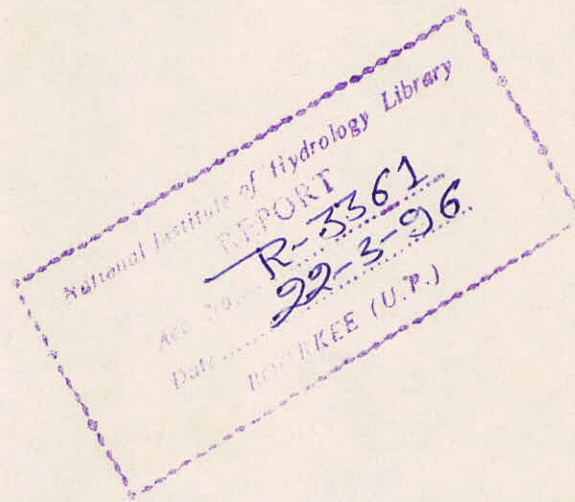


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NATIONAL INSTITUTE OF HYDROLOGY  
ROORKEE



ANNUAL REPORT 1982-83



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**CHART 1 : Proposed Organisational Structure of NIH**



## OBJECTIVES OF NIH

To undertake, aid, promote and co-ordinate 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 co-operate and collaborate with other national 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 have great relevance to national planning and development in the area of water resources.

The Institute started functioning in February, 1979 with Dr. S Ramaseshan as the first Director. The Institute has in the first phase (1979-84) six scientific and technical divisions in the areas of Information Systems, Hydrologic Analysis (Surface Water), Hydrologic Analysis (Ground Water), Hydrologic Synthesis (Surface Water), Hydrologic Synthesis (Ground Water), and Integrated Planning. The Institute also has two administrative divisions, one for General Administration and the other for Finance & Accounts.

UNDP is assisting in the setting up of this Institute in terms of provision of 12 man months of a Chief Technical Advisor, 6 man months of consultancy, study tours for the Director and senior scientists and training fellowships for other scientists. Under the UNDP project there is also provision for procurement of equipment.

This annual report specifically presents the salient aspects of the programmes and progress of National Institute of Hydrology with particular reference to the year 1982-83.

## DIRECTOR'S REPORT

The National Institute of Hydrology (NIH) was set up in December, 1978 as an autonomous Society under the Ministry of Irrigation, Govt. of India with its registration under the Societies Registration Act, 1860. The Headquarter of the Institute is at Roorkee (UP). The Union Minister for Irrigation is the President of the Society and it has a number of scientific, technical and administrative members as listed in Appendix-I. 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 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 Central Ministeries, Chairman; Central Water Commission, Vice Chancellor; University of Roorkee, Director General; India Meteorological Department etc., as listed 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 has been presented in four earlier annual reports, viz., 1978-79, 1979-80, 1980-81 and 1981-82. The annual report for the period from April 1982 to March 1983 is now being presented before the Society.

The Institute has completed nearly 4 years of its first 5 years phase and the programmes for the last year have been planned. Deliberations and investigations indicate that some of the basic data with reference to various hydrologic processes are not available from research point of view. In order to ensure that they are collected, compiled, analysed, interpreted and used in hydrologic modelling and design, it has been proposed to study water balance of one or more automated representative basins in some selected locations in the country. If necessary, it will be undertaken in collaboration with other academic and research organisations. The National Flood Commission has indicated that NIH should contribute towards some priority areas of research with reference to floods. It has also suggested setting up of four regional centres of NIH. Adequate deve-



lopment of water resources requires the use of planning techniques which depend to a large extent on reliable estimate of key hydrologic variables such as streamflow. Although many streams have been gauged to provide continuous stream-flow records, very often little or no information is available for the point of interest.

There are problems associated with the changes in the observation techniques, accuracy of observations, establishment of stage discharge relationship etc. which have to be tackled in a systematic and scientific manner in order to arrive at homogeneous record of streamflow. In the research activities of the Institute, emphasis has been made on development and use of appropriate techniques for data processing including statistical analysis techniques. These have been applied to field problems associated with estimation of design flood for Narmada project, as well as surface water groundwater interaction studies in UGC command area. These sponsored research projects at the Institute have provided an opportunity for use of some of the methodologies implemented and developed at the institute and also provided useful data for research studies at the Institute.

The High Level Technical Committee on Hydrology with Chairman, Central Water Commission as Chairman has been constituted by the Ministry of Irrigation to look after the activities of undertaking, aiding, promoting, and coordinating systematic and scientific studies in theoretical, and applied hydrology and to cooperate and collaborate with foreign and international organisations in the field of hydrology. The High Level Technical Committee on Hydrology accordingly serves as the Indian National Committee for International Hydrological Programme and its Secretariate serves as the Secretariate of the Asian Regional Coordination Committee on Hydrology. The Secretariate is presently under the administrative and technical control of National Institute of Hydrology as approved by the Society in its third meeting.

Until December '82 the Institute was functioning in a rented accommodation provided by the University of Roorkee and a private party. The Administrative Building of National Institute of Hydrology was completed in December' 82. Late Shri Kedar Pandey, the then Union Minister for Irrigation and President of NIH Society inaugurated the building on 27th. December '82 and it was named as 'Jal Vigyan Bhavan.' A portion of the rented accommodation from the University of Roorkee is presently being used for the Computer Centre and it is expected that by the end of 1983 when power supply



is made available by UP State Electricity Board to the NIH campus through a sub-station, the Computer Centre will be shifted to the Administrative Building. The Laboratory block, Substation, Guest house, Pump house etc. have been entrusted to University of Roorkee for construction as deposit works and are expected to be ready by March '84.

The VAX-11/780 Computer System, procured under the UNDP Project, was received in April/May '82. The Computer System was installed and its testing was completed by October' 82. The Computer System is fully operational since then and is being used by the Institute for its research work. An Automated Hydrologic Station with real time data collection system is being procured through the UNDP Project and is expected to be operational by February '84.

A library has been set up for collecting latest publications and journals in the fields of hydrology and water resources for reference and use in scientific research activities. So far 1956 books, 549 volumes of 38 journals, 729 papers and 1090 reports have been acquired. The British Council has contributed to the institute £ 2000 and coupons worth £ 300 for provision of books in the area of hydrology and water resources.

NIH is gradually developing into a centre of excellence in scientific research with reference to the area of Hydrology and Water Resources. The research activities at NIH have gained momentum and it is hoped that the experience, expertise, and research findings will contribute to the scientific assessment and optimal development of national water resources.

With the commissioning of the Administrative Building, installation of Computer System and recruitment and training of number of scientists, NIH has developed a good infrastructure to carry out its research activities. With the recruitment and training of remaining scientists, I have no doubt that the research work of NIH will progress to meet the objectives of the Institute, which are crucial to the national developmental activities in the area of Hydrology and Water Resources.

We have been involved in establishment of the Institute under the blessings, direction, guidance, and help of the President of the Society, Chairman and Members of the Governing Body and TAC, UNDP, UNESCO, officers of CWC, India Meteorological Department, University of Roorkee, and several other organisations. Whatever has been

achieved in the past four years in establishing this Institute, would not have been possible without their guidance, direction and help; and untiring and devoted efforts of Dr. S. Ramaseshan, first Director of the Institute who has since reverted back to IIT., Kanpur on 15th July '83. I would like to gratefully acknowledge the help and cooperation received from the Chairman and Members of the Governing Body, TAC and Working Groups in the deliberations and decisions concerning details of research activities and administrative matters. I am also thankful to all the officers and staff of NIH for their active cooperation and help.

I am sure that the research activities will gain further momentum and the institute will develop into a strong nucleus of hydrological research of international repute.

DIRECTOR



# National Institute of Hydrology Roorkee

## ANNUAL REPORT 1982-83

### INTRODUCTION

A general introduction to the objectives, the constitution, and the management of National Institute of Hydrology has been given in the Summary and Director's Report.

### ORGANISATION

The President of NIH 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 other ministries and organisations including Central Water Commission, Central Ground Water Board, India Meteorological Department, University of Roorkee 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 NIH.

In order to achieve its objectives, the Institute is organised in six scientific and technical divisions. These are :

1. Information Systems.
2. Hydrologic Analysis (Surface water)
3. Hydrologic Analysis (Ground water)
4. Hydrologic Synthesis (Surface water)
5. Hydrologic Synthesis (Ground water)
6. Integrated Planning.

There are two administrative divisions one for General Administration and the other for Finance and Accounts. The detailed organisation structure of NIH is presented in Chart I.



The recruitment position of scientists and supporting scientific and technical staff at the end of year under report is as follows :

	Post	No.
1.	Scientist 'F'	1
2.	Scientist 'E'	2
3.	Scientist 'C'	5
4.	Scientist 'B'	10
5.	Senior Research Assistant	3
6.	Research Assistant	4
7.	Technical Assistant	1

2 Scientists 'C' , 5 Scientists 'B' and 4 Senior Research Assistants have already been identified and further action has been initiated for making the offers. Advertisement has been issued for filling up the remaining sanctioned and released posts in different categories including 1 Scientists 'F' and 2 Scientists 'E'.

At present, the scientific activities are functioning under three divisions, headed by 1 Scientist 'F' and 2 Scientists 'E'.

The Administrative Division and Finance Division are headed by Chief Administrative Officer and Finance Officer, respectively. They are assisted by an Office Superintendent and other Administrative Group 'C' staff.

The details of staff are given in Appendix III.

## **BUILDING & SERVICES**

Until December '82, the Institute was functioning in rented accommodations at 102, Vigyan Kunj provided by the University of Roorkee and other rented from a private party. The Administrative Building of National Institute of Hydrology was completed in December '82. Late Shri Kedar Panday, the then Union Minister for Irrigation and President of NIH Society inaugurated the building which was named as 'Jal Vigyan Bhavan'. The Institute is presently functioning in Jal Vigyan Bhavan. The University of Roorkee has kindly permitted the use of part of the accommodation 102, Vigyan Kunj, for NIH Computer Centre. It is expected that by the end of 1983, adequate power supply will be made available to NIH Campus through a sub-station, and then only the Computer Centre along with A.C. System will be shifted to Jal Vigyan Bhavan. The buildings for sub-station, laboratory block and guest house (experts' hostel) have been planned and are being taken up for construction as deposit work by the University of Roorkee. It is expected that the



construction work of these buildings will be nearly completed by next year.

The Uttar Pradesh State Electricity Board (UPSEB) has agreed to provide a feeder and a power supply of 250 KVA load through a sub-station. Necessary deposit of Rs. 4,95,454.00 has been made in advance to UPSEB, and an agreement has been signed for provision of power supply. A tube well with a discharge of .057 Cumec (2 Cusecs) has been constructed and developed by the Central Ground Water Board. Further action has been initiated for construction of Pump house and procurement of pump set-

## **EQUIPMENT**

There is a provision for equipment worth US \$ 549,880 (latest revised figure after Mid Term Review in Dec. '82) under the UNDP Project. A VAX-11/780 mini Computer System was received by the Institute in April/May '82. Some of the peripherals were received later. The installation and acceptance test of the Computer were completed in October '82. Since then the system is under one year warranty period maintenance by M/s Hinditron. The Computer Maintenance Corporation (CMC) and Hinditron are being contacted for their quotations for planning and provision of environmental facilities and for shifting of the Computer System in Jal Vigyan Bhavan, and also for maintenance after end of warranty period.

An Automated Hydrologic Station for real time collection of hydro-meteorologic, soil moisture, ground water and lysimeter data with provision for recording on cassette tapes, is being procured through the UNDP Project. This station will be extremely useful for understanding the basic components of hydrologic cycle and serve as a pilot station for further similar studies. Additional equipment for research work of National Institute of Hydrology to be procured within India has also been identified. Further necessary action is being taken for their procurement, so that they are available when the construction of laboratory block is completed.

## **UNDP PROJECT**

United Nations is collaborating with the Govt. of India in the establishment of the NIH under a UNDP Project and UNESCO is the executing agency. The UNDP Project is for 5 years duration and it started in March, 1979. It envisages financial support from UNDP of the order of US \$ 988,716 (latest figure revised after mid-term review Dec. 1982) with a counterpart expenditure of Rs. 128.85 lakhs by the Government of India. The UNDP contribution is under the following broad heads :

### **i) Consultancy**

Consultancy includes visits of the Chief Technical Advisor on a number of occa-



sions for a total period of 12 months and six man-months of consultancy by other experts. Prof. Maniak, Professor Braunschweig University, West Germany visited the Institute thrice during the year under review for providing consultancy as Chief Technical Advisor. Prof. Maniak visited the Institute for two weeks in September '82 during which the progress of UNDP was reviewed and proposals regarding study tour and training of scientists, procurement of equipment etc., under the project were discussed. During his second visit for a period of two weeks in Dec. '82, a Consultative Committee meeting of the UNDP Project was held for reviewing the progress of the project. Dr Maniak also visited National Institute of Hydrology for a period of three weeks in February/March '83 for finalising the Mid Term Review Report of the UNDP Project and for finalising proposals regarding study tours, training programmes, procurement of equipment etc.

Mr D R Dawdy, formerly Chief (Surface Water Research), US Geological Survey and Professor Colorado State University and presently working with a private consulting firm visited the Institute as a consultant during January '83. Mr Dawdy was involved in training of some of the scientists in establishing the stage discharge rating curves using data for Narmada river and its tributaries. Dr D H Pilgrim, Associate Prof., University of New South Wales, Australia visited NIH in Jan. '83 for 4 weeks as a Consultant in the areas of agricultural and watershed hydrology. He worked with the scientists on unit hydrograph studies, flood routing studies and design flood estimation. Mr. Arlen D Feldman, Chief (Research), Hydrologic Engineering Centre, US Army Corps of Engineers was invited as a Consultant at NIH in February '83. Mr Feldman introduced and supervised the scientists in implementing and testing of HEC-Programmes, particularly HEC-1, HEC-4, and HEC-5. Under his supervision HEC-1 program was also tested using data for Narmada Basin.

The third meeting of the Consultative Committee for National Institute of Hydrology, UNDP Project wherein mid term review report was finalised, was held on December 6, 1982. The progress and programme of the project was reviewed by Govt. of India and UNDP and it was considered quite satisfactory. The project document contemplated a UNDP contribution of US \$ 790350 and the Government of India contribution of Rs. 72.82 lakhs in kind. The UNDP contribution has now been revised to US \$ 913716 and the Government of India counterpart contribution was raised from Rs. 72.82 lakhs to 128.85 lakhs. It was felt that in order to meet the minimum requirement of the field equipment of the project the UNDP equipment component which was not revised to take up the inflation should be further increased by US \$ 75000 and this has been agreed to in the Mid-Term Review meeting.

## ii) Study Tours and Fellowships

The original project document includes a study tour for a period of 3 months



each for Director and senior scientists and training fellowships for scientific personnel for a total period of 120 man months. Dr S Ramaseshan, Director undertook a study tour for a period of 7 weeks to USSR, Hungary, China, Japan, Australia and Thailand in November/December 1982. Dr S M Seth, Scientist 'F' undertook a study tour for a period of 5 weeks to Egypt, Italy, USA and Ireland in January/February 1983. They had detailed discussions with a number of experts in different institutions/organisations/universities. They also visited several field stations. During the tours, they also identified some consultants as well as areas and places of training for scientists of NIH.

In the year under review four scientists have completed their training in various fields under UNDP Project as given below :

Name (Period)	Country	Field of study	Remarks
1. Dr PV Seethapathi Scientist 'C' & presently Scientist 'E' (5 months)	USA, West Germany	Ground Water Hydrology	Research work covering effects on storativity of regional aquifers of distributed low permeability.
2. Sh K S Ramasastrri Scientist 'C' (5 months)	USA, Canada, UK, USSR	Hydrometeo- rology	Research work on Data Quality Control programme of precipitation in an operational system.
3. Sh B Soni. Scientist 'B' (7 months)	Nether- lands. USA	Watershed Modelling	Research work on Rainfall Runoff Wageningen Model for Hupselseueck catchment area in the Netherlands & on evaluation of management effects on infiltration parameters.
4. Sh S R B Dhason Scientist 'B' (5 months)	USA	Reservoir Operation	Attended courses on water Resources Systems Analysis, Systems Engineering & Optimization and Statistics in Water Resources.



Under the year of review the following scientists proceeded on training abroad under UNDP Project :

	Name	Duration	Country	Field of Study
1.	Sh A K Bhar Scientist 'C'	5 months	USA	Remote Sensing Applications in Hydrology.
2.	Sh B Datta Scientist 'C'	5 months	Japan	Watershed Hydrology
3.	Sh A B, Palaniappan, Scientist 'B'	5 months	USA	Flood Routing

Mr R D Singh, Scientist 'B' has proceeded on 12 months training programme at University College, Galway, Ireland and will specialise in rainfall-runoff relationships. Fellowship applications of five scientists are under processing for training, in second half of 1983. In general, the progress of UNDP Project under consultancy and training activities is quite satisfactory.

#### **HYDCOM :**

After a decision was taken on April 20, 1982 by the Government to transfer the responsibilities of INC for IHP from DST/CSIR to Ministry of Irrigation, a High Level Technical Committee was constituted by Ministry of Irrigation on 18th August 1982. The High Level Technical Committee on Hydrology is the successor body of the INC for IHP with a wider function and broader composition consisting of representatives from some state governments as well. The Secretariate of this Committee has been placed under the administrative control of the National Institute of Hydrology, Roorkee and for the present, it is located at Delhi.

The first meeting of the Committee since its constitution in August, 1982 was held on 22nd Feb., 1983. The secretariate of the Committee which was previously located at DST complex has been shifted to Sewa Bhawan, R.K. Puram, New Delhi, provided by Central Water Commission on a temporary basis. Identification for renting of a permanent accommodation for HYDCOM is in progress. HYDCOM was taken over by NIH from CSIR on 31st March, 1983.

1. The erstwhile Indian National Committee for IHP had not been able to consider formally the programmes of IHP Phase-II (1981-83) and Phase-III (1984-85) to



decide on the national priorities and India's participation in the IHP projects and programmes. Chairman, HYDCOM, therefore constituted an interdepartmental Expert Review Group for the IHP Phase-III Programmes, under the Chairmanship of Member (WR). The Expert Review Group considered the phase-II and Phase III documents in detail and identified programmes of priority and interest to India and suggested appropriate action. As regards Phase-II the Secretariate had approached a number of agencies in the country to elicit information whether they would be able to take up any of the projects of IHP-II. On the recommendations of the Expert Review Group several other agencies were approached. Responses on some projects have been received and other responses are awaited. On Phase-III India had communicated its views on all preparatory circulars and questionnaires received from UNESCO.

2. Intergovernmental Council sessions of IHP are important for the review of the progress of IHP and the evolution of the future programme. Shri H S Krishnaswamy, Member (WR), Central Water Commission, attended the fifth session of the IC, held in Paris from 8-15 November, 1982, as an observer from India. Commitment has been made specially on the implementation of the research activity regarding the pilot project on "Hydrological Aspects of Waste Disposal" on the recommendation of the Indian National Committee for IHP. The matter is being pursued by Member (WR), CWC on the recommendation of HYDCOM in its first meeting.

3. Dr S Ramaseshan, Director, NIH, Roorkee and Member (Hydcom) attended the III meeting of the IHP Committee on Training and Technical Assistance for developing countries, held in Paris on 2-5 November, 1982, as an observer from India. It was specifically suggested at the meeting that India should, with its extensive expertise, sponsor programmes for technicians training. HYDCOM had a detailed discussion on this subject in its first meeting and it was decided to constitute a sub-committee for designing on-the-job training courses for technicians of varying categories employed in hydrometeorological observations and data collection for meeting different needs.

4. The Second Meeting of the Asian Regional Coordination Committee on Hydrology (ARCCOH) was hosted by HYDCOM in Delhi on 10-12 January, 1983. The meeting was attended by representatives from China, India, Japan, Republic of Korea, Malaysia, Mongolia, Nepal, Pakistan, Phillipines, Sri Lanka, Thailand and USSR. Based on the discussions on country report seven recommendations emerged. Twenty priority areas have been identified for holding seminars and workshops by the ARCCOH countries. The meeting elected India, Japan, Malaysia, Nepal and Pakistan as the Members of the ARCCOH Steering Committee for the next term of three years. Under Recommendation No. 1 the National Committees of the countries in the ARCCOH region



have been requested by the Secretariat to prepare a report indicating the areas of interest of their country in the various IHP Phase-III projects for appointment of working groups or rapporteurs as necessary to frame programmes for different projects. Under Recommendation No. 2 a questionnaire for ARCCOH countries is being prepared to provide necessary information for compiling a directory showing education, training and research facilities and expertise in the field of hydrology. Under Recommendation No. 3 the National Committees have been requested by the Secretariat to send information on training and educational courses available in their countries.

Under Recommendation No. 7 a working group consisting of Nepal, USSR, China, Pakistan, Malaysia and India was constituted to formulate a major regional project related to conservation and utilisation of water resources, with India as convener. HYDCOM considered Recommendations 1 and 7 of ARCCOH-II in its first meeting and regarding recommendation 7 Prof. Subhash Chander of IIT Delhi, who is the member of HYDCOM, was nominated as the representative from India to convene the working group and was requested to convene a small group from within India to formulate ideas regarding a useful project from the view point of India. In consultation with Member (WR), and with assistance of Dr P R Rao, Central Water Commission Dr. Subhash Chandra has identified the following main sub heading in the projects :

1. Water Management
2. Irrigation & Drainage
3. Integrated Development
4. Education and Dissemination
5. Drinking Water and Sanitation

5. HYDCOM Secretariat has supplied information to UNESCO/IHP rapporteurs and working groups in respect of the following IHP-II projects :

- i) A.1.3.2--Compilation of Global sediment yield data.
- ii) A.1.4 —To assess possibilities of artificial ground water resources.
- iii) A.3.5 —To review the effects of interbasin water transfer.
- iv) A.1.7 —Water quality models.

6. A research project on High Flow Range Forecasting with particular reference to the Yamuna and the Brahmaputra rivers has been in progress at IIT Delhi, with Prof. Subhash Chander as Principal Investigator, at a total cost of Rs. 55000/-. As the extended term of the project ended on 31.12.82, on the request of the Principal Investigator HYDCOM agreed to extend the term upto 31.12.83.



7. There are five regular courses under IHP where HYDCOM nominates Indian candidates. Two candidates were nominated for the USSR Course.

8. HYDCOM has been bringing out a quarterly journal called Hydrology Review-A contribution to IHP. It has been an unpriced publication so far with a circulation list of about 700 in India and abroad. Due to reasons beyond the Secretariat's control, its publications have fallen in arrears, great efforts were being made to bring it up to date. Combined issues in the form of yearly volumes for 1979 and 1980 have been published and the issues are being circulated.

### MEETINGS OF AUTHORITIES

The Third Annual General Meeting of the National Institute of Hydrology Society was held on 27th December 1983 to review the progress and performance of the Institute. It also considered the Annual Report and the audited accounts of the Society for the year 1981-82. It approved the transfer of the International Hydrological Programme activities to National Institute of Hydrology through the High Level Technical Committee on Hydrology set-up by Government of India for which National Institute of Hydrology will provide the Secretariat. Several directions were given to the Institute with reference to its activities.

The Governing Body of National Institute of Hydrology met three times during the year under review namely on 9th July, '82, 16th October, '82 and 18th March '83. Several decisions concerning the administration of the Institute, provision of funds for the appropriate functioning of the Institute, identification of priority areas of research, recruitment of scientists and staff, procurement of equipment, identification of consultants and training programme for the scientists, and review of the programme and progress of research activities of the Institute were taken.

The Technical Advisory Committee has been entrusted with the technical scrutiny of the programme and progress of research work of National Institute of Hydrology. Constitution of the Technical Advisory Committee is given in Appendix IV. The Technical Advisory Committee met four times in the year namely on 26 June 1982, 6th and 14th Oct. 1982 and 17th Dec. 1982. Several decisions concerning the research activities and research programme of NIH, proposals for future development of NIH with particular reference to the continuation of the first phase of UNDP project, setting up of regional centres and other development programmes were taken.

A Coordination Committee of National Institute of Hydrology has been set up to ensure effective coordination between University of Roorkee and National Institute of Hydrology. It met on January 25, 1983 during the year under review and a number of decisions



concerning the coordination between NIH and UOR were taken.

The Governing Body of NIH has identified 8 priority areas of research. In order to monitor and advise the Institute in its research activities, under each of these areas the Governing Body has constituted Working Groups as given in Appendix V (a). The details of meetings of Working Groups during 82-83 are given in Appendix V (b).

## RESEARCH ACTIVITIES

### RESEARCH PROGRAMMES :

The research programmes of NIH have been considered and recommended by the Technical Advisory Committee, Governing Body and the NIH Society. As per the decisions taken, NIH will consider the entire hydrologic cycle and the various components including man's influence on the water resources. Accordingly the Institute will deal with various component processes of the hydrologic cycle and their interactions 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 existing 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 will deal with :
  - (a) measuring techniques, data collection and processing
  - (b) hydrological analysis of surface and/or ground water systems and the components/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 systemization : 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, programmers 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 hydrology 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 consultancy capability so that sponsored projects can be taken up by NIH outside the regular budget for the solution of complex problems.

As the Institute is still in its infancy and in the process of establishment, the research activities have progressed at a relatively slow pace initially and are now gradually gaining momentum.

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

- (1) Hydrologic analysis of streamflow in a basin.
- (2) Water balance of river basins.
- (3) Watershed models, including those for snowfed basins, and basins with limited data.
- (4) Methods of operation of a system of reservoirs taking into consideration the effects 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.

The highlights of research activities in these areas during 1982-83 are briefly discussed, as follows :

### **1, HYDROLOGIC ANALYSIS OF STREAMFLOW IN A BASIN :**

Study of surface water resources has been handicapped due to limited availability of streamflow records. The available historical records may exhibit seasonal and probabi-



listic fluctuations in space and time. It is also probable that historical records may not be representative of future fluctuations particularly if the records are short. In order to study the temporal variation of streamflow and its randomness, probabilistic and stochastic approaches are used. The methodology developed to analyse flows can also be applied to study the stochastic/statistical characteristics of time series of rainfall, groundwater, temperature etc.

NIH had earlier developed and/or implemented several approaches/computer programs for statistical analysis of streamflows. These included :

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

The frequency analysis programme has been further modified to improve its structure to use different number of classes depending on length of data series and to test any of the following five distributions :

- i) log normal distribution,
- ii) log normal distribution based on the theoretical relationship between original and log domain parameters.
- iii) inverse Pearson type III distribution,
- iv) log inverse Pearson type III distribution,
- v) square root normal distribution.

Literature survey has been completed for preparation of draft guidelines for flood frequency analysis. Simple and multiple regression analysis programmes of scientific subroutine package of IBM have been implemented and tested using all possible options on VAX-11/780 computer and documentation is being prepared describing salient features and instructions for data preparation. Computer program for BOX-COX transformation procedure has been implemented and tested on VAX-11/780. Its comparison with other normalisation procedures is being taken up.

## **2. WATER BALANCE OF RIVER BASINS :**

For proper utilisation of water resources, the estimation of availability of water



either as surface or ground water is very important. Water balance study is based on principle of conservation of mass and is an important tool in the evaluation of water resources of a basin, ground water system, lakes etc.

NIH had taken up two water balance studies, one with reference to the Upper Ganga Canal Command Area and the other with reference to the river Hindon. Estimation of various components of hydrologic cycle were made for both monsoon and nonmonsoon seasons. It was found that two season water balance can be reasonably achieved with the available data and the major sources of error were identified to be (i) rainfall recharge to ground water in monsoon, and (ii) evapotranspiration during non-monsoon season. Monthly water balance study for Upper Ganga Canal command Area is being undertaken.

Data collection and compilation has been completed for a few years for Hindon Basin. Preliminary analysis of ground water component has been taken up after formulating approaches for analysis. Draft preliminary reports have been prepared for canal seepage, base flow, evapotranspiration and water balance studies for UGC area. Central Ground Water Board has been contacted for providing copies of reports for Ghaggar and other basins.

### **3. WATERSHED MODELS INCLUDING THOSE FOR SNOWFED BASINS :**

A conceptual mathematical model can simulate various interacting component processes of hydrologic cycle in a basin. In case of limited streamflow data, the rainfall-runoff relationship of a basin can be established using a conceptual model and parameters of the rainfall-runoff process can be estimated. Once the parameters are estimated, streamflow data can be generated using available hydrometeorological data of the watershed.

The USGS rainfall-runoff model has been implemented on VAX-11/780 system in the Institute and has been tested for Indian catchment. The model has been calibrated for different combinations of flood events of Kasurnala catchment using storm rainfall and runoff data for the years 1973 and 1975. The peak flow and volume of direct runoff have been simulated quite accurately.

Rainfall-runoff relationship for a watershed has also been established by using Betson model. The model simulates two processes, viz., soil moisture accounting and surface runoff. Betson model is a lumped parameter model and input data needed for this model is daily rainfall. Average rainfall values can be used when the basin has more than one raingauge station. Out-put from the model consists of simulated daily stream-



flow and daily antecedent precipitation index. Betson model has also been implemented and tested with Kasurnala data. The simulated peak value and the recession limb of the runoff hydrograph match well with the observed values.

The tank model is a conceptual non-linear model for simulation of rainfall-runoff relationship of a basin. It can be used for flood analysis and daily analysis for both humid and non-humid basins. Generally, four tanks are considered vertically in series representing discharge from top tank as surface discharge, discharge from second tank as intermediate discharge while discharge from third and fourth tank are taken as base discharge. Each tank has a side outlet and a bottom outlet. Discharges depend on amount of storage and discharge coefficients. Parameters of the model are obtained by trial and error starting from initial set of parameters by subjective comparison of calculated and observed discharge hydrographs till an overall good fit is obtained. Studies have been made using computer programs for tank models for flood analysis, daily analysis and 4x4 Tank model for Jamtara and Belkheri basins using available rainfall-runoff and evapotranspiration data for 1978-79.

Reports of the studies are under preparation.

#### **4. METHOD OF OPERATION OF A SYSTEM OF RESERVOIRS TAKING INTO CONSIDERATION EFFECTS OF IRRIGATION, FLOOD CONTROL AND POWER GENERATION :**

The streamflow in different rivers varies in space and time. In India approximately 80% to 90% of annual streamflow occurs during the monsoon season. Generally the demand during non-monsoon season exceeds the available streamflow. Accordingly, it may be necessary as well as desirable to store the excess water available during monsoon season in reservoirs for subsequent use for different purposes like irrigation, power generation, water supply etc. Further, it is necessary to operate the reservoir during flood season in order to minimize the flood damage and at the same time conserve water for future beneficial use.

Several mathematical approaches for simulation and optimization of operation of reservoir systems have been developed by various agencies and some of them have been implemented on VAX-11/780 system at the Institute. These are "River-basin" simulation model—"SIMYLD-II" developed by Texas Water Development Board, USA, and "HEC-V model for reservoir operation for flood control and conservation" developed by Hydrologic Engineering Centre of US Army Corps of Engineers. Some relevant data for Bhakra-Beas system and Damodar Valley system has been collected from different organisations for testing these models. Further data collection is in progress.



## **5. EVOLUTION OF MATHEMATICAL MODELS FOR STORM PRECIPITATION FOR FLOOD ESTIMATION :**

The estimation of precipitation is vital in assessing, forecasting, and control of floods. The recent developments include various approaches for estimation of shorter duration precipitation and snow cover, estimation of design storms from depth-area frequency relationships, identification of meteorologically homogeneous area, quantitative precipitation forecasting, and modelling of moving storms. Moving storm studies on Narmada basin have been carried out using four-storms namely 3-6 Sept. 70, 28-31 Aug. 73, 28-30 Aug. 78 and 8-11 Sept. 79. Interstation correlation upto a maximum lag of eighteen hours has been carried out for pairs of stations either way. Lag corresponding to the optimum correlation in each case has been found. Findings of storm movements between stations have been compared with the observations made by I.M.D. Further work and preparation of report is under progress.

## **6. EVOLUTION OF METHODOLOGIES FOR FLOOD ESTIMATION, FORECASTING AND CONTROL :**

India receives intensive precipitation during monsoon season over a few isolated periods which causes heavy floods and serious damages. These floods also contribute to the surface water resources of the nation. It is, therefore, necessary to develop methodology for estimating, forecasting, and controlling the flood in small and large basins. The different aspects of flood viz., estimation, forecasting and control can be grouped under the following categories :

### **1. Flood estimation**

(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, and (d) Flood wave modification due to surface water ground water interaction,

### **3. Flood forecasting**

(a) Forecast models, (b) Updating models including filtering algorithms, and (c) Multivariable methods, and

### **4. Flood Control**

(a) Dam break problem, (b) Flood bank overtopping and failure, and (c) Data collection and transmission system.



NIH has implemented and tested a number of computer programmes in this research area which include

- i) Loss rate optimisation and unit hydrograph program developed by Hydrologic Engineering Centre, USA.
- ii) Lump and multiple inputs system model program based on Nash model of instantaneous unit hydrograph developed by IIT Kanpur.
- iii) Inverse modelling program for estimation of unit hydrograph coordinates.
- iv) Constrained Linear System (CLS) model.
- v) USGS program for stream flow routing with losses due to bank storage.
- vi) HEC-I Flood Hydrograph Package.
- vii) Streamflow Synthesis and Reservoir Regulation (SSARR) Model.
- viii) Muskingum Cunge method of flood routing.
- ix) HEC-II water surface profile program.

Studies have been taken up for application of multiple input and lump input system program using data of small catchments in Godavari basin; unit hydrograph estimation using loss rate optimisation program of HEC for sub-basins in Narmada basin and flood routing studies using HEC-I and SSARR programme for Narmada river system.

## **7. METHODOLOGY FOR GROUNDWATER ESTIMATION AND DEVELOPMENT :**

Water stored below the surface of the earth is estimated to make up more than one-fifth of the earth's total fresh water resources. Its proper utilization should be a fundamental tenet of good water management in every country. India has extensive groundwater reservoirs in the Indo Gangetic basin and in the costal aquifers which can be used effectively to cope up with the increasing demand of water in the domestic, industrial and agricultural sectors.

The understanding of the interactions between ground and surface water is a major problem today. A study dealing with interaction between surface and ground water in Upper Ganga Canal Command Area has been completed. The study has indicated limitations in the estimation of some important components of ground water balance, viz., rainfall recharge, evapotranspiration, seepage losses from canals, and base flow.

Tyson Weber Finite Difference model has been adapted and implemented on VAX-11/780 system for simulating monsoon and non-monsoon water table fluctuations. Using this model, simulation of monthly fluctuation of water table is being carried out for UGC command area. Draft report on Hydrogeological studies in UGC command area



has been completed. Fence diagrams for the entire UGC Command Area and Hindon river basin have also been drawn. Analytical solution for studying interference of canal and shallow water table, distribution of seepage losses from a canal in an aquifer of large depth have been obtained. Estimation of seepage into the aquifer from river bed has been one of the major problems in groundwater hydrology. The seepage from a river of large width to a shallow water table aquifer has been quantified using conformal mapping technique. The seepage from a river is proportional to the difference in the level of water in the river and in the aquifer in the vicinity of river, the constant of proportionality being known as "Reach Transmissivity". The Reach Transmissivity has been determined for a river of large width. A critical review on seepage losses from Deoband canal by tracer studies is under progress.

## **8. STUDY OF EXTREME STORMS AND FLOODS AND THEIR IMPLICATIONS IN HYDROLOGIC SYNTHESIS :**

Most of the dams are designed for extreme floods and the probable maximum flood is used as a design criteria. The flood is ratified from time to time based on historical extreme storm occurrence. The flash floods among extreme floods are a class by themselves and are generally experienced in association with an extreme rainfall. Though in reality, every dam could not be designed for flash floods, their potential could atleast be identified and necessary safeguards through the dam design or operating rules could be built in. The studies during the immediate future need to be oriented towards:

- i ) characteristics of flash flood,
- ii ) identifying region of flash flood occurrence, and
- iii) possibility of flash flood occurrence.

The causes of flash flood are meteorological (storm rainfall), tidal waves (storms or earthquakes) and man made. Before designing a dam, the PMF vis-a-vis flash flood could be examined and the additional design required for flash flood may be estimated.

On the meteorological side, since the rain-gauge network is limited, an extreme rainfall event might go undetected. The use of Radar for estimating rainfall on an areal basis could, therefore, be made operational to augment the rainfall data from conventional surface rain gauges. Review of literature on different aspects of flash floods is under progress.



## **VISITS OF EMINENT SCIENTISTS AND SCIENTIFIC DELEGATIONS**

1. Dr. Douglas L James of Water Resources Centre, Utah State University, Utah, USA visited the Institute on 17th June, 1982. He discussed different aspects of flood studies for Narmada basin.
2. Dr. Edwin Ted Engman, Chief, USDA Hydrology Lab., Maryland, USA, visited the Institute on 28th Aug., 1982. He was apprised of the progress and programme of the research activities of the Institute. He gave useful suggestions regarding research in the area of watershed modelling.
3. A ten member scientific delegation under protocol agreement of Govt. of India and USSR visited the Institute on 7th Jan., 1983. They discussed and exchanged views on hydrological research activities, particularly hydraulics and hydrological studies on large canal systems.
4. A twelve member delegation of second meeting of ARCCOH visited the Institute on 13th Jan. 1983. They were apprised of the Institute's research activities and future programmes.

## **PARTICIPATION IN SEMINARS / SYMPOSIA / COURSES**

The details of participation in Seminars / Symposia and courses during the year under report by scientists of the Institute are given in Appendix VI.

## **PUBLICATIONS**

During the year under report a number of papers have been published by Director, and scientists in various professional journals as well as in proceedings of seminars, symposia. A list of papers published/presented is given in Appendix VII.

## **ACCOUNTS & FINANCE**

The Govt. of India, Ministry of Irrigation provided as grant-in-aid an amount of Rs. 25.00 lakhs to the NIH during the year under review. The actual expenditure for the year 1982-83 was of the order of Rs. 22.93 lakhs. The provision of Rs. 38.00 lakhs has been made in the budget estimate for the year 1983-84. The audited statement of accounts for the year 1982-83 consisting of receipts and payments of accounts, income and expenditure account and the balance sheet as at 31st March' 83 duly certified by the auditors M/s Thakur Vaidyanath Aiyar and Co , New Delhi is given at Appendix VIII.

## **CONSIDERATION AND APPROVAL OF ANNUAL REPORT OF NIH BY GOVERNING BODY**

As required under Rule 14 of the Rules and Regulations of NIH, the Annual Report of proceedings of the NIH Society and all works undertaken during the year, have to be prepared by the Director and approved by the Governing Body for the information of the members of the Society and the audited accounts of the Society alongwith the auditors' report thereon have to be placed before the Society at its Annual General Meeting and also on the Table of the Houses of Parliament.

The Annual Report of NIH for the year 1982-83 and the auditors' report by M/s Thakur vaidyanath Aiyar & Co., New Delhi including the receipt and payment account, income and expenditure account and the balance sheet as on 31st March 1983 were placed before 18th meeting of the Governing Body held on 7th Oct 1983 at Shram shakti Bhavan, New Delhi (as agenda item No 18.4).

The Governing Body in it's 18th meeting held on 7th October, 1983 approved the Annual Report for 1982-83 as submitted by the Director, NIH for placing before the Society and also on the Table of the Houses of Parliament.



# APPENDICES

# CONSTITUTION OF NATIONAL INSTITUTE OF HYDROLOGY SOCIETY

## PRESIDENT

1. Minister for Irrigation,  
Govt. of India  
Shram Shakti Bhavan,  
NEW DELHI-110001

## VICE-PRESIDENT

2. Minister of State for Irrigation,  
Govt. of India,  
Shram Shakti Bhavan,  
NEW DELHI-110001

## MEMBERS

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>3. Member,<br/>Planning Commission,<br/>Yojna Bhavan,<br/>Parliament Street,<br/>NEW DELHI-110001</li> <li>4. Minister in charge of Irrigation,<br/>Govt. of Haryana,<br/>CHANDIGARH</li> <li>5. Minister in charge of Irrigation,<br/>Govt. of Uttar Pradesh,<br/>LUCKNOW</li> <li>6. Minister in charge of Irrigation,<br/>Govt. of Punjab,<br/>CHANDIGARH</li> <li>7. Minister in charge of Irrigation,<br/>Govt. of Bihar,<br/>PATNA</li> <li>8. Minister in charge of Irrigation,<br/>Govt. of West Bengal,<br/>Writer's Building,<br/>Dalhousee Square,<br/>CALCUTTA</li> </ol> | <ol style="list-style-type: none"> <li>9. Minister in charge of Irrigation<br/>Govt. of Orissa,<br/>BHUBNESHWAR</li> <li>10. Minister in charge of Irrigation,<br/>Govt. of Andhra Pradesh,<br/>HYDERABAD</li> <li>11. Minister in charge of Irrigation,<br/>Govt. of Kerala,<br/>TRIVENDRUM</li> <li>12. Minister in charge of Irrigation,<br/>Govt. of Maharashtra, Mantralaya,<br/>BOMBAY</li> <li>13. Minister in charge of Irrigation,<br/>Govt. of Madhya Pradesh,<br/>BHOPAL</li> <li>14. Vice-Chancellor,<br/>University of Roorkee,<br/>ROORKEE</li> <li>15. Shri A. N. Malhotra,<br/>Chairman,<br/>Brahmputra Board, Silpukhuri,<br/>GAUHATI-3</li> </ol> |
|--|---|



16. Shri K. V. Krishnamurthy,  
Consulting Engineer & Editor,  
Water World,  
B-1 (2nd Floor), L.S.C., J Block, Saket,  
NEW-DELHI-110017
17. Shri S. C. Sharma,  
Director,  
Gujarat Water Resources Development  
Corporation Ltd.,  
3rd Floor, Balvantrai Mehta,  
Panchayat Bhavan, Sector No. 17,  
GANDHINAGAR-383017
18. Director General,  
National Water Development Agency,  
Annexe Behind CSMRS Building,  
Outer Ring Road, I. I. T. Hostel,  
NEW DELHI-110016
19. Chairman,  
Narmada Control Authority,  
D-37, N. D. S. E. Part-II,  
NEW DELHI-110049
20. Shri J. A. Murray,  
Retd. Chief Engineer, P.W.D., A. P.  
H. No. 3-3-319 8/8,  
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HYDERABAD-500873
21. Shri Hari Mohan,  
Retd. Engineer-in-Chief,  
Irrigation Department, Uttar Pradesh,  
C-26/2 G, Wazir Hasan Road,  
LUCKNOW-226001
22. Prof Subhash Chander,  
Civil Engineering Department,  
Indian Institute of Technology,  
NEW DELHI-110016
23. Dr. Satish Chandra,  
Professor,  
School of Hydrology,  
University of Roorkee,  
ROORKEE
24. Dr. P. S. Rao,  
Professor  
Indian Institute of Management,  
33, Langford Road,  
BANGALORE-560027
25. Secretary,  
Govt. of India, Ministry of Irrigation,  
Shram Shakti Bhavan,  
NEW DELHI-110001
26. Secretary,  
Govt of India,  
Department of Science and Technology,  
Technology Bhavan,  
New Mehrauli Road,  
NEW DELHI-110029
27. Secretary,  
Govt. of India,  
Ministry of Energy,  
Shram Shakti Bhavan,  
NEW DELHI-110001
28. Secretary,  
Govt. of India,  
Department of Civil  
Aviation,  
Sardar Patel Bhavan,  
NEW DELHI-110001
29. Secretary,  
Department of Expenditure,  
Ministry of Finance,  
Govt. of India,  
(or his nominee),  
North Block,  
NEW DELHI-110001
30. Secretary,  
Ministry of Works  
and Housing,  
Govt. of India,  
Nirman Bhavan,  
NEW DELHI-110002

31. Secretary,  
Planning Commission,  
Govt of India,  
Yojna Bhavan,  
Parliament Street,  
NEW DELHI-110001
32. Chairman,  
Central Water Commission,  
Seva Bhavan,  
R.K. Puram,  
NEW DELHI
33. Member (WR),  
Central Water Commission,  
Seva Bhavan, R.K. Puram,  
NEW DELHI
34. Member (Floods)  
Central Water Commission,  
Seva Bhavan, R.K. Puram,  
NEW DELHI
35. Chairman,  
Central Electricity Authority,  
Seva Bhavan, R.K. Puram,  
NEW DELHI
36. Chairman,  
Central Ground Water Board,  
Krishi Bhavan,  
Dr. Rajendra Prasad Road,  
NEW DELHI
37. Director General,  
Meteorology,  
India Meteorological Department,  
Lodi Road,  
NEW DELHI
38. Director General,  
Geological Survey of India,  
Chowringee Road,  
(Jawahar Lal Nehru Road),  
CALCUTTA
39. Secretary,  
Indian National Committee of  
International Hydrological  
Programme,  
West Block-1, Wing-IV,  
Room No. 19-20, R.K. Puram,  
Seva Bhavan,  
NEW DELHI
40. Joint Secretary (Admn.)  
Ministry of Irrigation,  
Shram Shakti Bhavan  
NEW DELHI-110001
41. Joint Secretary (Ganga Basin),  
Ministry of Irrigation,  
Shram Shakti Bhavan,  
NEW DELHI-110001
42. Commissioner (Indus Basin).  
Ministry of Irrigation,  
Shram Shakti Bhavan,  
NEW DELHI-110001
43. Director,  
National Institute of Hydrology,  
ROORKEE.



## LIST OF MEMBERS OF THE GOVERNING BODY

## CHAIRMAN

1. Shri M. G. Padhye,  
Secretary to Government of India,  
Ministry of Irrigation,  
Shram Shakti Bhawan, Rafi Marg,  
New Delhi-1.

## VICE-CHAIRMAN

- 2 Vice-Chancellor,  
University of Roorkee,  
Roorkee.

## MEMBERS

3. Secretary,  
Government of India,  
Ministry of Energy  
Department of Power,  
Shram Shakti Bhawan,  
New Delhi-1.
4. Secretary,  
Government of India,  
Department of Civil Aviation,  
Sardar Patel Bhawan,  
New Delhi-1.
5. Secretary,  
Government of India,  
Ministry of Works & Housing,  
Nirman Bhawan,  
New Delhi-1.
6. Joint Secretary and Financial Advisor,  
Ministry of Irrigation,  
Shram Shakti Bhawan,  
New Delhi-1.
7. Secretary,  
Planning Commission,  
Government of India,  
Yojna Bhawan,  
New Delhi.
8. Secretary,  
Department of Science & Technology,  
Government of India,  
Technology Bhawan,  
New Delhi.
9. Chairman,  
Central Water Commission,  
Sewa Bhavan,  
R K Puram,  
New Delhi.
10. Chairman,  
Central Electricity Authority,  
Sewa Bhavan,  
R K Puram,  
New Delhi.

11. Chairman,  
Central Ground Water Board,  
Krishi Bhavan,  
New Delhi.

12 Director General,  
India Meteorological Department  
Lodi Road,  
New Delhi.

**MEMBER-SECRETARY**

13. Director,  
National Institute of Hydrology  
Roorkee.



POSITION OF STAFF OF NIH AS ON 1.4.82 & 31.3.83  
(Except HYDCOM Division)

S. No.	Description	Existing as on		Remarks
		1.4.82	31.3.83	
1.	Director	1	1	
2.	Scientist 'F'	1	1	
3.	Scientist 'E'	-	2	
4.	Scientist 'C'	5	5	
5.	Scientist 'B'	5	10	
6.	Senior Research Assistant	4	3	
7.	Tech. Asst./Research Asstt.	3	5	
8.	Tracer	2	2	
9.	S. L. A. (Store)	-	1	
10.	Computer Operator	-	2	
11.	A/C Mechanic	1	1	
12.	Chief Admn. Officer	1	Vacant	Offer has been issued to Sh. Y P Sareen
13.	Finance Officer	1	1	
14.	Sr. Personal Assistant	1	1	
15.	Superintendent	1	1	
16.	Upper Division Clerk	2	2	
17.	Stenographer	3	3	
18.	Lower Division Clerk	4	5 + 3* (3* adhoc)	
19.	Driver	1	2	
20.	Messenger	3	3	
21.	Messenger-cum-Chowkidar	2	3	
22.	Chowkidar	2	2	
23.	Mali	-	1	

# CONSTITUTION OF TECHNICAL ADVISORY COMMITTEE OF NIH

## CHAIRMAN

1. Sh Pritam Singh  
Chairman,  
Central Water Commission,  
Sewa Bhavan, R.K. Puram,  
New Delhi-110066.

## MEMBERS

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>2. Member (Water Resources)<br/>Central Water Commission<br/>Sewa Bhavan, R K Puram<br/>New Delhi-110066</li> <li>3. Member (Floods)<br/>Central Water Commission<br/>Sewa Bhavan, R.K. Puram,<br/>New Delhi-110066</li> <li>4. Chairman<br/>Central Ground Water Board<br/>Krishi Bhavan,<br/>New Delhi-110011</li> <li>5. Director-General<br/>India Meteorological Department<br/>Lodi Road,<br/>New Delhi-110033</li> <li>6. Director,<br/>Central Water &amp; Power Research Station<br/>Khadakwasla,<br/>Pune-411024</li> </ol> | <ol style="list-style-type: none"> <li>7. Dr. Subhash Chander<br/>Prof. in Civil Engineering<br/>Indian Institute of Technology,<br/>New Delhi-110016</li> <li>8. Dr. Satish Chandra.<br/>Prof. of Hydrology<br/>University of Roorkee,<br/>Roorkee-247667</li> <li>9. Sh. P.A. Raj<br/>Secretary<br/>Government of Gujarat,<br/>Irrigation Department,<br/>Sachivalaya, Gandhinagar,<br/>Gujarat.</li> <li>10. Sh. M.A. Chitale,<br/>Secretary,<br/>Irrigation Department,<br/>Govt. of Maharashtra,<br/>Mantralya<br/>Bombay-400032.</li> </ol> |
|--|---|

## CONVENER

11. Director  
National Institute of Hydrology,  
Roorkee



NOTE:—The Governing Body in its 15th meeting held on 14.10 82 has recommended the inclusion of a representative of the Department of Science and Technology in the Technical Advisory Committee of N.I H. and he is being invited as a special invitee pending approval of change of constitution of TAC by NIH Society.

#### 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

## CHAIRMAN

- |   |                   |
|---|-------------------|
| 1. Director, National Institute of Hydrology,<br>Roorkee. | Dr. S. Ramaseshan |
|---|-------------------|

## MEMBERS

- |   |  |
|---|--|
| 2. Nominee of Central Water Commission,<br>New Delhi.                             | Director (Hydrology II)                                      |
| 3. Chief Engineer, Hydrological Observations,<br>CWC,                             | (i) Chief Engineer, Patna<br>(ii) Chief Engineer, Hyderabad. |
| 4. Nominee of Chief Engineer, Karnataka<br>Irrigation Department, Bangalore.      | Special Officer, Hydrology, WRDO                             |
| 5. Dr. S.K. Spolia, Indian Institute of<br>Technology, Delhi.                     |  |
| 6. Dr. Satish Chandra, Professor in Hydrology,<br>University of Roorkee. Roorkee. |  |
| 7. Dr. K.N. Mutreja, U.P. Irrigation<br>Department, Roorkee.                      |  |
| 8. Divisional Head, National Institute of<br>Hydrology, Roorkee.                  | Dr. S M. Seth, Scientist 'F'                                 |

## MEMBER-SECRETARY

- |  |   |
|--|---|
| 9. Scientist In-charge, National Institute<br>of Hydrology, Roorkee. | (i) Sh. B. Datta, Scientist-C<br>(ii) Sh. M. Perumal, Scientist-B |
|--|---|

## II. WATER BALANCE OF RIVER BASINS

## CHAIRMAN

- |   |                   |
|---|-------------------|
| 1. Director<br>National Institute of Hydrology, Roorkee | Dr. S. Ramaseshan |
|---|-------------------|

## MEMBERS

- |   |  |
|---|--|
| 2. Nominee of Central Water Commission,<br>New Delhi        | Director, NWP  |
| 3. Nominee of Central Ground Water Board,<br>New Delhi      | Chief Engineer,<br>Ministry of Irrigation                    |
| 4. Nominee of India Meteorological Department,<br>New Delhi | Deputy Director-General<br>Meteorology<br>(Hydrometeorology) |
| 5. Nominee of Water Technology Centre,<br>New Delhi         |  |



- |     |  |  |
|-----|--|--|
| 6.  | Nominee of Planning Commission,<br>Govt. of India<br>New Delhi   | Joint Adviser/<br>Deputy Adviser (I & CAD) |
| 7.  | Nominee of Chief Engineer<br>Govt. of Gujarat, Gandhinagar   |  |
| 8.  | Nominee of Director<br>UP Irrigation Research Institute, Roorkee   | Research Officer (Groundwater)             |
| 9.  | Dr. G C. Mishra<br>School of Hydrology,<br>University of Roorkee, Roorkee<br>(On deputation to NIH<br>since 17th Sept. 1982) |  |
| 10. | Dr. B. P. Singh,<br>Professor, Physics Department,<br>University of Roorkee, Roorkee   |  |
| 11. | Divisional Head,<br>National Institute of Hydrology, Roorkee   | Dr. S. M. Seth<br>Scientist 'F'            |

**MEMBER-SECRETARY**

- |     |   |                                  |
|-----|---|----------------------------------|
| 12. | Scientist In-charge<br>National Institute of Hydrology, Roorkee | Shri A. K. Bhar<br>Scientist 'C' |
|-----|---|----------------------------------|

**III. WATERSHED MODELS INCLUDING THOSE FOR SNOWFED BASINS AND  
BASINS WITH LIMITED DATA**

**CHAIRMAN**

- |    |   |                   |
|----|---|-------------------|
| 1. | Director,<br>National Institute of Hydrology, Roorkee | Dr. S. Ramaseshan |
|----|---|-------------------|

**MEMBERS**

- |    |   |   |
|----|---|---|
| 2. | Nominee of Central Water Commission,<br>New Delhi   | Dr. P. R. Rao<br>Sr Hydrologist                                       |
| 3. | Nominee of Chief Engineer (I)<br>Govt. of Maharashtra, Bombay                             | Sh. V. G Washimkar<br>Executive Engineer,<br>W. R. Division, Amravati |
| 4. | Nominee of Central Water and<br>Power Research Station, Pune                              | Dr. K. S. Rajagopalan,<br>Sr. Research Officer                        |
| 5. | Nominee of Bhakra Beas Management Board,<br>Chandigarh.                                   | Executive Engineer, Hydrology   |
| 6. | Director,<br>Central Soil Water Conservation<br>Research and Training Institute, Dehradun |   |

- Dr. P. B. S. Sarma.  
Senior Scientist (Hydrology)  
Water Technology Centre, IARI, New Delhi
8. Dr. B. S. Mathur,  
School of Hydrology  
University of Roorkee, Roorkee
9. Divisional Head,  
National Institute of Hydrology, Roorkee
- Dr. S. M. Seth,  
Scientist 'F'

#### MEMBER-SECRETARY

10. Scientist In-charge,  
National Institute of Hydrology, Roorkee.
- Sh. B. Datta,  
Scientist 'C'

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

#### CHAIRMAN

1. Director,  
National Institute of Hydrology, Roorkee
- Dr. S. Ramaseshan

#### MEMBERS

2. Nominee of Central Water Commission,  
New Delhi
- Shri A. D. Mohile  
Sr. System Planner (GBWS)
3. Nominee of Central Electricity Authority,  
New Delhi.
- Director,  
Hydroelectric (Planning)  
Directorate
4. Nominee of Bhakra Beas Management Board,  
Chandigarh.
- Member (Irrigation)  
Chief Engineer (Civil)
5. Nominee of Damodar Valley Corporation,  
Calcutta-700 027
6. Dr. A. Sunder  
Indian Institute of Science,  
Bangalore-560 027
7. Dr. G. N. Yoganarasimhan  
W. R. D. T. C., University of Roorkee,  
Roorkee.
8. Divisional Head  
National Institute of Hydrology, Roorkee.
- Dr. S. M. Seth,  
Scientist 'F'



MEMBER-SECRETARY

9. Scientist In-charge  
National Institute of Hydrology, Roorkee

Shri S. R. B. Dhason,  
Scientist 'B'

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

CHAIRMAN

1. Director,  
National Institute of Hydrology, Roorkee

Dr. S. Ramaseshan

MEMBERS

2. Nominee of Central Water Commission,  
New Delhi.

Director  
(Hydrology I)

3. Nominee of India Meteorological Department,  
New Delhi.

Dy. Director-General of  
Meteorology  
(Hydrometeorology)

4. Nominee of Indian Institute of  
Tropical Meteorology,  
Pune

Dr. O. N. Dhar  
Asstt. Director  
(Hydrometeorology)

5. Dr. Subhash Chander  
Professor,  
Indian Institute of Technology,  
New Delhi.

6. Nominee of Research, Design & Standards Organisation,  
Ministry of Railway, Lucknow.

Joint Director  
(B & F)

7. Divisional Head  
National Institute of Hydrology, Roorkee.

Dr. S. M. Seth,  
Scientist 'F'

MEMBER-SECRETARY

8. Scientist In-charge,  
National Institute of Hydrology, Roorkee.

Shri K. S. Ramasastrri  
Scientist 'C'

VI. (A) EVOLUTION OF METHODOLOGIES FOR FLOOD ESTIMATION, FORECASTING AND CONTROL - SMALL CATCHMENTS

CHAIRMAN

1. Director,  
National Institute of Hydrology, Roorkee

Dr. S. Ramaseshan

MEMBERS

2. Nominee of Central Water Commission,  
New Delhi.

Director (Hydrology)  
Small Catchments

- |  |  |
|--|--|
| 3. Nominee of India Meteorological Department,<br>New Delhi.   | Dy Director-General<br>Meteorology<br>(Hydrometeorology)             |
| 4. Nominee of Research, Design and Standards Organisation,<br>Ministry of Railways, Lucknow.           | Joint Director, Research<br>(B & F)                                  |
| 5. Nominee of Forest Research Institute,<br>Dehradun.  | Shri B. K. Subbarao<br>Officer In-charge<br>Forest Influences Branch |
| 6. Dr. Subhash Chander,<br>Professor in Civil Engineering<br>Indian Institute of Technology,<br>Delhi. |  |
| 7. Dr. R. J. Garde,<br>Professor in Civil Engineering,<br>University of Roorkee,<br>Roorkee.           |  |
| 8. Divisional Head,<br>National Institute of Hydrology, Roorkee.                                       | Dr. S. M. Seth,<br>Scientist 'F'                                     |

MEMBER SECRETARY

- |   |                                  |
|---|----------------------------------|
| 9. Scientist In-charge,<br>National Institute of Hydrology, Roorkee | Sh. M. Perumal,<br>Scientist 'B' |
|---|----------------------------------|

VI. (b) EVOLUTION OF METHODOLOGIES FOR FLOOD ESTIMATION, FORECASTING  
AND CONTROL - LARGE CATCHMENTS

CHAIRMAN

- |   |                   |
|---|-------------------|
| 1. Director,<br>National Institute of Hydrology, Roorkee. | Dr. S. Ramaseshan |
|---|-------------------|

MEMBERS

- |  |  |
|--|--|
| 2. Nominee of Central Water Commission,<br>New Delhi.            | Dy. Director, Flood<br>Forecasting (Planning<br>and Development) |
| 3. Nominee of Brahmaputra Flood Control Commission,<br>Gauhati-3 |  |
| 4. Nominee of Ganga Flood Control Commission,<br>Patna.          |  |
| 5. Nominee of India Meteorological Department,<br>New Delhi.     | Dy. Director-General of<br>Meteorology (Hydro-<br>meteorology)   |
| 6. Nominee of Chief Engineer (Irrigation),<br>Patna.             | Chief Engineer<br>(Irrigation)                                   |



7. Dr. Subhash Chander,  
Professor in Civil Engineering,  
Indian Institute of Technology, Delhi.
8. Dr. R. J. Garde,  
Professor in Civil Engineering,  
University of Roorkee, Roorkee.
9. Divisional Head,  
National Institute of Hydrology,  
Roorkee

Dr. S. M. Seth  
Scientist 'F'

#### MEMBER - SECRETARIES

10. Scientist In-charge,  
National Institute of Hydrology,  
Roorkee.

Sh. A. B. Palaniappan  
Scientist 'B' and  
Sh. M. Perumal  
Scientist 'B'

#### VII. METHODOLOGY FOR GROUNDWATER ESTIMATION AND DEVELOPMENT

##### CHAIRMAN

1. Director, National Institute of Hydrology,  
Roorkee. Dr. S. Ramaseshan

##### MEMBERS

2. Nominee of Central Groundwater Board,  
New Delhi. Chief Hydrologist  
CGWB
3. Nominee of Engineer-in-Chief,  
Punjab Irrigation Department,  
Chandigarh. Director, Water Resources  
Directorate
4. Nominee of Engineer-in-Chief,  
U. P. Irrigation Department,  
Lucknow.
5. Dr. V. Lakshminarayana,  
Professor in Civil Engineering,  
Indian Institute of Technology,  
Kanpur.
6. Dr. B. B. S. Singhal,  
Professor,  
Department of Earth Sciences,  
University of Roorkee, Roorkee.
7. Dr. A. S. Chawla,  
Professor,  
WRDTC,  
University of Roorkee, Roorkee.

8. Chief Engineer,  
Andhra Pradesh Irrigation Department,  
Hyderabad.
9. Divisional Head, National Institute of  
Hydrology, Roorkee.

Dr. S M. Seth, Scientist 'F'

MEMBER-SECRETARY

10. Scientist In-charge, National Institute  
of Hydrology, Roorkee.

Shri. A K. Bhar, Scientist-'C'

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

CHAIRMAN

1. Director,  
National Institute of Hydrology, Roorkee

Dr. S. Ramaseshan

MEMBERS

2. Nominee of Central Water Commission,  
New Delhi.
3. Nominee of India Meteorological Department,  
New Delhi.
4. Nominee of Indian Institute of  
Tropical Meteorology,  
Pune.
5. Nominee of Chief Engineer,  
Gujarat Irrigation Department,  
Gandhinagar.
6. Dr. Satish Chandra, Professor in Hydrology,  
University of Roorkee,  
Roorkee.
7. Divisional Head,  
National Institute of Hydrology, Roorkee.

Director, Hydrology . I

Dy. Director-General of  
Meteorology  
(Hydrometeorology)

Dr. O. N. Dhar  
Asstt. Director  
(Hydrometeorology)

Shri J. F. Mistry,  
Chief Engineer (IP)

Dr. S. M. Seth,  
Scientist 'F'

MEMBER-SECRETARY

8. Scientist In-charge,  
National Institute of Hydrology, Roorkee.

Shri K. S. Ramasastr  
Scientist 'C'



## APPENDIX V (b)

THE FOLLOWING IS THE LIST OF MEETINGS OF THE WORKING GROUPS HELD  
DURING YEAR 1982-83.

Sl. No.	Name of the Working Group	Date of Meeting
1.	Hydrologic analysis of streamflows in a basin.	16-4-1982
2.	Method of operation of a system of reservoirs	3-8-1982
3.	Evolution of mathematical models for storm precipitation for flood estimation.	3-6-1982
4.	Methodology for ground water estimation and development.	19-4-1982
5.	Study of extreme storms and extreme floods and their implications in hydrologic synthesis.	21-6-1982

SYMPOSIA, SEMINAR ETC. ATTENDED BY THE SCIENTISTS

1. Dr. S.M. Seth , Dr. G.C. Mishra , and Mr. B.Dutta attended the International Symposium on "Hydrological Aspects of Mountaineous Watersheds", held at School of Hydrology, University of Roorkee, Roorkee, during 4-6 November, 1982. Dr. S.M. Seth was General Reporter for the session on Hydrological Modelling.



## PUBLICATIONS OF NATIONAL INSTITUTE OF HYDROLOGY

1. Ramaseshan S., 1982. Disaster prevention and mitigation-A review. National Seminar on Quakes, Floods and Cyclones, GERI, Vadodara.
2. Seth S.M., and Datta B., 1982. Flood flow Frequency Analysis-comparative study of different approaches. Proceedings of the International Symposium on Hydrologic Aspects of Mountainous Watersheds, Roorkee
3. Seth S.M., and Mihayo J.M., 1982. Statistical analysis of daily flow series of Ramganga river at Kalagarh. Proceedings of the International Symposium on Hydrologic Aspects of Mountainous Watersheds, Roorkee.
4. Datta B., and Mishra G.C., 1982. Verification of Horton-Izzard model of overland flow. Proceedings of the International Symposium on Hydrological Aspects of Mountainous Watersheds, Roorkee.
5. Mishra G.C., Seethapathi P.V., and Chachadi A.G., 1983. Distribution of the seepage loss from a canal in an aquifer of large depth. Published in Proceeding of Seminar on Assessment, Development and Management of Ground Water Resources, New Delhi, India. 1983.
6. Seethapathi P.V., 1983. Finite element solutions in fully and partially screened wells with storage in confined aquifers. Published in Proceeding of Seminar on Assessment, Development and Management of Ground Water Resources, New Delhi India, 1983.
7. Chachadi, A.G. and Mahapatra, D.K. 1982. Use of principal component analysis in hydrochemical interpretations—an example. Proceedings of the Seminar on Hydrological investigation during the last 25 years in India, Waltair.
8. Chachadi, A.G. and Singhal D.C., 1982. Study of groundwater quality around Sohna District Gurgaon, Haryana. Proceedings of the Seminar on Hydrological investigations during the last 25 years in India, Waltair.
9. Seethapathi P.V., 1983. Management of Ground Water Resources. Published in Proceeding of Seminar on Assessment, Development and Management of Ground Water Resources, New Delhi, India, 1983.
10. Seth; S.M., 1983,. Modelling of daily snow melt runoff during pre-monsoon months for Beas Basin upto Mahali. First National Symposium on seasonal snow cover, Delhi.

THAKUR VAIDYANATH AIYAR & CO.  
CHARTERED ACCOUNTANTS

**Auditors Report to the Member 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, 1983 and report that 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 and that in 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, 1983, and
2. In case of Income and Expenditure Account of the deficit for the year ended on that date.

Sd/-  
Chartered Accountants

Dated : 29-7-83



THAKUR VAIDYA NATH AIYAR & CO.  
CHARTERED ACCOUNTANTS

### UTILISATION CERTIFICATE

Certified that the National Institute of Hydrology, Roorkee has incurred a sum of Rs. 22,93,184.76 (Rupees twenty two lacs ninety three thousand one hundred eighty four and paise seventy six only) during the financial year 1982-83 out of which a sum of Rs. 5,18,639.47 (Rupees Five lacs eighteen thousand six hundred thirty nine and paise forty seven only) is on acquisition of fixed and other assets and Rs. 17,74,545.29 (Rupees seventeen lacs seventy four thousand five hundred forty five and paise Twenty nine only) on revenue expenditure against the grant-in-aid of Rs. Rs. 25,00,000/- (Rupees twenty five lacs 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 M Seth)  
Director

Sd/- ( Illigible )  
Chartered Accountants

Dated : 29th July, 1983

(SEAL)

THAKUR VAIDYA NATH AIYAR & Co.  
CHARTERED ACCOUNTANTS

July 29, 1983

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

Dear Sir,

**Sub : Audit of Accounts of National Institute of Hydrology for the year  
ended 31st March, 1983**

We have completed the audit of the accounts of National Institute of Hydrology for the year ended 31st March, 1983 and are enclosing herewith 4 copies of the Balance Sheet as at 31st March, 1983. 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 has been approved by the Governing Body.

Our observations on the accounts are details as below :

1. WORKING RESULTS

During the year under audit, the net revenue expenditure incurred by the Institute Works out to Rs. 16,95,677.94 as against Rs 9,32,931.13 in the previous year. The net revenue expenditure excluding depreciation 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. 5,18,639.47 has been transferred to 'Assel Fund Account' from 'Grant-in-Aid'. Account being cost of acquisition of Fixed and other Assets during the year under audit. The details are as under :



	Amount
1. Increase in Fixed Assets	(+) 4,33,525.45
2. Increase in Building work-in-progress	(+) 1,00,000.00
3. Decrease in advances	(-) 44,973.90
4. Increase in deposits	(+) 25,110.00
5. Increase in due from others	(+) 11,074.10
6. Decrease in prepaid expenses	(-) 6,096.18
Total Rs.	<hr/> 5,18,639.47 <hr/>

The same may be approved by the Governing Body.

### 3. TRANSFER DEED OF LAND

As mentioned in previous years' audit reports, the transfer deed of land measuring 6.5 acres on which administrative building of the Institute is being constructed has not yet been executed. We have been given to understand that the delay in execution of transfer deed is due to some mis-understanding over the ownership of land. However, the matter is being taken up with appropriate authorities. This may be got expedited.

### 4. ADDITIONS TO FIXED ASSETS

During the year under audit, a sum of Rs. 4,33,525.45 has been spent on additions to various fixed assets as given in Schedule-A forming part of the accounts. These may be approved.

### 5. DEPRECIATION

As per the policy of the Government, depreciation on fixed assets is not allowed as expenditure for the utilisation of the Grant-in-aid, since the cost of fixed assets are financed by them fully. Consequently, depreciation total upto 31-3-1982 amounting to Rs. 66,238.49 has been written back and added to respective fixed assets. No depreciation has been provided for the year 1982-83. The treatment may be approved.

### 6. BUILDING WORK IN PROGRESS

A sum of Rs. 17,79,928.78 has been spent as at 31st March, 1983, 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 and Steel	5,22,6 8.78
3. Further advance to University of Roorkee	1,00,000.00
Total (Rs.)	<u>17,79,928.78</u>

#### 7. ADVANCES TO UNIVERSITY OF ROORKEE & OTHERS

A sum of Rs. 7,48,819.58 is outstanding as at 31st March, 1983. The details of the aforesaid outstanding are given in Schedule-B forming part of the accounts. The detailed observations are as under :

##### a) Advance for 60KW Power Supply (Rs. 55,168.00)

The contract was given to the University of Roorkee in the month of March 1981 for 60 KW Power Supply to be used for computer system. We understand that the work has been completed long back but due to non-receipt of final adjustment bill, this could not be adjusted. An early action may be taken in this respect.

##### b) Advance for wiring between UPS & Battery—Rs. 1,980.00

**c) Advance for internal electrification work for computer system—Rs. 20,000**

We have been told that the works are already over. Bills may be received and adjusted as per earliest.

##### d) Advance to UPSEB—Rs. 4,95,454/-

A sum of Rs. 4,95,454/- has been given as advance to Uttar Pradesh State Electricity Board for erecting a sub-station of 250 KW. We have been explained that the work is expected to commence in the month of August, 1983.

##### e) Advance for Franking Machine—Rs. 5270.18

A proforma invoice for the supply of franking machine amounting to Rs. 5,270.18 was received in the month of March, 1982. In spite of supplier's assurance to supply it in March, 1983, no supply is received till 25.7.1983. The matter may be got expedited.

##### f) Advance for construction of Tube well—Rs. 1,20,000/-

A contract was given to Central Ground Water Board, Ambala for construction of tube well in May-June, 1982. We have been told that the technical aspects in respect of it are already complete. Final Bills have not been submitted as yet.



## 8. DUE FROM DGS & D & OTHER (Rs. 11,739.10)

The details are as under :

A Matador Van was purchased amounting to Rs. 78,973.90 out of an advance of Rs. 90,000/-, thus leaving a balance of the above said amount. Sincere efforts must be taken to recover this amount as per earliest.

A sum of Rs. 713/- is recoverable from University of Roorkee on account of white washing advance and urinals which may be adjusted as per earliest.

## 9. LOCAL COST OF UNDP PROJECT – Rs. 4,52,815.50

This includes an expenditure of Rs. 1,66,908.20 on account of maintenance and warrantly Rs. 1,75,000 on installation and a sum of Rs. 1,10,907.30 on modification, minor repairs and air-conditioning of the old building of the Institute to make the computer system VAX-11/780 procured under UNDP Project put to use without delay. Owing to the reason that the old building is a rented one and the University of Roorkee has asked the Institute to vacate it by December, 1983, the expenditure of Rs. 2,85,907.30 on modification, minor repairs, air-conditioning and installation also becomes temporary for which partial benefit is going to accrue in future. On this consideration, the amount of Rs. 4,52,815.50 has been booked as an expenditure in this year's accounts. The treatment may be approved.

## 10. ADDITIONS TO COMPUTER MACHINERY – (Rs. 1,73,600/-)

A computer system VAX-11/780 has been given to the Institute under 'United Nations Development Programme' free of cost. As a result thereof only the cost of acquisition of 3 Packaged units of air-conditioning and its parts amounting to Rs. 1,73,600/- has been capitalised. This may be approved.

## 11. CONSULTANCY ASSIGNMENTS

### 1. WAPCOS Project

The Institute had been entrusted to take up U.P. composite irrigation Project (Modernisation of Upper Ganga Canal) for water and Power Consultancy services, New Delhi in 1979-80. During the year under audit, the Institute had completed the assignment and submitted a final bill of Rs. 3,77,199.81. Out of this, Rs. 2,50,000/- have already been received, thus leaving a sum of Rs. 1,27,199.81 as recoverable.

### 2. NARMADA Project

The expenditure on this project for the year is Rs. 83,048.34. No receipt is there for the year. For both the projects, receipts have been accounted for on cash basis.

12. NIH CPF ACCOUNT -Rs. 70,642.55

This represents employees' contribution to the Contributory Provident Fund and interest credited thereon. We understand that further action to deposit the Institute's Contribution is in progress.

In the end, we wish to place on record our thanks to the office bearers for the co-operation extended to us during the course of our audit.

Yours faithfully,  
Sd/-  
Chartered Accountants



Thakur Vaidyanath Aiyar & Co.,  
Chartered Accountants

**National Institute of Hydrology, Roorkee**  
**Balance Sheet as at 31st March, 1983**

As at 31-3-82	LIABILITIES	Amount Rs.	As at 31-3-82	ASSETS	Amount Rs.
	GRANT IN AID FROM GOVT. OF INDIA, MINISTRY OF IRRIGATION, NEW DELHI			FIXED ASSETS (AT COST)	
528601.62	Balance brought forward from previous year	738707.91	349497.62	(As per Schedule A annexed)	849261.56
	Add : Received from Govt. of India, Ministry of Irrigation, New Delhi	2500000.00		BUILDING WORK IN PROGRESS	
3300000.00		<u>3238707.91</u>		As per last balance sheet	1679928.78
<u>3828601.62</u>			1679928.78	Advance to Roor- kee University	1779928.78
(-)	Less : a) Cost of acquisition of fixed and other assets transferred to Asset Fund A/c	518639.47		ADVANCES & OTHERS	
2125980.18				Advance to Univer- sity of Roorkee & others (As per Schedule B	748819.58
	b) Transferred to Income & Expendi- ture A/c to meet the excess of expendi- ture over income for the yr.	1695677.94	793793.48	annexed)	748819.58
(-)		2214317.41	7761.18	Prepaid Expenses	1665.00
<u>963913.53</u>		1024390.50		Deposits (As per Schedule C	
<u>738707.91</u>			91380.00	annexed)	116490.00
861533.32	ASSET FUND ACCOUNT			Due from DGS & D	
	Balance brought forward	2987513.50		and Others	11739.10
	from previous year				
	Add : Transferred from				
	Grant-in-aid a/c	<u>518639.47</u>			
2125980.18		3506152.97			

Contd.

Contd. from previous page

As at 31-3-82	LIABILITIES	AMOUNT Rs.	AS AT 31-3-82	ASSETS	AMOUNT Rs.
	CONTRIBUTORY PROVI- DENT FUND ACCOUNT			CASH AND BANK BALANCES	
	Balance brought forward from previous year	22502.00	2264.50	Cash-in-hand	13024.30
	Add : 1. Employee's con- tribution during the year	47363.05	1500.00	Imprest with Divisional Heads	3000.00
21837.00	2. Interest credited during the year	4597.00		Balance with Savings Bank Account	
665.00		<u>74462.05</u>	886030.91	with State Bank of India, Roorkee	1093497.75
—	Less : Withdrawals made during the year	3819.50		Balance with Savings Bank Account with Indian Overseas Bank, Roorkee	59322.15
—	NIH STAFF GROUP INSU- RANCE SCHEME		21837.00		
	Balance as per last Balance Sheet	3054.00			
	Add : Recoveries made from employees during the year	4870.00			
3054.00		<u>7924.00</u>			
—	Less : Remittances made during the year	7136.70			
	LIABILITY FOR EXPENSES (As per Schedule 'D' attached)				
82881.06		74774.90			
<u>3834658.47</u>	TOTAL Rs.	<u>4676748.22</u>	<u>3834658.47</u>	TOTAL Rs.	<u>46,76,748.22</u>

SEAL

Subject to our Report of even date  
Examined and found correct

212-Deen Dayal Marg,  
New Delhi-110002.

Dated : July 29, 1983

Sd/-  
Finance Officer  
NIH-ROORKEE

Sd/-  
Director  
NIH-ROORKEE

Sd/-  
Chartered Accountants



**National Institute of Hydrology, Roorkee**  
**Income and Expenditure Account For The Year Ended 31st March, 1983**

Previous Year	Expenditure	Amount Rs.	Previous Year	Income	Amount Rs.
619957.55	Salaries, Wages & Allowances	906301.97		Interest on Savings	
32687.65	Travelling & Conveyance	41872.50	33282.39	Deposits	39445.53
73239.25	Office Expenses	97418.43	1401.01	Miscellaneous Receipts	4798.16
30006.17	Printing & Stationery	42125.06			
8931.10	Postage & Telegrams	10481.75	100000.00	Receipts on WAPCOS Project	—
	<b>Payments to Auditors</b>		—	Depreciation Written back	66238.49
2000.00	Audit Fees	2000.00			
200.00	Other Expenses	803.00		Transferred from grant-in-aid account to meet the expenditure for the year	1695677.94
—	Local cost of UNDP Project	2803.00			
		452815.50			
61921.43	Compter Expenses	31322.30	963913.53		
13100.00	Grant-in-aid/Subsidies	3150.00			
5081.85	Hospitality Expenses	5650.90			
9261.00	Advertisement Expenses	22319.75			
22397.44	Miscellaneous Expenses	28588.75			
1000.00	Consultancy Charges	23750.00			
35908.66	Newspapers & Periodicals	17486.75			
—	T.A. to candidates	20058.60			
30982.40	Depreciation	—			
106812.96	Expenditure on WAPCOS Project	12369.52			
44444.47	Expenditure on Narmada Project	83048.34			
665.00	Interest on Contributory Provident Fund	4597.00			
<b>1098596.93</b>		<b>1806160.12</b>	<b>1098596.93</b>		<b>1806160.12</b>

212-Deen Dayal Marg,  
New Delhi-110002

SEAL

Dated : July 29, 1983

Subject to our Report of even date  
Examined and found correct

Sd/-

Chartered Accountants

Sd/-

Finance Officer

NIH-ROORKEE

Sd/-

Director

NIH-ROORKEE

Thakur Vaidyanath Aiyar & Co  
CHARTERED ACCOUNTANTS

National Institute of Hydrology, Roorkee

Receipts and Payments Account For The Year Ended 31st March, 1983

Previous Year	RECEIPTS	Amount Rs.	Previous Year	PAYMENTS	Amount Rs.
<b>CASH AND BANK BALANCES</b>					
3,728.92	Cash-in-hand	2,264.50	5,86,609.51	Salaries, Wages & Allowances	9,05,023.45
5,96,319.25	Savings Deposit with State Bank of India, Roorkee	8,86,030.91	32,686.65	Travelling & Conveyance	41,774.50
—	Savings Deposit with Indian Overseas Bank, Roorkee.	21,837.00	63,283.30	Office Expenses	80,801.79
1,000.00	Imprest with Divisional Heads	1,500.00	—	Refund on Group Insurance Scheme	2,266.70
33,00,000.00	Grant-in-aid received from Govt. of India, Ministry of Irrigation, New Delhi.	25,00,000.00	30,006.17	Printing & Stationery	42,125.06
33,282.39	Interest on Savings Deposits	39,445.53	8,931.10	Postage & Telegrams	10,481.75
1,00,000.00	Consultancy fee from WAPCOS Project	—	2,000.00	Payment to Auditors	—
151.07	Recoveries of House Rent, Water and Electricity.	18.00	200.00	Audit Fee	2,000.00
—	Recovery of Income-tax deducted at source.	6,835.00	58,933.34	Other Expenses	803.00
3,054.00	Staff Group Insurance Scheme Recovery.	—	4,901.00	Computer Expenses	25,758.09
21,837.00	Staff Provident Fund Recovery	43,543.55	18,739.91	Furniture & Fixture	19,907.74
57,749.55	Refund of Advance for purchase of vehicles	—	82,781.10	Office Equipment	4,619.41
1,441.01	Miscellaneous Receipts	4,798.16	35,908.66	Library Books	99,227.10
2,347.00	Recovery of Advances	—	9,261.00	Journals & Periodicals	17,486.75
			22,397.44	Advertisement	22,319.75
			1,000.00	Miscellaneous Expenses	28,588.75
			13,100.00	Consultancy Fee	23,750.00
			—	Grant-in-aid & Subsidies	3,130.00
			5,081.85	T.A. to candidates	20,058.60
			50,709.65	Hospitality	5,650.90
			1,575.60	Machinery & Equipment	14,544.40
			—	Stores & Spares	—
			—	Other Deposits	20,830.00
			—	OYT Deposit	8,000.00

Contd.





## SCHEDULE OF FIXED ASSETS AS AT 31st MARCH, 1983

Sr. No.	Particulars	Cost as at 1-4-82	Additions	Total	Upto 31-3-82	For the year	As at 31.3.83	As at 31.3.82
1.	Furniture & Fixtures	75090.56	41312.54	116403.10	13825.96	-13825.96	116403.10	61264.60
2.	Office Equipments	91760.02	25867.51	117627.53	23503.51	23503.51	117627.53	68256.51
3.	Vehicles	49318.10	78973.90	128292.00	17754.62	-17754.62	128292.00	31563.48
4.	Computer Machinery	9216.00	173600.00	182816.00	3317.40	-3317.40	182816.00	5898.60
5.	Library Books	138102.83	99227.10	237329.93	—	—	237329.93	138102.83
6.	Machinery & Equipments	52248.60	14544.40	66793.00	7837.00	-7837.00	66793.00	44411.60
	<b>Total Rs.</b>	<b>415736.11</b>	<b>433525.45</b>	<b>849261.56</b>	<b>66238.49</b>	<b>-66238.49</b>	<b>849261.56</b>	<b>349497.62</b>



## ADVANCES TO UNIVERSITY OF ROORKEE AND OTHERS AS ON 31st MARCH, 1983

Sr. No.	Details	Amount as at 31.3.1983
<b>A-Advances to University of Roorkee</b>		
1.	Advance for 60 KW Power Supply for computer purposes	55,168.00
2.	Advance for Internal Electrification work for computer purposes	20,000.00
3.	Advance for wiring between UPS & Battery	1,980.00
B-	Advance to Uttar Pradesh State Electricity Board for Sub-Station	4,95,454.00
<b>C-Advances to Others</b>		
1.	Advance to M/s Roneo Vickers for Franking Machine	5,270.18
2.	Advance to Post Master Roorkee for 4 Telephone Lines	12,600.00
3.	Advance to Uttar Pradesh State Electricity Board for temporary connection charges	11,388.00
4.	Advance to E.E., C.G.W.B., Ambala for Tubewell	1,20,000.00
5.	Advance to Survey of India for Maps	176.00
6.	Advance to ETTDC Diehi for Magnetic Tapes	7,688.00
7.	Advance to M/s M&Co. Electronics for photocopier repair	1,830.40
8.	Advance to employees :	
	1. Travelling expenses	3,000.00
	2. Cycle	1,408.00
	3. Scooter	10,097.00
	4. Festival	2,760.00
		17,265.00
	<b>Total Rs.</b>	<b>7,48,819.58</b>

**SCHEDULE OF DEPOSIT AS AT 31.3.1983**

Sr. No.	Particulars	Amount as at 31.3.83	As at 31.3.82
1.	Deposit with University of Roorkee for Computer charges	20,000.00	20,000.00
2.	OYT Deposit	19,160.00	14,880.00
3.	Security Deposit for purchase of petrol	1,000.00	1,000.00
4.	Fixed Deposit with State Bank of India for Excise Security purposes	55,500.00	55,500.00
5.	Deposit for Gas Cylinder	350.00	—
6.	Deposit with Uttar Pradesh State Electricicy Board in connection with new building power	12,000.00	—
7.	Deposit with UPSEB for Sub-station	8,480.00	—
	Total Rs.	<u>1,16,490.00</u>	<u>91,380.00</u>



**SCHEDULE OF LIABILITY FOR EXPENSES AS AT 31-3-83**

Sr. No.	Particulars	Amount as at 31-3-1983	As at 31-3-1982
1.	Maintenance of Car	1,565.50	2,911.20
2.	Rent, Rates & Taxes	240.00	—
3.	Telephone expenses	1,846.20	1,312.10
4.	Salaries Wages-NIH	60,060.70	42,193.18
	—Narmada	2,111.50	1,767.80
5.	Audit Fee 1982-83	2,000.00	2,000.00
6.	House Rent outstanding	18.00	22.58
7.	Computer hire charges	—	15,956.71
8.	Income-tax deducted at source	6,835.00	—
9.	Electricity & Water charges	—	128.49
10.	Leave Salary & Pension Contribution	—	16,589.00
11.	Unpaid Travelling expenses	98.00	—
	Total Rs.	<u>74,774.90</u>	<u>82,881.06</u>