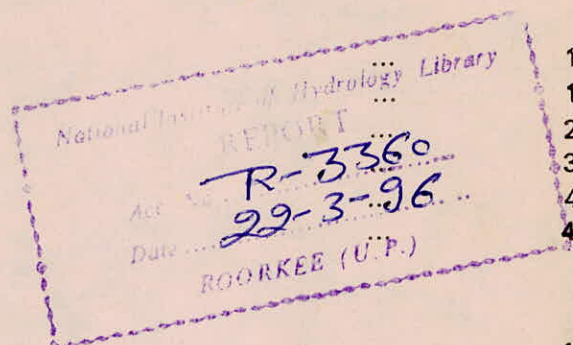


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NIH's Objectives

To undertake, aid, promote and coordinate systematic and scientific studies in theoretical and applied hydrology so as to improve the present practices in planning, design and operation of water resources projects.

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

To establish and maintain a research reference library in pursuance of the objectives of the Society and equip the same with books, reviews, magazines, newspapers and other relevant publications.

To do all other such things as the Society may consider necessary, incidental or conducive to the attainment of the above objectives.

SUMMARY

National Institute of Hydrology (NIH) is an autonomous research Society under the Ministry of Irrigation, Government of India. It is a national research organisation entrusted with carrying out systematic scientific research activities in basic, theoretical and applied hydrology which has very great relevance to national planning and developmental activities in the area of water resources.

The Institute started functioning in February 1979 with Dr. S. Ramaseshan as the Director. The Institute will have in the first phase six scientific and technical divisions in the areas of Information System, Hydrologic Analysis (Surface Water), Hydrologic Analysis (Ground Water), Hydrologic Synthesis (Surface Water), Hydrologic Synthesis (Ground Water) and Integrated Planning, and will also have two administrative divisions, one for General Administration and the other for Finance and Accounts.

The recruitment of scientists and staff, the procurement of equipment, etc., are in progress.

UNDP is assisting in the setting up of this Institute in terms of provision of a Chief Technical Advisor; 6 man-months of consultancy; study tours for the Director and senior scientists; fellowships for the junior scientists and equipment. They are in various stages of procurement or attainment as the case may be.

This annual report specifically present the salient points of the progress and programmes of National Institute of Hydrology with particular reference to the year 1981-82.

DIRECTOR'S INTRODUCTION

The National Institute of Hydrology (NIH) was set up in December, 1978 as an autonomous Society under the Ministry of Irrigation, Government of India with its registration under the Societies Registration Act 1860. The headquarters of the Institute is at Roorkee (UP). The Union Minister for Irrigation is the President of the Society and it has a number of official and non-official scientific and technical and administrative members as shown in Appendix-I. The affairs and funds of the Society are managed, administered, directed and controlled subject to rules, bye-laws and orders of the Society by a Governing Body. The Secretary, Ministry of Irrigation, Government of India is the Chairman of the Governing Body and the other members include Secretaries to a number of Ministries; Chairman, Central Water Commission; Vice Chancellor, University of Roorkee; Director General, India Meteorological Department; etc., as indicated in Appendix-II.

The Institute is a national research organisation entrusted with carrying out systematic scientific research activities in basic, theoretical and applied hydrology which has great relevance to national planning and developmental activities in the area of water resources.

NIH was formally registered as an autonomous research Institute in December 1978 and Dr. S. Ramaseshan joined as the first Director in February 1979. The progress

and programme of the Institute since then have been presented in 3 earlier annual reports, viz., 1978-79, 1979-80 and 1980-81. This report covers the period from April 1981 to March 1982. The report presents in addition to Director's introduction, a general report on the programmes and progress of NIH in its various aspects and also briefly reports separately on the research activities and highlights of research.

The Institute has completed nearly 3 years in its first phase of 5 years and is planning for the programme and progress not only for the next 2 years of this phase but also with reference to consolidation of present research activities and diversification during the next phase between 1984-89. Deliberations and investigations indicate that some of the basic data with reference to various characteristics of hydrologic process are not generally available. In order to ensure that they are collected, compiled, analysed, interpreted and used in hydrologic modelling and design, the Institute is proposing setting up of a number of automated hydrologic stations in India in collaboration with other academic and research organisations. The National Flood Commission has indicated certain priority areas of research with reference to floods where NIH should contribute. It has also suggested setting up of 4 regional stations of NIH. Accordingly a proposal for setting up atleast 2 of the 4 regional centres in the second phase is being planned.

The Institute is presently functioning in a rented accommodation provided by the University of Roorkee. The Administrative Building of NIH is under construction and is expected to be ready by October 1982.

A library devoted to publications and journals on several areas of hydrology and water resources is being set up. The UNDP equipment for the NIH consists essentially of a VAX-11/780 computer system, which is expected to be received in April 1982. It is hoped that the computer may be installed and tested by July 1982. The availability of the minicomputer will significantly improve the progress of research in NIH. There is also a significant improvement in the recruitment of scientists and staff of the Institute and the research activities have also gained momentum. The various activities are presented in the next section in greater detail.

NIH is being developed as a centre of excellence in scientific research with particular reference to the area of hydrology and water resources. Its research activities have gained momentum and it is hoped that the experience, expertise and research findings will contribute to the optimal development of national water resources.

I am extremely thankful to the advice and blessings of the President, Vice President and members of the Society. I wish to acknowledge the help, guidance and direction received from Sri C.C. Patel, Chairman, Governing Body; Chairman, Central Water Commission; Vice-Chancellor, University of Roorkee and other members of the Governing Body, officials of the Ministry of Irrigation and other organisations.

I wish to acknowledge the help and cooperation I received from the Chairman and members of the Technical Advisory Committee, and members of the Working Groups in our deliberations and decisions concerning the details of research activities.

I am very thankful to the officers and staff of NIH for the cooperation and services to the NIH.

Finally it is hoped that with significant progress in recruitment of scientists and staff, with the arrival of the computer and with the administrative building expected to be ready by October 1982, the research work of NIH will progress significantly with speed and momentum.

NATIONAL INSTITUTE OF HYDROLOGY ROORKEE

ANNUAL REPORT

1981-82

Introduction

The genesis, the objectives, the constitution and the management of NIH have been indicated in Director's introductory remarks.

Organisation

The President of the Society is the Union Minister for Irrigation. The affairs and funds of the Society are being managed, administered, directed and controlled subject to rules, bye-laws and orders of the Society by the Governing Body with the Secretary, Ministry of Irrigation as its Chairman. The other members of the Governing Body have been drawn from several other ministries and organisations including Central Water Commission, Central Ground Water Board, India Meteorological Department, etc. The Director, National Institute of Hydrology is the Member-Secretary of the Governing Body and the Society and is also the Chief Executive of the NIH.

In order to implement the objectives of NIH, the organisation of the Institute is planned to consist of six scientific and technical divisions, one each in the area of Information System, Hydrologic Analysis (Surface Water), Hydrologic Analysis (Ground Water), Hydrologic Synthesis (Surface Water), Hydrologic Synthesis (Ground Water) and Integrated Planning, and two administrative divisions one for General Administration and the other for Finance and Accounts. The detailed organisational chart of NIH is presented in Fig. 1.

Presently an Officer of the level of Scientist 'F' (Rs. 2000-2500) is in position and offers of appointment have been made to fill up one post each of Scientist 'F' & Scientist 'E' (1500-2000). In addition we have 6 Scientist 'C' (Rs. 1100-1600), 5 Scientist 'B' (Rs. 700-1300), 3 Senior Research Assistants, 3 Research and Technical Assistants and other supporting staff. At present all the scientific activities are being conducted under a single scientific division and a Divisional Head. With the recruitment and expected joining of other senior scientists, it is expected that they may be divided into about 3 divisions in the year 1982-83.

The administrative divisions are being headed respectively by a Chief Administrative Officer and Finance Officer and assisted by a Superintendent and other administrative group 'C' staff.

The Institute is presently functioning in a rented accommodation provided by the University of Roorkee and an additional accommodation has been rented in the city for the Administrative Divisions. It is expected that the administrative building of the Institute will be ready by October 1982 and the problem of Office accommodation for the scientists and the staff of the Institute will reduce when the Institute moves to its own building.

Meeting of Authorities

The Second Annual General Meeting of the National Institute of Hydrology Society was held on 1 October 1981 to review the progress and performance of the Institute. It also considered the annual report and audited accounts of the Society for the years 1979-80 and 1980-81 and further amendments to certain Rules and Regulations of NIH Society. At the instance of the President of the NIH Society, a Special General Meeting of the Society was held on 27 January 1982 at Roorkee to review the progress of the Institute. It also considered amendments and alterations to Rules and Regulations of NIH Society and the Working Rules governing the service conditions of the employees of the Institute. Several directions were given in the above meetings to the Institute with reference to its activities.

The Governing Body of NIH has met four times during the year under review viz., on 26 June 1981, 24 September 1981, 8 January 1982 and 30 March 1982. Several decisions concerning the administration of the Institute, procurement of equipment, provision of funds for the appropriate functioning of the Institute, identification of priority areas of research and programme and progress of research activities of the Institute were taken.

The Technical Advisory Committee has been entrusted with the technical scrutiny of programme and progress of research work of NIH. The terms of reference and constitution of Technical Advisory Committee is given in Appendix-III. The Technical Advisory Committee met on 18 September 1981 and several decisions on the revision of the workplan and research activities of the Institute were taken.

A Consultative Committee for UNDP Project at the National Institute of Hydrology has been constituted by the Ministry of Irrigation, which met on 21 August 1981 and recommended the policy initiatives and coordination required to meet the objectives of the project.

The Coordination Committee of NIH has been set up to ensure effective coordination between University of Roorkee and NIH. It met on 2 occasions during the year under review i.e. on 8 September 1981 and 3 March 1982 and several decisions concerning the coordination between University of Roorkee and National Institute of Hydrology were taken.

The Governing Body has identified 8 priority areas of research for NIH. In order to monitor and advise the research activities under each of these areas, the Governing Body has Constituted 8 working Groups for these priority areas. The constitution of the Working Groups is enclosed in Appendix-IV. These Working Groups were constituted in this year itself and

only one meeting of a Working Group viz., Evolution of Methodologies for Flood Estimation, Forecasting and Control was held on 17.10.1981 in this year.

UNDP Project

The project has been included in the Country Programme of UNDP assisted projects and UNDP is contributing US \$ 900 550 for establishing the Institute on which the Government of India contribution would be Rs. 128,85,000 spread over a period of five years.

The UNDP contribution is under three broad heads viz.,

i) Consultancy:

It includes visits on a number of occasions for a total period of 12 months by the Chief Technical Advisor and 6 man months consultancy by other experts to be identified by the Project. Prof. U. Maniak, Professor, Braunschweig University, West Germany has so far visited the Institute 6 times approximately at 6 months intervals for providing consultancy as the Chief Technical Advisor. During the year under review Prof. Maniak had visited in July-August 1981 and at that time the workplan was revised and the project documents for phase-II of the Institute for a duration of 5 years were prepared. A consultant in Ground Water area had visited the Institute from 7 July 1981 to 27 July 1981 for a period of 3 weeks.

ii) Study Tours and Fellowships:

The original project document included a study tour for a period of 3 months each for Director and Senior Scientists and training fellowships for the scientific personnel for a total period of 120 man months. Dr. S. M. Seth, Scientist 'F' had undertaken a study tour for the period of 8 weeks to Europe and United Kingdom and had held detailed discussions with a number of experts in different institutions/organisations and universities and also made visits to field stations. He also identified potential areas and places of training for the scientists.

Two scientists have completed fellowships training in the field of computer hardware and software and system management training for VAX-11/780 system at the DEC Training Centre, U.S.A. One scientist has been sent for training in the field of Watershed Simulation by Mathematical Models at the US Department of Agriculture Hydrology Laboratory, U.S.A. and Agricultural University, Wageningen, The Netherlands and is expected to return to India by June 1982.

Another scientist deputed to have his training fellowship in the area of groundwater, water hydrology, has gone for training in the field of regional modelling of ground water system with the National Centre, US Geological Survey, Reston, U.S.A. The fellowship application forms of 3 more scientists have been processed through UNESCO in the specialised

fields of Hydrology viz., flood routing and flood forecasting, design storm for hydraulic structure and precipitation forecasting; and reservoir operation and they are likely to go for training during the year 1982-83.

iii) Equipment:

There is a provision for equipment of \$ 454 685 under the UNDP Project. A VAX-11/780 mini-computer system has been despatched from U.S.A. and is expected to be received by the Institute some time in the first week of April 1982. The installation and testing of the computer may take place about 2 to 3 months of its arrival at the site. The system is likely to be operational by July 1982.

Ancillary equipment available in India for use in the mini-computer system are being identified and procured. Furthermore, equipment to be provided for research work during the remaining period of project which can be procured within India or under UNDP Project have also been identified.

Building and Services:

The National Institute of Hydrology is presently located in a rented building of the University of Roorkee. The administrative offices are located in a nearby location in the Civil Lines area in another rented building. The construction of the main building of the Institute has been entrusted to the University of Roorkee as a deposit work. This building has an area of 1400 Sq. m., the construction work of the building is progressing satisfactorily and the building will be ready for occupation by October 1982. Actions for a sub-station and for a tubewell are in progress.

Accounts and Finance:

The Government of India, Ministry of Irrigation provided as grants-in-aid an amount of Rs. 33 lakhs to the NIH during the year under review. The actual expenditure for the year 1981-82 was of the order of Rs. 30.65 lakhs. The provision of Rs. 37.00 lakhs has been made in the budget estimate for the year 1982-83. The audited statement of accounts for the year 1981-82 consisting of receipts and payments of accounts, income and expenditure account and the balance sheet as at 31.3.1982 duly certified by the auditors are enclosed at Appendix-~~1182~~ VII

RESEARCH ACTIVITIES

Research Programmes:

The details of the research programmes of NIH have been considered by the Technical Advisory Committee, Governing Body and the NIH Society. NIH will consider the entire hydrologic cycle and the various components including man's influence on the water resources. Accordingly they will deal with various component processes of the hydrologic cycle and

their interaction in the evaluation and utilisation of surface and groundwater resources with particular reference to hydrologic analysis, hydrologic synthesis and integrated planning. However, initially NIH will concentrate on basic(theoretical) and applied (engineering) aspects of hydrology with particular reference to the development of methodologies using field data and net studies of field problems as such. The activities of NIH will include the following:-

- (i) Research which may involve development of systematic (mostly computer oriented) procedures for hydrologic analysis and synthesis including planning to enable less experienced personnel to use the procedures satisfactorily with minimum guidance and to save time for experienced specialists; and theoretical and basic studies in hydrology for understanding the component processes and their interactions. In particular research activities deal with :-
 - (a) Measuring techniques, data collection and processing.
 - (b) Hydrological analysis of surface and/or ground water systems and the component processes including precipitation, infiltration, evaporation, consumptive use, surface water, soil moisture and ground water.
 - (c) Hydrological synthesis or planning of surface water, ground water and conjunctive utilisation.
- (ii) Methods Systemisation: To standardise and systemise methods for analysis and synthesis on a national basis in collaboration with National and State Government agencies.
- (iii) Documentation: To develop a proper system of documentation of research results including working papers, reports, programmes' manuals, user manuals, training documents, etc
- (iv) Training: One or two training seminars of a week's duration per year on new methodologies including the application of computer programmes with respect to intensive and effective training in hydrologic analysis.
- (v) Special Assistance: To provide assistance and advice for engineers/scientists in the application of procedures developed or implemented by NIH and/or in the application of other procedures for unusual problems in the field.
- (vi) Planning Assistance: To develop a consultation capability so that sponsored projects can be taken up by NIH outside the regular budget for the solution of complex problems.

The Institute is in the process of establishment. Naturally the initial activities are now concentrated on research while other activities are expected to follow soon.

The following problems have been identified as priority areas of research of NIH :-

- (1) Hydrologic analysis of streamflows in a basin.

- (2) Water balance of river basins.
- (3) Watershed models including those for snowfed basins and basins with limited data.
- (4) Method of operation of a system of reservoirs taking into consideration the effect of irrigation, flood control and power generation.
- (5) Evolution of mathematical models for storm precipitation for flood estimation.
- (6) Evolution of methodologies for flood estimation, forecasting and control.
- (7) Methodology for ground water estimation and development.
- (8) Study of extreme storms and floods and their implications in Hydrologic synthesis.

Brief highlights of research activities in these areas are indicated here.

Hydrologic Analysis of Streamflows:

Planning and development of surface water resources depends very much on available limited records of streamflows. However, historical records may exhibit seasonal and probabilistic fluctuations in space and time. It is also possible that short historical records may be unrepresentative of future fluctuations particularly if the records are short. In order to study the seasonal (temporal) variation of streamflows and also their random variability frequency analysis, regression analysis, time series analysis and stochastic approach including data generation can be used. The technology used for stream flows can also be applied to study the characteristics of rainfall, ground water, water quality, etc. separately and jointly.

NIH has developed and/or implemented several approaches for statistical analysis of streamflows. These include :-

- (i) Frequency analysis for fitting different probable distributions which is generally suitable for seasonal, monthly, and 10 daily streamflows rainfalls, etc. These methods have been tested with some data of streamflows in river Ganga, Yamuna, Ravi, Beas, Sutlej and Narmada etc.,
- (ii) Regression and correlation analysis.
- (iii) Programmes for fitting probable distributions for flood peaks which have been tested with data of Narmada at Garudeswar.

It is proposed to test these programmes with some more data and also develop a general guideline for frequency analysis of hydrologic data.

A number of programmes for analysing time series data which will take into account seasonal and sequential probabilistic variations of the hydrologic processes are available and they will be implemented and tested with field data in the near future.

Water Balance of River Basins

The estimation of availability of water resources as surface and/or ground water is very important for proper utilisation of these scarce resources. Water balance deals with the appli-

cation of principle of conservation of matter to the input and output components as well as changes in storage, if any. It is an important tool in the evaluation of water resources of a basin, ground water system, lakes, etc.

NIH has taken up two water balance studies one with reference to the Upper Ganges Canal Command area and the other with reference to the river Hindon. Different approaches for estimation of components; the order of errors present in the estimation of components and the resulting water balance are being studied for a simple two seasonal approach which considers the monsoon season and the non-monsoon season. Our experience indicates that with available data reasonable two season water balance can be achieved and the major sources of error seem to be rainfall recharge to ground water and actual evapotranspiration in the non-monsoon season.

The study will be extended to other basins and also for larger number of subperiods, say, 4 seasons or 12 months within a year in order to arrive at a better understanding of the component processes and a better estimation of the variability of these components and availability of resources.

Watershed Models

The estimation of surface water is difficult when data are limited. The problem becomes extremely complex when data are scarce particularly only 1 to 5 years streamflow records are available. It will be possible to develop a conceptual mathematical model to define the various interacting component processes of the hydrologic cycle in a basin and express the behaviour of a basin or the process in terms of the process/system parameters. Using available limited streamflow data and concurrent hydrologic data, the parameters of the model can be estimated on the basis of the conceptual model to characterise the rainfall runoff relationship of a basin. Parameters so derived can be used for the estimating streamflows from the generally longer hydrometeorological data available for the watershed. These data can then be used in planning proper utilisation of streamflows.

There are a large number of models available. NIH has implemented two simple programmes for watershed simulation viz., TVA Betson model and USGS model which are considered suitable for the limited data environment of India. They need extensive testing with field data and it is proposed to use data of river Hindon and sub-basins of Narmada for this purpose. More complicated models including HEC-I programme for flood estimation in rivers and SSARR model developed by US Army Corps of Engineers, North Pacific Division, have been implemented and are used with data for Narmada basin. A number of other models of different levels of complexity are also available and depending upon the field applications for different regions and problem and they may be implemented in due course.

Reservoir Operation

Streamflow in different rivers varies in space and time and particularly in a monsoon envi-

ronment 80 to 90% of annual streamflow occurs during the monsoon season. However the demand exceeds the streamflow not only during non-monsoon season but also during the pre-monsoon, break monsoon and post monsoon seasons. Accordingly it will be necessary to store the water available during monsoon season in surface and/or ground water reservoirs and use them subsequently for different purposes like irrigation, power generation, water supply, etc. Further it will be necessary to operate the reservoir during the flood control season in order to minimise the damage due to floods and at the same conserve water resources for future beneficial use.

Complex mathematical approaches for the operation of reservoir systems have been developed and some of them are available with NIH. We have implemented a number of programmes including the SYMYLD II of the Texas Water Development Board and HEC-III and HEC-V of US Army Corps of Engineers, University of Roorkee computer system. It is proposed to use the data for Ganga between Raiwala and Narora to study the availability of water for meeting the requirements of the existing and contemplated schemes with or without Tehri Dam; to use the data for the Bhakra Beas system in order to study the integrated operation of reservoirs and diversion and power generation; and in the interconnected series of reservoirs of DVC system with particular reference to conservation use and flood control.

Mathematical Model for Storm Precipitation for Flood Estimation

The estimation of precipitation is vital in estimating forecasting and control of floods. Recent developments include the different approaches for estimation of daily shorter duration precipitations and snow cover; estimation of design storms in terms of depth-area-frequency relationships, identification of meteorologically homogeneous areas; quantitative precipitation, forecasting and modelling of moving storms.

While several analysis are in progress or have been completed for the Upper Ganga Canal Command area and Narmada basin, the development of newer technologies particularly in the area of Quantitative Precipitation, Forecasting and modelling of moving storms seems to be very important in Indian environment. It is proposed to take up research activities in this area using the data for Yamuna flood forecasting system and Narmada respectively.

Floods

India receives intensive precipitation during monsoon season over a few isolated periods which causes heavy floods and serious damage. These floods also contribute to the surface water resources of the nation. It is hence necessary to have the capability of estimating, forecasting and controlling the floods in smaller or larger basins, in order to reduce flood damages and to conserve the flood for future utilisation. The different approaches for estima-

tion forecasting and control of flood are generally grouped under the following categories:-

1. Hydrologic Models :
 - (a) Unit Hydrograph models
 - (b) Rainfall-runoff relationships
2. Flood Routing :
 - (a) Hydrologic methods of flood routing
 - (b) Hydraulic methods of flood routing
 - (c) Comprehensive flood routing programs
 - (d) Flood wave modification due to surface water ground water interaction
3. Flood Forecasting :
 - (a) Forecast models
 - (b) Updating models including filtering algorithms
 - (c) Multivariable methods.
4. Flood Control :
 - (a) Dam break problem
 - (b) Flood bank overtopping and failure
 - (c) Data collection and transmission systems.

National Institute of Hydrology has a number of computer programmes to carry out different studies based on the above approaches using limited data. Some of those approaches have been listed and studies will be continued with data from a number of river basins, in the next couple of years.

Ground Water

Surface water in monsoon areas are highly unpredictable and variable. India has fairly extensive ground water reservoirs in the Indo-Gangetic basin and the coastal aquifers which can be used efficiently and effectively to avoid to a large extent the catastrophic effect due to vagaries of the monsoon.

A study dealing with interaction between surface and ground water in Upper Ganges Canal Command area is nearing completion. This study has indicated limitations of an existing model and approaches particularly in terms of the factors :

1. Rainfall recharge in the monsoon areas with particular reference to the influence of intensity duration, depth water table, soil, plant influences.
2. Actual evapotranspiration in the non-monsoon season.

3. The estimation modelling of canal losses and base flow in rivers.
4. The importance of specific data concerning better estimation, procedures for specific yield of the aquifer in the water table fluctuation zone using technologies developed in NIH and available with NIH or other organisations in India.

It is proposed to investigate in greater details smaller areas of the above doab as well as other basins for which data are available and wherein studies are in progress or having been completed in order to understand the component processes and interaction in different environments

This will lead to better modelling of ground water system, the interaction of surface water, ground water and irrigation systems and hence to a better conjunctive utilisation of national resources.

Flash Floods

Because of greater urbanisation in India localised rainfall of severe intensity often referred to as "cloud burst" cause flash floods. The intense floods are due to heavy rainfall occurring generally over small watershed and cause extensive damage to life, transportation systems and property. The effect of human interference may also be present. It will not be generally economical or possible to design small structures for these very rare storm and floods. However it is necessary and possible to develop criteria or procedures to identify the occurrence of intense storms which may lead to flash flood perhaps using radar imagery, remote sensing techniques, etc. and also develop design criteria based on considerations of uncertainty and risk to identify and characterise the possibilities of occurrence of floods.

Preliminary work with reference to study of some of major and recent flash floods like those of Jaipur, Morvi, etc. are in progress.

Information Systems

Hydrologic analysis and design as well as planning and operation of water resources depend on proper utilisation of available data concerning various hydrometeorological and engineering factors. However, very often these data which are collected and are available in raw form in the field, are not available for study and use of field organisations in planning, design and operation of water resources systems.

Several approaches for development of Data Base Management Systems (DBMS) have been developed in different countries all over the world.

NIH intends to prepare an inventory of water resources data available in India, say for a region in order to demonstrate the methodologies and procedure to be adopted in the preparation of such inventories on national basis. We will also develop DBMS for storage and retrieval of water resources data.

It is also proposed to develop simple programmes for divisional field level vetting of data as and when the data are collected so that the quality of data available for the field organisation can be significantly improved.

Participation in Seminar/Symposium/Courses :

Director and other scientists participated in several seminars, symposia and courses during the year. The details of their participation are given in Appendix-~~V~~ V

The Director and scientists presented a number of papers in various professional journals and seminars and symposia, etc. A list of papers presented is given in Appendix-~~V~~ VI

Visitors :

There were also a number of visitors to the Institute during the year. Mr. W.M. Barber and Mr. Carr, World Bank Consultants on ground water modelling visited NIH on a number of occasions and also had detailed discussions with the scientists.

Prof. Y. Takahasi, Department of Civil Engineering, University of Tokyo, Japan visited NIH between 30.11.1981 to 2.12.1981 and had detailed discussions with the scientists in the area of surface water and urban hydrology.

A sub-committee of the UNESCO Executive Board with Professor E. Inonu as the Chairman and M/S K. Boersch and K. Smasdi Panish as members and accompanied by Mr. A Balkan visited NIH on 13 February 1982 and reviewed the programme and progress of the UNDP NIH Project.

Dr. Henry Gunston, Institute of Hydrology, Wallingford, U.K. visited NIH on 16 March 1982. Dr. N.T. Kottegoda, Department of Civil Engineering, University of Birmingham, U.K. visited NIH for a fortnight from 21 March to 4 April 1982 and worked in the area of stochastic water resources technology under a scheme financially supported by British Council.

LIST OF THE MEMBERS OF NATIONAL INSTITUTE OF HYDROLOGY SOCIETY

1. Minister for Irrigation,
Government of India,
Shram Shakti Bhavan,
NEW DELHI-110 001.
2. Minister of State for Irrigation,
Government of India,
Shram Shakti Bhavan,
NEW DELHI-110 001
3. The Member,
Planning Commission,
Yojna Bhavan,
Parliament Street,
NEW DELHI-110 001
4. Minister-in-charge of Irrigation,
Government of Andhra Pradesh,
HYDERABAD
5. Minister-in-charge of Irrigation,
Government of Assam,
DISPUR
6. Minister-in-charge of Irrigation,
Government of Bihar,
PATNA
7. Minister-in-charge of Irrigation,
Government of Gujarat,
GANDHINAGAR
8. Minister-in-charge of Irrigation,
Government of Haryana,
CHANDIGARH
9. Minister-in-charge of Irrigation,
Government of Himachal Pradesh,
SIMLA
10. Minister-in-charge of Irrigation,
Government of Jammu & Kashmir,
SRINAGAR

11. Minister-in-charge of Irrigation,
Government of Karnataka,
Vidhana Soudha,
BANGALORE
12. Minister-in-charge of Irrigation,
Government of Kerala,
TRIVANDRUM
13. Minister-in-charge of Irrigation,
Government of Madhya Pradesh,
BHOPAL
14. Minister-in-charge of Irrigation,
Government of Maharashtra,
Mantralaya,
BOMBAY
15. Minister-in-charge of Irrigation,
Government of Manipur,
IMPHAL
16. Minister-in-charge of Irrigation,
Government of Meghalaya,
SHILLONG
17. Minister-in-charge of Irrigation,
Government of Nagaland,
KOHIMA
18. Minister-in-charge of Irrigation,
Government of Orissa,
BHUBNESHWAR
19. Minister-in-charge of Irrigation,
Government of Punjab,
CHANDIGARH
20. Minister-in-charge of Irrigation,
Government of Rajasthan,
JAIPUR
21. Minister in-charge of Irrigation,
Government of Sikkim,
GANGTOK

22. Minister-in-charge of Irrigation,
Government of Tamil Nadu,
'Kurinji'
Greenways Road,
MADRAS-600 028
23. Minister in-charge of Irrigation,
Government of Tripura,
AGARTALA
24. Minister-in-charge of Irrigation,
Government of Uttar Pradesh,
LUCKNOW
25. Minister-in-charge of Irrigation,
Government of West Bengal,
Writer's Building,
Dalhousie Square,
CALCUTTA
26. Dr. Jagdish Narain,
Vice Chancellor,
University of Roorkee,
ROORKEE
27. Shri Y.K. Murthy,
84, Lodi Estate,
NEW DELHI
28. Dr. Jai Krishna,
61, Civil Lines,
ROORKEE
29. Dr. V. C. Kulandaiswamy,
Vice Chancellor,
Madurai University,
MADURAI
30. Dr. O. P. Jain,
Director,
Indian Institute of Technology,
Hauz Khas,
NEW DELHI

31. Shri P. C. Saxena,
Director,
Central Water & Power
Research Station, Khadakvasla,
PUNE-411 024
32. Shri P. A. Raj,
Secretary to the
Government of Gujarat,
(Irrigation Department)
Sachivalaya,
GANDHINAGAR-382 010
33. Shri S. P. Sen.
Engineer-in-Chief & Secretary,
Irrigation Department
Government of West Bengal,
Writer's Building,
CALCUTTA-700 001
34. Shri V. R. Deuskar,
Secretary,
Irrigation Department,
Government of Gujarat,
GANDHINAGAR
35. Shri S. C. Tripathi,
Chief Engineer,
Irrigation Department,
Government of Orissa,
BHUBANESHWAR.
36. The Chairman,
Ganga Flood Control Commission,
PATNA
37. Shri C. C. Patel,
Secretary,
Ministry of Irrigation,
Shram Shakti Bhavan,
NEW DELHI-110 001

38. The Secretary,
Department of Science & Technology,
Government of India,
Technology Bhavan,
New Mehrauli Road,
NEW DELHI-29
39. The Secretary,
Department of Power,
Ministry of Energy,
Shram Shakti Bhavan,
NEW DELHI
40. The Secretary,
Department of Civil Aviation,
Government of India,
Sardar Patel Bhavan,
NEW DELHI-1
41. The Secretary,
Department of Expenditure,
Ministry of Finance,
Government of India,
North Block,
NEW DELHI-1
42. The Secretary,
Ministry of Works & Housing,
Government of India,
Nirman Bhavan,
NEW DELHI-1
43. The Secretary,
Planning Commission,
Government of India,
Yojna Bhavan,
Parliament Street,
NEW DELHI-1

44. The Chairman,
Central Water Commission,
Seva Bhavan,
R. K. Puram,
NEW DELHI
45. The Member (WR),
Central Water Commission,
Seva Bhavan,
R. K. Puram,
NEW DELHI
46. The Member (Floods),
Central Water Commission,
Seva Bhavan,
R. K. Puram,
NEW DELHI
47. The Chairman,
Central Electricity Authority,
Seva Bhavan,
R. K. Puram,
NEW DELHI
48. The Chairman,
Central Ground Water Board,
Krishi Bhavan,
Dr. Rajendra Prasad Road,
NEW DELHI
49. The Director General,
Meteorology, Lodi Road,
NEW DELHI
50. The Director General,
Geological Survey of India
Chowringee Road
(Jawahar Lal Nehru Road)
CALCUTTA

51. The Secretary,
Indian National Committee of
International Hydrological Programme,
C.S.I.R., Technology Bhavan,
New Mehrauli Road,
NEW DELHI-110 029
52. The Joint Secretary (Admn.),
Ministry of Irrigation,
Shram Shakti Bhavan,
NEW DELHI-1
53. The Joint Secretary (Ganga Basin),
Ministry of Irrigation,
Shram Shakti Bhavan,
NEW DELHI-1
54. The Commissioner (Indus Basin),
Ministry of Irrigation,
Shram Shakti Bhavan,
NEW DELHI-1
55. Dr. S. Ramaseshan,
Director,
National Institute of Hydrology,
ROORKEE.

APPENDIX-II

CONSTITUTION OF THE GOVERNING BODY

1. Shri C.C. Patel, Chairman
Secretary to
Government of India,
Ministry of Irrigation,
Shram Shakti Bhawan,
Rafi Marg,
New Delhi-1.
2. Dr. Jagdish Narain, Vice-Chairman
Vice-Chancellor,
University of Roorkee,
ROORKEE.
3. The Secretary, Member
Government of India,
Ministry of Energy,
Department of Power,
Shram Shakti Bhavan,
NEW DELHI-1
4. The Secretary, Member
Government of India,
Department of Civil Aviation,
Sardar Patel Bhavan,
NEW DELHI-1
5. The Secretary, Member
Government of India,
Ministry of Works & Housing,
Nirman Bhavan,
NEW DELHI-1
6. Shri B.M.K. Mattoo, Member
Joint Secretary and
Financial Adviser,
Ministry of Irrigation,
Shram Shakti Bhavan,
NEW DELHI-1

7. The Secretary, Member
Planning Commission,
Government of India,
Yojna Bhavan,
NEW DELHI
8. The Secretary, Member
Department of Science & Technology,
Government of India,
Technology Bhavan,
NEW DELHI.
9. The Chairman, Member
Central Water Commission,
Seva Bhavan,
R.K. Puram,
NEW DELHI
10. The Chairman, Member
Central Electricity Authority,
Seva Bhavan,
R.K. Puram,
NEW DELHI
11. The Chairman, Member
Central Ground Water Board,
Krishi Bhavan
NEW DELHI
12. The Director General, Member
Meteorology,
Lodi Road,
NEW DELHI
13. Dr. S. Ramaseshan, Member-Secretary
Director,
National Institute of Hydrology,
ROORKEE

CONSTITUTION OF TECHNICAL ADVISORY COMMITTEE OF NIH

1. Shri R. Ghosh, Chairman
Chairman,
Central Water Commission,
Seva Bhavan,
R.K. Puram,
NEW DELHI-22
2. The Member (W.R),
Central Water Commission,
Seva Bhavan,
R K. Puram,
NEW DELHI-22
3. The Member (Floods),
Central Water Commission,
Seva Bhavan,
R.K. Puram.
NEW DELHI-22
4. Dr. B D. Pathak,
Chief Hydrogeologist,
Central Ground Water Board,
Jamnagar House,
Man Singh Road,
NEW DELHI-110 011
5. The Deputy Director General,
Meteorology (Hydrometeorology),
India Meteorological Department,
Lodi Road,
NEW DELHI.
6. Dr. Satish Chandra,
Professor of Hydrology,
School of Hydrology,
University of Roorkee,
ROORKEE.

7. Prof. Subhash Chander,
Head,
Department of Civil Engineering,
Indian Institute of Technology,
Hauz Khas,
NEW DELHI
8. Shri P. A. Raj,
Secretary to Government
of Gujarat,
Public Works Department,
AHMEDABAD
9. Sri M. A. Chitale,
Secretary (II),
Irrigation Department,
Government of Maharashtra,
Mantralaya,
BOMBAY-400 032
10. Shri P. C. Saxena,
Director,
Central Water & Power Research Station,
PUNE
11. Dr. S. Ramaseshan, Convener.
Director,
National Institute of Hydrology,
ROORKEE

TERMS OF REFERENCE OF TECHNICAL ADVISORY COMMITTEE

The Technical Advisory Committee will, interalia be responsible for :—

- i) technical scrutiny of the research programme of the Institute and recommending priorities;
- ii) carrying out technical scrutiny of the individual schemes drawn up by the National Institute of Hydrology for inclusion in the annual/Five Year Plan/External assistance;
- iii) examine the expansion proposals of the Institute;
- iv) perform any other functions as may be assigned to it by the Governing Body.

CONSTITUTION OF WORKING GROUPS**I HYDROLOGIC ANALYSIS OF STREAMFLOWS IN A BASIN :**

1. Dr. S. Ramaseshan, Director, NIH, Roorkee	Chairman
2. Director (Hydrology), CWC, New Delhi	Member
3. Shri D.C. Channegowda, WRDO, Bangalore	Member
4. Dr. Satish Chandra, U.O.R., Roorkee	Member
5. Dr. K N. Mutreja, UP Irrigation Dept , Roorkee	Member
6. Dr. S.K. SPOLIA, IIT, New Delhi	Member
7. Chief Engr. Hydrological Observation, CWC, Patna	Member
8. Dr. S M. Seth, Sc. 'F', NIH, Roorkee	Member
9. Shri B. Dutta, Sc. 'C', NIH, Roorkee	Scientist-in-charge.
10. Shri M. Perumal, Sc. 'B' NIH, Roorkee	Scientist

II. WATER BALANCE OF RIVER BASINS

1. Dr. S. Ramaseshan, Director, NIH, Roorkee	Chairman
2. Director, (NWP) CWC, New Delhi (Nominee of CWC)	Member
3. Chief Engineer (MI), Min. of Irrig., New Delhi (Nominee of CGWB)	Member
4. Nominee-India Meteorological Department	Member
5. Shri K.M. Maheswari, Jt. Adviser (I & CAD) Planning Commission, New Delhi (Nominee of Planning Commission)	Member
6. Nominee of Water Technology Centre, New Delhi	Member
7. Shri I.C. Patel, Chief Engineer, Narmada Design, Gandhinagar, Gujarat	Member
8. Research Officer, UP Irrigation Research Institute. Roorkee	Member
9. Dr. G C. Mishra, School of Hydrology, UOR, Roorkee	Member
10. Dr. B.P. Singh, Professor, Dept. of Physics, U.O.R., Roorkee	Member
11. Dr. S.M. Seth, Sc. 'F', NIH, Roorkee	Member
12. Scientist-in-charge, NIH, Roorkee	Member-Secretary.

III. WATERSHED MODELS INCLUDING THOSE FOR SNOWFED BASIN WITH LIMITED DATA

- | | |
|---|---------------------|
| 1. Director, NIH, Roorkee | Chairman |
| 2. Dr. P.R. Rao, CWC, New Delhi | Member |
| 3. Shri V.C.G. Washimkar, Water Resources Div. Amravati | Member |
| 4. Dr. K.S. Rajagopalan, CWPRS, Pune | Member |
| 5. Shri G.S. Dhadwal, BBMB, Chandigarh | Member |
| 6. Shri Gurmel Singh, CS&WCRTI | Member |
| 7. Dr. P.B.S. Sarma, WTC, New Delhi | Member |
| 8. Dr. B.S. Mathur, UOR, Roorkee | Member |
| 9. Dr. S.M. Seth, NIH, Roorkee | Member |
| 10. Shri B. Dutta, NIH, Roorkee | Scientist-in-charge |

IV. METHOD OF OPERATION OF A SYSTEM OF RESERVOIRS TAKING INTO CONSIDERATION THE EFFECT OF IRRIGATION, FLOOD CONTROL AND POWER GENERATION.

- | | |
|---|------------------|
| 1. Dr. S. Ramaseshan, Director, NIH, Roorkee | Chairman |
| 2. Dr. A. Sunder, IIM, Bangalore | Member |
| 3. Shri R.J. Prasad, Chief Engineer (Civil) Alipore, Calcutta. (Nominee of DVC) | Member |
| 4. Shri V.V. Ramakrishnarao, Deputy Director, H E (P) Directorate, C.E. Authority | Member |
| 5. Shri A.D. Mohile, Sr. System Planner, CWC, Vasant Vihar, New Delhi | Member |
| 6. Member, Irrigation, BBMB, Sector 35-B, Chandigarh | Member |
| 7. Dr. G.N. Yoganarasimhan, Professor, WRDTC, Roorkee | Member |
| 8. Dr. S.M. Seth, Sc. 'F', NIH, Roorkee | Member |
| 9. Shri S.R.B. Dhasan, Sc. 'B', NIH, Roorkee | Member-Secretary |

V. EVOLUTION OF MATHEMATICAL MODELS FOR STORM PRECIPITATION FOR FLOOD ESTIMATION

- | | |
|---|----------|
| 1. Dr. S. Ramaseshan, Director, NIH Roorkee | Chairman |
| 2. Shri K. Krishnamurthy, Director, (Hydrology), CWC, New Delhi | Member |
| 3. Nominee of India Meteorological Dept., New Delhi | Member |

- | | | |
|--|---|------------------|
| 4. | Dr. O. N. Dhar, Asstt. Director, Indian Institute of Tropical Meteorology, Pune (Nominee of IITM). | Member |
| 5. | Shri U. S. Pandey, Jt. Director (B & F) RDSO, Lucknow | Member |
| 6. | Prof. Subhash Chander, IIT, New Delhi | Member |
| 7. | Dr. S.M. Seth, Sc. 'F', NIH, Roorkee | Member |
| 8. | Shri K. S. Ramasastry, Sc. 'C', NIH, Roorkee | Member-Secretary |
| VI. EVOLUTION OF METHODOLOGIES FOR FLOOD ESTIMATION, FORECASTING AND CONTROL | | |
| 1. | Director, NIH, Roorkee | Chairman |
| 2. | Nominee of CWC, New Delhi | Member |
| 3. | Nominee of IMD, New Delhi | Member |
| 4. | Shri U.S. Pandey, Jt. Director, RDSO, Lucknow. (Nominee of Director-General) | Member |
| 5. | Shri B.K. Subba Rao, Officer-in-charge, Forest Influence Branch, FRI, Dehradun. | Member |
| 6. | Dr. Subhash Chander, IIT, Delhi | Member |
| 7. | Dr. R.J. Garde, U.O.R., Roorkee | Member |
| 8. | Dr. S.M. Seth, Divisional Head, NIH, Roorkee | Member |
| 9. | Shri M. Perumal, Sc. 'B', NIH, Roorkee | Member |
| 10. | Shri A.B. Palaniappan, Sc. 'B', NIH, Roorkee | Member |
| VII. METHODOLOGY FOR GROUNDWATER ESTIMATION AND DEVELOPMENT | | |
| 1. | Director, NIH, Roorkee | Chairman |
| 2. | Dr. B.D. Pathak, Chief Hydrogeologist, CGWB, New Delhi | Member |
| 3. | Sri M.R. Goel, Director, Water Resources, Punjab. | Member |
| 4. | Shri K. C. Varshney, S.E (I&P), Irrigation Dept., U.P. Meerut, (Nominee of Engineer-in-Chief, Irrigation Dept., UP) | Member |
| 5. | Dr. V. Lakshminarayan, Prof. Civil Engg., I.I.T., Kanpur | Member |
| 6. | Shri N. V. M. Krishna, C. E., Investigation, Hyderabad, Andhra Pradesh | Member |
| 7. | Dr. B. B. S. Singhal, Prof. Earth Science. U.O.R., Roorkee | Member |
| 8. | Dr. A. S. Chawla, Prof. W.R.D.T.C., U.O.R., Roorkee | Member |

9. Dr. S. M. Seth, Sc. 'F', NIH, Roorkee Member
10. Scientist-in-Charge, NIH, Roorkee Member-Secretary

VIII STUDY OF EXTREME STORM AND FLOODS AND THEIR
IMPLICATIONS IN HYDROLOGIC SYNTHESIS.

1. Director, NIH, Roorkee Chairman
2. Director Hydrology I, CWC, New Delhi Member
3. Nominee of IMD, New Delhi Member
4. Dr. O. N. Dhar, Asstt. Director, IITM, Poona Member
5. Shri J. F. Mistry, C.E. (IP) and Jt. Secretary to
Govt. of Gujarat, Irrigation Dept., Gandhinagar Member
6. Dr. Satish Chandra, Prof., School of Hydrology, Roorkee Member
7. Dr. S. M. Seth, Sc. 'F', NIH, Roorkee Member
8. Shri K. S. Ramasastri, Scientist 'C', NIH, Roorkee Member-Secretary

PARTICIPATION IN SEMINAR/SYMPOSIUM/COURSES

1. Dr. S. Ramaseshan, Director participated in International Symposium on Flood Disastors organised by Indian National Science Academy held during 3-5 December, 1981 at New Delhi.
2. Dr. S. M. Seth, Sc. 'F' and Shri A. K. Bhar, Sc. 'C' participated in the International Symposium on Water Resources Conservation, Pollution and Abatement organised by University of Roorkee and Co-sponsored by NIH in December 1981.
3. Dr. P. V. Seethapathi, Sc. 'C' participated in a seminar on Water Resources and its Development organised by Haryana State Minor Irrigation (Tube-wells) Corporation from 28-29 November, 1981 at Chandigarh.
4. Shri M. Perumal, Sc. 'B' participated in a course on SSARR model given by Mr. Billy J. Thomas of US Army Corps of Engineers at CWC, New Delhi under UNDP Scheme, from 24 August 1981 to 17 September 1981.
5. Shri B. Dutta, Sc. 'C' participated in a course on CLS (Constrained Linear System) Model by Mr. R.J. Moore of Institute of Hydrology, U.K. at CWC under UNDP Scheme New Delhi from 18-11-81 to 11-12-81.
6. Shri K.S. Ramasastrí, Sc. 'C' participated in HEC-I course given by Dr. De Vories of HEC, California at CWC, New Delhi from Jan. 28 to Feb. 12, 1982.
7. Shri S.R.B. Dhason, Sc. 'B' participated in HEC 5 Course given by Dr. De Vories of HEC, California at CWC, New Delhi from 15 Feb. 1982 to 27 Feb. 1982.

LIST OF PUBLISHED PAPERS IN PROFESSIONAL JOURNALS

1. Ramasastry, K.S. et al. 1981. 'Estimation of Short duration storm rainfall over some river basins in India' Irrigation and Power, Vol 38, No. 3.
2. Ramaseshan, S , 1981 : 'Seepage Losses in Canals', paper presented in Seminar on Seepage Losses in Canals, WAPCOS, New Delhi.
3. Ramaseshan, S., 1981 : 'Introduction to Hydrologic Modelling' Preparatory Courses Lecture Notes, International Workshop on Systems Analysis of Problems in Irrigation, Drainage and Flood Control, CBIP, New Delhi.
4. Ramaseshan, S. and Seth, S.M., 1981 : 'Hydrologic Research Needs for Flood Forecasting and Control', International Conference on Flood Disasters, INSA, New Delhi.
5. Ramaseshan, S., 1982: 'Evaluation and Utilisation of Water Resources in India-An Engineering Perspective', IVth IHD Endowment Lectures, Centre for Water Resources, College of Engg., Perarignar Anna University of Technology, Madras, India.
6. Ramaseshan, S., 1982 : 'Disaster Prevention and Mitigation-A Review' National Seminar on Quakes, Floods and Cyclones, CERI, Vadodara, India.
7. Ramaseshan, S., 1982 : 'Multi Objective Analysis-Case study, Lecture notes, International Workshop on Systems Analysis of Problems in Irrigation, Drainage and Flood Control, CBIP, New Delhi, India pp. 209-231.
8. Ramaseshan, S., 1982 : 'Operation Policy for Multipurpose Reservoirs through Simulation-A case Study', *ibid*, pp 232-256.
9. Ramaseshan, S. and Rao, B.K., 1979 : 'Adaptation of available digital simulation models for watershed behaviour studies in India', Conference on Hydrometeorology, Am. Met. Society, Boston, pp 122-128.
10. Seth, S.M , 1981 : 'Daily snow melt runoff during pre-monsoon months in Beas Basin with limited data,' International Symposium on Rainfall-Runoff modelling held at Mississippi State University.

Dated : 7 July, 1982
New Delhi, 110002

THAKUR, VAIDYANATH AIYAR & Co.
CHARTERED ACCOUNTANTS

**AUDITORS REPORT ON THE ACCOUNTS
OF
NATIONAL INSTITUTE OF HYDROLOGY, ROORKEE**

We have audited the attached Balance Sheet and the Income and Expenditure Account of the National Institute of Hydrology as on 31st March, 1982 and report that we have obtained all the informations and explanations which to the best of our knowledge and belief were necessary for the purpose of our opinion and to the best of our information and according to the explanations given to us the accounts give a true and fair view :

1. In case of the Balance Sheet, the state of affairs of the Institute as on 31st March, 1982 and;
2. In case of Income and Expenditure Account of the deficit for the period ended on that date.

For Thakur, Vaidyanath Aiyar & Co.

Sd/-
(K.N Gupta)
Partner
Chartered Accountants

THAKUR, VAIDYANATH AIYAR & Co.
CHARTERED ACCOUNTANTS
NEW DELHI

UTILISATION CERTIFICATE

Certified that the National Institute of Hydrology, Roorkee has incurred a sum of Rs. 30,14,457.83 (Rupees Thirty lakhs fourteen thousand four hundred and fifty seven and paise eighty three only) out of which Rs. 21,25,980 18 (Rupees Twenty one lakhs twenty five thousand nine hundred and eighty and paise eighteen only) is on acquisition of fixed and other assets and Rs. 8,88,477.65 (Rupees eight lakhs eighty eight thousand and four hundred seventy seven and paise sixty five only) on revenue expenditure against the grant-in-aid of Rs. 33,00,000/- (Rupees Thirty three lakhs only) given to the Director, National Institute of Hydrology, Roorkee and the same has been verified with reference to the account records maintained by the Institute and has been found to be correct.

Sd/-
(R. R. AGARWAL)
FINANCE OFFICER

Sd/-
(S. RAMASESHAN)
DIRECTOR

Sd/-
CHARTERED ACCOUNTANTS

Dated : July 7, 1982

THAKUR, VAIDYANATH AIYAR & CO.
CHARTERED ACCOUNTANTS
NEW DELHI

July 7, 1982

The Chairman,
Governing Body,
National Institute of Hydrology,
University of Roorkee Campus,
ROORKEE
(U.P.)

Dear Sir,

**Re : Audit of Accounts of National Institute of
Hydrology for the year ended 31st March, 1982**

We have completed the audit of the accounts of National Institute of Hydrology for the year ended 31st March, 1982 and are enclosing 4 copies of the Balance Sheet as at 31st March, 1982, Income and Expenditure Account and Receipts and Payments Account for the year ended on that date. One copy of the accounts may be returned to us for our record after the same have been approved by the Governing Body.

Our observations on the accounts are as under :

1. WORKING RESULTS

During the year, the net revenue expenditure incurred by the Institute works out to Rs. 9,63,913.53 (including Rs. 30,982.40 for depreciation) as against Rs. 4,44,785.16 (including Rs. 35,256.09 for depreciation) in the previous year. The net revenue expenditure has been shown as a deduction in the Balance Sheet from the Grant-in-aid received from Govt. of India, Ministry of Irrigation, New Delhi.

2. ASSET FUND ACCOUNT

A sum of Rs 21,25,980.18 has been transferred to "Asset Fund Account" from "Grant-in Aid" account being cost of acquisition of fixed and other assets during the year under audit.

3. TRANSFER DEED OF LAND

As mentioned in the previous year's audit report, the transfer deed of land on which Administrative Building of the Institute is being constructed has not yet been executed. We

understand that the matter is pending for verification with Distt. Magistrate, Saharanpur. This may be got expedited.

4. ADDITIONS TO FIXED ASSETS

During the yer 1981-82, a sum of Rs. 1,55,297.75 has been spent on additions to the various fixed assets as given in Schedule 'A' forming part of the accounts. These additions may be approved.

5. DEPRECIATION

As per the decision of the Governing Body, depreciation on the various fixed assets has been provided as per the rates given in the Income-tax rules.

We would request the Governing Body to-consider its decison of providing depreciation in view of the fact that Govt. of India, is giving 100% grant-in-aid to meet both recurring and non-recurring expenditure. As per the policy of the Government, depreciation on fixed assets is not allowed as an expenditure for the utilisation of the grant-in-aid since the cost of the fixed assets are financed by them fully.

6. BUILDING WORK IN PROGRESS

A sum of Rs. 16,79,928.71 has been spent as at 31.3.1982 on the construction of the administrative building of the Institute. The details are as under :

1. Advance to University of Roorkee and others	11, 57, 240.00
2. Cost of Cement & Steel	5, 22, 688.78
	<hr/>
Rs.	16, 79, 928.78

7. ADVANCES TO UNIVERSITY OF ROORKEE & OTHERS

A sum of Rs. 7,93,793.48 is outstanding as at 31st March, 1982 as against Rs 2,29,644.55 in the previous year. The details of the aforesaid advances are given in Schedule 'C' forming part of the accounts. We understand that some of these advances could not be adjusted for want of final bills. These may be got settled at an early date.

8. CONSULTANCY ASSIGNMENT

The Institute has two consultancy assignments namely WAPCOS Project and NARMADA Project. A sum of Rs 1,94,726.48 and Rs. 44,444.47 respectively has been incurred upto 31st

March, 1982 on the aforesaid projects. As against this, a sum of Rs. 250,000.00 has been received on WAPCOS PROJECT. We understand that the Institute intends to account for income from Consultancy Assignment on cash receipt basis.

9. NIH-C.P.F. ACCOUNT-Rs. 22,502.00

This represents employee's contribution and interest thereon for the year 1981-82. We understand that the Institute's contribution will be made after the lapse of 3 years from the date of introduction of the scheme.

10. NIH-STAFF GROUP INSURANCE SCHEME-Rs. 3,054.00

This scheme has been introduced with effect from 1.1.82 on the lines of Central Govt. Employees Group Insurance Scheme. This scheme is yet to be approved by the Governing Body.

In the end, we wish to place on record our thanks to the various officers and staff of the Institute for the co-operation extended to us during the course of our audit.

Yours faithfully,
Sd/-
CHARTERED ACCOUNTANTS

NATIONAL INSTITUTE OF HYDROLOGY, ROORKEE
RECEIPTS AND PAYMENTS ACCOUNT FOR THE YEAR ENDED 31st MARCH, 1982

THAKUR, VAIDYANATH AIYAR & CO.
CHARTERED ACCOUNTANTS

Previous Year	Receipts	Amount Rs.	Previous Year	Payments	Amount Rs.
	Cash and Bank Balances		3,18,367.66	Salaries, Wages & Allowances	5,86,609.51
—	Cash in hand	3,728.92	31,245.84	Travelling & Conveyance	32,686.65
4,25,873.47	Savings Deposit with State Bank of India, Roorkee	5,96,319.25	33,291.99	Office expenses	63,283.30
1,000.00	Imprest with Chief Admn. Officer	1,000.00	22,605.54	Printing & Stationery	30,006.17
12,00,000.00	Grant-in-aid received from Govt. of India, Min. of Irrigation	33,00,000.00	6,225.55	Postage & Telegrams	8,931.10
10,098.00	Interest on Savings Deposits	33,282.39	1,690.00	Payment to Auditors : Audit Fee	2,000.00
2,200.16	Miscellaneous Receipts	1,441.01		Other expenses	200.00
480.00	Recovery of Advances	2,347.00	10,669.27	Computer Hire expenses	58,933.34
1,50,000.00	Consultancy and other fee from water and power consultancy organisation project	1,00,000.00	17,169.44	Furniture & Fixtures	4,901.00
—	Recoveries of House rent water & Electricity	151.07	45,863.50	Purchase of Office equipments	18,739.91
—	Recoveries on account of staff Group Insurance Scheme	3,054.00	46,489.13	Books & Journals	1,18,689.76
			3,808.36	Advertisement	9,261.00
			17,155.13	Miscellaneous Expenses	22,397.44
			—	Professional consultancy fee	1,000.00
			1,940.35	Hospitality expenses	5,081.85
			4,600.00	Grant-in-aid/Contribution/ Subsidies	13,100.00

—	Recoveries on account of Staff Provident Fund	21,837.00	9,216.00	Machinery & Equipments	50,709.65
—	Refund of Advance for Purchase of vehicle	57,749.55	11,321.23	Stores & Minor equipments	1,575.60
			—	Narmada Project Expenses	32,124.28
			2,186.48	Remittance to UOR	—
			86,513.16	WAPCOS Project Expenses	1,15,611.24
			2,32,100.28	Cement & Steel for construction of Admn. Building.	2,90,588 50
			—	Minor Repairs & Maintenance	802 00
			55,500 00	Fixed Deposit with SBI, Roorkee	—
			2,29,644.55	Advances to U.O.R. and others	17,42,045.48
			1,000.00	Securit Deposit for Petrol	—
				<u>Cash & Bank Balances</u>	
			3,728.92	Cash in Hand	2,264.50
			1,000.00	Imprest with Chief Admn. Officer	1500,00
				Saving Deposit with SBI, & IOB, Roorkee	9,07,867.91
<u>17,89,651.63</u>		<u>41,20,910.19</u>	<u>5,96,319.25</u>		<u>9,11,632.41</u>
			<u>17,89,651.63</u>		<u>41,20,910.19</u>

Subject to our Report of even date examined and found correct.

SEAL 212, Deen Dayal Marg.
NEW DELHI-110002
Date : 7 July, 1982

Sd/-
CHARTERED ACCOUNTANTS

Sd/-
Finance Officer,
NIH, Roorkee

Sd/-
Director
NIH, Roorkee

THAKUR, VAIDYANATH AIYAR & Co.

NATIONAL INSTITUTE OF HYDROLOGY, ROORKEE

CHARTERED ACCOUNTANTS

Income and Expenditure Account for the year ended 31st March, 1982

Previous Year Rs.	Expenditure	Amount Rs.	Previous Year	Income	Amount Rs.
3,18,517.10	Salaries, Wages & Allowances	6,19,957.55	10,098.00	Interest on Savings Deposits	33,282.39
31,245.84	Travelling & Conveyance	32,687.65	2,200.16	Miscellaneous Receipts	1,401.01
36,544.60	Office expenses	68,302.25	1,50,000.00	Receipts on WAPCOS Project Transferred	1,00,000.00
22,605.54	Printing & Stationery	30,006.17	4,44,785.16	from Grant-in-aid account to meet the expenditure for the year	9,63,913.53
6,225.55	Postage & Telegrams	8,931.10			
	Payments to Auditors :				
	Audit Fee	2,000.00			
2,190.00	Other Expenses	200.00	2,200.00		
10,517.36	Stores & Equipments	—			
—	Repair & Maintenance	4,937.00			
10,669.27	Computer Hire Expenses	61,921.43			
4,600.00	Grant-in-aid/contribution/subsidies	13,100.00			
1,940.35	Hospitality expenses	5,081.85			
3,808.36	Advertisement expenses	9,261.00			
17,155.13	Miscellaneous expenses	22,397.44			
—	Professional consultancy Fee	1,000.00			

17,894.61	News papers and periodicals	35,908.66		
35,256.09	Depreciation	30,982.40		
87,913.52	Expenditure on WAPCOS Project	1,06,812.96		
—	Expenditure on NARMADA Project	44,444.47		
—	Interest on C.P.F.	665.00		
<u>6,07,083.32</u>		<u>10,98,596.93</u>	<u>6,07,083.32</u>	<u>10,98,596.93</u>
	Total Rs.			

Subject to our report of even date
EXAMINED AND FOUND CORRECT

Seal

212-Deen Dayal Marg,
NEW DELHI-110002
Dated :

Sd/-
Chartered Accountants.

Sd/-
Finance Officer
NIH

Sd/-
Director
NIH

THAKUR, VAIDYANATH AIYAR & Co.

Chartered Accountants

NATIONAL INSTITUTE OF HYDROLOGY, ROORKEE

Balance Sheet as at 31st March, 1982

Previous year (Rs.)	Liabilities	Amount Rs.	Previous year (Rs.)	Assets	Amount (Rs.)
1	2	3	4	6	8
	Grant-in-Aid from Govt. of India Min. of Irrigation, N. Delhi			Fixed Assets (At cost less depreciation)	
3,95,642.07	Balance brought forward from previous year	5,28,601.62	2,25,182.27	(As per Schedule 'A' annexed)	3,49,497.62
	Add			Building work-in-progress	
12,00,000.00	Received from Govt. of India Min. of Irrigation, N. Delhi	33,00,000.00		Opening Balance	2,83,873.40
15,95,642.07	Less	38,28,601.62		Advance to Roorkee University	11,00,000.00
	(a) Cost of acquisition of fixed & other assets transferred to Asset		2,83,873.40	Cost of Cement & Steel	2,96,055.38
(—)	Fund a/c			Advance to UOR & others (As per scheduled 'C' Annexed)	7,93,793.48
6,22,255.29	21,25,980.18		2,29,644.55	Prepaid Expenses	7,761.18
	(b) Transferred to Income & Expd. A/c to meet the expenditure for the year		3,167.00	Other deposits (As per schedule 'D' annexed)	91,380.00
(—)			76,100.00	Due from UOR for white washing	665.00
4,44,785.16			—	Due from Steel Authority of India	—
5,28,601.62	9,63,913.53	30,89,893.71	5,466.88		
		7,38,707.91			

<u>Asset Fund</u>				<u>Cash & Bank</u>		
<u>Account</u>				<u>Balances</u>		
	Balance brought forward from previous year	8,61,533.32		3,728.92 1,000.00	Cash in hand Imprest with Chief Admn. Officer	2,264.50 1,500.00
	<u>Add</u>					
8,61,533.32	Transferred from grant-in-aid a/c	21,25,980.18		5,96,319.25	Balance on Savings Bank a/c with SBI, Roorkee	8,86,030.91
			29,87,513.50			
—	<u>NIH C.P.F. Account</u>				Balance on Savings Bank a/c with Indian Overseas Bank, Roorkee	
	Employees' contribution during the year	21,837.00				
	<u>Add : Interest</u>					
	NIH Staff Group Insurance Scheme	665.00	22,502.00			
	Recoveries made from employees during the year		3,054.00			
34,347.33	Liability for					
	<u>Expenses</u>					
	(As per Schedule 'B' annexed)		82,881.06			
<u>14,24,482.27</u>		Total Rs.	<u>38,34,658.47</u>	<u>14,24,482.27</u>	Total Rs.	<u>38,34,658.47</u>

Subject to our report of even date
EXAMINED AND FOUND CORRECT

SEAL 212, Deen Dayal Marg,
NEW DELHI-110002

Date : 7 July, 1982

Sd/-
CHARTERED ACCOUNTANTS

Sd/-
(R. R. AGARWAL)
Finance Officer

Sd/-
(S. RAMASESHAN)
Director

NATIONAL INSTITUTE OF HYDROLOGY, ROORKEE

THAKUR, VAIDYANATH AIYAR & CO.
CHARTERED ACCOUNTANTS

Schedule of Fixed Assets as at 31st March, 1982

Sl. No.	PARTICULARS	Gross Block			Rate	Depreciation		Net Block		
		Cost as on 1.4.81	Additions during the year 81-82	Total		Upto 31.3.81	For the year 81-82	Total As at 31.3.82	As at 31.3.81	
1.	Furniture & Fixture	70189.56	4901.00	75090.56	10%	7018.96	6807.00	13825.96	61264.60	63170.60
2.	Duplicating Machine	13918.36	—	13918.36	15%	2087.75	1774.00	3861.75	10056.61	11830.61
3.	Office Equipments	62474.61	15367.05	77841.66	15%	9371.19	10270.57	19641.76	58199.90	53103.42
4.	Vehicle	49318.10	—	49318.10	20%	9863.62	7891.00	17754.62	31563.48	39454.48
5.	Computer Machinery	9216.00	—	9216.00	20%	1382.40	1935.00	3317.40	5898.60	7833.60
6.	Library Books	55321.73	82781.10	138102.83	—	5532.17	(-)5532.17	Nil	138102.83	49789.56
7.	Machinery & Equipment	—	52248.60	52248.60	20%	—	7837.00	7837.00	44411.60	—
		260438.36	155297.75	415736.11		35256.09	30982.40	66238.49	349427.62	225182.27

Subject to our Report of even date examined and found correct.

SEAL 212, Deen Dayal Marg, Sd/-
NEW DELHI-110002 CHARTERED ACCOUNTANTS

Date : 7 July, 1982

Sd/-
Finance Officer,

Sd/-
Director

Thakur, Vaidyanath Aiyar & Co.
Chartered Accountants

National Institute of Hydrology

Roorkee

Schedule of liability of expenses as on 31.3.82

Sr. No.	Head of Account	Amount as on 31.3.1982	Amount as on 31.3.81
1.	Maintenance of Car	2,911.20	2,105.34
2.	Electricity & Water charges	128.49	2,285.34
3.	Rent, Rates & Taxes	—	237.00
4.	Telephones	1,312.10	72.00
5.	Salaries, NIH	42,193.18	8,348.82
	WAPCOS	—	2,258.36
	NARMADA	1,767.80	—
6.	Leave Salary & Pension contribution	16,589.00	16,827.45
7.	Audit Fee 1981-82	2,000.00	2,000.00
8.	Unpaid Salary	—	213.02
9.	House Rent outstanding	22.58	—
10.	Computer Hire charges	15,956.71	—
		<u>82,881.06</u>	<u>34,347.33</u>

THAKUR, VAIDYANATH AIYAR & CO.
CHARTERED ACCOUNTANTS

NATIONAL INSTITUTE OF HYDROLOGY
ROORKEE

Schedule of Advances as on 31-3-1982

Sl.No.	Details	Amount (Rs.)
1.	<u>Advances to University of Roorkee :</u>	
	(i) Advances for 60 KW Power Supply	55,168.00
	(ii) Advance for Civil Works-Installation of computer	59,800.00
	(iii) Advance for construction of Urinals.	1,500.00
	(iv) Advance for Internal Electrification work	20,000.00
	(v) Advance for Iron Gate	4,755.00
	(vi) Advance for Civil Works for Airconditioning	4,626.00
	(vii) Advance for wiring between UPS and Battery	1,980.00
		1,47,829.00
2.	Advance to American Refrigerators Company for Air-conditioners	1,81,500.00
3.	Advance to D.G.S. & D. for purchase of Matador Van	90,000.00
4.	Advance to U.P. State Electricity Board for Electric sub-station	3,00,000.00
5.	Advance to M/s Roneo Vickers for Duplicating Machine	4,680.00
6.	Advance to M/s Roneo Vickers Ltd. for Franking Machine	5,270.18
7.	Advance to M/s Lloyd Safe Co. for purchase of furniture	21,404.80
8.	Advance to M/s J.K. Business Machines for computer stationery	8,330.40
9.	Advance to M/s Spencer & Co., New Delhi for Vaccum Cleaner	2,496.00
10.	Advance to the Post Master, Roorkee for providing 4 telephones lines	12,600.00
11.	Advance to Dy. Controller of Accounts, Department of Supply, Bombay for purchase of 5 Godrej Typewriters	14,072.10
12.	Advance to Employees	
	(i) Cycle advance	Rs. 1,331.00
	(ii) Festival Advance	Rs. 1,320.00
	(iii) Scooter Advance	Rs. 2,960.00
		5,611.00
	TOTAL	Rs. 7,93,793.48

THAKUR, VAIDYANATH AIYAR & CO.
CHARTERED ACCOUNTANTS

NATIONAL INSTITUTE OF HYDROLOGY
ROORKEE

Schedule of other Deposits as on 31.3.1982

Sl. No.	Details	Amount (Rs.)
1.	Deposit with University of Roorkee for Computer charges	20,000.00
2.	OYT Deposits	14,880 00
3.	Security Deposit for purchase of Petrol	1,000.00
4.	Fixed Deposit with State Bank of India for Excise Security purposes.	55,500.00
	TOTAL Rs.	<u>Rs. 91,380.00</u>