) was taken up. The grab samples of the lake water were collected from eight locations (P1 to P8) along its periphery. The physico-chemical analysis of various water quality parameters including temperature, pH, EC, TDS, Ca, Mg, K, Na, nitrate, phosphate, bicarbonate, sulphate, chloride, DO, BOD, calcium hardness and magnesium hardness were performed. The concentrations of the parameters were found well within limit i.e.below the levels prescribed for class-A drinking water standards (Indian Standards for Inland Surface Waters). The DO and BOD values of water were also found within the limit for drinking purposes.

iv. Ground Water Quality Monitoring and Evaluation in Jammu District

The quality of ground water is of great importance in determining the suitability of ground water for a certain use (public water supply, irrigation, industrial applications, etc). Ground water samples were taken from 47 open wells in Jammu district was carried out during August, December 1994 and March 1995.

The samples were analysed for the physico-chemical parameters such as temp., pH, EC, TDS, Ca, Mg, Na, K, cl, So_4, HCo_3, No_3, Po_4 etc. The depth of water in the open wells was also measured during sampling. The Sodium Absorption Ratio (SAR) values were determined for classifying the ground water for irrigation purposes in the Jammu District. The physico-chemical parameters were compared with Indian Standards for class-A drinking water. The study indicated that ground water in Jammu district is fit for irrigation purposes and drinking water.

4.4 Ganga Plains Regional Centre (Patna)

During the year the Regional Centre has carried out the following studies

i. Remote Sensing Approach to Sediment Deposition Pattern in Massanjore Reservoir

This study deals with the digital image processing and visual interpretation technique to locate the sediment concentration in the Massanjore reservoir of Mayurakshi river basin, WB using IRS LISS II satellite data. The results of the study were published in the paper in proceedings of an international conference on Remote Sensing & GIS held at Hyderabad.

ii. Determination of Flooded Area and Flood Plain Characteristics of Mayurakshi River basin using IRS LISS II Data

The study was undertaken as per the request of Central Design Organisation, West Bengal. The flooded area was delineated for floods of different frequencies.

iii. HEC-I Application for Flood Estimation at a Proposed Barrage Site at Hamidnagar

The study was undertaken for the proposed barrage site at Hamidnagar of Punpun river basin, Bihar. HEC-I is an excellent tool to develop rainfall-runoff relationship using curve number, unit hydrograph and routing technique. The necessary data has been collected and analysed using the model for estimating the flood.

iv. Establishment of Runoff Curve Number for Punpun Sub-basin using IRS-1A LISS II Data

The preparation of hydrological year book for the Punpun sub-basin indicated that the information on land use and storm runoff were not available. The SCS curve number technique was used on a regional basis for different Indian soil conditions. Suitable curve numbers for calculating the runoff were determined.

v. Status of Ground Water Quality in Patna Town

Out of the 50 major tube-wells in Patna town, 15 wells were selected for the study. Water samples from the tubewells especially the shallow tube-wells which are more vulnerable for pollution have been collected and analysed for various water quality parameters.

4.5 Deltaic Regional Centre (Kakinada)

During the year the Regional Centre has carried out the following studies

i. Seasonal Groundwater Balance of Puri District, Orissa

The lumped model water balance study is conducted for the groundwater system of Puri district in Orissa to assess the recharge from rainfall. The study has been carried out on seasonal basis for monsoon and non-monsoon seasons for a period of 5 years. Based on the available information, the water balance components for the study area were

identified and each component except the rainfall recharge has been computed independently by analyzing the basic data. The recharge from rainfall has been evaluated during monsoon seasons as a residual term in the ground water balance equation. The unaccounted water calculated during non-monsoon seasons was found to be within reasonable limits. Based on the annual recharge, the groundwater potential of the area was also estimated.

ii. Conjunctive Use Studies in Krishna Delta - Seasonal Ground-water Balance in Bandar Canal Command Area - Part II

The conjunctive use studies in Krishna delta were started by Deltaic Regional Centre of NIH, with collaboration of Andhra Pradesh State Ground Water Department. The study is very important for understanding the behaviour of the hydrological system and working out the strategies for development and management of water resources of a region or basin. Due to limited data the seasonal ground water balance for monsoon and non-monsoon seasons for five years i.e. from 1985 to 1990 has been prepared.

iii. Groundwater Quality Monitoring and Evaluation Study in Kakinada

The groundwater pollution in the Kakinada city may be due to shallow water table, which causes water logging in rainy seasons due to the slow rate of infiltration. Another source of pollution may be the salt water intrusion due to the sea as well as by the salt water creek flowing across the city.

For the groundwater quality monitoring and evaluation study in the Kakinada town, 29 observation wells were selected and the quarterly samples have been collected since October, 1994 and analysed for various physical and chemical parameters like pH, conductivity, TDS, alkalinity, total hardness, calcium, magnesium, sodium, potassium, chloride, sulfate, nitrate, phosphate and heavy metals as well. Most of the ground water is affected by the salinity, may be due to the above pollution factors. The other parameters are well within the limits, making it safe for human consumption.

5.0 STAFF AND FACILITIES

The Institute has 17 scientific divisions and 4 units of administration, finance, maintenance and extension services. During the sixth plan the Institute had a sanctioned strength of 121 posts and 20 posts of INCOH(out of which only 14 posts were released). Out of the 173 posts sanctioned during the 7th plan (1985-90) only 157 posts were released. Thus out of these 314 posts only 292 posts have been released so far. Remaining 22 posts have been abolished by Ministry of Water Resources. During the 8th plan (1992-97) 118 posts were sanctioned in the SFCs. However, no posts were released till 31st March 1995. Further, as per the Government of India's requirement for cut of 10% posts in sanctioned strength, nine posts have been identified out of existing 292 posts and recommended for abolition.

The status of staff as on 1.4.1994 and 31.3.1995 is given in Appendix X.

5.1 Director

Dr S M Seth, Scientist F, who was looking after the charge of Director, NIH from 1.9.1993 has been appointed to the post of Director, NIH with effect from 29.3.1995.

5.2 Scientists

During the year, 6 scientists have joined the Institute while 2 scientists and one Assistant Engineer left the Institute. At the end of the year (March 31, 1995) the Institute had 60 scientists.

5.3 Scientific and Technical Staff

At the end of the year (31st March 1995) the Institute had 104 scientific and technical staff including two Principal Research Assistants.

5.4 Other Supporting Personnel

At the end of the year (31st March 1995) the Institute had 94 other supporting personnel including one Finance Officer, one Documentation Officer and one Section Officer.

5.5 Awards and Higher Degrees

Shri K S Ramasastri, Scientist F of the Institute has been awarded Ph.D. Degree from the Department of Hydrology by the University of Roorkee,Roorkee.

Shri N Varadarajan, RA has been awarded AMIE.

Dr B Soni completed one year Post Doctorate Research Work at International Institute for Applied Systems Analysis in Laxenburg, Austria under North South Dialogue Fellowship Program in the area of Irrigation and Water Management.

Shri R D Singh, Scientist E and Shri S K Mishra, Scientist C were selected for the annual cash award of Rs.2500/- (to be shared equally) for the scientific work carried out at scientist B,C and E level for the year 1993-94.

Cash awards for those who rendered meritorious services among the Group B, C and D staff in the Institute were given on 15th August 1994 for the year 1993-94. The list of awardees is given in Appendix XI.

Guidance of ME/M.Tech. dissertations/theses

Shri R D Singh,Sc E guided ME dissertation on 'Water availability study of Deo Irrigation Project' of Shri Krushna Chandra Mohanty, Department of Hydrology, University of Roorkee, Roorkee.

Dr S K Jain,Sc E guided one ME dissertation on 'Optimisation study of Upper Indravati Project, Orissa' of Shri B R Mohanty, Department of Hydrology, University of Roorkee, Roorkee.

Dr V K Choubey, Sc E guided ME dissertation on Water Quality Assessment of Dal Lake, Kashmir, 1994-95'. of Shri M M Wani, Dept. of Hydrology, University of Roorkee, Roorkee

Shri S K Jain, Sc C was one of the guides of the dissertation 'Applications of RS and GIS for snow studies in a part of Garhwal Himalaya' of Shri Mritunjai Roy, M Tech. Student, Department of Earth Sciences, UOR, Roorkee.

Shri S K Jain, Sc C was one of the guides of the Special problem 'Direct runoff estimation using remote sensing and GIS technique' of Shri K K Dash, M E (Hydrology) Student, Department of Hydrology, UOR ,Roorkee.

Shri B C Patwary, Sc E guided ME dissertation College on 'Estimation of Watershed Parameters' of Assam Engineering College.

Shri S R Kumar, Sc B guided ME dissertation College on 'Optimum Crop Water Requirement' of Assam Engineering College.

5.6 Laboratories

From the year 1984-85, the Institute has embarked on a programme for carrying out field and laboratory oriented studies in addition to the computer based studies and research. Initially the following four laboratories were established during the 7th plan period:

- Water Quality Laboratory
- Remote Sensing Applications Laboratory
- Ground Water Laboratory
- Service and Instrumentation Laboratory

The Hydrological Investigations and Soil Water Laboratories were established during 1990-91. During the year 1993-94, the Nuclear Hydrology Laboratory was established at Roorkee.

Water Quality Laboratory

The Water Quality Laboratory is being used to monitor physical, chemical and biological parameters of various water bodies like rivers, lakes, aquifers, canals etc. The laboratory is fully equipped to cater to analyse physical and chemical parameters and to a limited extent it can be used for biological parameters of water and waste water. Presently, the laboratory has capability to determine about 40 parameters with different degrees of accuracy.

During the year, the Institute procured atomic absorption spectrophotometer (AAS) under the UNDP project and the equipment is being utilised for determination of trace elements contamination in different water bodies.

During the year, studies on water quality of river Kali (near Muzaffarnagar) were carried out to determine number of constituents of water, for use in modelling of surface water quality. Adsorption of heavy metal ions on bed sediments have also been studied to determine the tolerance of the system for the heavy metal load. Besides this, number of water samples were analysed for various water quality parameters relating to studies at regional centres and sponsored projects in the Institute.

The water quality laboratory facilities are also being provided on a limited basis to outside government and other organisations for physical, chemical and some biological parameters.

Remote Sensing Applications Laboratory

The laboratory has been functioning as a central technical facility since 1989. During the year 1994-95, using existing image processing and GIS softwares ILWIS version 1.3 and PC ERDAS version 7.5 ,various hydrological studies e.g. runoff modelling, land capability mapping, soil erosion and water logging estimation have been completed. Mostly, the studies have been done in upper Narmada basin. Hydrological modelling has been done and a good accuracy in runoff volume estimation has been obtained for a small catchment. Land capability mapping has been done for small scale map preparation. Such maps are useful in making management decisions about the agricultural practices in the catchment.

Ground Water Laboratory

The laboratory has equipment for particle size analysis. Universal oven and equipment for measurement of unsaturated hydraulic conductivity. During 1994-95 laboratory shaking machine, hydrometers and u-tube mercury manometers were procured indigenously.

During this year ,the facilities of the laboratory were used for a number of field investigations and laboratory experiments in connection with the sponsored project 'Subsurface Drainage Investigations in Stage II of IGNP at RD 838' from CAD, Government of Rajasthan. Determination of soil texture for a number of soil samples collected from the following sites were also made:

i. Base Camp at Glacier Expedition at Dokriani

ii. Narasinghpur District of MP under the 'Study of Soil Moisture Variation and Recharge to Groundwater using nuclear technique"

Hydrological Instrumentation Laboratory

The laboratory is equipped with a number of test and measuring equipment purchased from Institute funds and received under an Indo-Dutch Project WAMATRA-II. The equipment includes digital storage oscilloscope, signal generator, PC based data acquisition system in circuit emulator, microcontroller kit, universal programmer and tester,

logic analyzer. The laboratory has recently procured a software package PCAD for designing of PCBS. The laboratory has developed prototypes of state-of-art, micro controller based instruments for measurement and recording of rainfall and snowfall data.

1. Weighing Type Rain Gauge

The instrument is based on weighing mechanism. A load cell is used to weigh the accumulated rainfall. The accumulated rain water, after a preset level, is drained out using a solenoid valve. A micro-controller based data logger controls the sampling and data storage frequency, operation of the solenoid valve, and stores the measured data alongwith the date and time in on-board memory.

A prototype of the instrument, using an available 10 kg load-cell and solenoid valve was fabricated during 1994. The operation and accuracy of the load cell based weighing mechanism was tested in the lab using an available imported data logger (model CR10 from Campbell Scientific, Inc.). A micro-controller based data logger with indigenously available components is also being designed for use with the rain gauge.

2. Automated Snow Water Equivalent Instrument

The Institute has developed an automated sensor for snowfall measurement. The instrument is well suited for operation at remote locations, with provision for unattended data collection and locations. storage for about four months. The instrument is based on weighing principle and uses a 300 kg load-cell. The instrument was initially installed and tested 1994 at a site (elevation 2250m amsl) in J&K state. After necessary modifications in the hardware and software sections, the sensor, alongwith an imported ultrasonic snow height sensor, and a data acquisition system was again installed in 1995 at Kaddu Khal (elevation 2800m amsl) in Western UP Hills, and tested for about two months. A micro-controller based data logger with indigenously available components is also being designed for use with the snow instrument.

3. Soil Moisture Instrument for Ground Water Recharge Studies

Under a sponsored project entitled, 'Development of instrument for automation of irrigation scheduling and ground water recharge monitoring using soil moisture measurements', from Ministry of Agriculture, Govt. of India, an automated, portable instrument for in-situ measurement of soil moisture is under development. For this, a mega-ohm meter circuit based around an Intel 8031 micro-controller, with power converter section,

would be used to pass a near DC current in the soil, and the resulting potential difference would be measured using a in-built DVM circuit. The soil resistance would be interpreted in terms of the soil moisture using a dedicated software designed for the purpose.

Hydrological Investigation Laboratory

The laboratory is well equipped for carrying out a number of hydrological investigations. With the help of available instruments, some of the important hydrological parameters which can be assessed are

- Infiltration Rate : The laboratory has developed a microprocessor based infiltrometer. It is a complete device to conduct infiltration studies in controlled condition for in-situ.
- Velocity Measurement : Velocity measuring instruments are available to measure velocity in low flow to high flow suitable for a water course, flooded river, reservoir and ocean.
- Hydraulic Conductivity : With the help of Guelph permeameter which is very handy, saturated hydraulic conductivity can be measured in-situ, at different depth upto 2.00 m.

During the year, the infiltration rate , an important factor to assess the runoff, was measured in Bargi command area near Narsinghpur district headquarter of MP State in Narmada basin. Based on field investigation for infiltration, the required modification in the electronic infiltrometer was also made. Some of the hydrological parameters in Nainital lake were also observed with the help of available instruments of this laboratory.

Soil Water Laboratory

The Soil Water Laboratory is equipped with pressure plate apparatus for determination of soil water retention curves, Guelph and ICW permeameter for measurement of saturated hydraulic conductivity in the field. Tensiometers of varying length (15 cm to 150 cm) and soil moisture meter for measurement of soil moisture are also available.

During the year, soil samples were collected from sub-basin of Narmada basin in Narasinghpur District of Madhya Pradesh and from IGNP Stage II Project for determination of particle size distribution, saturated hydraulic conductivity, infiltration, and soil moisture characteristics for various hydrological studies. The hydraulic conductivity was measured in the field as well in the laboratory by using Guelph permeameter and ICW permeameter respectively.

Nuclear Hydrology Laboratory

The laboratory was established during 1993-94 and is equipped with the instruments such as, Ultra Low Level Liquid Scintillation System, Normal Liquid Scintillation System, Multichannel Gamma Ray Spectrometer, Geolog Ratemeter, Neutron Moisture Probe, Ultrasonic Depth Indicator, and Tritium Enrichment Unit.

These equipment are being used for field investigations and laboratory analysis for study of soil moisture movement and estimation of recharge to ground water, surface water and ground water interaction and lake studies using isotopes. During the year 1994-95, surface water and ground water interaction along river Ganga between Hardwar and Narora and water balance, sedimentation and identification of recharge sources for lake Naini in District Nainital using isotopic techniques have been carried out while the study of recharge to ground water due to rainfall and irrigation in Narmada catchment using Tritium tagging technique is in progress.

5.7 Technical Facilities

The Institute has the following technical facilities for use by the various scientific divisions:

Computer Centre

Computer oriented research is one of the main activities of the Institute. In the first phase of UNDP project for the establishment of the Institute, the main emphasis was laid on creation of infrastructure facilities including computer centre. A VAX-11/780 Computer was installed in October 1982. With the expansion of the Institute, several facilities like VAX workstation 3200, plotter, digitizer, networking of some PCs etc. were provided.

Now the computational facilities are available at three levels: Main frame, Workstations and PCs. As many of these machines are networked, the peripherals attached to them can also be shared. The availability of various types of machines also allows ready use of a number of general purpose and specific purpose software for various hydrological applications.

In order to meet out the current trend of workstation based computing, for DIGITAL's ALPHA series of work station and facilities for networking of all PCs are being procured under UNDP Project.

During the current year, internal training courses were organised for use of different software. Efforts have also been started for introducing computerisation in all the routine activities of the Institute. The computer facilities are being used by scientists and scientific staff as well as by the administration and finance section for their day-to-day work. Multilingual facility has also been provided on some of the PCs.

Automated Hydrologic Station

The Institute has an Automated Hydrologic Station (AHS) procured from Switzerland under the first UNDP project and an Automated Weather Station received under the WAMATRA -II project. The hydrometeorological data on rainfall, temperature, humidity, wind speed and direction, solar radiation, sunshine are recorded continuously. Hydrological data on soil moisture (conductivity), percolation, soil temperature, weight of the lysimeter are also recorded at an interval of 30 minutes.

Workshop

The workshop not only helps in carrying out the works entrusted by the maintenance unit but also renders help to scientists in developing prototypes of automated hydrological instruments. During the year the workshop has been used for fabricating rainfall sensor, suspended sediment sensor, water level sensor and their laboratory testing equipment in addition to the various types of other petty instruments. Office furniture - like small and big racks, and tree guards, etc have also been fabricated in the workshop

Library

As laid down in the objectives of the Memorandum of Association, the Institute since its inception has been in the continuous process of building a good technical library with latest publications in the area of hydrology and water resources. The Library has so far procured 7603 books on the various disciplines of hydrology and water resources, computers and electronics. Out of these 1141 books were transferred to the libraries at the Regional centres of NIH. Besides 3043 technical reports and technical papers were made available by other organisations. The library also has 442 manuals of computer software, 1975 maps,41 microfiche and 305 Indian and foreign standards. The library is subscribing to 34 Indian Journals and 40 Foreign Journals. Three of the Indian Journals are in Hindi. During the year, the library was shifted to a new building with adequate space and controlled environmental conditions with air conditioning. A number of books in Hindi also were procured during the year and a separate Hindi Section has been started.

5.8 Buildings

The construction of staff colony of the Institute by the Construction Division of University of Roorkee has been monitered through periodical meetings and has progressed satisfactorily during the year. The construction is being carried out on a 10 acre land situated on the Roorkee Hardwar road at a distance of approximately 5 km. from the Institute campus.

During the year two blocks of Group B & C residences (24 Nos) have been completed. Construction of two blocks of Scientist E & F residences (8 Nos), two Blocks of Scientist B & C residences (12 Nos) and one Block of Group D staff (12 residences) was taken up and these are in various stages of construction. A tube well was completed by CGWB and construction of over head tank with 200 kilo litre capacity has been completed during the year. The planning for construction of reception at the gate, sub-station, pump house and internal roads has been done and the work will be started during the next financial year.

At the Institute campus, the construction of second laboratory block extension was completed. This block will house the laboratories and shall also provide the sitting places for the scientist/scientific staff attached to the laboratories.

The extension of field hostel has been completed during the year. The new garages which were completed in 1993-94 have been taken over by the Institute and are being used.

6.0 CONSULTANCY AND SPONSORED PROJECTS

From the inception, besides regular R and D work, the Institute has been carrying out limited number of studies having research bias and referred to it by the various State and Central Government organisations on consultancy basis. Some research projects were sponsored and funded by Government organisations. During 1994-95, research studies were done in the following consultancy/sponsored projects.

CONSULTANCY PROJECTS COMPLETED:

6.1 Estimation of Snow and Glacier Melt Contribution in Chenab and Ganga Rivers

Snow and Glaciers contribute significantly to the flows in Himalayan rivers. Realizing the importance of snow and glacier melt in the Chenab and Ganga, the Ministry of Water Resources, Government of India has sponsored a research project 'Estimation of snow and glacier contribution in Chenab and Ganga Rivers' in the Institute. The objective of the project is to estimate the average contribution of snow and glacier melt in the annual flows of Chenab river at Akhnoor and Ganga at Devprayag. Water budget for each of the basins has been made on the basis of data for the period 1982 to 1992 (10 years). Snow free area in the basins was delineated by use of satellite imageries of IRS 1 A and Landsat for estimation of evapotranspiration from snow free area. This study provides a good methodology for use in planning purposes.

The project has been completed during the year 1994-95.

6.2 Reservoir Operation Manual - Machhu Project

The Irrigation Department , Govt of Gujarat approached NIH with a request to prepare the operational manual for the Machhu I and Machhu II reservoirs located in the Machhu river catchment. The scope of work included development of policy for conservation and flood control regulation of the reservoirs, regulation of spillway gates for Machhu II reservoir and development of real time flood forecasting model for the Machhu basin.

The studies for this sponsored project have been completed. Under the project, operation studies for the Machhu-I and Machhu II reservoir were carried out. Rule curves have been recommended for conservation operation of these reservoirs. Policy for flood regulation of Machhu II reservoir was developed. Spillway gate regulation procedure has been specified and a model for real time inflow forecasting at the Machhu

II reservoir has been developed. A computer program has also been developed for the real time operation of the Machhu II reservoir for flood control.

6.3 Survey and Evaluation of Hydrological Instruments and Structures and identification of Suitable Setup for Watershed Hydrology of different regions

This project was sponsored by National Land Use and Conservation Board, Ministry of Agriculture, Government of India for a period of 2 years with the following objectives:

- survey and evaluation of hydrological/hydrometeorological instruments available within the country
- survey and evaluation of hydrological instruments available abroad and their availability in India,
- identification of suitable set up for watershed hydrology in different regions.

The following activities have been carried out under this project:

i. A Directory and Buyer's Guide for Hydrological Instruments covering the details of about 250 products and 450 Indian as well as foreign firms, have been published.

ii. A software package for the data storage and retrieval for hydrological instruments have been developed, and

iii. The final report of the project is completed.

6.4 Indigenous Development of Hydrological Instruments with the Provision to use data logger for the Measurement of Rainfall, Runoff and Sediment load

This project was also sponsored by National Land Use and Conservation Board, Ministry of Agriculture, Government of India in order to develop rainfall, water level and sediment sensors.

The following activities have been carried out under this project.

i. Water level sensor has been developed using optical shaft encoder technique with an accuracy of 1 mm in measurements. The testing of this equipment has been carried out so far in the laboratory,

ii. A rainfall sensor based on weighing technique has been developed and tested in the laboratory, and

iii. A suspended sediment sensor has been developed for the monitoring of suspended sediment continuously in rivers/ streams etc. for which a unique device has been developed and incorporated to clean the sensor automatically. This does not require any power supply. The unit will also provide the information about the flow velocity in the stream alongwith the suspended sediment concentration of discharge of stream. The testing of the sensor in the field is in progress.

ON-GOING CONSULTANCY PROJECTS

6.5 Study of Interaction of Surface and Groundwater for River Ganga from Narora to Kanpur

This consultancy project has been referred by Investigation and Planning Division of Water Resources Department, UP. The purpose of the study is to find the exchange of flow rate between River Ganga and the adjacent aquifer between Narora and Kanpur during the lean flow period. Some of the data required for the study have been supplied. The mathematical model for interaction of river and multiple aquifer system has been formulated. The expression for computing the river resistance parameter has been derived. An interim report has been prepared. Further studies are planned after receiving the pertinent data from sponsoring organisation.

6.6 Assessment of Impact of Irrigation Application in a Part of IGNP Stage II Command Area Underlain by Hydrologic Barrier

This consultancy project has been referred by Command Area Development Department Indira Gandhi Nahar Pariyojana (IGNP), Bikaner, Rajasthan. The study area includes the command areas of Pokharan lift and Phalodi lift canals. The following aspects are to be studied under the project:

(i) The impact of different water allowances and evolution of water table under different delta,

(ii) the amount of water which will infiltrate through the hard pan and join the aquifer underlain by the hard pan,

(iii) design of the drainage system to control the water logging in the project area including cost estimate of the drainage and their benefit cost ratio, and

(iv) conjunctive use in hard pan and non hard pan areas.

The evolution of water table for different deltas has been studied and an interim report has been submitted. Water balance has been carried out considering the hydraulic conductivity of hard pan that has been determined by laboratory tests. The insitu hydraulic conductivity is being determined by field tests. The study is under progress.

6.7 Subsurface Drainage Investigations in Stage II of IGNP (RD 838)

This consultancy project has been referred by Command Area Development Authority, Indira Gandhi Nahar Pariyojana (IGNP), Bikaner, Rajasthan. The study area includes the command areas of IGNP Main canal at RD 838. The following aspects are to be studied under the project.

(i) determination of hydraulic conductivity (in-situ and laboratory), grain size distribution, bulk density, and chemical analysis of soil and water;

(ii) water balance of the study area,

(iii) identification of the cause of waterlogging, and

(iv) design of subsurface drainage (spacing, depth and filter)

Interception drains have been designed. An interim report has been submitted. The study is under progress.

6.8 Hydrogeological Studies at Jhamarkotra Mines

This consultancy project has been referred by Rajasthan State Mines and Minerals Ltd. with the objective to carry out ground water modelling to suggest the network of pumping wells to achieve the required drawdown in the Jhamarkotra Mines area in Udaipur district of Rajasthan. The following aspects are being studied:

(i) identification of source of recharge to the water bearing rockphosphate and ground water potential zones,

(ii) a total water management plan, design and the effective dewatering wells to achieve drawdown of 15 m per annum,

(iii) computer aided ground water model of the area,

(iv) regional effect of mine dewatering on groundwater regime in the area, and

(v) any remedial measures to stop/reduce water ingress to the pit.

6.9 Identification of Land slide Prone Areas using Remote Sensing Techniques in Chamoli and Uttarkashi districts of Uttar Pradesh.

This consultancy project has been referred by Ministry of Environment and Forests, Government of India. The objective of the project is the landslide hazard zonation (LHZ) using remote sensing data. The study is nearly complete and the first draft of the final report has been prepared. The preprocessing of the satellite data procured from NRSA has been done and various thematic maps. viz. geological map, land use map, potential landslide area map, slope and aspect map, drainage map, etc have been prepared.

6.10 Reservoir Operation Manual - Dharoi

Reservoir operation is a very important aspect related to planning and management of water resources systems. Detailed guidelines are to be given to the operator to enable taking appropriate decisions of reservoir operation. The Irrigation Department, Govt of Gujarat had approached the NIH with a request to prepare the operational manual for the dams located in the Sabarmati basin. The dams and weirs are the Dharoi dam, Harnav dam and Harnav weir, Guhai dam, Hathmati dam and Hathmati weir and Wasna barrage. The scope of this consultancy project included development of reservoir operation manual for Dharoi dam for flood control as well as conservation purposes, development of operation procedures for Harnav dam, Guhai dam, Hathmati dam, Hathmati weir, Harnav weir and Wasna barrage for irrigation purposes and spillway gate regulations at different dam sites.

The studies under this project are currently in progress and are in the final stages of its completion. The comments of Gujarat Government on the Report entitled 'Conservation Storage Regulation' have been received and the document is being modified. The policy for flood regulation has been developed. The work on real time inflow forecasting at the Dharoi reservoir is currently in progress.

6.11 Development of data logger and sensor unit for watershed hydrology

A data logger based on 8051 micro controller, is being developed with the external assistance of M/s Micron, Roorkee. This data logger has the provision to connect one raingauge having one tipping bucket system, one weighing system including solenoid valve; and one water level sensor based on optical shaft encoder technique and four suspended sediment

sensors including one current meter. Provision has also been made to use solar panel for charging DC 12V 24AH battery for the uninterrupted working of the data logger. The data of rainfall, water level/stage and suspended sediment can be stored in a memory module at preselected time interval and data can be transferred on to the PC directly in the field or the data can be retrieved on the PC in the laboratory. The development of the data logger has been completed and it is under testing.

6.12 Hydrological Studies of Lake Naini, District Nainital

This project has been sponsored by the Department of Environment , Government of UP, through Naini Lakes Development Authority, Nainital for a period of 3 years. Following activities have been carried out under this project:

i. One integrated data logger, 3 water level recorders and 4 raingauges (recording type) have been installed in the Naini Lake catchment. Regular surveys of water quality, water balance, sedimentation and identification of recharge have been conducted bi-monthly till Feb. 1995 and now on monthly basis.

ii. The analysis of the water samples for water quality, suspended sediments and bed sedimentation rate using dating techniques and stable isotopic analysis are being carried out at NIH as well as at BARC, Bombay.

iii. A preliminary report on hydrological studies of lake Naini have been submitted and interim report is being prepared.

iv. Many streams emerging out from the lakes have been identified with the help of stable isotopic technique along with the streams emerging into the lakes with the locations.

An imported bed sediment corer has been used successfully for the collection of bed sediment cores maximum upto 55 cm from the bed for the study of sedimentation rate using Cs 137 and Pb 210 dating techniques alongwith the present sedimentation rate.

7.0 INTERNATIONAL COLLABORATION

7.1 Developing Capabilities for Hydrological Studies UNDP Assisted Project

A project 'Developing Capabilities for Hydrological Studies' assisted by UNDP under the third country programme has been in operation in the Institute since November 1991. The project is for a period of 5 years and is phased accordingly to achieve year to year progress.

The areas of hydrology which were proposed to be developed through the project are as follows:

- Hydrological Instrumentation
- Deltaic Hydrology
- Nuclear Hydrology
- Hydrometeorology
- Lake Hydrology
- Catchment Hydrology
- Data Processing and Analysis
- Snow Hydrology
- Mountain Hydrology
- Remote Sensing Applications
- Environmental Hydrology (Man's influence)
- Forest Hydrology

The infrastructural facilities which are being made available to the Institute through the Govt. of India counterpart contribution would be strengthened through the following components provided under the project:

- Consultants visit in the twelve areas
- Study tours of senior scientists
- Training of scientists abroad on fellowship in the specialized areas
- Strengthening of the following laboratories through procurement of equipment which are not available otherwise in the country
  - Hydrological Instrumentation Laboratory
  - Nuclear Applications Laboratory

- Remote Sensing Application Laboratory
- Water Quality Laboratory
- Surface Water Laboratory
- Ground Water Laboratory
- Computer Centre
- Laboratories at the Regional Centres and
- Observatories in the Representative Basins under Regional Centres.

The componentwise status of the project implementation up to the end of March 1995 is as follows:

a) Seventeen visits of consultants have been made so far in the areas of Forest Hydrology, Data Processing and analysis, Catchment Hydrology, Snow Hydrology, Remote Sensing Applications, Lake Hydrology, Environmental Hydrology and Hydrometeorology. The consultants during their stay interacted with the scientists of the Institute who were identified to work in one of the respective areas. In some cases the consultants were also taken on field visits to facilitate the scientists to obtain the views of the consultants on the latest methods of data collection and sampling techniques. During the year 1994-95, two consultants visits were made. The details of the consultant's visits are given in Appendix XII-a.

b) Fifteen scientists at the level of Scientists B and C received training at the Institutes of excellence in the advanced countries like USA, Canada, France, and Australia in the areas of Hydrometeorology, Snow Hydrology, Catchment Hydrology, Deltaic Hydrology, Data Processing, Nuclear Hydrology, Remote Sensing Applications, Environmental Hydrology and Mountain Hydrology. The scientists prepared Status Reports in the respective areas of their training as a pre-requisite for the training so that they will have the adequate latest knowledge before they go for specialized training. The job description for the training period of each of the scientists was prepared in consultation with the supervisors in the host institutes to meticulously follow the work assignment. During 1994-95, four scientists were trained. Subsequent to their return from training the scientists submitted reports on their training. The scientists after return from their training also delivered Seminar talks in the Institute so that the experiences of the training can be shared by others as well. The details of the training of scientists are given in Appendix XII-b.

c) The Project Director, two Project Coordinators have gone on study tour for a period of one month each and six senior scientists at the level of E and F have gone on study tour so far for a period of 15 days each in the areas of Forest Hydrology, Hydrometeorology, Environmental Hydrology, Data Processing, Mountain Hydrology and Lake Hydrology. These included four study tours made during 1994-95. The senior scientists were expected to visit at least three organizations in each country and identify the Institutions which have facilities to impart training for the scientists in the specialized areas. Subsequent to their return from the study tour a report on the tour is submitted indicating the possible places of training for the scientists, equipment to be procured and possible consultants, which is used for further planning of the activities under the UNDP project. During 1994-95, four study tours were undertaken. The countries which were visited under the study tours so far included China,Japan, Thailand, Australia, Canada, USA, Switzerland, Sweden, Germany, and France.

Under the project, equipment worth nearly US $ 1 million were procured and orders for equipment worth US $ 0.15 million were placed. The equipment thus procured so far has been made operational in Computer Centre and in the various laboratories at Headquarters like, Remote Sensing Application Laboratory, Water Quality Laboratory, Nuclear Hydrology Laboratory and in the laboratories and representative basins under the the Regional Centres. The list of equipment procured during 1994-95 is given in Appendix XII-c.

7.2 Hydrology Project

A reliable and easily accessible data base providing historical records for all aspects of the hydrological cycle is essential for planning and management of water resources development particularly for long term planning and real time management of the resources and for preservation of the resources within the overall environment in both quantitative and qualitative terms.

The Indian National Committee on Hydrology (previously HILTECH) considered and made a detailed review of the specific problems in different areas in the country in December 1985. The draft proposal prepared by NIH was considered by the then HILTECH in September 1986 wherein the broad scope of National Hydrology Project (NHP) was discussed. It was recommended that the river basins in peninsular India may be included under

the project and the National Institute of Hydrology was asked to prepare the project proposal for NHP.

The draft prepared by NIH was discussed both at a meeting of the participating organisations and the meeting of the then HILTECH in January 1987. The project proposal was revised in the light of the discussions and suggestions in March 1987 and submitted to Ministry of Water Resources for assistance from the World Bank. A team of World Bank experts visited the peninsular river basins and held discussions with the various participating organisations in 1988.

After a gap of nearly four years the project was revived in September 1992 under the coordination of Central Water Commission. During October-November 1993, teams of World Bank experts visited the peninsular river basins and held discussions with scientists and engineers of the participating Institutes and state organisations.

Keeping in mind the above objective "Hydrology Project" was formulated for peninsular region of the country. Project is at finalisation stage and its implementation is expected to start in the second half of the year 1995-96 with the help of World Bank aid and will continue for six years. Concerned agencies involved in the project are Central Water Commission, India Meteorological Department, Central Ground Water Board, National Institute of Hydrology, Central Water and Power Research Station and State organisations in seven states.

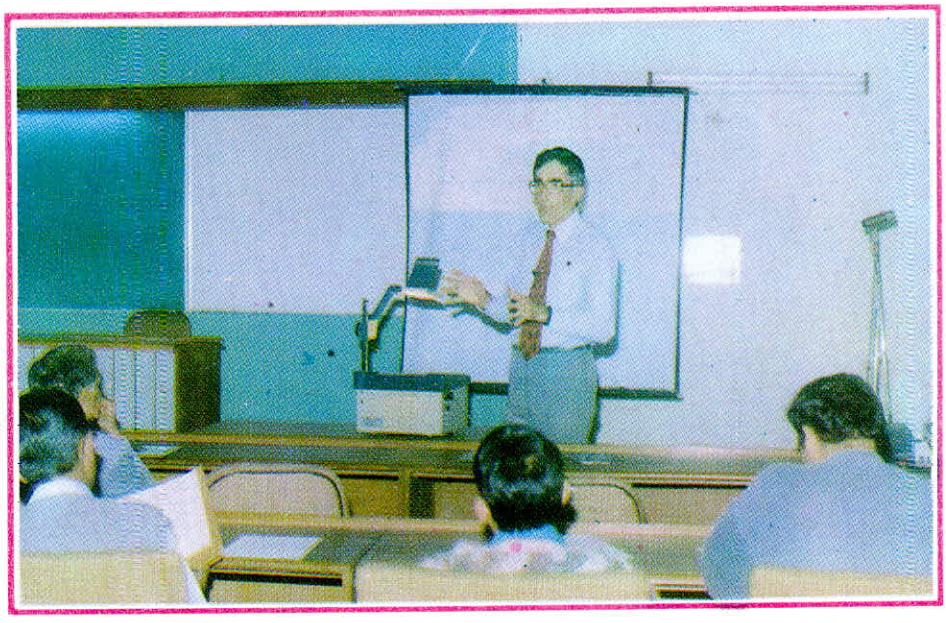
Project support to National Institute of Hydrology would focus on institutional strengthening to firmly establish its role in i. applied hydrology research for water resources development and management; and ii. carrying out training activities related to hydrometry, hydrology and data management.

The project would support NIH in carrying out applied hydrology research activities for central and states on a demand basis.

The main role of NIH in the "Hydrology Project" is to strengthen and expand its capabilities for training to serve important training objectives of the project in the following areas: i. Data collection and processing procedures ii. Use of computers and softwares for water data management and iii. Skills in the use of specialised laboratory equipment

A major responsibility of NIH would be to provide for training of trainers in the required skills through short courses run at Roorkee and

Tripartite Review Meeting of UNDP Project held at Roorkee



Prof Ian Cordery Consultant in the area of Data Processing and Analysis Delivering lectures during Workshop at Roorkee

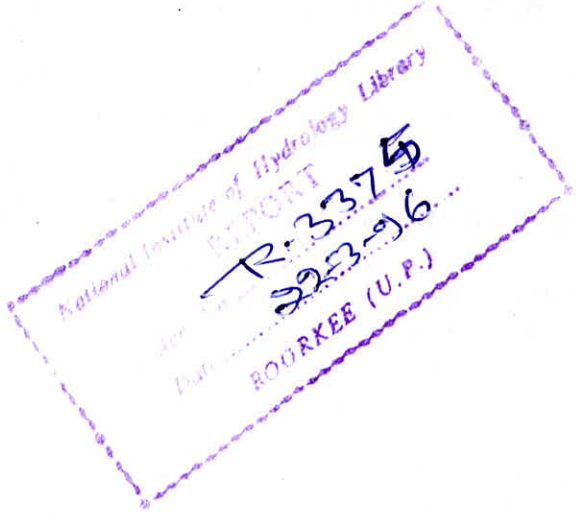
NATIONAL WORKSHOP ON
ADVANCES IN HYDROLOGICAL INSTRUMENTATION
ROORKEE 25-26 October 1994

Dr. M.S. Reddy Secretary (WR) and Chairman Governing Body of NIH Delivering the Inaugural Address

Sri A.B. Joshi, Chairman, Central Water Commission and Chairman Technical Advisory Committee of NIH Delivering Valedictory Address at the Workshop

in the States. NIH would advise the states on the content of the training courses which would be subsequently run in-house by the state agencies.

In its course of implementation, the policy and conceptual aspects of the project would be monitored by a national level Steering Committee constituted by Ministry of Water Resources under the chairmanship of Secretary (WR) Govt of India. The implementation of the project would be coordinated by a national level Coordination Committee under the chairmanship of Member (RM), Central Water Commission.



8.0 TECHNOLOGY TRANSFER AND MASS COMMUNICATION

One of the objectives as laid down in the Memorandum of Association of NIH is the transfer of technology developed or implemented by the Institute. Since 1985 besides carrying out basic and applied research, the Institute has been organising short duration workshops on various topics of hydrology at Roorkee and in the states. From time to time the Institute is also organising Regional Courses, National and International Seminars and Symposia.

The Institute is also disseminating the methodologies developed at the Institute through publication and circulation of reports, manuals and technical papers.

8.1 Workshops

The Institute is continuing the technology transfer programme and has been organising short duration (five days) training workshops for the benefit of the states as in earlier years. During the year,workshops were organised in Assam, Bihar, Maharashtra, Orissa, West Bengal and Roorkee. The details are given in Appendix XIV.

Scientists and Engineers from several Central and State Government organisations, academic institutes participated in the workshops. The workshops/courses were well received and appreciated.

8.2 Seminars and Symposia

The Institute organised a two day National Workshop on Advances in Hydrological Instrumentation at NIH Roorkee during October 25-26, 1994. The workshop was cosponsored by INCOH, Ministry of Agriculture,(Govt. of India) and Department of Science and Technology. The workshop was inaugurated by Dr M S Reddy, Secretary to Govt of India, Ministry of Water Resources and Chairman, Governing Body, NIH; Prof. Bharat Singh, former Vice-Chancellor, University of Roorkee delivered the presidential address.The Valedictory address was delivered by Shri A B Joshi, Chairman, Central Water Commission. More than 40 papers were presented during the workshop and about 80 delegates participated.

8.3 Water Resources Day

The Water Resources Day is being organised all over the country since 1986 in order to make the people more conscious about the

problems associated with management of water. As a result of increasing enthusiastic response from Universities/State and Central Government Organisations and other technical associations and societies it was organised in about 1200 places all over the country during 1992 and 1993.

In order to generate consciousness among people about the need for conserving water and managing it on scientific lines, the Organisations working in the field of Hydrology and Water Resources at Roorkee, jointly celebrated the Water Resources Day on May 9, 1994. Keeping in view the importance of minor irrigation and the vast scope of farmers' participation in the irrigation sector, the theme for 1994 was chosen as 'Role of Ground Water and Small Dams in Water Resources Development'. The programme was inaugurated by Prof. Bharat Singh, former Vice-Chancellor, University of Roorkee. The Jal Stuti was recited by the staff of NIH. On this occasion, Director NIH delivered the keynote address. Among the guests present were Shri J F Mistry, former Secretary (Water Resources), Govt of Gujarat. The guests and the speakers presented their views on the theme. An exhibition was also organised by NIH in this connection.

As part of the public awareness programme, NIH participated and distributed pamphlets/brochures of NIH in the seminar on Public Awareness in Water Management: Focus on Industry held on 21 March 1995 at New Delhi where more than 300 delegates were present.

8.4 Newsletter

The Newsletter of the Institute 'Jalvigyan Samachar'was published quarterly. The Newsletter contains abstracts of studies and research carried out by the Institute and information on the activities of the Institute. News on the activities relating to Hydrology and Water Resources from other organisations is also published. The newsletter is circulated to the various Central and State Government Organisations and Academic and Research Institutes dealing with Hydrology and Water Resources.

8.5 Water Conservation

Water Conservation is an important input for overall economic development of the nation. In view of the need for national awareness on water conservation, the Institute launched a long term plan to bring out pamphlets on various water conservation and hydrology related topics to create awareness among general public. Twelve pamphlets have been brought out in this series on the following topics so far (in English):

- Water - Nature's Wonder Hydrologic Cycle
- Control Evaporation Save Water
- Hydrological Influences of Forests
- Hydrological Influences of Landuse Changes
- Sediment Yield from Different Landuses
- Water Conservation
- Man's Influence on Hydrologic Cycle
- Water Quality Conservation
- Flood and its Management
- Rainwater Harvesting
- Water Yield from Snow and Glaciers
- Water Availability - Variation in Time and Space

During the year 1994-95 three pamphlets were prepared one in Hindi on "Nirvanikaran Evam Vanikaran ka Vibhinna Jalvigyaniya Prachalon par Prabhav"; and two in English: one on "Analytical Capabilities of Rainfall to Drought Identification" and the other on "Lake as a Hydrologic Unit". One English Pamphlet entitled, "Water - Nature's Wonder Hydrologic Cycle" was translated into Hindi and got printed.

9.0 HINDI - OFFICIAL LANGUAGE

9.1 Progress in Use of Hindi

The Institute contributed significantly during the year towards the furtherance of the cherished objectives enshrined in the Constitution for implementation of the Official Language. Communications with Central and State Government Department/Offices located in region A and B were made cent percent in Hindi. Most of the official work of the Administration, Finance and Maintenance Branch of the Institute was done in Hindi.

Two one day workshops were organised by the Hindi Cell for the scientists and scientific staff of the Institute. In the workshop organised on June 22, 1994 the scientists B and C of the Institute were made familiar with Hindi words in daily administrative work. In another workshop on June 23, 1994 the PRA, SRA, RA and JRAs were informed about the technical words used in the field of Hydrology. Two workshops on Hindi computer softwares were organised for the Stenographers , Upper Division Clerks, Assistant Superintendents and Superintendents during June 22-29, 1994 and November 15-17, 1994. A training workshop for all the Stenographers and Upper Division Clerks was organised during October 10-13,1994 to impart training in Hindi typing.

Two non-Hindi speaking Scientists, one non-Hindi speaking SRA were enrolled for the training in Hindi through correspondence with Rajbhasha Vibhag and one Scientist underwent training in Hindi at the Part-time Training Centre at CBRI, Roorkee, organised by Central Hindi Training Institute, New Delhi. One Stenographer Gr. II went for training under intense training programme of eighty days at Rajbhasha Vibhag. Four Stenographers and one LDC were enrolled for training at Part-time Training Centre at CBRI, Roorkee.

A board with slogans (bilingual) on Water Conservation has been installed near the Institute's main gate.

9.2 Rajbhasha Karyanvayan Samiti

The Official Language Implementation Committee of the Institute held 4 meetings and took important decisions regarding implementation of Hindi in day to day official proceedings and activities.

9.3 Publications in Hindi

The Institute brought out various technical and literary publications in Hindi for the benefit of the employees of the Institute and other organisations. These include:

i. Prakriti ka Ashcharya-Jaliya Chakra -a pamphlet on Hydrologic Cycle

ii. Jalvigyan Shabdawali-I, Jebi Shabdakosh - a pocket dictionary of Hydrological terms.

iii. Pravahini - Literary inhouse magazine

iv. Jal Sanrakshan Kaise Karen - A pamphlet on tips for water conservation was circulated with the newspaper to the residents of Roorkee on the occasion of 46th Republic Day of India. The copies were also sent to the local schools and colleges.

v. Prakaran Adhyayan ke Saransh-A report comprising of translations in Hindi of the abstracts of all the case studies brought out by the Institute is under publication.

9.4 Hindi Week Celebrations

Various activities for the promotion of Hindi in the Institute were organised during the Hindi Week, September 12-16, 1994. The activities included the essay, typing and debate competitions. The guests present during the celebrations included Shri J F Mistry, former Secretary (WR), Govt. of Gujarat; Shri M S Billore, former Secretary (Irrigation), Govt of Madhya Pradesh; Shri S S Ganguly, former Secretary (Irrigation), Government of West Bengal; Dr V K S Dave, former Head, Department of Earth Sciences, University of Roorkee and Dr P L Srivastava, Principal, KLDAV Degree College, Roorkee

Sri A.B. Joshi, Chairman, Central Water Commission and Chairman Technical Advisory Committee of NIH Releasing the Hindi Sabdakosh Pocket Book

Sri J.F. Mistry Chairman, Achievements Review Committee Releasing the Hindi Mgazine Pravahini on the occasion of Hindi Day

Dr. M.S. Reddy Secretary (WR) and Chairman Governing Body of NIH visiting the facilities in NIH

Secretary (WR) and Chairman Governing Body of NIH visiting the Staff Colony of NIH

10.0 OTHER ACTIVITIES

10.1 Hydrology Terminology

The work for the preparation of Hydrological Terminology-II has been initiated during the year. The first volume of the Terminology contains 395 terms of Hydrology. For the second volume, 605 terms were selected and their definitions have been prepared. The terms alongwith their definitions, have been sent to the eight concerned states for getting the equivalents in respective state languages. The concerned state department officials are finalising the equivalents in the respective Indian languages viz. Bengali, Gujarati, Hindi, Kannada, Malayalam, Marathi, Tamil, and Telugu.

10.2 Awards

NIH has instituted two awards for encouraging studies and research in Hydrology.

Through an endowment provided by M/s Hoysala Group of Companies, Bangalore, NIH instituted an award in honour of Prof. Bharat Singh, former Vice-Chancellor, University of Roorkee. The BHARAT SINGH AWARD with a cash prize of Rs.10,000 is given biennially to Engineers, Technocrats and Scientists for outstanding work carried out in the area of Hydrology and Water Resources. So far, the award has been given for the years 1987 and 1989. For considering the Bharat Singh Award for the year 1991 and 1993 the meetings were held on 20th May 1994 at Delhi and 26th October 1994 at Roorkee. respectively. Dr. A S Chawla was selected for the Bharat Singh Award for the year 1993. None were found suitable for the Award for 1991.

The NATIONAL HYDROLOGY AWARD is given every year to eminent Engineers, Technologists and Scientists working in the area of hydrology or those who have made significant contributions for promoting hydrology. Three awards 1st, 2nd and a certificate of merit are given every year. The awards for the year 1989 and 1990 in the area of 'Water Logging and Drainage' and 'Water Quality' respectively have been distributed by Dr M S Reddy to the following at the inaugural function of the National Workshop on Advances in Hydrological Instrumentation at Roorkee on 25 October 1994:

i. National Hydrology Award for the year 1989 was awarded to Prof. Jaswant Singh (first) and Shri C P Sinha (second)

ii. National Hydrology Award for the year 1990 was awarded to Prof. S A Abbasi (first) and jointly (second) to Dr P M Modak and Dr K K S Bhatia.

The following persons have been selected for the National Hydrology award for the years 1992 and 1993:

1992 -First Award of Rs. 4000.00 Dr N H Rao
-Second Award of Rs. 2000.00 Dr D V L N Rao

1993 -First Award of Rs. 4000.00 Dr V K Choubey
-Second Award of Rs. 2000.00 Dr S N Rai
Certificate of Merit and Rs. 1000.00 Sh B P Singh

10.3 Visitors

Dr M S Reddy, Secretary (WR) and Chairman, Governing Body of NIH visited the Laboratories and other facilities in the Institute and the Staff Colony on 24 and 25 October 1994.

The following persons visited the Institute during the year in connection with meetings and interaction with the Institute.

Dr S R Singh
Project Director
Water Technology Centre for Eastern Region
Bhubaneswar

Dr V N Sharda
Senior Scientist (Engg)
Central Soil & Water Conservation Research and Training Institute ,Dehdradun

Dr Y K Murthy
Consultant World Bank
New Delhi

Shri M Kaliaperumal
Chief Engineer & Director, PWD
IHH, Poondi, Tamilnadu

Dr B S Tanwar
Director
Haryana State Minor Irrigation & Tubewells Corpn
Karnal

Dr V Rechitski
Head of Rock Foundations of
Hydroproject Institute
Moscow, Russia

Prof. P E O'Connell
Prof. of Water Resources Engg.
University of Newcastle upon Tyne
United Kingdom

Dr T Prasad
Director
Centre for Water Resources Studies
Bihar College of Engineering
Patna

Shri S S Sohani
Commissioner (Indus)
Ministry of Water Resources
New Delhi

Shri Kanwal Nath
Joint Secretary & Financial Advisor
Ministry of Water Resources
New Delhi

Dr Edwin T Engman
Hydrological Science Branch
NASA Goddard Space Flight Centre
Maryland, USA

Prof. V P Singh
Department of Civil Engineering
Louisiana State University, Baton Rouge
USA

Shri V G Lagwankar
Director
Maharashtra Engineering Research Institute
Nasik

Shri S Mukherjee
Director
CGWB, Lucknow

Prof. Subhash Chander
Deputy Director
IIT, New Delhi

Dr C D Thatte
Chairman
DST Committee on Landslides
New Delhi

Shri A B Joshi
Chairman
CWC, New Delhi

Dr V M Sharma
Director
CSMRS, New Delhi

Maj. Gen S P Metha
Surveyor General of India
Dehradun

Prof. Ian Cordery
School of Civil Engineering
UNSW, Sydney,
Australia

Sumit Ghosh
Jury Member
NASA, USA

Suchitra Ghosh
Jury Member
NASA, USA

Prof. S Vedula
Department of Civil Engineering
IISc, Bangalore

10.4 Qaumi Ekta Week

Qaumi Ekta week was celebrated by the Institute from 18 -24 November 1994. Director administered the Pledge on National Integration to the scientists and staff of the Institute on 18 November 1994

10.5 Recreation Club

During the year 1994-95 Recreation Club has organised several programmes for its members like Kavi-Sammelan, Quiz competition, Essay Competition and Drawing Competition for the children of the employees. A cultural programme was also performed by the Song,Dance and Drama Division of Ministry of Information and Broadcasting, New Delhi on 15th August 1994. To promote the spirit of friendship among the staff members, annual games were organised by the club for outdoor and indoor games. A Nukkar Natak (Street Play) was performed by the Navankur Shamstha of Roorkee which was appreciated by all the members.

11.0 FINANCE AND ACCOUNTS

During the year under review, Ministry of Water Resources, Government of India provided an amount of Rs. 252.00 lakhs and Rs. 140.00 lakhs as Grant-in-Aid to the Institute under Plan and Non-plan heads respectively. The actual total expenditure during the year under review after taking into account the amount carried forward from the previous year was Rs. 3,91,93,028.21 (Rs. 2,52,11,057.82 under Plan and Rs. 1,39,81,970.39 under non-Plan). The accounts were audited by M/S Satyendra & Co. Chartered Accountants, Roorkee. The Auditor's report alongwith audited accounts is given at Appendix XVI.

An addition of Rs. 1,78,27,441.58 has been made to the fixed assets of the Institute during the year as under :

ASSET FUND ACCOUNT

Sc A	Increase in fixed assets	(+)	7055765.18
Sc B	Increase in Works in Progress	(+)	14310100.00
Sc C	Increase in Deposits	(+)	950.00
Sc D	Decrease in Advances	(-)	3029230.32
Sc F	Decrease in Prepaid	(-)	640663.00
		Sub total	17696921.86

Less :

Sc G	Decrease in Deposits	Nil	
Sc E	Decrease in Liability	(-) 130519.72	
	Sub Total	(-) 130519.72	(+) 130519.72
	Total increase in asset fund A/C		17827441.58

12.0 ACKNOWLEDGEMENTS

The Institute made progress in all spheres under the directions and guidance of the President of the Society, the Vice-President of the Society, the Chairman, Governing Body, the Chairman, Technical Advisory Committee, the Chairman, Standing Committee and the Members of the Society, Governing Body and TAC. The support and cooperation from UNDP, UNESCO, Department of Economic Affairs, Officers of the Ministry of Water Resources, Central Water Commission, India Meteorological Department, University of Roorkee and several other Central and State Government Organisations is gratefully acknowledged. The significant achievements of the Institute during the year under report would not have been possible without their cooperation and guidance. The Institute also acknowledges the advice and cooperation received from the Members of the Working Groups, Regional Coordination Committees, and the Scientists and Engineers from various academic and research organisations.

The Institute is grateful to various Central and State Government organisations and public sector undertakings who have provided the opportunity to the Institute to solve various real life problems through consultancy and sponsorship.

The Institute is also thankful to various State Government organisations who have invited the Institute for organising short duration workshops in the States for the benefit of their in-service engineers and technical personnel.

13.0 APPENDICES

NATIONAL INSTITUTE OF HYDROLOGY SOCIETY

PRESIDENT

Union Minister
for Water Resources
Government of India
New Delhi

VICE PRESIDENT

Minister of State
for Water Resources
Government of India
New Delhi

MEMBERS

Minister in Charge
of Irrigation
Govt of Andhra Pradesh
Hyderabad

Minister in Charge
of Irrigation
Govt of Punjab
Chandigarh

Minister in Charge
of Irrigation
Govt of Maharashtra
Bombay

Minister in Charge
of Irrigation
Govt. of Tamil Nadu
Madras

Minister in Charge
of Irrigation
Govt of West Bengal
Calcutta

Minister in Charge
of Irrigation
Govt of Madhya Pradesh
Bhopal

Minister in Charge
of Irrigation
Govt of Orissa
Bhubaneswar

Minister in Charge
of Irrigation
Meghalaya
Shillong

Minister in Charge
of Irrigation
Govt of Himachal Pradesh
Shimla

Minister in Charge
of Irrigation
Govt of Uttar Pradesh
Lucknow

Member (Irrigation)
Planning Commission
New Delhi

Shri M S Billore
65 Ravindra Nagar
Old Palasa
Indore
Hyderabad

Prof. S K Sinha
Director
Indian Agricultural Research
Institute
New Delhi

Dr B S Mathur
Dept. of Hydrology
University of Roorkee
Roorkee

Shri Paritosh Tyagi
48 B, Green View Apartments
Sector 15 A,NOIDA
Ghaziabad

Dr R S Varshney
8/127 Sector 3 ,Rajendra
Nagar (Sahibabad)
Ghaziabad

Secretary to Govt of
India
Ministry of Water Resources
New Delhi

Secretary to Govt of
India
Ministry of Science and
Technology
New Delhi

Vice Chancellor
University of Roorkee
Roorkee

Prof. B L Deekshatulu
Director
National Remote Sensing
Agency, Balanagar
Hyderabad

Dr J Venkateswarlu
26 SBI Colony
(1st Venture)
New Bakaram
Hyderabad

Dr R D Verma
M R Engineering College
Jaipur

Dr S Vedula
Dept of Civil Engineering
Indian Institute of Science
Bangalore

Dr V C Kulandaiswamy
23 MGR Road,Kala Chetra
Colony, Basant Nagar
Madras

Secretary to Govt of
India
Ministry of Power
New Delhi

Secretary to Govt of
India
Ministry of Agriculture
and Cooperation
New Delhi

Secretary to Govt of India
Planning Commission
New Delhi

Secretary to Govt of India
Ministry of Urban Development
New Delhi

Secretary to Govt of India
Ministry of Environment and Forests, New Delhi

Chairman
Central Water Commission
New Delhi

Chairman
Central Electricity Authority
New Delhi

Additional Secretary
Ministry of Water Resources
New Delhi

Member (WP&P)
Central Water Commission
New Delhi

Member (RM)
Central Water Commission
New Delhi

Chairman
Central Ground Water Board
Faridabad

Director General
of Meteorology
New Delhi

Director General
Geological Survey of India
Calcutta

Financial Advisor
and Joint Secretary
Ministry of Water Resources
New Delhi

Chairman
Central Pollution Control Board
New Delhi

Joint Secretary (Admn)
Ministry of Water Resources
New Delhi

Commissioner (River Basin)
Ministry of Water Resources
New Delhi

Representative of
Indian National Committee
on Hydrology

Commissioner (Indus)
Ministry of Water Resources
New Delhi

Member (Joint River Commn.)
Ministry of Water
Resources
New Delhi

Member Secretary

Director
National Institute of Hydrology
Roorkee

GOVERNING BODY

CHAIRMAN	:	Secretary to Govt. of India Ministry of Water Resources, New Delhi
VICE CHAIRMAN	:	Vice Chancellor University of Roorkee Roorkee
MEMBER SECRETARY	:	Director National Institute of Hydrology Roorkee

MEMBERS

Advisor (Irrigation & CAD)
Planning Commission
Yojna Bhawan
New Delhi

Chief Engineer
Water Resources Development
Organisation
Ananda Rao Circle
Bangalore

Chairman
Central Water Commission
Sewa Bhawan,
New Delhi

Chief Engineer
Irrigation and
Flood Control Deptt.,
Jammu and Kashmir

Additional Secretary to Govt.
of India
Ministry of Water Resources
New Delhi

Secretary (Irrigation)
Govt. of U.P.
Sachivalaya
Lucknow

Financial Advisor & Joint
Secretary (Finance)
Ministry of Water Resources
New Delhi

Secretary to Govt of Assam
Irrigation Deptt.Chandmari
Guwahati

TECHNICAL ADVISORY COMMITTEE

1.	Chairman Central Water Commission	..	Chairman
2.	Member (WP&P) Central Water Commission	..	Member
3.	Member (RM) Central Water Commission	..	Member
4.	Director National Institute of Hydrology	..	Member
5.	Chairman Central Ground Water Board	..	Member
6.	Representative of India Meteorological Dept.	..	Member
7.	A Professor of Univ. of Roorkee	..	Member
8.	A Professor engaged in research in water resources area from one of the IITs	..	Member
9.	A Professor engaged in research in water resources area from one of the State Universities	..	Member
10.	Director of one of the Water Technology Centres	..	Member
11.	Expert of Hydrology in Individual capacity	..	Member
12.	Expert of Hydrology in Individual capacity	..	Member
13.	Head of one of the State Hydrology cell	..	Member
14.	Scientist F (to be nominated by Director) National Institute of Hydrology	..	Member

Note: Members at Sr.No. 8 to 13 will be nominated by the Chairman, Governing Body for a period of three years.

WORKING GROUPS

Constitution of Working Group for Surface Water

(Surface Water analysis and Modelling, Flood Studies, Hydrologic Design, Mountain Hydrology, Atmospheric Land Surface Process Modelling, Hydrometeorology, Watershed Development and Water Resources System divisions)

Chairman :

1. Director, National Institute of Hydrology

Members :

2. Chief Engineer (Hydrology)/Director (Hydrology RS) Central Water Commission
3. Chief Engineer (BPMO)/Director (Reservoir operation) Central Water Commission
4. Nominee of India Meteorological Dept.
5. Nominee of National Water Development Agency
6. Nominee of Central Water and Soil Training and Research Institute, Dehra Dun
7. Nominee of Indian Institute of Technology,Delhi
8. Nominee of University of Roorkee
9. Nominee of Irrigation Department, Uttar Pradesh
10. Nominee of Irrigation Department, Gujarat
11. Nominee of CWRDM, Kozhikode, Kerala
12. Nominee of National Centre for Medium Range Forecasting, New Delhi
13. Nominee of Indian Institute of Tropical Meteorology,Pune
14. Dr S Vedula, Indian Institute of Science, Bangalore

Convener :

15. Scientist F, NIH (to be nominated by Director,NIH)

Constitution of Working Group for Ground Water

(Groundwater Assessment, Conjunctive Use, Drainage, Drought Studies, Environmental Hydrology and Lake Hydrology divisions)

Chairman :

1. Director, National Institute of Hydrology

Members :

2. Nominee of Central Groundwater Board
3. Nominee of Groundwater Department, Andhra Pradesh
4. Nominee of Groundwater Department, Gujarat
5. Nominee of Groundwater Department Uttar Pradesh
6. Nominee of NABARD
7. Director (Water management) Central Water Commission, New Delhi
8. Nominee of National Geophysical Research Institute, Hyderabad
9. Nominee of Department of Environment,New Delhi
10. Nominee of Central Pollution Control Board, New Delhi
11. Nominee of U P Environmental Department, Lucknow
12. Nominee of Central Arid Zone Research Institute, Jodhpur
13. Nominee of Central Soil Salinity Research Institute, Karnal
14. Nominee of University of Roorkee
15. Dr R D Verma, Professor, M R Engg College, Jaipur

Convener :

16. Scientist F, NIH (to be nominated by Director, NIH)

Constitution of Working Group for Hydrological Observation and Instrumentation

(Hydrological Investigation, Hydrological Information System, Nuclear Hydrology, Hydrological Instrumentation and Remote sensing Application divisions)

Chairman :

1. Director, National Institute of Hydrology

Members :

2. Nominee of Central Water and Power Research Station, Pune
3. Chief Engineer (RM)/ Director (RD), CWC
4. Nominee of Space Applications Centre, Ahmedabad
5. Nominee of India Meteorological Department
6. Nominee of Indian Institute of Remote Sensing, Dehra Dun
7. Nominee of A P Engineering Research Labs, Hyderabad
8. Nominee of U P Irrigation Research Institute, Roorkee
9. Nominee of BARC, Bombay
10. Dr B P Singh, Nuclear Science Centre, New Delhi

Convener :

11. Scientist F, NIH (to be nominated by Director,NIH)

CONSTITUTION OF REGIONAL COORDINATION COMMITTEES OF NIH REGIONAL CENTRES

1. Deccan Hard Rock Regional Centre, Belgaum

Chairman

Director, NIH

Members

1. D.D.G. (Agrometeorology), India Meteorological Dept., Pune
2. Chief Engineer, Central Water Commission, Hyderabad
3. Director, Central Ground Water Board,Bangalore
4. Chief Engineer, AP Irrigation Deptt., Hyderabad
5. Chief Engineer, WRDO, Karnataka, Irrigation Deptt., Bangalore
6. Chief Engineer, Maharashtra Irrigation Deptt., Pune
7. Professor, Soil Science Agriculture University, Dharwar
8. Chief Engineer (GW), Tamilnadu

Member Secretary

Head, Regional Centre

* *In absence of Director, NIH, his nominee not below the rank of Sc. F will chair the meeting of RCC.*

2. North Eastern Regional Centre, Guwahati

Chairman

Director, NIH

Members

1. General Manager, Brahmaputra Board, Guwahati
2. Chief Engineer, Assam Irrigation Deptt., Guwahati
3. Chief Engineer, West Bengal Irrigation Dept., Calcutta
4. Chief Engineer, Mizoram

5. Advisor, (I, FC&WS), NEC Shillong
6. Chief Engineer, Central Water Commission, Shillong
7. Director, NE Region, CGWB , Guwahati
8. Professor M M Das, Assam Engineering College, Guwahati

Member Secretary

Head, Regional Centre

* *In absence of Director, NIH, his nominee not below the rank of Sc. F will chair the meeting of RCC.*

3. Western Himalayan Regional Centre, Jammu

Chairman

Director, NIH

Members

1. Chief Engineer, (J&K), Jammu
2. Chief Engineer , HP Irrigation Deptt., Shimla
3. Chief Engineer (WR), UP Irrigation Deptt., Lucknow
4. Representative of F.R.I., Dehradun
5. Director, SASE, Manali
6. Joint Commissioner (Indus), MOWR, New Delhi
7. Prof. M N Kaul, Deptt. of Geography, University of Jammu,Jammu
8. Representative of CWC to be nominated by Chairman, CWC

Member Secretary

Head, Regional Centre

* *In absence of Director, NIH, his nominee not below the rank of Sc. F will chair the meeting of RCC.*

4. Deltaic Regional Centre, Kakinada

Chairman

Director, NIH

Members

1. Chief Engineer, Andhra Pradesh Irrigation Dept., Hyderabad
2. Chief Engineer, Orissa Irrigation Deptt.,Bhubaneswar
3. Chief Engineer, Govt of Tamilnadu or his nominee
4. Professor Engineering College, Kakinada to be nominated by the Principal Kakinada Engineering College
5. Dr S R Singh, Director, Water Technology Centre, Bhubaneswar
6. Director, Centre for Water Resources, Madras
7. Director, State Ground Water Board, Hyderabad
8. Representative of NRSA, Hyderabad to be nominated by Director, NRSA

Member Secretary

Head, Regional Centre

* *In absence of Director, NIH, his nominee not below the rank of Sc. F will chair the meeting of RCC*

5. Ganga Plains Regional Centre, Patna

Chairman

Director, NIH

Members

1. Chief Engineer, Central Water Commission, Patna
2. Chief Engineer, DVC, Maithon
3. Representative of Chairman, GFCC, Patna
4. Director, (Hydromet), IMD,Patna
5. Chief Engineer, (Irrigation and Waterways), Calcutta
6. Chief Engineer & Director, WALMI, Patna
7. Chief Engineer (WR), UP Irrigation Deptt., Lucknow

8. Chief Engineer (Monitoring), Water Resources Deptt., Bihar

Member Secretary

Head, Regional Centre

* *In absence of Director, NIH, his nominee not below the rank of Sc. F will chair the meeting of RCC.*

STUDIES CARRIED OUT ON HYDROLOGICAL PROBLEMS IN THE VARIOUS STATES DURING THE YEAR 1994-95

ASSAM

i. Infiltration studies at Dudhnai (Assam & Meghalaya)

ii. Collection of isotopic data in precipitation for Indian subcontinent (Collaborative study with BARC) - Assam

iii. Remote sensing studies in selected reach of Brahmaputra

ANDHRA PRADESH

i. Hydrological modelling of river Nagavali (AP)

ii. Ground water quality monitoring in Kakinada (AP)

iii. Ground water balance in Bandar Canal command of Krishna Delta (AP)

GUJARAT

i. Flood regulation of Dharoi dam (Gujarat)

HIMACHAL PRADESH

i. Studies on precipitation distribution in Sutlej (HP)

JAMMU AND KASHMIR

i. Microwatershed studies are being undertaken for modelling and soil erosion studies in the Shivaliks at Rui watershed near Jammu. The study is with cooperation of Eco-task Force (Forest Deptt.)Jammu

KARNATAKA

i. Infiltration and permeability tests were carried out in Bagalkot, Biligi, Jamkhandi, Mudhol Taluks of Bijapur District.

ii. Pumping and recovery tests were carried out as a part of the work programme "Study of failure of open wells in Hukkeri taluk of Karnataka state"

MADHYA PRADESH

i. Studies on Geomorphology for Narmada (MP)

ii. Hydrological soil properties for subbasin of Narmada (M.P.) for determination of soil moisture, soil texture analysis infiltration and measurement of saturated hydraulic conductivity.

iii. Reservoir operation for Bargi (MP)

iv. Groundwater-tank interaction in Jabalpur district (MP)

v. Study of soil moisture movement and recharge to groundwater using tritium taging technique in Narmada catchment (MP)

vi. Infiltration studies near Narsinghpur, MP in Narmada basin

vii. Estimation of evaporation losses for Bargi Reservoir

MEGHALAYA

i. Representative basin studies at Dudhnai subbasin (Meghalaya and Assam)

ii. Water quality studies (Greater Guwahati /Dudhnai)

iii. Implementation of HEC-II model for Subbasin Digaru

iv. Hydrological and Engg. classification of soil (Dudhnai representative basin)

ORISSA

i. Ground water balance in Puri District, Orissa

RAJASTHAN

i. Indira Gandhi Nahar Pariyojna, Rajasthan for determination of soil moisture, soil texture analysis, infiltration and measurement of saturated hydraulic conductivity.

TAMILNADU

i. Hydrological year book for Palar basin (TN)

UTTAR PRADESH

i. Glacier studies on Dokriani (UP)

ii. Surface water and ground water interaction alongwith river Ganga between Hardwar and Narora using isotopic technique in UP.

iii. Hydrological studies of lake Naini in Uttar Pradesh

ORGANISATIONS TO WHOM PUBLICATIONS OF NIH WERE SENT DURING 1994-95

1. National Natural Resources Management System, Antariksh Bhavan, New Bell Road, Bangalore
2. Central Water and Power Research Station, PO Khadakwasla Research, Station, Pune
3. Indian Institute of Tropical Meteorology, Dr Homi Bhabha Road, Pune
4. Punjab State Council for Science and Technology, SCO 2935,Sec 22-C Chandigarh
5. Civil Engineering Department, University of Roorkee, Roorkee
6. Central Scientific Instruments Organisation, Sector 30, Chandigarh
7. Centre for Research in Rural and Industrial Development,2-A Sector 19 A, Chandigarh
8. Bengal Engineering College (Deemed University), PO Botanic Garden, Howrah, WB
9. Indian Institute of Technology, Civil Engg. Dept., Kharagpur
10. University College of Engineering, Dept. of Civil Engineering, Burla, Sambalpur, Orissa
11. College of Technology and Agricultural Engineering (Rajasthan Agricultural University, Bikaner), Campus, Udaipur,Rajasthan
12. Central Designs Organisation, Dr Jivraj Mehta Bhavan, Gandhinagar
13. Department of Science and Technology, New Mehrauli Road, New Delhi
14. Council of Scientific and Industrial Research, Rafi Marg, New Delhi
15. Bureau of Design and Hydel Irrigation (BODHI), Narmada Bhavan, Water Resources Department, Tulsi Nagar, Bhopal
16 Cauvery Technical Cell, 406 Pantheon Road, Egmore, Madras
17. University College of Science, Geography Dept,, 35 Ballygunge Circular Road, Calcutta
18. Ground Water Department, BRKR Govt Office Complex, Hyderabad
19. Ground Water Department, 8th Div., Hablok Road, Lucknow
20. Bidhan Chandra Krishi Visvavidyalaya, Dept. of Agricultural Engineering Mohanpur, Nadia, WB
21. Central Ground Water Board, 21 Central Bazar Road, New Ramdaspeth, Nagpur

22. GB Pant Institute of Himalayan Environment and Development, HP Unit, Shamshi Kullu, HP
23. Giri Institute of Development Studies, Sector O,Aliganj Housing Scheme, Lucknow
24. Centre for Water Resources Development & Management, Kozhikode,Kerala
25. Regional Engineering College, G T Road, Bye Pass, Jalandhar,Punjab
26. School of Continuing and Distance Education, Jawaharlal Nehru Tech. University, Hyderabad
27. Regional Engineering College, Warangal , AP
28. Madan Mohan Malviya Engineering College, Gorakhpur
29. Regional Institute of Technology, Jamshedpur
30 Manipal Institute of Technology, Manipal (South India) 576 119
31. Pondicherry Engineering College, Pillaichavady, Pondicherry
32. Narmada Control Authority, 27 Press Complex,AB Road, Indore MP
33. Technical Services Division, KERS, KR Sagara
34. Public Health Engineering Department, Madhya Pradesh , Bhopal MP
35. Visvesvaraya Regional College of Engineering, Nagpur
36. College of Agricultural Engineering, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar, Maharashtra
37. College of Engineering and Technology ,Orissa UOAT, Bhubaneswar
38. Institute of Hydraulics and Hydrology, Poondi
39. Government Engineering College, Jabalpur , MP
40. Hydrology Division, Bhakra Beas Management Board,Nangal Township, Punjab
41. Institute of Water Studies, Tharamani, Madras
42. STJ Institute of Technology, Ranebennour, Karnataka
43. Indian Institute of Technology, Civil Engineering Dept, Madras
44. Indian Agricultural Research Institute , (NRL Division), New Delhi
45. Centre for Water Resources Studies (Patna University), Bihar College of Engineering, Patna
46. Water and Power Consultancy Services (India) Ltd,Janakpuri, New Delhi
47. Indian Institute of Science, Bangalore
48. Civil Engineering Dept., HBTI, Kanpur
49. Haryana Agricultural University, Hissar
50. Gaugings Division, Public Works Department, Madras

51 Dept. of Agriculture and Cooperation, (Soil and Water Conservation Div), DAC, New Delhi

52. Water Technology Centre for Eastern Region, Sailashree Vihar, Bhubaneswar, Orissa

53. AP Engineering Research Lab, Himayat Sagar, Hyderabad.

54. Irrigation and CAD Dept., Errum Manzil, Hyderabad

55. Dam Safety Cell in Karnataka, KERS, Krishnarajasagar

56. L D College of Engineering,Ahmedabad

57. Water and Land Management Training and Research Institute, Hyderabad

58. CADA, Solapur, Maharashtra

59. Soil Conservation Department, Banda Division, Banda, UP

60 Subernrekha Project Unit, Bikash Bhavan, Adityapur, Jamshedpur, Bihar

61. Indian Institute of Technology, CED, Kanpur

62. Regional Engineering College, Kurukshetra

63. Kurukshetra University, (Dept ofGeophysics), Kurukshetra

64. WRDTC, University of Roorkee, Roorkee

65. Water and Land Management Institute, PO Box 80, Anand, Gujarat

66. Rajasthan Agricultural University, Udaipur

67. Central Planning and Designs Organisation, Bhubaneswar, Orissa

68. Institute of Development Studies Library, 8 B Jhalana Dungari Institutional Area, Jaipur

69. Centre for Water Resources, Anna University, Madras

70. Sri Krishnadevaraya University, Anantapur, Sri Venkateswarapurm, AP

FOREIGN ORGANISATIONS

1. The Delft Hydraulics, PO Box 152, 8300 AD , Emmeloord, The Netherlands

2. National Research Institute for Earth Science and Disaster Prevention Tennodai 3-1, Tsukuba, Ibaraki 305, Japan

3. Asian Institute of Technology, GPO Box 2754, Bangkok 10501, Thailand

4. SOGREAH, 6 Rue de Lorraine, 38130 Echirolles, Grenoble, France

5. Danish Hydraulic Institute, Agern Alle 5, DK 2970 Horsholm, Copenhagen, Denmark

6. National Water Research Institute, Environment Canada, 867 Lakeshore, Boulevard, Burlington, Ontario, Canada L7R 4A6

7. Swiss Federal Institute of Technology , Department of Geography ETH, Winterthuerstrasse, 190 , CH 8057, Zurich, Switzerland

8. International Comm. on Atmosphere-Soil-Vegetation Relations, CSIRO, Div. of Water Res., Canberra Lab, GPO Box 1666, Canberra City, Australia

9. Hydrologic Engineering Centre, Dept. ofArmy, Water Resources Support Centre, Corps of Engineers, 609 , Second St. Davis, California,95616 USA

10. Institute of Hydrology, Maclean Building, Crownmarsh Gifford, Wallingford Oxfordshire, OX10 8BB, UK

SCIENTIFIC AND TECHNICAL REPORTS PREPARED DURING 1994-95

1. Derivation of GIUH for small catchments of Upper Narmada and Tapi Sub-zone (3c)-Part-I
2. Processing of Hydrological Data for Narmada (upto Manot) Basin using HYMOS
3. Development of Flood Control Regulation Policy
4. Real-time flood forecasting
5. Identification of Aquifer Parameters in Narmada Basin
6. Groundwater Quality Monitoring and Evaluation in and around Kakinada, Andhra Pradesh
7. Prediction of Water Quality Parameters Using Statistical Approach in Upper Narmada Basin
8. Water Quality Modelling of River Kali Using QUALZE
9. Uncertainty Analysis of Dissolved Oxygen Model
10. Adsorption of Metal Ions on Sediments
11. Prediction of Longitudinal Dispersion Coefficient for Natural Stream
12. Hydrological Data Book for Narmada Basin (Upto Bargi Dam) 1981-90
13. Infiltration Study in a Sub-basin of Narmada basin
14. Groundwater Tank Interaction in Jabalpur District, Madhya Pradesh
15. Seasonal Groundwater Balance Study in Puri District, Orissa (Part-II)
16. Seasonal Groundwater Balance Study of Bandar Canal Command Area, Krishna Delta, Andhra Pradesh (Part II)
17. Development of Regional Flood Formula for Mahanadi Subzone-(3D).

18. Hydrological Study on Dokriani Glacier in Garhwal Himalayas (Part II)

19. Fluvial Geomorphological Characteristics of four Sub-basins of Upper Narmada

20. Estimation of Evaporation from free Water Surface in Semi-arid areas

21. Comprehensive Data Requirement for NWS DAMBRK with Selected Examples

22. Simple Linear Modelling of River Flow

23. Assessment of Recharge from Partially Penetrating in Fluent Stream

24. Conjunctive Use Studies of D-29 Command Area of Sriram Sagar Project, Andhra Pradesh.

25. Effect of Water Table Depth on Recharge due to Rainfall

26. Thermal Regime of Lakes

27. An Analysis of the Computerization Facilities for Technical Literature in NIH Library

28. Spillway Gate Regulation

29. A Model for Simulation of Multireservoir System for Conservation Operations

30. Parameter Determination in a Semipervious Stream-aquifer System

31. Effect of Urbanization on Hydrological Parameters

32. Comprehensive Hydrological Study of Narmada River Basin-Estimation Hydrological Soil Properties of Narsinghpur District

33. Regional Flood Frequency Analysis for Upper Narmada and Tapi Subzone 3(c)

34. Sensitivity Analysis Using Bats

35. Springflow Modelling of Different Geohydrological Conditions

36. Groundwater Balance before Introduction of Irrigation in Canal Command Area

37. Users' Manual for Design of Subsurface Drainage System under unsteady and Steady State Condition and Recharge

38. Failure of Open Wells in Hukkeri Taluka (Karnataka)

39. Measurement of Surface Soil Hydraulic Properties for Ghataprabha Command Area

40. Effect of Downstream Boundary Conditions as the Propagation Characteristics of the Dam Break Floods

41. Flood Protection Studies Using HEC2 Model on river Tawi near Bridge Site, Jammu

42. A Runoff Model for Snow dominated Catchments in Greater Himalayas

43. Water Quality Studies of Suriusai Lake in Jammu Region

44. Ground Water Quality Monitoring and Evaluation in Jammu District (J&K)

45. Remote Sensing approach to Sediment Deposition pattern in Massanjore Reservoir

46. Application of HEC1 Model for Flood Estimation at a proposed Barrage site at Hamidnagar

47. Establishment of Runoff Curve Number for Pun Pun Sub-basin Using IRS-1A LISS II data

48. Status of Ground Water Quality in Patna town

49. Determination of Flooded Areas and Flood Plain Characteristics of Mayurakshi river basin using IRS LISS II data

50. Representative basin Studies at Dudhnai -Part I Hydrometeorological aspects

51. Representative basin Studies at Dudhnai -Part II Infiltration Studies

52. Representative basin Studies at Dudhnai -Part III Hydrogeomorphological aspects

53. Network Design of Raingauge Stations for Nagaland.

PAPERS PUBLISHED/SENT FOR PUBLICATION DURING THE YEAR

1. International Journals

Choubey V K, "Ground truth collection and analysis considerations for suspended sediment correlation with remotely sensed data", Asian-Pacific Journal, Vol.6, No.2, 1994.

Choubey V K, "Monitoring water quality in reservoir with IRS-1A-LISS-I data", Water Resources Management, Vol. 8, No.2, 1994.

Choubey V K, "Monitoring surface water conductivity with IRS-1A data: A case study from central India", IAHS Publication No. 219, 1994.

Choubey V K, "The effect of properties of sediment type on the relationship between suspended sediment concentration and radiance", Hydrological Sciences Journal, Vol. 39, No. 5, 1994.

Chowdhary Hemant,R D Singh and S M Seth, "Derivation of Clark Model parameters using geomorphological characteristics", communicated to International Jour. of Water Resources Development, UK.

Chowdhary Hemant, R D Singh and S M Seth, "Time series analysis of water quality data of river Yamuna at Delhi, India", Submitted to Asian Environment, Philippines.

Divya and R Mehrotra, "Climate change and hydrology with emphasis on Indian subcontinent", Hydrological Sciences Journal, Vol. 40, No.2, 1995.

Jain S K and T Kishii,"Real-time flow forecasting", Report of the National Research Institute for Earth Science and Disaster Prevention, No. 54, Jan. 1995.

Jain S K and T Kishii, "River flow forecasting using ARMA model and Kalman filter", Submitted to the Japan Society of Civil Engineers.

Keshari Ashok K. and Bithin Datta, "Integrated optimal management of groudwater pollution and withdrawal", Ground Water, (accepted).

Kumar Sudhir, "Holocene landform and soil evolution in the western Gangetic plains: implications of neotectonics and climate", Accepted in Annals of Geomorphology.

Majumdar P K and B K Purandara, "Groundwater chemistry in Vaniyambadi - Vellore zone of Palar river basin in Tamilnadu, India", Communicated to International Journal of Hydrology.

Ponce V M and A V Shetty, "A conceptual model of catchment water balance 1. Formulation and calibration", Accepted in International Journal of Hydrology.

Ponce V M and A V Shetty, "A conceptual model catchment water balance 2. Application to runoff and baseflow modelling", Accepted in International Journal of Hydrology.

Singh Pratap, K S Ramasastri, U K Singh, J T Gergan and Dobhal,"Hydrological characteristics of Dokriani glacier in Garhwal Himalayas", Journal of Hydrological Sciences, Vol. 40, No.2.

Srivastava P, B Prakash, J L Sehgal and Sudhir Kumar, "Role of neotectonic and climate in development of the Holocene geomorphology and soils of the Gangetic plains between the Ramganga and Rapti rivers", Sedimentary Geology, Vol. 94, 129-151, 1994.

2. National Journals

Bhatia K K S and M Arora, "Surakshit paryavaran hetu jal vibhajak sansadhano ka vikas (in Hindi)", Institution of Engineers(I), 1-5, Vol. 75, Sept., 1994.

Bhatia K K S and Anup Kumar, "Sarvobhomic mridakshye samikaran ke vikas ke sameeksha bhag-I (in Hindi)", Institution of Engineers (I), 19-22, Vol. 75, Sept.,1994.

Bhatia K K S and R K Jaiswal,"Hindon Nadi mein ghulit Oxygen ka pramanikaran - ek tulnatamak adhyayan (in Hindi)", Institution of Engineers(I), Vol.76, March, 1995.

Chandramohan T, "Application of FESWMS-2DH in estuarine modelling", Communicated to Journal, Institution of Engineers (I).

Chandramohan T and Ramakar Jha, "GIS applications in hydrology - estimation of runoff curve number", Communicated to Photo Nirvachak Journal.

Chandramohan T, "Hydrological studies for watershed management", Communicated to Journal of AHI.

Choubey V K, "Assessment of sediment distribution pattern in the Tungabhadra reservoir using satellite imagery", Photonirvachak (ISRS), Vol.22, No. 2, 1994.

Divya and R Jha, "A study of sensitivity of evapotranspiration to expected climatic changes", The New Irrigation Era, Vol. LX, No.3, 1994.

Furquanullah M, "Contribution of Indian hydrologists in Journal of Hydrology: A scientometric analysis", Annals of Library Science and Documentation, Vol. 41, No. 3, 1994.

Garg Pankaj and M K Shukla, "Jal lagnata evam jal risav ka command khetra man nirdharan (in Hindi)", Bhagirath, July-Sept.1994.

Ghosh N C and S M Seth,"Atmospheric pollutant and their effect on quality of water", Indian Land of Environment Health, Vol.36, No.2, 1994.

Goel M K and P K Agarwal, "Operation of a reservoir for conservation storage regulation - a case study", Revised paper sent for publication in the Journal of IWRS.

Goel M K and S K Jain, "Evaluation of reservoir sedimentation using multitemporal IRS-1A LISS-II data", Revised paper sent for publication in the Journal of IWRS.

Haque M E and Rakesh Kumar,"Low flow forecasting - A review", Hydrology Journal of IAH, Roorkee, Vol. XVI, No.3 & 4, 1993.

Jain S K and A K Saraf, "GIS for the estimation of soil erosion potential", GIS India, Vol.4, No. 1, 1995.

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Kumar Rakesh, S M Seth and R D Singh, "Sensitivity analysis of the SHE model for a typical grid of Ganjal sub-basin of river Narmada", Hydrology Journal of IAH, Roorkee. Accepted.

Lohani A K and K N Tiwari, "IRS-1A upagrah dwara bhumi evam jal sansadhan chitran (in Hindi)", Institution of Engineers (I), No. 75, Vol. March, 1995.

Lohani A K, M Arora and R K Jaiswal, "Varshamapi network abhikalpan ki vibhinna vidhion ki bhartiya paridrashya main upyogita (in Hindi)", Bhagirath, Vol. April-June, 1994.

Lohani A K and K K S Bhatia, "Jal gunta adhyayan main sudur samvendan ki chamata (in Hindi)", Bhagirath, Vol. April-June, 1994

Majumdar P K, P V Seethapathi and B K Purandara, "Groundwater pollution in upper Palar zone of Palar river basin, Tamilnadu", Communicated to Journal of AHI.

Majumdar P K and P V Seethapathi, "State of art for groundwater quality modelling", Communicated to Commemorative volume to be published by University of Roorkee in the Honour of Prof. B B S Singhal.

Mishra S K and P K Garg, "Narmada nadi par pura barh technique dwara barh anuman (in Hindi)", Bhagirath, Oct-Nov. 1994 issue.

Shukla M K and M K Hardana, "Seepage and waterlogging problems in command areas - a case study", Accepted for publication in Civil Engineering Division of Institution of Engineers (I), 1994.

Singh R D, Rakesh Kumar and S M Seth, "Flood frequency estimates using revised Dicken's and Inglis formulae for lower Narmada and Tapi region" Subzone 3(b)", Accepted for presentation at the Annual Paper Meeting of the Civil Engineering Division, Institution of Engineers (I).

Singh R D and Rakesh Kumar,"Development of flood frequency relationships for Mahanadi basin subzone 3(d)", Sent for publication in J. of Institution of Engineers (I).

Singh U K, "Some rainfall features of North-East India", Vayumandal, Jan-June 95, Vol 24, No.1-2, PP 12-16, 1994.

Sinha S C and M Furquanullah, "Information profile of an Indian bibliometrician" Bibliometric study of Dr I N Sengupta's publications, 1969-92", Indian Journal of Information Library and Society, Vol. 7, No.3-4, 1994.

Venkatesh B and B K Purandara, "Simulation of Daily runoff for the catchments of the Hard Rock Region - A case study", Accepted for publication in Journal of IAH.

3. International Conferences

Devi Rama and Vijay Kumar,"Kringing of water levels in an irrigated area", Proc. International Conference on Remote Sensing and GIS, ICORG, Hyderabad, 3-6 Dec. 1994.

Devi Rama and Vijay Kumar,"Assessment of water availability in ungauged basins", Proc. Ninth Congress of the Asian and Pacific Division of the International Association for Hydraulic Research, Singapore, 24-26 Aug.1994.

Jain S K and M K Shukla, "Waterlogged hazard zonation using RS and GIS technique in a part of Sharda Sahayak command area", Accepted for publication in International Seminar on Disasters, Environment and Development, Delhi, Dec.9-12, 1994.

Jain S K and M K Goel, "Simulation of conservation operation of a multi-reservoir system", Accepted for publication, WRM '95 Conference to be held at Isfahan University of Technology, Iran, in Aug. 1995.

Jha R, S K Srivastava and Manohar Arora, "Reservoir sedimentation evaluation using IRS LISS-II satellite data", presented at International Symposium on Remote Sensing and GIS, Hyderabad in Dec. 1994.

Kumar Anil and P V Seethapathi, "Landslide hazard zonation using ILWIS", Accepted for the International Conference on Disasters and Mitigation to be held at Madras from Jan.19-22, 1996.

Kumar Rakesh, R D Singh and S M Seth, "Development of regional flood formula for Mahanadi Subzone-3(d)", Accepted for presentation in the International Conference on Disasters and Mitigation, to be held in Madras from Jan. 19-22, 1996.

Kumar Rakesh, R D Singh and S M Seth, "Effects of Errors in annual maximum peak floods on flood frequency estimates", Accepted for review for the International Conf. in Honour of Prof. J Bernier on Statistical & Bayesian Methods in Hydrological Sciences, to be held in Paris from 11-13 Sept.,1995.

Kumar Bhishm and Rm.P Nachiappan, "A mathematical approach based on tritium tagging technique to evaluate recharge to groundwater due to monsoon rains", Accepted for presentation in IAHS International Conference to be held in Boulder, USA from 4-14 July 1995 (and to be published in IAHS publication No. 43.

Kumar Bhishm and Rm.P Nachiappan, "Water column length correction - measurement of seepage loss from canal by single well dilution technique using radio tracer", Accepted for presentation and publication in the proceedings of IAHS International Conference to be held in Boulder, USA from 4-14 July 1995.

Nachiappan Rm.P, Bhishm Kumar and S V Navada, "Identification of groundwater isotopic index for surface water groundwater interaction studies", Accepted for publication in IAEA, International Conference on Isotopic Water Management held in Vienna, Austria from 20-24 March 1995.

Kumar Bhishm and B P Singh, "Is it correct to assume that movement of water in unsaturated soil strata is piston flow?', Proceedings of International Conference on Hydrology and Water Resources held in New Delhi on 20-22 Dec. 1993

Kumar Bhishm , Rm P Nachiappan and Rajan Vatsa, "A new technique for the calibration of neutron moisture probe",Proceedings of International Conference on Hydrology and Water Resources held in New Delhi on 20-22 Dec. 1993

Kumar Bhishm, "An automatic electronic infiltrometer", Proceedings of International Conference on Hydrology and Water Resources held in New Delhi on 20-22 Dec. 1993

Kumar Bhishm, et al, "A new automatic rainfall sensor", Proceedings of International Conference on Hydrology and Water Resources held in New Delhi on 20-22 Dec. 1993

Saraf A K and S K Jain, "Geographic information systems for mass balance studies of a Himalayan glacier and part of Antarctic shelf ice", SASE,Manali, 26-28 Sept. 1994.

Singh Pratap, K S Ramasastri and Naresh Kumar, "Study on snow distribution in Chenab basin", presented at International Symposium on Snow and Its Related Manifestations, held in Manali from 26-28 Sept.1994.

Singh Pratap, "Glacier mass balance and recession trends of hydrographs", presented at International Symposium on Snow and Its Related Manifestations, held in Manali from 26-28 Sept. 1994.

Soni, B et al ,"Optimal crop planning for Kansabahal Irrigation Project, Orissa, India", Submitted for presentation in the Regional Conference in WRM Conf. to be held at Isfahan, Iran in Aug. 1995.

Tyagi Aditya, R D Singh and S M Seth, "Water Quality Control under uncertainty", Submitted to International Conf. in Honour of Prof. J. Bernier on Statistical & Bayesian Methods in Hydrological Sciences, to be held in Paris from 11-13 Sept.,1995.

4. National Conferences

Bhar A K, "Status of measurement accuracy in the lake water balance studies", National Workshop on Advances in Hydrological Instrumentation, Roorkee, 25-26 Oct. 1994.

Bhar A K and G C Mishra, "Analysis of unsteady flow to a spring", 6th National Symposium on Hydrology, Shillong, 10-12 April 1994.

Chalisgaonkar D, "Artificial intelligence techniques in hydrology", National workshop on Advances in Hydrological Instrumentation, NIH Roorkee, 25-26 Oct. 1994.

Chandramohan T and S M Seth, "Sensitivity of dam breach parameters on resulting flood wave characteristics - a case study using DAMBRK", Presented in the Annual Paper Meeting of Institution of Engineers (I) at Mahalaxmi, Bombay, 7 Jan. 1995.

Chowdhary Hemant, R D Singh and Pratap Singh,"Stream gauging in India -Practices and problems", Proc. National Workshop on Advances in Hydrological Instrumentation, Roorkee, 25-26 Oct 1994.

Divya, A K Keshari and S M Seth,"Effect of subgrid scale variability in precipitation temperature and soil parameters on energy and moisture fluxes for central India", 8th National Space Science Symposium (NSSS-94),Trivandrum, 20-24 Dec.1994.

Jain S K, A K Saraf, U C Choubey and M T Geleta,"Estimation of potential runoff from a watershed using GIS technique", IIRS, Dehradun, 22-24 Feb.1995.

Kumar S and B Prakash ,"A Holocene soil chronoassociation in the western Gangetic plains", 1994.

Majumdar P K and B K Purandara, "Surface water availability for reservoir in water scarce zone - a reappraisal", Presented at XII Annual Convention of AHI and National Seminar on Hydrology, Poona University, 22-24 Dec. 1994.

Majumdar P K and B K Purandara, "Rainfall-runoff correlation for Malaprabha catchment", Presented in Balekundry Memorial seminar on Irrigation organised by Institution of Engineers (I) Belgaum Local Centre, Belgaum, 8 Jan.1995.

Patwary B C and P K Bhuyan, "Newer techniques of watershed measurements", National Workshop on Advances in Hydrological Instrumentation, Roorkee, 25-26 Oct. 1994.

Rangan D. Mohana and A B Palaniappan,"Network design of raingauge stations in Nagaland", presented in 6th National Symposium on Hydrology, held at Shillong, 10-12 April 1994.

Ramasastri K S, "Automated snow monitoring system for Himalayas", Proc. National Workshop on Advances in Hydrological Instrumentation, Roorkee, 25-26 Oct. 1994.

Ramasastri K S, "Meteorological applications in hydrology - recent advances", Tropmet 95, Hyderabad, Feb. 1995.

Rao S V N, "Undertaking representative, experimental and benchmark basin studies", presented in the Seminar on Hydrology, Pune, 22 Dec. 1994.

Saraf A K, R P Gupta, S K Jain and N K Srivastava, "GIS based processing and interpretation of ground water data", Proc. Regional Workshop on Environmental Aspects of Groundwater Development,Kurukshetra, 17-20 Oct. 1994.

Shetty A V, "Vaporization and wetting potential of an Indian hard rock catchment", Presented at XII Annual Convention of AHI and National Seminar on Hydrology, Poona University, 22-24 Dec. 1994.

Shukla M K and G C Mishra,"Canal discharge and seepage and waterlogging problems in command areas - a case study", Accepted for publication in Civil Engineering Division of Institution of Engineers (I), 1994.

Shukla M K and S K Jain ,"Remote sensing technique for mapping waterlogged and salt affected areas for district Barabanki", Proc. Regional Workshop on Environmental Aspects of Ground Water Development, Kurukshetra, Oct 17-19, 1994.

Shukla M K ,"Urban hydrology - some issues", presented at Workshop on Infrastructural Development in Human Settlement at Dept. of Architecture and Planning, University of Roorkee, Jan.13, 1995.

Shukla M K, et al,"Estimation of soil hydrological properties of Doab in Narsinghpur District of M.P.", Accepted for presentation in the National Conference on Agriculture Development, organised by NIC, New Delhi to be held during 24-25 May 1995.

Shukla M K, et al,"Assessment of soil degradation due to waterlogging and salinity problems in command areas", Accepted for presentation in the National Conference on Agriculture Development, organised by NIC, New Delhi to be held during 24-25 May 1995.

Shukla M K and G C Mishra, "Canal seepage and discharge relationship", 6th National Symposium on Hydrology ,Shillong, April 1994.

Singh Pratap, Hemant Chowdhary and K S Ramasastri, "Streamflow measurements in mountainous areas", Proc. National Workshop on Advances in Hydrological Instrumentation, Roorkee, 25-26 Oct 1994.

Soni B, "Salt and water movement using Green & Ampt equation", Accepted for presentation in the National Conference on Agriculture Development, organised by NIC, New Delhi to be held during 24-25 May 1995.

Soni B, et al,"Multi objective crop planning using Goal programming", Accepted for presentation in the National Conference on Agriculture Development, organised by NIC, New Delhi to be held during 24-25 May 1995.

Venkatesh B and B K Purandara, "Application of Wadi model for water resources management problems - a case study", presented at XII Annual Convention of AHI and National Seminar on Hydrology, Poona University, 22-24 Dec 1994.

Venkatesh B, "Peak flood estimation for sub basins of Krishna river using empirical formulae", Presented at XII Annual Convention of AHI and National Seminar on Hydrology, Poona University, 22-24 Dec. 1994.

Venkatesh B and K Ramamurthi, "Optimal irrigation scheduling for dry crops", Presented in Balekundry Memorial seminar on Irrigation organised by Institution of Engineers (I) Belgaum Local Centre, Belgaum , 8 Jan.1995.

Purandara B K , T Chandramohan and S Chandrakumar, "Optimal use of water resources for Belgaum Districts", Presented in Balekundry Memorial seminar on Irrigation organised by Institution of Engineers (I) Belgaum Local Centre, Belgaum , 8 Jan.1995.

APPENDIX-X

POSITION OF STAFF OF NIH AS ON 1.04.1994 AND 31.3.1995

S.No.	Description	Existing on 1.04.1994	31.3.1995
1.	Director	-	1
2.	Scientist F	3	2
3.	Scientist E	8	8
4.	Scientist C	18	19
5.	Scientist B	28	31
6.	Assistant Engineer	1	-
7.	Administrative Officer	-	-
8.	Finance Officer	1	1
9.	Documentation Officer	1	1
10.	Principal Research Assistant	2	2
11.	Section Officer	1	1
12.	Senior Personal Assistant	1	1
13.	Senior Research Assistant	21	22
14.	Senior Technician Asst.(Library)	1	1
15.	Senior Technician	1	1
16.	Superintendent	2	2
17.	Research Assistant	15	22
18.	Junior Research Assistant	-	9
19.	Junior Engineer	2	2
20.	Stenographer Gr I	1	1
21.	Assistant Superintendent	2	2
22.	Stenographer Gr II	7	7
23.	Hindi Translator	1	1
24.	Technician Gr I	1	1
25.	Technician Gr II	13	12
26.	Draftsman Gr II	2	2
27.	Technician Gr III	11	11
28.	Stenographer Gr III	9	10
29.	Draftsman Gr III	2	2
30.	Upper Division Clerk	5	5
31.	Lower Division Clerk	12	16
32.	Receptionist	1	1
33.	Driver	5	7
34.	Attendant	17	17
35.	Messengers	23	23
36.	Chowkidar	7	7
37.	Mali	4	4
38.	Safai Karmachari	4	4
	TOTAL	233	259

LIST OF AWARDEES UNDER SCHEME OF CASH AWARDS FOR

GROUP B C AND D STAFF

YEAR 1993-94

Group B:

Shri Naresh Kumar
Senior Research Asstt.

Shri Rajesh Goel
Senior P.A. to Director

Group C:

Shri Tilak Raj Sapra
Technician Gr II

Shri Qurban Azeem Ansari
Stenographer Gr II

Shri D. Mohan Rangan
Technician Gr III

Shri Paltu Ram
Driver

Group D:

Shri Tej Pal Singh
Attendant

Shri Ravindra Kawalekar
Messenger

Shri Satyender Prasad
Messenger

APPENDIX-XII (A)

VISITS OF CONSULTANTS UNDER UNDP PROJECT

S.No.	Name	Area of Consultancy	From	Period
1.	Dr Ian Cordery	Data Processing and Analysis	Australia	9 Nov.94 to 9 Dec. 94
2.	Dr Edwin T.Engman	Remote Sensing Applications	USA	1 March 95 to 15 March 95

APPENDIX-XII (B)

TRAINING OF SCIENTISTS

S.No.	Name	Area of Training	Place of Training	Period of Training
1.	Shri N C Ghosh	Environmental Hydrology	USA	8 May 94 to 7 Sept 94
2.	Shri A K Lohani	Data Processing	USA	2 Sept 94 to 1 Jan. 95
3.	Shri Y R S Rao	Data Processing	USA	1 Feb. 95 to 1 June 95
4.	Shri S V Vijaykumar	Deltaic Hydrology	UK	19 Feb. 95 to 19 June 95

EQUIPMENT PROCURED UNDER UNDP PROJECT

1. Sample Ring Kit
2. Automatic Weather Station (4 Nos)
3. Core Sampler
4. Unsaturated Permeameter
5. Wide Range PF Meter
6. Water Testing Kit

PARTICIPATION IN SEMINARS, SYMPOSIA AND CONFERENCES

Shri A K Lohani and R K Jaiswal attended the Computer Aided Design and Operation of Conjunctive Irrigation Project held on 2-7 May 1994 at Bihar College of Engineering, Patna.

Shri A K Lohani attended the International Symposium on Water Research and Management in Semiarid Environment held on 1-3 Nov. 1994 at Tucson, Arizona,USA.

Shri A V Shetty, Sc B; Shri B Venkatesh, Sc B and Shri B K Purandara, SRA attended the 12th Annual Convention and Seminar on Hydrology with a Special Colloquium on Sustained Water Resources Development in Drought Prone Area held on 22-24 Dec. 1994 at University of Poona, Poona.

Shri B C Patwary, Sc E attended the Training Course (as faculty) on Flood and Irrigation Management in Hilly Region held on 13 Sept. 1994 at Tezpur.

Shri B C Patwary, Sc E attended the Training course (as faculty) on Hydrology Obervation and Flood Forecasting held on 15 Dec. 1994 at Tezpur.

Shri B C Patwary, Sc E attended the Training Course (as faculty) on Watershed Management for Hilly Region held on 5-11 Jan. 1995 at Aizwal, Mizoram.

Shri B C Patwary, Sc E attended the Training Course (as faculty) on Hydrological Investigation and Project Preparation held on 21 Feb. 1995 at Tezpur.

Shri B C Patwary, Sc E and Shri B Chakravorty attended the National Workshop on Drainage Manual held on 28 Feb.-1 Mar. 1995 at Roorkee.

Dr Divya, Sc C attended the National Space Science Symposium, NSSS-94 held on 20-24 Dec. 1994 at Trivandrum.

Dr G C Mishra, Sc F; Shri A K Bhar, Sc E; Shri A B Palaniappan, Sc E, Shri M K Shukla, Sc B and Shri N C Ghosh, Sc C attended the 6th National Symposium on Hydrology with special reference to the N-E region held on 10-12 Apr 1994 at Shillong.

Dr K K S Bhatia, Sc F attended Water Resources Development in Mine Areas held on June 1-2, 1994 at Delhi.

Dr K S Ramasastri, Sc F;Shri A K Bhar, Sc E; Shri R D Singh, Sc E; Dr. V C Goyal Sc C, Dr Pratap Singh, Sc C, Shri N C Ghosh, Sc C and Shri Hemant Chowdhary, Sc B attended the National Workshop on Advances in Hydrological Instrumentation held on 25-26 October 1995 at Roorkee.

Dr K S Ramasastri, Sc F; Dr Pratap Singh,Sc C and Shri S K Jain, Sc C attended the International Symposium on Snow and Its Related Manifestations held on 26-28 Sept. 1994 at Manali.

Dr K S Ramasastri, Sc F attended the Workshop on Design Storm for Design Flood of Hirakud held on 10-11 Jan. 1995 at CWC, New Delhi.

Dr K S Ramasastri, Sc F attended the TROPMET 95 held on 8-11 Feb. 1995 at Hyderabad.

Shri M Furquanullah, STA (Library) attended the Training Course on Computer Applications in Library and Information Activities held on 5 Sept - 7 Oct. 1994 organised by INSDOC at New Delhi.

Shri M K Shukla, Sc B and Shri Vijay Kumar, Sc B attended the Indo-Dutch National Training Course on Irrigation and Drainage held on 4-18 Feb. 1995 at CCS, Haryana Agriculture University, Hissar.

Shri N Varadarajan, Research Assistant attended the Training Course on Radiation Safety Aspects of Nucleonic Gauges held on 16-20 Jan. 1995 at BARC, Bombay.

Shri P K Agarwal, SRA and Shri S L Srivastava, RA attended the Training Course on Fortran Programming held on 19-24 Oct. 1994 at NIH Roorkee.

Shri P K Majumdar, Sc C; Shri A V Shetty, Sc B; Shri B K Purandara, SRA and Shri N Vardarajan, RA attended the Balekundry Memorial Lecture and Seminar on Irrigation organised by Institution of Engineers (I), Belgaum Local Centre held on 8 Jan. 1995 at Belgaum.

Shri P K Sarkar, RA attended the Training on Neutron Probe held during 16-26 Jan. 1995 at BARC, Trombay, Bombay.

Shri S L Srivastava, RA attended the Training Course on PC held in June 1994 at NIH Roorkee.

Shri S K Jain, Sc C attended the ISRS Silver Jubilee Symposium on Remote Sensing for Environmental Monitoring and Management with special emphasis on Hill Regions held during 22-24 Feb. 1995 at Dehradun.

Dr S M Seth, Director attended National Symposium on Hydrology and delivered key note address at the inaugural function held during 9-12 April 1994 at Shillong.

Dr S M Seth, Director attended National Confrence on Conservative and Environmental Pollution of Historical Monuments held during 31 October 1994 at Delhi.

Dr S M Seth, Director attended the 8th International Soil Conservation Conference and chaired the session on the theme of Modelling Conservation and Productivity, held during 4-8 December 1994 at Delhi.

Dr S M Seth, Director attended Round Table Discussion on Management of Water Resources in Industry on the eve of World Water Day held on 21 March 1995 at Delhi.

Shri S V N Rao, Sc C attended the Seminar on Hydrology held on 22 Dec 1994 at Pune.

Shri T Vijay, Senior Research Assistant attended the Workshop on Pollution in Urban Environments held on 30 May to 13 June 1994 at Andhra University, Waltair.

Dr V C Goyal, Sc C attended the 8th International Soil Conservation Conference held on 4-8 Dec. 1994 at New Delhi.

Dr V C Goyal, Sc C attended the Technology Platform 95 held on 12-19 Feb. 1995 at New Delhi

Shri Vijay Kumar, Sc B and Shri A R S Kumar, attended the Short term Course on Remote Sensing for Water Resources Development and Management held on 24 June- 5 July 1994 at Centre for Remote Sensing, CED, University of Roorkee, Roorkee

Shri Vijay Kumar, Sc B and Shri S L Srivastava, RA attended the National level Training Course on Water Management in Command Areas held on 3-9 Jan. 1995 organised by WAPCOS, at NIH Roorkee.

Shri Vijay Kumar, Sc B attended the International Conference on Remote Sensing and GIS held on 3-6 Dec. 1994 at JNTU, Hyderabad.

Shri V S Jeyakanthan, Sc B and Shri A K Lohani, Sc B attended the Workshop on Remote Sensing Applications in Hydrology held on 12-16 Dec. 1994 at Calcutta.

Shri V S Jeyakanthan, Sc B attended the Proceedings of the Fifth User Interaction held on 14-15 Feb. 1995 at Hyderabad.

APPENDIX-XIV

LIST OF WORKSHOPS AND COURSES ORGANISED DURING 1994-95

S.No.	Title	Date	Place	Number of Participants
1.	Flood Routing and Flood Forecasting	25-29 Jul 1994	Nasik	19
2.	Project Hydrology	5-9 Dec 1994	Roorkee	
3.	Processing and Analysis of Precipitation Data	12-15 Dec 1994	Bhubaneswar	45
4.	Remote Sensing Applications in Hydrology	12-16 Dec 1994	Calcutta	25
5.	National Workshop on Drainage Manual	28 Feb-1 Mar 95	Roorkee	22
6.	Hydrological Analysis	28-30 Nov. 1994	Guwahati	60
7.	Reservoir Operation	19-23 Dec. 1994	Roorkee	12
8.	Estimation of Floods for Ungauged Catchments	17 Nov. 1994	Patna	39
9.	Catchment Hydrology	5-10 Dec 1994	Roorkee	22

TECHNICAL SEMINARS AT THE INSTITUTE DELIVERED BY GUESTS FROM OTHER ORGANISATIONS

Topic of the seminar	Date	Place	Speakers
Water Management in Command Areas organised by WAPCOS	3-9 Jan.95	NIH Roorkee	From Central/ State Govt. organisations

AUDITED STATEMENT OF ACCOUNTS

UTILISATION CERTIFICATE

Certified that the National Institute of Hydrology, Roorkee has utilised the Grant-in-aid as details hereunder during the financial year 1994-95 and the same has been verified with reference to accounting records maintained by the Institute and has been found to be correct:

Particulars	PLAN	NON PLAN	TOTAL
Opening Balance (as on 01.4.1994)	53555.82	18236.89	71792.71
Grant-in-aid received from Ministry of Water Resources, N.Delhi	25200000.00	14000000.00	39200000.00
Total	25253555.82	14018236.89	39271792.71
Less Payment	25211057.82	13981970.39	39193028.21
Closing balance as on 31.3.1995	42498.00	36266.50	78764.50

Sd/-
(Y.P.Singh)
Finance Officer

Sd/-
(S.M.Seth)
Director

For SATYENDRA & CO.
CHARTERED ACCOUNTANTS

Sd/-
(S.K. GUPTA)
PARTNER

Place : Roorkee
Date : 4th Aug. 1995

NATIONAL INSTITUTE OF HYDROLOGY, ROORKEE (U.P.)
BALANCE SHEET AS AT 31st MARCH, 1995

PREVIOUS YEARS(Rs.)	FUNDS AND LIABILITIES			CURRENT YEAR(Rs.)		PREVIOUS YEARS(Rs.)	ASSETS	CURRENT YEAR(Rs.)
	UNSPENT BALANCE						FIXED ASSETS (AT COST)	
61,193.51		OPENING BALANCE		71,792.71		6,64,31,957.83	(AS PER SCHEDULE 'A')	7,34,87,723.01
3,87,00,000.00	Add:	(a)	GIA FROM GOI.MOWR.ND	3,92,00,000.00				
(-)2,73,53,090.20		(b)	AMOUNT TRANSFERRED FROM CURRENT ASSETS FUNDS	35,38,423.60			BUILDING WORKS IN PROGRESS	
94,48,972.63	Less	(a)	AMOUNT TRANSFERRED TO FIXED ASSETS FUNDS	(-)2,13,65,865.18		87,60,900.00	(AS PER SCHEDULE 'B')	2,30,71,000.00
(-)2,07,85,283.23		(b)	AMOUNT TRANSFERRED TO INCOME & EXPENDITURE	(-)2,13,65,586.63				
						89,360.00	DEPOSITS (AS PER SCHEDULE 'C')	90,310.00
71,792.71	CLOSING BALANCE			78,764.50	78,764.50			
	ASSETS FUND ACCOUNTS						LOAN AND ADVANCES	
8,46,41,830.46	OPENING BALANCE			7,51,92,857.83		3,37,00,271.41	(AS PER SCHEDULE 'D')	3,06,71,041.09
(-) 94,48,972.63	Add: TRANSFERRED FROM GIA			2,13,65,865.18				
							PRE PAID EXPENSES	
7,51,92,857.83	SUB TOTAL			9,65,58,723.01	9,65,58,723.01	19,05,466.00	(AS PER SCHEDULE 'E')	12,64,803.00
	CURRENT LIABILITIES							
4,17,690.32	LIABILITIES FOR EXPENSES (AS PER SCHEDULE 'F')			2,87,170.60				
2,000.00	DEPOSITS (AS PER SCHEDULE 'G')			2,000.00		71,792.71	STATE BANK OF INDIA. UOR. ROORKEE	66,567.50
4,19,690.32	SUB TOTAL			2,89,170.60	2,89,170.60		CASH IN HAND	12,197.00
	CURRENT ASSETS FUNDS							
79,22,316.89	OPENING BALANCE			3,52,75,407.09				
2,73,53,090.20	Loss: TRANSFERRED FROM CURRENT ASSETS FUNDS			(-) 35,38,423.60				
3,52,75,407.09	SUB TOTAL			3,17,36,983.49	3,17,36,983.49			
11,09,59,747.95	TOTAL				12,86,63,641.60	11,09,59,747.95	TOTAL	12,86,63,641.60

Note : Schedule No. 'A' to 'G' are forming integral part of this Balance Sheet.

As per our report of even date attached
For SATYENDRA & CO., CHARTERED ACCOUNTANTS

Sd/-
(Y.P.Singh)
Finance Officer

Sd/-
(S.M.Seth)
Director

Sd/-
(S.K. GUPTA)
PARTNER

Place : Roorkee
Date : 4th Aug. 1995

NATIONAL INSTITUTE OF HYDROLOGY, ROORKEE (U.P.)

INCOME AND EXPENDUTER ACCOUNTS FOR THE YEAR ENDING 31st MARCH 1995

PREVIOUS YEARS (Rs.)	EXPENDITURE	CURRENT YEAR(Rs.) PLAN	NON PLANT	TOTAL	PREVIOUS YEAR (Rs.)	INCOME	CURRENT YEAR (Rs.) PLAN	NON-PLAN	TOTAL
1,11,27,464.30	SALARIES, WAGES AND ALLOWANCES	7,43,056.75	1,22,54,766.00	1,29,97,822.75	30,360.31	INTEREST ON SAVIGNS/ DEPOSITS	-	2,96,339.00	2,96,339.00
6,59,542.50	TRAVELLING AND CONVEYANCE	3,67,573.00	1,41,724.63	5,09,297.63					
11,882.60	NEWSPAPER AND PERIODICALS	-	-	-	42,967.44	MISCELLANIOUS RECEIPTS	6,276.00	91,946.82	98,222.82
3,58,327.60	ELECT./WATER AND GEN. RUN COST	2,82,488.60	2,37,332.00	5,19,820.60					
3,81,980.70	PRINTING AND STATIONAREY	3,53.294.35	69,320.00	4,22,614.35	27,265.00	INTEREST ON ADVANCE	-	1,17,126.03	1,17,126.03
10,03,674.10	POSTAGE, TELEPHONE AND TELEX	7,04,131.89	43,030.00	7,47,161.89					
4,28,228.00	SEMINAR/GRANTS	7,03,814.50	-	7,03,814.50					
3,21,004.00	ADVERTISEMENT	2,16,836.00	1,11,600.00	3,28,436.00	-	SUB TOTAL	6,276.00	5,05,411.85	5,11,687.85
12,67,065.00	PAINTING OF TECHNICAL BOOKS	4,09,154.00	-	4,09,154.00	-				
4,05,927.10	MISCELLANEOUS	4,30,714.27	1,81,181.82	6,11,896.09					
3,07,096.43	REPAIR & MAINT.OF VECHICLE	91,329.55	2,46,241.00	3,37,570.55	2,07,85,283.23	TRANSFERRED FROM GIA ACCOUNT TO MEET EXPENDITURE FOR THE YEAR	68,54,689.11	1,45,10,897.52	2,13,65,586.63
32,20,593.30	REPAIR & MAINT. OF OTHERS	19,42,714.59	9,27,028.92	28,69,743.51					
1,69,164.00	INTREST ON CPF	-	(-) 61,782.00	(-) 61,782.00					
5,02,477.00	EMPLOYER'S CONTRIBUTION TO CPF	-	6,17,028.00	6,17,028.00					
4,13,,644.25	RUNNING COST OF LAB./COMPUTER	5,54,811.61	18,878.00	5,73,689.61					
2,60,067.00	RENT,RATES & TAXES	61,046.00	2,29,961.00	2,91,007.00					
47,738.10	LOSS ON SALE OF ASSETS	-	-	-					
2,08,85,875.98	TOTAL	68,60,965.11	1,50,16,309.37	2,18,77,274.48	2,08,85,875.98	TOTAL	68,60,965.11	1,50,16,309.37	2,18,77,274.48

As per our report of even date attached
For SATYENDRA & CO., CHARTERED ACCOUNTANTS

Sd/-
(S.K. GUPTA)
PARTNER

Sd/-
(S.M.Seth)
Director

Sd/-
(Y.P.Singh)
Finance Officer

Place : Roorkee
Date : 4th Aug. 1995

NATIONAL INSTITUTE OF HYDROLOGY (U.P.)

RECEIPTS AND PAYMENTS ACCOUNTS FOR THE YEAR ENDING ON 31st MARCH 1995

PREVIOUS YEARS (Rs.)	RECIPTS	CURRENT YEARS(Rs.)			PREVIOUS FINANCIAL YEAR	PAYMENTS	CURRENT YEARS(Rs.)		
		PLAN	NON-PLAN	TOTAL			PLAN	NON-PLAN	TOTAL
61,193.51	OPENING BALANCE	53,555.82	18,236.89	71,792.71	1,08,93,866.50	SALARIES,WAGES & ALLOWANCES	5,27,368.00	1,19,25,405.00	1,24,52,773.00
					3,35,798.00	TREVELLING & CONVEYANCE	2,48,655.00	2,23,082.00	4,71,737.00
					3,80,598.00	ELETRICITY & WATER CHARGES	2,57,110.00	2,09,650.00	4,66,760.00
					3,83,554.30	PRINTING & STATIONERY	1,89,389.00	24,453.00	2,13,842.00
					7,71,230.60	POSTAGE TELEPHONE & TELEX	4,87,912.00	90,466.00	5,78,378.00
3,87,00,000.00	GIA RECEIVED FROM GIO/MOWR/ND	2,52,00,000.00	1,40,00,000.00	3,92,00,000.00	3,62,569.00	ADVERTISEMENT	2,16,836.00	1,11,600.00	3,28,436.00
					3.74,376.00	JOURNAL & PERIODICALS	5,39,582.00	-	5,39,582.00
					12,67,065.00	PRINTING OF TECHNICAL BOOKS	4,09,154.00	-	4,09,154.00
					16,94,509.00	REGIONAL CENTRES	9,30,000.00	1,77,810.00	11,07,810.00
					3,58,881.50	MISCELLANEOUS	1,93,638.00	73,117.00	2,66,755.00
					2,14,804.35	REPAIR & MAINTENCE OF VEHICLE	-	1,58,845.00	1,58,845.00
30,360.31	INTEREST FROM BANKS		2,96,339.00	2,96,339.00	35,71,443.85	REPAIR & MAINTENANCE-OTHERS	11,85,914.42	5,41,989.42	17,27,903.84
					6,71,641.00	INTREST OF CPF/CPF-CORTRIBUTION	-	5,55,246.00	5,55,246.00
					2,25,932.00	FURNITURE & FIXTURE	1,30,209.00	-	1,30,209.00
					11,91,542.00	OFFICE EQUIPMENT	70,503.00	-	70,503.00
1,23,521.34	MISCELLANEOUS RECEIPTS	6,276.00	91,861.50	98,137.50	7,68,645.00	LIBRARY BOOKS	2,29,083.00	536.00	2,29,619.00
					33,79,186.50	MACHINERY/LAB.EQUIPMENT/ COMPUTER	29,30,546.00	-	29,30,546.00
					49,483.00	RENT,RATES & TAXES	-	200.00	200.00
27,265.00	INTEREST ON ADVANCES		1,15,525.03	1,15,525.03	756.00	REMITTANCES	-	-	-
					5,58,189.00	BUILDING & BULK SERVICES	-	-	-
					3,99,782.00	RUNNING COST OF LAB./ COMPUTER	2,62,156.00	18,635.00	2,80,791.00
3,99,390.00	RECOVERY OF FIRMS ADVANCES	73,884.00		73,884.00	23,84,834.00	ADVANCES TO FIRMS	15,36,977.00	44,164.00	15,81,141.00
					45,869.85	DEPTT.ADVANCES/ADVANCE TO DIV.HEADS	5,97,575.40	3,06,885.50	9,04,460.90
	RECOVERIES OF ADD.TO EMPLOYEES	8,100.00	2,31,441.00	2,39,541.00	6,19,281.00	ADVANCES TO EMPLOYEES	17,010.00	2,55,053.00	2,72,063.00
					79,50,000.00	ADVANCES TO UOR	1,41,50,000.00	-	1,41,50,000.00
					4,16,100.00	SEMINAR & CONFERENCES	1,89,700.00	-	1,89,700.00
					71792.71	CLOSING BALANCES: AT BANK	31,982.00	34,585.50	66,567.50
						CASH IN HAND	10,516.00	1,681.00	12,197.00
3,93,41,730.16	TOTAL	2,53,41,815.82	1,47,53,403.42	4,00,95,219.24	3,93,41,730.16	TOTAL	2,53,41,815.82	1,47,53,403.42	4,00,95,219.24

As per our report of even date attached
For SATYENDRA & CO., CHARTERED ACCOUNTANTS

Sd/-
(Y.P.Singh)
Finance Officer

Sd/-
(S.M.Seth)
Director

Sd/-
(S.K. GUPTA)
PARTNER

Place : Roorkee
Date : 4th Aug. 1995

SCHEDULE-A

NATIONAL INSTITUTE OF HYDROLOGY

Fixed Assets as on 31st March 1995

Sl. No.	Particulars	Cost as on 01.4.94	Additions during the year	Sale/Adjust-ment during the year	Total Balance as on 31.3.95
1.	Building	15820873.06	Nil	-	15820873.06
2.	Land for colony	1234222.50	Nil	-	1234222.50
3.	Furniture & Fixtures	4245657.96	715373.05	-	4961031.01
4.	Office equipment	6143107.33	359922.60	-	6503029.93
5.	Computer Mach.	14696736.80	3328751.00	-	18025487.80
6.	Vehicle	1124826.50	554474.00	-	1679300.50
7.	Library Books	4239407.32	777073.00	-	5016480.32
8.	Machinery & Equipment	18721198.36	1320171.53	-	20041369.89
9.	Generator Set	205928.00	Nil	-	205928.00
	Total	66431957.83	7055765.18	-	73487723.01
Previous Year 31.3.1994		54882186.01	11549771.82	-	66431957.83

SCHEDULE B

NATIONAL INSTITUTE OF HYDROLOGY, ROORKEE

Building Works in Progress as on 31st March, 1995

Sl.No.	Particulars	Amount as on 01.4.1994	Addition during the Year	Amount as on 31st March 1995
1	U.O.R. Roorkee	8760900.00	14310100.00	23071000.00

SCHEDULE C

NATIONAL INSTITUTE OF HYDROLOGY, ROORKEE

Deposits as on 31.3.1995 (Made by NIH with outside parties)

Sl.No.	Particulars	Amount (Rs.) Plan	Non Plan	Total
1.	Security deposits for Gas Cylinders	1900.00	350.00	2250.00
2.	Deposits to UPSEB for sub station	-	8480.00	8480.00
3.	Security deposits for Telex	-	10000.00	10000.00
4.	Deposits with SAIL Gaziabad for steel	15000.00	-	15000.00
5.	SDO (Telegraph) for telephones	-	13800.00	13800.00
6.	Security deposits for telephone at RC Belgaum	8000.00	-	8000.00
7.	Distt. G.M. Telecomm for telephone connection at Guwahati	8000.00	-	8000.00
8.	M/S Deepti Gas Agency Guwahati	500.00	530.00	1030.00
9.	Accounts Officer (Tel) Jammu	6000.00	-	6000.00
10.	A.O.(Tel) Patna	16000.00 +950.00	-	16000.00 +950.00
11.	A.O.(Tel) Kakinada	800.00	-	800.00
	Total	57150.00	33160.00	90310.00
	Previous Year 31.3.1994	56200.00	33160.00	89360.00

SCHEDULE D

NATIONAL INSTITUTE OF HYDROLOGY, ROORKEE

Current Assets, Loans and Advances as on 31.3.1995

Sl.No.	Particulars	Amount (Rs.) Plan	Non Plan	Total
1.	Advances to firms	1348955.00	9132.00	1358087.00
	Sub Total	1348955.00	9132.00	1358087.00
2.	Advances to employees			
	a) Cycle Advance	Nil	8185.00	
	b) Festival Advance	Nil	35760.00	
	c) Fan Advance	Nil	200.00	
	d) Scooter Advance	Nil	349520.00	
	e) Car Advance	Nil	22400.00	
	f) LTC Advance	Nil	58053.00	
	g) TA Advance	41829.00	26850.00	
	h) Departmental Adv.	64290.00	4410.00	
	i) Pay advance	Nil	7150.00	
	j) Adv to Div. Head	4949.90	6708.95	
	k) House Building Adv	Nil	800971.00	
	l) Medical Advance	Nil	1000.00	
	Sub Total	111068.90	1321207.95	1432276.85
3.	Advances for construction			
	a) UOR, Roorkee	19989889.77		
	b) Ex.Engr.Const.Div. CPWD, New Delhi	1250000.00		
	c) Ex.Engr.Const.Div. Patna	1900000.00		
	d) Ex.Engr.& Monitority Div.No.17, Patna	2500000.00		
	e) Supdt. of works,PWD, DVC, Hardwar	207000.00		
	f) Ex.Engr.Elect.Div. Roorkee	1835000.00		
		27681889.77		27681889.77

4.	Amount transferred to RCs.			
	a) Belgaum	389.85	521.70	
	b) Guwahati	51870.66	13025.80	
	c) Jammu	64372.00	10447.36	
	d) Patna	26090.74	13163.98	
	e) Kakinada	12141.78	6763.60	
		154865.03	198787.47	
	Total	29296778.70	1374262.39	30671041.09
Previous Year (31.3.1994)		33055442.17	644829.24	33700271.41

SCHEDULE E

NATIONAL INSTITUTE OF HYDROLOGY, ROORKEE

Outstanding expenses as on 31.3.1995

Sl.No. Particulars	Amount (Rs.) Plan	Non Plan	Total
I. Establishment			
D.A. Arrear		140392.00	
OTA		9743.00	
RTF		2138.00	
Hon.		3574.00	
TA Advance		3645.60	
Wages	1909.00	9017.00	
II. O.E.			
Audit Fee		6000.00	
Telephone	7153.00	8853.00	
Running cost of Lab.	2000.00	-	
RRT (Guwahati)	-	10000.00	
III. Capital			
Office Equipment	45488.00		
Lab.Equipment	6839.00		
IV. Maintenance			
- of lab.equipment	12147.00		
- Building	14610.00		
V. Recoveries from salary			
NIH/GSLI/FP		3662.00	
Total	90146.00	197024.60	287170.60
Previous year (31.3.1994)	279874.00	137816.32	417690.32

SCHEDULE F

NATIONAL INSTITUTE OF HYDROLOGY, ROORKEE

Prepaid expenses as on 31.3.1995

Sl.No.	Particulars	Amount (Rs.) Plan	Non Plan	Total
1.	Telephone	2016.00	152.00	
2.	Journals	346805.00	-	
3.	Maintenance of office equipments	17330.00	3500.00	
4.	Maintenance of Computer	468850.00	426150.00	
	Total	835001.00	429802.00	1264803.00
	Previous year (31.3.1994)	1121677.00	783789.00	1905466.00

SCHEDULE G

NATIONAL INSTITUTE OF HYDROLOGY, ROORKEE
Deposits as on 31.3.1995
(made by outside parties with NIH)

Sl.No.	Particulars	Amount (Rs.) Plan	Non Plan	Total
1	Sri Nagendra Kumar for Canteen		2000.00	2000.00
	Total			
	Previous year (31.3.1994)	Nil	2000.00	2000.00

AUDITORS'' REPORT	REPLIES/ACTION TAKEN
We have audited the balance Sheet of NATIONAL INSTITUTE OF HYDROLOGY, ROORKEE as at 31st March, 1995 and also the annexed Income & Expenditure Account for the year on that date subject to the following observations :-	
1. PROJECT The accounts of the projects are being maintained separately. As these are also accounts of N.I.H., these should be suitably reflected in the overall accounts.	The accounts of the projects are being maintained separately as Utilisation Certificates are to be furnished to the Project Authorities.
2. FIXED ASSETS (Rs.7,34,87,723) 2.1 The Institute is having large number of T & P registers at different laboratories and the same needs to be compiled and reconciled with the financial books. The Institute should have a Centralised register and physical verification system needs improvements. The assets which have been created and records maintained at Regional Centres could not be verified by us.	The Central Stock Register has been made operational from 1st April, 95. Physical verification of T&P items at Headquarters as well as regional centres has been carried out as on 31.3.95 and stock verification reports were shown in audit. The suggestions for improvement in stock verification system are noted for future compliance.
2.2 LAND AT KAKINADA The possession of the land has been handed over by State Govt but legal formalities like lease deed etc. have not been executed. A sum of Rs.1.75 lakhs was incurred for fencing of the land.	The draft lease deed agreement was under examination at the Ministry and will now be placed in the 47th meeting of GB of NIH on 25.9.95 and further necessary action shall be taken.
3. ADVANCES (Rs.2,76,81,889) As pointed out in our last year audit report, subsidiary ledgers have been maintained, but some suggestions have been made for improvement.	Suggestions have been noted for future compliance.

3.1 EX.ENGR. CONSTRUCTION DIVISION, WALMI PATNA (Rs.44.00 lacs)

As pointed out in our last year audit report, the above advance was given for construction of the building without executing the legal formalities for transferring the land at Patna. No terms and conditions were settled and negotiated and estimate of Rs.91.64 lacs was approved. The work of Rs.63.61 lacs was executed by WALMI and demanding Rs.19.61 lacs.

The matter for lease deed is pending with Govt. of Bihar and is being pursued. The buildings are being constructed by an agency of Bihar Govt., as per the terms and conditions for deposit works.

3.2 UNIV. OF ROORKEE Rs.(23071000+19989889) =Rs.4,30,60,889

As pointed out in our last year audit report, the above advances are outstanding since long against construction of building. A copy of detailed terms and conditions between N.I.H. and U.O.R., Roorkee as approved had not been provided to us for our verification.

All construction works of NIH for buildings at Roorkee are being carried out by Univ. of Roorkee as deposit works as per UPWD norms since 1980. During 1994-95 the works to the tune of Rs.143.00 lakhs were completed and additional advance was given. The works are progressing well as per schedule. Settlement of advances will be made after completion and handing over of works.

3.3 EX.ENGR.CONSTRUCTION DIV., CPWD, NEW DELHI Rs.12,50,000

As pointed out in our last year audit report, the above advance was given for construction of Guest House at New Delhi and outstanding since long. It is reported that work has still not been commenced.

The matter has been taken up with Ministry of Water Resources and also being followed with CSMRS.

3.4 EX.ENGR.UPSEB, ROORKEE (Rs.18,35,000)

As pointed out in our last year audit report, the above advance was given for colony electricity new connection and is outstanding since long.

UPSEB, authorities at Meerut and Lucknow were approached for early decision of Urban Feeder for staff colony and matter is being pursued constantly.

3.5 ADVANCES TO FIRMS (Rs.13,58,087)

The above advances are outstanding and efforts should be made to recover/adjust the same at the earliest.

The matter is being pursued with concerned firms for expediting the supply of items and to adjust the outstanding advances.

3.6 ADVANCES TO STAFF MEMBERS (Rs.14,32,276)

As pointed out in our last year audit report, it includes the advances of departmental, Housing, LTC, Scooter, Fan, Festival etc. Advance registers have been maintained to control the advances. However, it is suggested to maintain the same in proper subsidiary ledgers.

Suggestions have been noted for compliance.

4. REGIONAL CENTRES (Rs.3,53,652.50)

The Institute has shown the above amount towards the Regional Centres as on 31st March 1995. The Regional Centres are having the bank balances and the same have been reflected in the accounts as advances.

No comments required.

5. INTERNAL CONTROL

As pointed out in the last year's audit report, improvements have been made. However, further strengthening is suggested. The purchase procedures are generally followed but needs improvement.

Noted for compliance.

6. CASH AND BANK BALANCES

6.1 STATE BANK OF INDIA, ROORKEE (Rs.66,567.50)

The same as per bank is Rs.93,46,132.50 on 31.3.95 and there are number of entries in the bank reconciliation.

No comments required.

6.2 IPOs of Rs.4951.00 were deposited in 1990-91 but bank has not given credit so far.

The matter was taken up with the bankers for giving credit.

6.3 State Bank of India had debited Rs.11,466.00, Rs.4273.00 and Rs.10,000.00 in 1993-94 and needs adjustment.	Credit of Rs.12,963/- has been given by bank on 17.8.95. The matter for adjustment of Rs.2776/- (out of the amount of Rs.11466) and Rs.10,000/- has been taken up with the bankers.
6.4 A cheque of Rs.8250.00 was deposited on 25.04.94 but no credit was given so far.	Action to obtain the credit from the bank is being taken.
6.5 Interest amounting Rs.87232.00 was not credited by bank as explained.	- do -
7. ACCOUNTS The accounts are being maintained on double entry system, but needs improvement. The Institute should have an Accounts Manual to follow the accounting standards and norms.	Suggestions are noted for future compliance. The matter for preparation of Accounts Manual is under consideration with Controller of Accounts, Min. of Water Resources, New Delhi.
8. The balances due to and due from are subject to confirmation.	No comments required.
9. Subject to the aforesaid observations and report that:	No comments required.
9.1 We have obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purpose of our audit.	
9.2 The balance sheet and the Income & Expenditure Accounts dealt with by the report are in agreement with the books of account.	
In our opinion and to the best of our information and according to the explanation given to us, the statements together with the schedule attached give a true and fair view.	

i. In the case of the Balance sheet of the state of affairs as at March 31st 1995 and

ii. In the case of the Income & Expenditure Account of the Deficit for the year ended on that date.