

JALVIGYAN SAMACHAR



जल विज्ञान समाचार

Newsletter of National Institute of Hydrology

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REORGANISATION OF DIVISIONS IN NIH

In order to encompass more topics in the arena of Hydrology and to broaden its field of study, the work at the institute will be carried out by 13 scientific divisions. The divisions are as follows :

1. Flood Studies
2. Surface Water Analysis and Modelling
3. Hydrologic Design
4. Mountain Hydrology
5. Ground Water Assessment
6. Conjunctive Use
7. Drainage
8. Water Resources System
9. Man's Influence
10. Drought Studies
11. Remote Sensing Applications
12. Information System and Data Management including Computer Centre
13. Hydrologic Investigation

With this, it is hopefully expected that major aspects of hydrologic studies will be given due emphasis and it will be possible to deal with them in greater detail.

DIRECTOR HEADS INDIAN DELEGATION TO IHP INTER GOVERNMENTAL COUNCIL SESSION AT PARIS

The seventh session of the IHP Inter governmental Council (IGC) took place in Paris, France from 18-23 June, 1986 which was attended by 30 members of the council besides representatives from WMO, IAEA and a number of non-governmental International Organisation. India which is not an elected member of the council, participated in the session with an observer status. The Indian delegation was led by Dr. Satish Chandra, Director, National Institute of Hydrology, Roorkee. Dr. Chandra was assisted in the deliberations by Mr Pradeep Singh, Second Secretary of the Permanent Delegation of India to UNESCO. The IGC Session was preceeded by the first session of the UNESCO Committee on Education & Training held during June 16-17, 1986, of which India is a member. Since Director, NIH could not participate in this meeting, it was attended by Sri Pradeep Singh. The committee evaluated UNESCO's activities relating to Education & Training in the field of water resources and made appropriate recommendations to the Inter Governmental Council of the IHP

राष्ट्रीय जल विज्ञान संस्थान
रूड़की

C. D. Kumar
Scientist 'B'
N I H, ROORKEE (U. P.)

At the seventh session of the council, the progress made so far under IHP-III was evaluated. The council noted that at the time of the 7th session, 98 member States of UNESCO had National Committee for IHP and national focal points have been defined by 40 other member States. It was further informed that in order to decide best possible ways of executing IHP-III projects, working groups have been constituted which include 160 experts from 42 member states. Seven experts from India have been included in various working groups/committees. The council noted that since 1984, 16 international symposia, workshops, and seminars have taken place on various aspects of hydrology and water resources and the number of UNESCO sponsored Hydrologic courses has increased to 32. The council also considered that preliminary report on the planning of the 4th phase of the IHP (1990-95), prepared by an adhoc group. The IHP-IV programme has been divided into 4 sub-programmes, namely, hydrological research, water resources management, education and training and public information. The representatives of the World Meteorological Organisation (WMO) and the International Atomic Energy Agency (IAEA) presented written reports on their hydrology related activities to the council and representatives from International Association of Hydrological Sciences (IAHS), International Geographical Union (IGU) and International Water Resources Association (IWRA) presented verbal reports. The regional hydrologists of UNESCO and delegates from member states presented reports on various activities under IHP-III. Dr. Chandra informed the council of the various activities planned to be undertaken by Indian National Committee on Hydrology (HILTECH) under different themes of IHP-III. The activities of Asian Regional Coordinating Committee on Hydrology (ARCCOH) were highlighted in view of its effective role of implementing IHP at regional level. The council session was followed by a workshop on 'Strategies for Acquisition of knowledge and Technology by Developing Countries in the Field of Hydrology

and Water Resources'. At this workshop a report of the IHP working group under IHP-III project 18.1 on recommended IHP strategies for technology transfer was presented for discussion and suitable recommendations were made.

Meetings of Authorities

(a) Governing Body (G.B.)

The 27th Governing Body meeting of the institute was held in Shram Shakti Bhawan, New Delhi on 30th June, 1986.

(b) Technical Advisory Committee.

The 4th meeting of Technical Advisory Committee was held at New Delhi on 13th May, 1986.

Gold Medal Awarded to N.I.H. Scientist

Dr. P.V. Seethapathi, Scientist 'E' received a gold medal for his technical paper titled "Flow towards Partially Penetrating Wells with Storage in Confined Aquifers" presented at the 52nd Research Session of C.B.I. & P. held at Aurangabad during 2-5th February 1985. The gold medal was awarded to him during the 53rd R & D session of C.B.I. & P. held at Bhubaneshwar from 7th to 10th May, 1986.

Studies and Research Activities

Studies were conducted and reports have been prepared under different categories viz. Technical Notes, Case Studies, Documentation of Programmes and Status Reports. Some selected abstracts of these reports are given as under.

(a) Technical Notes

1. Estimation of Seepage from Canal Using Tracer Technique

Loss of water due to seepage from irrigation canals constitutes a substantial percentage of the total usable water. By the time the water reaches the field, it has been estimated that the seepage losses are of the order of 45 percent of the water supplied at the head of the canal.

Of the various factors which influence seepage loss from a canal, the most important are the boundary conditions of the flow domain and permeability of the medium. Only after a correct assessment of the coefficient of permeability and boundary conditions, the seepage losses can be estimated either by numerical method or by analytical technique. Needless to say that it is very difficult to determine the insitu coefficient of permeability of the porous medium. In order to avoid the difficult task of estimating the coefficient of permeability and the prevailing subsurface boundary conditions experimental techniques like ponding method and inflow-outflow method have been used for estimation of seepage losses. In recent years, tracer technique has also been used to estimate seepage loss from water bodies because of its comparatively easy operation in respect to other experimental methods.

The seepages velocities at various sections of Deoband canal, a branch of Upper Ganga Canal, have been found by U.P. Irrigation Research Institute using nuclear tracer technique. These seepage velocities have been used subsequently in a formula derived by U.P.I.R.I. to estimate the seepage losses from the canal. In a study carried out at NIH, the U.P.I.R.I. formula used for estimating the seepage loss from tracer technique test data, has been rederived from the fundamentals. The losses estimated by the rederived formula using tracer technique data are found to agree with seepage losses measured by other experimental methods. Conformal mapping analysis has also been carried out to determine seepage loss from the canal. From the analysis of seepage, it is found that the losses are only taking place through bed of the canal and the banks are relatively impervious. The deviation of the observed phreatic line from the locus of the phreatic line obtained analytically for a homogeneous flow domain justifies the above statement.

2. Study of Depth Area Duration and Depth Duration Characteristics

Some of the extreme storms in the contigu-

ous areas of Saurashtra and Rajasthan forming part of the arid and semiarid belt in India were analysed by the depth-area-duration and depth-duration techniques and their characteristics were examined. The depths of rainfall of these extreme storms were compared using the statistical estimates of rainfall over this region both shorter and longer durations. The meteorological systems associated with these extreme rain storms have also been examined with a view to identify any common characteristic which could be useful for study of the consequent flood events.

The studies have broadly indicated that

- (i) most of the severe storms in the Saurashtra and Rajasthan regions have occurred in the month of July;
- (ii) the extreme storms have occurred soon after the onset of monsoon over these regions namely June in Saurashtra and July in Rajasthan;
- (iii) the one day rain depths of the June 1983 storm over Saurashtra region have exceeded the 10,000 year return period estimates of rainfall over the Saurashtra region;
- (iv) the rainfall over shorter durations (less than 24 hour) have exceeded the 50 year return period estimates over their respective regions during the June 1983 storm over Saurashtra and July 1981 storm over Rajasthan; and
- (v) the storms of June 1983 and July 1981 have comparable magnitudes, though the July 1981 storm was relatively less intense & more localised than the June 1983 storm.

From the point of view of flash flood occurrence, the magnitude of the total storm depths of June 1983 and July 1981 storms and their intensities over shorter durations have far reaching implications in terms of the magnitude of peak flood as well as volume of water to be discharged. This indicates need for review of

the design flood of the hydraulic structures, existing or under construction and those being planned especially those with smaller catchment areas.

3. Study of Reach Transmissivity for Reach Aquifer Interaction

A river comprising boundary of flow domain is often encountered in regional groundwater flow modelling. When a river fully penetrates an aquifer and has considerable stream discharge, the river is to be treated as a boundary of prescribed head. In such a case, the region on each side of the river behaves independently. However, a situation is rarely seen where a river completely penetrates an aquifer. In case of partially penetrating river with considerable stream discharge in comparison to the seepage losses besides treating the river as specific head boundary, the exchange of flow between the river and the aquifer has to be introduced through boundary while modelling the groundwater flow. The recharge from a river to an aquifer is proportional to a difference in the level of water in the river and in the aquifer in the vicinity of river. The coefficient of proportionality is recognised as reach transmissivity, which depends on the stream-bed characteristics and shape of stream cross section besides the aquifer parameters.

In this report the reach transmissivity has been determined for a river with large width. The recharge from a river with large width to an aquifer, where water table exists at shallow depth, has been quantified using conformal mapping technique. The recharges occurring through bed and side of the river have been estimated separately. The suitable position of observation well to monitor ground water table, which can be used in assessing river recharge to the aquifer, has been identified. The influence of river stage and position of water table on reach transmissivity has been analyzed. It is found that, when the observation well is located at a distance more than $0.5 D_i$, where D_i is the depth to impervious stratum below the river bed, the corresponding reach transmissivity

is independent of the water table position at the observation well. The reach transmissivity depends on the river stage.

(b) Case Studies

1. Study of Hydrometeorological Aspects of Narmada Basin

The Narmada river is a east west flowing river of about 1,300 km length with a catchment area of 98,796 km². Since the study of Abbi et al (1970) at least two severe and two moderate storms have occurred in the basin necessitating review and updating of the hydrometeorology of the basin. The review has indicated that besides the moderate storms of August 1978 and August 1979, two severe storms have occurred in September 1970 and August 1973. Except for the storms in 1968 and 1970 which travelled all along the length of the basin, the tracks of other storms extended only upto half way of the basin. From the flood levels observed at Mortakka and Gurudeshwar it was inferred that the moderate storms like those of 1950, 1978 and 1979 have resulted in floods of similar magnitude.

After the award of Narmada tribunal, the Irrigation Departments of Madhya Pradesh and Gujarat had contemplated construction of two major dams namely Narmada Sagar at Punasa in Madhya Pradesh and Sardar Sarovar at Gurudeshwar in Gujarat. The India Meteorological Department and Central Water Commission had conducted design storm studies for Narmada Sagar and Sardar Sarovar dams. To meet the special needs of the Narmada basin arising out of the elongated shape, large catchment area and movement of storms parallel to the basin and in the same direction as the flood flows, synthesis of design storm by the sequential combination of different storms was proposed and accordingly the following design storm combinations were recommended for Narmada Sagar and Sardar Sarovar.

Narmada Sagar	28	29	30	15
	Aug	Aug	Aug.	July
	1973	1974	1973	1974

Sardar Sarovar 28 29 30 5 6
 Aug Aug Aug Sep Sep
 1973 1973 1973 1970 1970

Moisture maximisation studies were carried out by India Meteorological Department using 12 hours persisting dew point and second highest dew point. Also, return period analysis of maximum dew point temperature were carried out and a value of 1.35 has been recommended as against a value of 1.25 obtained by unpublished studies in Central Water Commission. Time distribution has been recommended by India Meteorological Department on the basis of eleven self recording raingauge stations located in and around Narmada basin.

Besides these studies, modelling of the moving storms which affected the catchment of Narmada basin was carried out using inter-station correlation coefficient of hourly rainfall at the recording raingauge stations in the basin. As the inter-station distance is large in comparison to the size of the rain cell the lag zero correlation was found to be not suitable for the analysis and the provision for carrying out inter-correlation with hourly shift upto a prescribed maximum lag has been made in the analysis. Four storms namely (i) 2-6 September, 1970, (ii) 28-31 August, 1973, (iii) 28-31 August, 1978 and (iv) 6-10 August, 1979 were considered in the analysis. The lag corresponding to optimum correlation analysis as indicated by the correlation analysis was compared with the physical movement of the storm as reported by India Meteorological Department and as revealed by the daily storm isohyetal pattern. The analysis indicates the lag zero correlation to be very poor as the relationship between inter-station distance and lag zero correlation is very obscure. The storms of 1970, 1978 and 1979 were noticed to have had comparable speeds while the 1973 storm was found to be relatively slower.

(c) Documentation of Programmes

1. Multiple Linear Regression

The association of three or more variables

can be investigated by multiple linear regression and correlation analysis. The derivation of relationships among hydrologic variables is of importance for the transfer of information from few gauged stations to many ungauged stations. The general form of the multiple linear regression is :

$$X_1 = B_1 + B_2X_2 + B_3X_3 + \dots + B_mX_m + \epsilon$$

where, X_1 is dependent variable and X_2, X_3, \dots, X_m are independent variables. ϵ is the error term.

In the documentation, listing of the source programme for multiple linear regression analysis, input data file and output file is given with test data and example calculations. In the programme the selection of different sets of independent variables and designation of dependent variable can be made as many times as desired.

The programme calculates mean, standard deviations of dependent and independent variables, correlation coefficients between dependent and independent variables, regression coefficients, standard error of regression coefficients, computed t-values, intercept, multiple correlation coefficient, standard error of estimate, analysis of variance for multiple regression and table of residuals.

2. Polynomial Regression

For any non linear function $Y = f(X)$ regression may be obtained by fitting a polynomial. The general form of the polynomial regression is as given under :

$$Y = a_0 + a_1X + a_2X^2 + \dots + a_mX^m + \epsilon$$

where :

Y is the dependent variable and a_0, a_1, \dots, a_m are the regression coefficients. The documentation of the computer programme for polynomial regression includes the listing of the source file, data file and output file with

test data and example calculations. The details of various statistics given in the programme output have also been given in the documentation.

(d) Status Reports

1. Water Quality and Sediment Modelling in Surface Water

The report has been divided into nine chapters. Chapter 1 sets the stage for general introduction of water quality and sediment modelling, the needs of such studies and covers the day by day increase of water resource requirements. Chapter 2 deals with the mathematical modelling, its advantages and classification of various mathematical models. It also gives a step by step method of building a model. Chapter 3 describes the various water quality parameters & gives the standards for various water uses e.g. irrigation water, industrial water, domestic water and water for drinking purposes. It also gives the envisaged planning for a systematic study of Indian rivers. Various parameters stressed by Central Board for Prevention and Control of Water Pollution, for survey, are also discussed. Some of the Indian studies are also discussed. Chapter 4 gives a detailed account of various water quality models available, their advantages and limitations, their capabilities etc. A mention has also been made of non-point source pollution models.

Chapter 5 details the sedimentation concepts giving definitions of various terms encountered in such studies. A comprehensive review of literature on stream load has also been attempted here, touching upon various types of loads e.g. dissolved load, suspended load and bed load. Chapter 6, enumerates reservoir sedimentation, its importance, damages caused by it and importance of carrying out sediment surveys and modelling studies. Various factors causing sediment erosion are also discussed. The sedimentation of few Indian reservoirs and the deposition of sediment and its pattern are also given. Siltation in rivers is included in

Chapter 7. The siltation of various rivers of the world is discussed in this chapter. Chapter 8 gives various mathematical models in vogue today. As the literature on this portion is very complex and voluminous it has been attempted to give only a brief introduction of various models. Chapter 9 brings out the status of the research in the area of water quality and sediment modelling and the needs of research. The report ends with an exhaustive bibliography on the topic.

2. An Interim Report on Hydrological Aspects of Drought in 1985-86

In view of the gravity of the drought situation during 1985-86, the Institute sent-out scientific and technical teams to the States of Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra and Rajasthan to acquaint with the drought situation and to collect necessary hydrometeorological data for updating the information collected during the first visit. Efforts were again made to collect varied hydrometeorological data for the last 8 to 10 years like rainfall, streamflows, reservoir inflows, storages and discharges, groundwater fluctuations, soil moisture data and the crop yields. Allied information from the State departments of Agriculture, Public Health, Economics and Statistics and Revenue were also gathered. However, the latest hydrometeorological data of 1985-86 could not become available for all the places. On the basis of the data available, analysis was conducted to understand the prevalent drought of 1985-86 from hydrologic point of view.

The present report has restricted itself in reporting the seriousness of the drought in 1985-86 in different portions of the country and some interim conclusions have been made which may not be generalised for all the areas. However the report concludes that it is not sufficient enough to go by the variability in the total rainfall alone but also analyse the time and spatial variability of rainfall as well along-with the deficits in surface runoff, lowering of

ground water levels, decreases in soil moisture condition together with the water demand patterns to appreciate the very nature of the impact of drought. It is also suggested to have proper data base, regular hydrological monitoring viz-a-viz drought monitoring and soil moisture monitoring on a regular basis.

Interaction with other Organisations

Dr. Satish Chandra, Director, NIH attended the National Conference of Irrigation and Water Resources Ministers of States and Union Territories, under the Chairmanship of Honourable Prime Minister Shri. Rajiv Gandhi, held on 8th and 9th July, 1986 at Vigyan Bhawan, New Delhi. Dr. Chandra participated in the discussions as member of Working Group IV on Cyclones, Floods and Droughts, which was chaired by Chief Minister of Himachal Pradesh and Co-Chaired by Chief Minister of Gujarat. The postponed plenary session of the conference, was held on 21st July, 1986 and the meeting was attended by Director.

Dr. Satish Chandra visited Tehri Dam and other projects in May and June.

Director attends Press Conference in Bangalore

A press Conference was called by Minister for Irrigation, Government of Karnataka on 14th May, 1986. On a query from the press, Dr. Satish Chandra, Director, NIH informed that the seminar would provide a common forum for Engineers, bioscientists, agricultural and environmental scientists, planners and policy makers to discuss and decide various aspects of drought in general and water resources in particular. Dr. Chandra informed that NIH has already set up a drought division to study drought as a phenomenon. The main objective of the drought division is to prepare a comprehensive information system for quantifying drought and planning drought management strategies for specific areas and establish norms for drought identification stressing the need for long term planning of drought management strategy. He informed

that water supply and fodder must get priority. He indicated that newly established remote sensing division will undertake snow mapping and modelling for predicting river flow for operation of reservoir. He added that sedimentation studies would also be taken up for reservoirs besides flood plain mapping, necessary for flood zoning.

Dr. Satish Chandra said that NIH proposes to set up regional centres for conducting regionwise hydrological investigations during the Seventh Plan period. The regional centres which would cover western Himalayan region, Deccan Plateau, Deltaic region and Semi-arid zone would interact with states concerned and regional programmes. Location of Regional Centre for Deccan Plateau will be decided by the Union Minister for Water Resources who is President of NIH Society.

Organisation of Workshops

National Institute of Hydrology proposes to organise a number of workshops in Roorkee and other places. The tentative programme is given as under :

Title	Venue/date
Flood Frequency Analysis	Bhubaneshwar August, 1986
Flood Routing and Flood Forecasting	Roorkee November, 1986
Design Storm and Design Flood	Roorkee November, 1986
Unit Hydrograph Techniques	Mysore Nov./Dec., 1986
Unit Hydrograph Techniques	Lucknow February, 1987
Design storm and Design Flood	Ahmedabad February, 1987
Unit Hydrograph Techniques	Jaipur March, 1987

For details kindly contact :

Dr. S.M. Seth
Scientist 'F'
Surface Water Analysis Division
National Institute of Hydrology
Roorkee-247 667

Seminars Attended

During April 24 & 25, 1986 a seminar on "Environmental consideration in Planning of Water Resources Projects" was organised by the Institution of Engineers (India), Roorkee Local Centre at Roorkee. Dr. G.C. Mishra, Scientist 'F'. Dr. K.K.S. Bhatia, Scientist 'C', Mr. A.K. Sikka, Scientist 'C', Mr. S.K. Jain, Scientist 'B', Mr. V.K. Lohani, Scientist 'B'. Mr. J. Hari Krishna, Scientist 'B' attended the seminar as delegates. Dr. K.K.S. Bhatia was the organising secretary of the seminar and Mr. V.K. Lohani was the technical secretary of the seminar.

Forthcoming Seminars/Symposia

<i>Title</i>	<i>Date/Venue</i>	<i>Sponsored</i>	<i>For details please contact</i>
1. Symposium on Remote Sensing in Glaciology	Sept. 7-12, 1986 Cambridge, U.K.	I.A.H.S.	Mr. H. Richardson, International Glaciological Society, Lensfield Road, Cambridge CB 2 IER-U.K.
2. Regional Training Course on Estuarine Research	Sept., 1986 (10 days) Calcutta	UNESCO	Mr. Raj Bhandari, Admn. Officer UNESCO, 15, Jor Bagh, New Delhi-110003.
3. Training Course on Integrated Watershed Management Practices for Arid Semi-Arid Regions	Oct. 13-23, 1986 Jodhpur	CAZRI	The Director, Central Arid Zone Research Institute, Jodhpur.
4. Review of Progress of Watershed Research and Development	Oct. 24-25, 1986 Almora	CAZRI	Vivekananda Parvatiya Krishi Anusandhan Shala, Almora-263601 (U.P.)
5. Workshop Water Management in Arid and Semi-Arid Zones	Nov. 25-27, 1986 Hissar	UNESCO	Mr. Raj Bhandari, Administrative Officer, UNESCO, 15, Jor Bagh New Delhi-110003.
6. International Hydrology Technicians Course	Nov. 1986 to Jan 1987, Islamabad, Pakistan	UNESCO	Mr. Gul Muhammad Shah, Regional Director, Regional Office, Pakistan Council of Research in Water Resources 106-C/2, Galberg-III, Lahore, Pakistan.

Four technical papers were presented at the seminar by NIH Scientists.

Dr G.C. Mishra, Scientist 'F', Dr. P.V. Seethapathi, Scientist 'E', Mr. K.S. Ramashastri, Scientist 'C', Mr. Ramesh Chand, Scientist 'C', Mr. M Perumal, Scientist 'C', Mr. A.G. Chachadi Scientist 'B' and Mr. S.K. Jain, Scientist 'B' attended the 53rd R & D session of C.B.I. & P held at Bhubaneshwar from 8th to 10 May, 1986. Nine technical papers were presented in this session by the Scientists of the Institute.

Dr. Satish Chandra, Director, Mr. A.K. Sikka, Scientist 'C' Mr. A.G. Chachadi, Scientist 'B', Mr. V.K. Lohani, Scientist 'B', Mr. J. Harikrishna, Scientist 'B' Mr. M.K. Santoshi, Scientist 'B' and Mr. A.K. Goel, S.R.A. attended the Seminar on "Drought Management Strategies" held at Mysore on May 15-16, 1986. Five technical papers were presented by Institute's scientists in this seminar.

<i>Title</i>	<i>Date/Venue</i>		<i>For details please contact</i>
7. Regional Workshop on Ground Water Modelling	Dec. 12-17, 1986 Roorkee	UNESCO	Dr. A. S. Chawla, Professor Water Resources Development Training Centre, University of Roorkee, Roorkee-247 667.
8. National Symposium on Land and Water Management in Ravines	Feb 11-13, 1987 Dehradun	Indian Assoc. of Soil and Water Conservation	Dr. L.S. Bhushan, Central Soil and Water Conservation Research and Training Institute Research Centre, 37, Old Vijay Nagar Colony, Agra-282004.

HILTECH Secretariat

International Hydrological Programme

Realization of the significance of a scientific basis of hydrology in the development of water resources was not always appreciated. It began to increase more rapidly in the period following the Second World War. In 1959 Unesco launched a programme of research on the world's arid zones, in which hydrology played an important role. This was followed in 1964 by the launching of the International Hydrological Decade (IHD), a truly remarkable example of International cooperation, which made a significant contribution to the understanding of the processes occurring in the water cycle, assessment of surface and ground-water resources, an adoption of a rational attitude towards water use. But gaps were still noted particularly in the application of scientific advances to solution of practical problems. The General Conference of Unesco therefore decided in 1974 to launch the long-term International Hydrological Programme (IHP) with the aim of finding solutions to the specific problems of countries in different geographical conditions and at different levels of technological and economical development. The International Hydrological Programme was launched on 1 January 1975 in accordance with the decisions taken by the General Conference at its seventeenth and eighteenth sessions and its preparation was largely based on the experience gained during the International Hydrological Decade (1965-1974). The IHP is a long term intergovernmental

programme focused on the scientific and educational aspects of hydrology and water resources management and based on an interdisciplinary approach to these aspects. It is planned in medium-term successive phases, the normal duration of which is six years. The contents of each phase is determined by the General Conference of Unesco following recommendations of the IHP Intergovernmental Council and adopted by the intergovernmental conferences bringing together all Member States. Under the arrangements agreed by Unesco and WMO such conferences are convened jointly by the two Organizations in order to better harmonize their respective programmes in the field of water resources.

The first phase of the IHP was executed from 1975 to 1980. The second phase of the IHP was exceptionally of a shorter duration (1981-1983) so as to ensure in the future full coincidence of IHP phases with the medium-term plans of Unesco. Thus, the third phase of the IHP corresponds to the second Medium-Term Plan of Unesco (1984-1989). The General title of the third phase of the IHP is 'Hydrology and the Scientific Bases for the Rational Management of Water Resources for Economic and Social Development'. The ultimate goal of the third phase of the International Hydrological Programme is to help and solve the crucial hydrologic, water management and water related socio-economic development problems as can be foreseen in the second half of the decade 1981-1990 and in the following years.

HILTECH Activities

1. The following seminar is sponsored and funded by HILTECH.
 - (i) The seminar on 'Drought Management Strategies' organised by Water Resources Development Organisation, Bangalore on 15 & 16 May, 1986.
2. It has been decided to sponsor the following Workshop/Seminar.
 - (i) Workshop on Flood Estimation in Himalayan Region being organised by U.P. Irrigation Research Institute, Roorkee. The Workshop had been proposed to be held on June 27-28, 1986, but was postponed due to unforeseen reasons for the time being.
 - (ii) International seminar on Water Management in Arid and Semi-Arid Zones being organised by Haryana Agricultural University, Hissar, 27-29 November, 1986. This seminar is being cosponsored by UNESCO.
3. The manuscript for Hydrology Review Journal for 1985 is ready. This will be published shortly. The name of the journal has been changed as Jal Vigyan Sameeksha-A publication of High Level Technical Committee on Hydrology (HILTECH) from 1986 issue.
4. Seminar on Drought Management Strategies was held from May 15th to 16th, 1986 at Kalamandir, Mysore. It was sponsored by HILTECH, Roorkee and Govt. of Karnataka and organised by Water Resources Development Organisation, Bangalore. The seminar was inaugurated by Shri B. Shankaranand, Hon'ble Minister for Water Resources. Shri M.A. Chitale, Chairman, HILTECH delivered a key note address. The seminar was attended by 166 delegates from different central and state organisations. 38 technical papers were presented.

ARCCOH Secretariat News

At the 3rd Meeting of ARCCOH Steering Committee it was decided to appoint National Coordinators in various member countries to coordinate various hydrological activities and to maintain the liaison between the National Committee and the ARCCOH Secretariat. Accordingly, the Secretariat requested all member countries to appoint National Coordinators. In response, National Committees of India, Maldives, Papua New Guinea, Malaysia, New Zealand, Mongolia, Sri Lanka, Bhutan, Burma, China and D.P.R. Korea have appointed National Coordinators. It was also decided at the meeting to publish an Annual Bulletin of ARCCOH for the calendar year 1985. In response to request made by ARCCOH Secretariat regarding hydrological activities held by member countries during the year 1985, the National Committees of Australia, New Zealand, Bhutan, Burma, China, India, Malaysia, Maldives, Papua New Guinea, Singapore and Sri Lanka have replied to the Secretariat.

Regarding compilation of hydrogeological map of Asian Region the National Committees of Afganistan, Malaysia, Sri Lanka and India have already appointed the National Coordinators for coordinating this activity. Preparations are underway to launch this mission at an early date.

During June 1986 the meeting of IHP Committee on Education and Training & 7th Session of Intergovernmental Council for International Hydrological Programme took place in Paris, France. Dr. Satish Chandra, Director, National Institute of Hydrology headed the Indian delegation at this meeting.

Lab News

Service and Instrumentation Workshop unit has procured various workshop machines and electronic instruments e.g. lathe, drilling, cutting, punching and welding machines and pulse/function generator etc. Efforts are being made to install these machines in order to establish

the general purpose workshop facility in the Institute.

Computer News

Calcomp 9100 Digitizer has been procured by the Institute under U.N.D.P. Scheme from Calcomp. Calcomp 9100 Digitizer is a latest generation, high resolution, high performance graphics input device or an output device to a Computer. VAX- 11/780 will act as its host Computer. It has the capability for

- digitizing of pictures
- terminal screen cursor steering
- menu selection

For proper utilisation of the Digitizer, the IGL Graphics Library package is available in NIH VAX-11/780 Computer System.

NEWS

Building and Related Activity

The construction of extension of Jal Vigyan Bhawan Phase I is near completion. The laboratory block has been completed.

Club Activities

The annual function of the NIH Recreation Club was held on 31st May '86. A colourful variety programme and Children's fancy dress were organised on the occasion which was followed by informal dinner. Mrs. Chandra kindly consented to give away the prizes to the winners of various events of annual sports and other competitions.

The elections of the new executive body of the Recreation Club for 1986-87 term took place in April, 1986. The term of the previous executive body ended on 31st May and the new executive body has taken over charge w.e.f. 1st June '86.

Appointments, Resignation Etc.

A total of 16 new staff have joined the Institute in various supporting technical and ministerial posts during the quarter.

Following Scientists and supporting staff were relieved off their duties.

1. Shri K. Ethirajan, Scientist-C (reverted back to his parent organisation)
2. Shri Nikhilendu Kumar Nikhil, Scientist-B
3. Shri A.K. Garg, Sr. Research Asstt.
4. Shri Yogesh Panwar, Sr. Research Asstt.
5. Shri J.M. Rathore, Tech. Asstt. (Lib.)

Following posts have been advertised :

- (i) Scientist-C (ii) Scientist-B (iii) Sr. Computer Operator (iv) Technical Asstt. (Lib.)

Interviews were held for the following post during the quarter.

- (i) Jr. Engineer (Civil) (ii) Jr. Engineer (Electrical) (iii) Sr. Research Asstt. (iv) Research Asstt. (v) Technical Asstt. (Photography), (vi) Sr. computer operator (vii) Computer Operator (viii) Upper Division Clerk (ix) Research Supervisor (x) Sr. Laboratory Asstt. (xi) Draftsman (xii) P.A. cum-Admn. Asstt. (xiii) Steno (xiv) Technician (xv) Lower Division Clerk (xvi) Messenger, Chowkidar, Mali and Safai Karmachari.

Recent Acquisitions in the Library

1. Anderson, M. G., 1985, Hydrological Forecasting, John Wiley & Sons, Chichester, 497 pages.
2. Anderson, O.D., 1985, Time series Analysis, Theory & Practice, North Holland, Amsterdam, 311 pages.
3. Central Board for the Prevention & Control of Water Pollution, 1985, River Basin Atlas of India, Central Board for the Prevention and Control of Water Pollution, Delhi, 36 pages.
4. Kashef, A. A. I., 1986, Ground Water Engineering, Mc Graw Hill, New York, 512 pages.
5. Martin, J, 1985, Computer Data-Base Organisation, Prentice Hall, New Delhi, 352 pages.

6. Sharma, M.K., 1986, Remote Sensing & Forest Surveys, International Book, Dehradun.
7. Stanbury, J., 1985, Hydraulics of Floods & Flood Control, B.H.R.A, Bedford, 526 pages.
8. U.S. Deptt. of the Interior, 1985, Ground Water Manual, Scientific Pub., Jodhpur, 480 pages.
9. USDI, 1985, Water measurement Manual., Scientific Publishers, Jodhpur, 327 pages.
10. Ward, C.H., 1985, Ground Water Quality. John wiley, New York, 547 pages.

Distinguished Visitors

1. Shri M.A. Chitale
Chairman
Central Water Commission
Sewa Bhawan,
R.K. Puram,
New Delhi-110066
2. Shri J.F. Mistry
Secretary (Irrigation)
Irrigation Department
Sachivalaya
Gandhi Nagar 282010
Gujarat.
3. Shri V.B. Patel
Secretary (CAD)
Irrigation Deptt.,
Govt. of Gujarat,
Gujarat.

4. Dr. Vijay P. Singh
Professor of Civil Engineering
Louisiana State University
Baton Rouge
Louisiana 70803 USA.

हिन्दी खण्ड

ऋग्वेद में जल विज्ञान

ऋग्वेद में व्याख्यायित जल महत्व एवं उपयोग के आधार पर राष्ट्रीय जल विज्ञान संस्थान में एक अनुसंधान कार्य चल रहा है। ऋग्वेद के साहित्य से स्पष्ट है कि उस काल के समाज में भी लोगों को चल चक्र आदि का पूर्ण ज्ञान था। निम्न उदाहरण से उस समय के ज्ञान का स्पष्टीकरण होता है।

अपाम् तिष्ठद् धरुण हरन्त मोडन्तवृत्रस्य जठरेषु पर्वतः ।
अभीमिन्द्रो नधो व त्रिगाहिता विश्रया अनुष्ठः प्रवणेष्ु
जिहनेत ॥

अर्थात्—सूर्य जल को आकर्षित कर अन्तरिक्ष में पहुँचाता है और वायु उसको धारण कर जल मिल (आर्द्रवष्प) बनाता है जो पर्वताकार होकर सूर्य के प्रकाश का आवरण करता है तथा बिजुली छेदन द्वारा जल रूप में यह भूमि में आ जाता है। इससे उत्पन्न हुये नानारूप युक्त नीचे जाने वाली नदियां पृथ्वी, पर्वत और वृक्षादिकों को छिन्न भिन्न कर वह जल समुद्र में मिल जाता है तथा फिर से अन्तरिक्ष को प्राप्त होकर बार-बार इसी प्रकार वर्षा करता है।

इस प्रकार के अनेक श्लोक ऋग्वेद में मिलते हैं जो जल विज्ञान पर प्रकाश डालते हैं। संस्थान ने पुस्तकालय में इन वेदों का संग्रह किया है। यह प्राचीन साहित्य वैज्ञानिकों के द्वारा किये जाने वाले शोध कार्यों में सहायता प्रदान करता है।