

# IHP INFORMATION

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*International Hydrological Programme*

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## IHP GENERAL

April 1993 in Noordwijkerhout, Netherlands.

### Implementation of IHP Projects

*Project H-2-2: Hydrology, water management and hazard reduction in low lying coastal regions and deltaic areas, in particular with regard to sea level changes*

*Project H-5-1: Hydrologic research and water resources management strategies in the humid tropics and other warm humid regions*

The *International workshop on storm surges, river flow and combined effects* was held in Hamburg, Germany from 8 to 12 April 1991.

This international workshop was the first of a series of three workshops which form part of this project. During the workshop views were exchanged between experts active in the field of storm surge and river flow forecasting, on present and developing techniques for computation, forecasting of and warning against high water levels in deltaic and coastal zones. 40 experts from 8 countries participated, most of them from countries strongly affected by storm surges. The participants presented a contribution related to one of the 9 main topics of the workshop. Furthermore, 3 working groups were established to discuss the following items:

- storm surges, high river floods and their joint probability
- forecasting of storm surges, river floods or their combined effects
- protection.

The following two publications resulted from the workshop.

- *State-of-the-art report on storm surges, river flow and combined effects*
- *Proceedings of the workshop.*

Copies may be obtained from: *IHP/OHP Sekretariat, 5400 Koblenz, Kaiserin-Augusta-Anlagen 15-17, Germany.*

The second International Workshop entitled *Sea level changes and their consequences for hydrology and water management* will be held from 19 to 23



The first publication in the new Humid Tropics Programme Series entitled *The Disappearing Tropical Forests* has been released. Documents now in preparation in this series cover the topics of health, urbanization, small islands and hydro-power reservoirs. Others will follow.

A contribution to the Humid Tropics programme entitled, *Hydrology and water resources of small islands: a practical guide*, prepared by A. Falkland and E. Custodio, edited by A. Falkland is now in press. The book will be in the *Studies and Reports in Hydrology* series, and is a product of IHP-III Project 4.6. It should be available for purchase before the end of the year.

The Asian Humid Tropics Center in Kuala Lumpur and the Panama Center for Humid Tropics Waters of Latin America and the Caribbean are expected to receive official UNESCO support during this year's General Conference. Discussions are now underway with the Regional Office for Science and Technology for Africa (ROSTA), Nairobi, to hold a regional meeting in Africa (probably during 1992) to organize the humid tropics activities in that region, and discuss the location of a possible center. IHP National Committees interested in discussing the establishment of a regional Humid Tropics Center in their country should contact ROSTA. It should be noted that these centers are expected to be basically financially self-sustaining, but will normally need some national and/or donor support during the formative periods.

A letter from the Economic and Social Commission for Asia and the Pacific (ESCAP) has indicated various activities in urban water management which may provide inputs to UNESCO's proposed network of urban experimental hydrological study basins. They have offered to provide useful links for the project and for the proposed Colloquium on Water Management in Urban Areas of the Humid Tropics (for Southeast Asia) and ESCAP's Regional Seminar on Water Management in Urban Areas of Asia and the Pacific. They have suggested that parts of the two meetings could be combined, or held simultaneously. The possibility of holding the seminar/colloquium jointly in 1993 will be further examined.

The IHP is always looking for possibilities for cooperative programmes with existing agencies for coordination through the humid tropics centers. If you have such an interest please contact UNESCO Division of Water Sciences (Paris), ROSTLAC, ROSTSEA or ROSTA.

At a meeting called in Dubrovnik, Yugoslavia by the International Research and Training Center for Urban Drainage (IRTCUD) the participants reported on the activities of different regions. The draft proposal for the UNESCO project dealing with *hydrologic studies in urban areas of the humid tropics* (in cooperation with IRTCUD) was discussed. Promotion of the project with a search for possible funding sources has begun. Mr. Maksimovic, Director of IRTCUD, reports that the meeting on the establishment of a regional sub-center for the urban drainage project, held in Sao Paulo, Brazil, in September 1991, was a great success. Cuba has recently expressed interest in participating in the programme. Other IHP National Committees with similar interests should contact the IHP Secretariat in Paris.

*Project H-5-5: Application of methods of hydrological analysis using regional data sets (Flow Regimes from International Experimental and Network Data Sets/FRIENDS)*

The objective of this project is to evaluate and understand the spatial and temporal variability of hydrological regimes and parameters using regional data sets.

### Background

An understanding of hydrological variability and similarity across time and space is essential for advances in both hydrological science and practice. Recognition of this need was one of the prime motivations behind the establishment of the FRENED (*Flow Regimes from Experimental and Network Data*) project in the third phase of the IHP. Improved appreciation of regional characteristics helped with the transfer and extrapolation of data and results from both small research basins and national network stations.

The FRENED project has led to improved understanding of hydrological variability in Northern and Western Europe. Central to the project was the establishment of an international data base of hydrological time series and basin characteristics, which required the development of procedures for transferring and archiving data from many measurement agencies. Subject to the permission of those who provided the data, this data base is available for research purposes from four European centres. Data from the data base have been used in conjunction with both new and established techniques for characterising regimes, understanding variability and transferring information to ungauged basins. The project has been dependent upon the exchange of data, techniques and staff amongst the cooperating countries.

A great deal was achieved during the three years of the FRENED project, and the opportunity now exists to build upon these achievements and develop further the data, concepts and techniques essential to an improved understanding of variations in hydrological behaviour and response to human activities. This can be undertaken within the framework of FRIEND (*Flow Regimes from International Experimental and Network*



Data): adding *International* to the title of the original project emphasizes the important benefits gained by scientists working together from different countries.

**Programme of studies**

The primary theme of FRIEND is the use of regional data sets and approaches for understanding the spatial and temporal variations in hydrological behaviour and the response to human activities. This is achieved by several projects running in parallel and using a common regional data base or data bases. Detailed project proposals have been formulated by research groups in the following topics:

- data base development
- low flows
- characterisation of large scale variations in river flow behaviour
- extreme rainfall and flood runoff estimation
- catchment processes.

**Implementation**

The original FRIEND project covered thirteen countries in Northern and Western Europe, and five international project groups from this region are currently developing research into each of the above topics. The project is being overseen by an advisory group with representatives from UNESCO and from each country in the project area, and a steering committee responsible for the detailed coordination of the research programme. Support is given to assist with the development of regional data bases and studies in other areas, and close cooperation between different regional groups is envisaged. FRIEND projects are currently being developed in the Southern Africa Region (SADDC) and the Mediterranean and Alpine Region (AMHY). Furthermore, strong links with the FRIEND projects are being developed from several countries in Central and Eastern Europe.

The research programme is a contribution to IHP-IV. Financial support for the project and its sub-projects should be sought by individual research groups from national and international funding agencies with UNESCO as the lead

agency. Cooperation will be maintained with the Euromediterranean Network of Experimental and Representative Basins.

**Next meeting**

The next meeting is planned for 14-18 October 1991 at CEMAGRET, Lyon, France, when the Northern and Western FRIEND steering committee will meet, workshops will be organized by the Mediterranean and Alpine region (AMHY), and the AMHY project steering committee will meet. It is envisaged that the Advisory Group will next meet in Spring 1992.

**Further information**

Further details are available from: *Dr. Alan Gustard, Institute of Hydrology, Wallingford, OX10 8BB, United Kingdom.*

*Project E-5-2: Development of reports for decision-makers and legislative bodies on water resources for sustainable development in a changing environment*

The project has been developing material for submission to the Office of the Coordinator of Environment (UNESCO) for the preparation of *Environmental Briefs*. An editor spent six weeks working with the project officer in Paris, during which time drafts of three Briefs were prepared on *groundwater quality protection, small island water problems, and urban problems*. These are now being reviewed by experts prior to submission for possible publication.

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Follow-up on IHP-IV Projects *H-1-1, H-2-1, H-4-1, H-4-2, M-3-1 and M-4-3* is reported below in Section *IHP/IAHS Corner* in the framework of the IUGG XX General Assembly (see p.14).

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## REGIONAL AND IHP NATIONAL COMMITTEES

### AFRICA

#### *Promotion of higher education in hydrology in Africa*

As a follow-up to the Sahel Forum (Ouagadougou, 1989) the Government of Norway has decided to finance, for execution by UNESCO, a mission to a number of African countries in order to assess the present status of university education in hydrology with a view to elaborating proposals for improving curricula and teaching facilities. The mission is planned for early 1992.

#### Ghana

#### *Training of sub-professionals in hydrology and water resources*

The Ghana National Committee for the IHP set up a *Working group on education and training* to survey the situation created by (a) the growing need for qualified professionals in hydrology and water resources due to the developments in the water sector of the economy (b) the difficulties encountered by water agencies in providing adequate training of specialists.

Based on the outline of the UNESCO/NORAD Training Course for Hydrology Technicians, the working group made the following proposals which were accepted at the 37th meeting of the National Committee, held on 31 May 1991, for submission to the appropriate authorities:

1. A training course could be organized by the University of Science and Technology, starting from the 1991/92 academic year.
2. Courses in hydrology, hydrometeorology and meteorology, water quality laboratory (for the 1st semester) and in hydrometry, water resources development, hydrological data management (2nd semester), could be introduced into the existing 2nd year syllabus for the Diploma in civil engineering and offered as an option for those specializing in hydrology and water resources.

The working group had previously proposed the introduction into undergraduate courses of hydrology and water resources subjects such as: civil engineering and town planning at the University of Science and Technology, Kumasi; geology at the University of Ghana in Legon, Accra; geography at the Universities of Science and Technology, Cape Coast and Ghana.

#### *Guidelines for the preparation of Environmental Impact Statements towards the development of water resources in Ghana*

Within the framework of the IHP, the promotion of a rational policy for the development and management of water resources takes into consideration the protection of the environment.

With this in mind, the Ghana National Committee set up a *Working group on pollution and environmental problems* which elaborated a number of guidelines on the preparation of Environmental Impact Statements (EIS) to be used by agencies when submitting water resources projects in Ghana for approval. The guidelines, amended by the National Committee at its 34th meeting held on 31st July 1990, have since been finalized and deposited with the Environmental Protection Council.

### ARAB STATES

A regional workshop on *Simulation Techniques in Surface Water Hydrology* will take place at the Syrian Scientific Studies and Research Center (SSRC), in Damascus, Syria, from 30 October to 4 November 1991. The workshop is jointly sponsored and organized, under the auspices of the IHP, by the Syrian Ministry of Irrigation, the Syrian State Planning Commission and the UNESCO Regional Office for Science and Technology for the Arab States (ROSTAS). It is co-sponsored by the UN Economic and Social Commission for Western Asia (UN/ESCWA) and the Arab Center for the Studies of Arid Zones and Dry Land (ACSAD).

During this workshop, the state-of-the-art in simulation techniques will be thoroughly discussed. Results, bottlenecks and trends (design, operation, etc.) will be examined. Workshop topics will include:

- Introduction to simulation modelling: principles, typical problems, examples and stochastic vs. deterministic simulation
- Multiple criteria for evaluation of simulation results
- Preparation of input data
- Output analysis
- Combined simulation optimization procedures
- Geographic Information Systems (GIS): data collection, presentation of results and general applications
- Application of simulation techniques in the Arab region: status, problems and future trends
- Strengthening regional cooperation through the establishment of a Hydrological Information Network.

A Sub-Regional *Training Course on Environmental Impact Assessment (EIA) of Hydrological Projects* will be held from 8 to 10 December 1991 at the Ain-Shams University in Cairo, Egypt. This course is organized under the auspices of the IHP and sponsored by UNESCO/ROSTAS and the Institute for Environmental Studies and Research of the Ain-Shams University.

The main objective of the training course is to review the state of the National Egyptian knowledge and practice based on the results of the application of methods of Environmental Impact Assessment to some major hydrological projects currently underway. Its scope, which is rather condense in nature, will include, among other items, a definition of and recommended methodologies for rapid Environmental Impact Assessment, with particular emphasis on some case studies in Egypt.

## EUROPE

### France/Romania

As a contribution to the International Hydrological Programme, the IHP National Committees of France and Romania organized jointly a scientific meeting sponsored by the International Association of Hydrological Sciences and supported by the French and Romanian Ministries of the Environment and the Association *Naturalia & Biologia*. This meeting was held at the *Ecole des Mines*, Paris, from 2 to 5 September 1991. A total of 95 papers were received, focusing around the following main

themes:

- Theme I: Underground Transfer and Dispersion of Matter and Energy - presented by G. de Marsily: (a) methodological and numerical problems / session chairman: A. Danchiv; (b) anthropic impacts / E. Ledoux
- Theme II: Operational Hydrology - presented by V. Stanescu: (a) measures, models and forecasting / chairman: R. Popa; (b) anthropic impacts / chairman: B. Ambroise; (c) rainfall and extreme flows / chairman: T. Leviandier.
- Theme III: Spatial Variability and Non Linearity - presented by C. Bocquillon: (a) spatial variability / chairman: R. Drobot; (b) non-linear variability / chairman: S. Lovejoy.

The proceedings will be published in French. For further information please write to: *Rencontres Hydrologiques Franco-Roumaines, Mr. Jean Pierre Carbonnel, Laboratoire de Géologie Appliquée, Université Pierre et Marie Curie, Case 123, 4 Place Jussieu, 75252 Paris, Cédex 05, France. Tel. 33 1 44 27 63 26; Fax. 33 1 44 27 51 25.*

## LATIN AMERICA AND THE CARIBBEAN

### Regional activities

*Evaluation of national experiences in conducting programmes of public information and ensuring public participation related to water resources development and management* (IHP-III Project 16.1.b)

The working group meeting was held in Buenos Aires from 3 to 6 September 1991 with the participation of the following specialists: B. Sadler (Australia), B. Hernandez (Colombia), W. Cox (USA) and M. Fuschini-Mejia (Argentina) as rapporteur. The opening session took place at the Faculty of Civil Engineering of the University of Buenos Aires with the attendance of university and governmental authorities.

The main conclusions and recommendations of the working group can be summarized as follows: to develop national action plans on the subject and to start national activities on public information concerning water resources development and management. The rapporteur will prepare the group's report for submission to the IHP Council.

***Major Regional Project on use and conservation of water resources in rural areas of Latin America and the Caribbean (MRP/LAC) - Rural energy***

The Manual on use and maintenance of solar cookers as an environmental alternative for depressed arid and semi-arid zones has been concluded. The project was executed by Maria Teresa Guzman, Gloria Jury and Elvira Duran on the basis of 5 years' work in pilot rural communities. The project was sponsored and funded by UNESCO and FAO. A guide for the general public will be published in the first half of 1992.

***Workshop on hydrology of the Altiplano***

In the framework of IHP-IV Project H-5-6 a workshop is being organized from 11-15 November 1991 in Antofagasta (Chile) with the objective of facilitating exchange of experiences on Altiplano hydrology between Chilean and Bolivian hydrologists and to define a medium and long term action plan.

***HIDRORED: Micro-energy network***

The HIDRORED bulletin (1/91) was published with sponsoring from GTZ (German Technical Cooperation Agency), UNESCO and institutions associated to PROMIHDEC (Peru), and is being circulated to participants of the MRP/LAC rural energy projects.

***UNESCO/WMO joint activities and projects***

A coordination meeting was held between Mr. Gerardo Lizano, Director of the Regional WMO Office for the Americas located in Asunción, and the UNESCO/ROSTLAC Regional Hydrologist with the purpose of defining joint working strategies for the following activities:

- Diagnosis of national water resources assessment activities, following the UNESCO/WMO Manual (1992)
- Publication of the Spanish version of *Water resources assessment activities - Handbook for national evaluation*, UNESCO/WMO (1992)
- Preparation of a meeting on the progress of surface water balances in the region (1993)
- Establishment of working groups on specific subjects
- Coordinated technical and financial

assistance to the Regional Committee on Hydraulic Resources of Central America (CRRH).

***Regional roving postgraduate course in hydrology and water sciences for the Central American Isthmus and the Dominican Republic (CRICA)***

CRICA's general coordinator, Mr. Juan Luis Guzman, presented the final report on the IX CRICA courses *Assessment of environmental impact of hydraulic resources projects and Application of HEC models*. The report indicates that 83 professionals from 5 countries (Costa Rica, Dominican Republic, Guatemala, Honduras and Panama) completed the courses and that each course was dictated by two visiting professors and a local one. Finally, the CRICA Coordination Board adopted a resolution thanking UNESCO for its support.

**National Activities**

**Argentina**

***Press conference on public information and water resources development and management***

On 6 September 1991 a press conference was held at the conference hall of the Argentine Association of Engineers with the participation of Messrs. W. Cox (USA), B. Sadler (Australia), M. Fuschini-Mejia (Argentina) and Ms. B. Hernandez (Colombia). This gave an opportunity to highlight the role UNESCO will play in the coming years with respect to the dissemination of information related to the water sciences among the general public and decision-makers.

***Parana river delta project (EEC)***

A joint technical assistance mission was carried out to the Parana river delta project by the Argentine national IHP, MAB and IOC committees and UNESCO professionals, at the request of the National Commission for the Metropolitan Area of Buenos Aires (COBAMBA). The project concentrates on three main themes: the environment, development and production, and infrastructure and territory. UNESCO will prepare a document with suggestions on subjects dealing with floods in the delta's area of influence.



## Bolivia

The Bolivian National IHP Committee has scheduled a series of itinerant conferences to take place in November and December 1991 in the cities of Tarija, Sucre, Santa Cruz and Trinidad.

The subjects to be dealt with are:

- water resources planning, projections for Bolivia and America
- recording networks for basin management
- basin management.

The itinerant conferences are being organized and sponsored by the development corporations of each province, CONAPHI-Bolivia and UNESCO.

## Brazil

### *International seminar on urban drainage*

The meeting took place from 11 to 14 September 1991 in Rio de Janeiro at the Brazilian Society of Engineers, with the participation of the Director of the International Research and Training Center on Urban Drainage (IRTCUD) of Yugoslavia Mr. Cedo Maksimovic, as well as Mr. Janusz Niemczynowicz of Sweden as invited lecturer. The seminar was sponsored by IRTCUD, CTH, ABRH, COBRAPHI and UNESCO.

### *Project on Hydrologic impacts on land use changes in the Amazon basin*

The project became operational in June 1991 in the framework of the programme on *Supporting research and training in the assessment of the water-climate system in the Amazon basin under the impact of large-scale land use changes* sponsored and funded by UNESCO/UNEP. The project manager is Mr. Benedito Braga Jr., Director of the Hydrology Division of the Hydraulics Technology Center (CTH) of the University of Sao Paulo and ABRH Chairman. The project is executed under UNESCO monitoring and supervision and will have a duration of three years. The second phase of the project will consist of a dissemination and training programme for scientists from the region.

### *Brazilian symposium on water resources and V Luso-Brazilian symposium on hydraulics and water resources*

The meetings will take place from 10 to 14 November 1991 at the conference center of the Hotel Gloria in Rio de Janeiro. The following subjects will be discussed: environmental hydrology and hydraulics, integrated planning and management of water resources and the environment, real-time drought and flood management, and others concerning specific techniques. Several round-table discussions, plenary sessions and workshops are included in the agenda. The meetings are organized by ABRH with sponsoring from UNESCO and other international cooperation agencies.

## Chile

### *Workshop on water resources use and conservation (La Serena, 21-24 August 1991)*

Upon conclusion of the workshop the Chilean National IHP Committee prepared a general report on the subjects presented, among which: UNESCO's International Hydrological Programme, the role of the Chilean IHP National Committee and its participating institutions, national water policies, natural and man-made water pollution (chemical pollution and biological aspects of sewage water: health risks and results of water treatment), the EULA-Chile project and geographic information systems (GIS) for water resources management.

## Guatemala

### *Seminar on formulation and evaluation of water resources development projects*

This activity will be held in Guatemala City between 21 and 25 October 1991 with sponsoring from the Regional School of Sanitary Engineering and Water Resources (ERIS), the Regional Committee on Hydraulic Resources (CRRH) and UNESCO. Its objective will be to refresh the knowledge of the professionals of the subregion on the subject of economic appraisal of development projects in water sciences.

## Paraguay

### *Surface water balance*

The project has been completed for 80% of the national territory. The areas shared with Argentina will be executed jointly once the corresponding hydrometeorological data becomes available. On 25 July 1991 the water balance was officially presented by the National Meteorology and Hydrology Service (SENAMHI/DINAC) and the National University of Asunción to the authorities of the Ministry of Defense and the mass media. Subsequently, during a special session the UNESCO Regional Hydrologist presented the water balance and hydrogeological map of Paraguay to the President of the Republic, General Andres Rodriguez, who expressed his thanks for the effort made by national technicians and for the support given by UNESCO. Several ministers and other high-level national water-related authorities attended the ceremony.

### *First symposium on groundwater and well drilling in Paraguay*

The meeting took place from 22 to 26 July at the House of Culture with the participation of 120 professionals. On that occasion, the symposium coordinator Mr. Eugenio Godoy submitted the hydrogeological map of Paraguay (executed under his coordination) for the consideration of the national technicians. In the same manner the focal point for the IHP Mr. Wilfrido Castro and his team presented the surface water balance of Paraguay. The UNESCO Regional Hydrologist made a presentation on the IVth Phase of the IHP and on the prospects of hydrology and water resources in the region.

### *Project on Groundwater development and protection in the humid tropics - Research in groundwater resources in Paraguay*

The project started under the coordination of the National Environmental Sanitation Service (SENASA) and during its first phase will establish a groundwater data bank at national level to be used later for the different demands of the rural areas. The project is sponsored and funded by UNESCO and the Paraguayan IHP focal point.

## Uruguay

### *Meeting on Uruguay's water resources*

This activity will take place in the last quarter of 1991 under the coordination of the Ministry of Public Works and Transport and CONAPHI-Uruguay. Its objective will be to make an assessment of activities carried out and prepare proposals to define a national water policy on water resources use and conservation.

## SOUTH & CENTRAL ASIA

A *Regional Course on Water Logging and Drainage* was organized by the Indian National Committee on Hydrology (INCOH) at Roorkee, India, from 16 to 22 April 1991. A total of 20 specialists participated, ROSTSCA supporting two from Iran and one from Afghanistan.

The *20th International Post-graduate Diploma and Master's Course in Hydrology* started on 17 July 1991 at the Department of Hydrology, University of Roorkee, India with 24 trainees attending from Afghanistan, Algeria, India, Pakistan, Sri Lanka, Sudan, Syria, and Vietnam. ROSTSCA supported the participation of trainees from Afghanistan and Pakistan. In addition, ROSTSCA is providing assistance for three trainees (Afghanistan, Iran and Vietnam) to complete their Ph.D. studies.

A workshop on *Hydrological Forecasting* was held in Tehran, Iran on 9-10 July 1991. It was organized by the Iranian IHP National Committee and attended by over 70 experts and engineers in hydrology, meteorology, irrigation, watershed management and water works from several public and private organizations. A total of 20 papers were received out of which 13 were selected for presentation. The proceedings are being printed in Farsi (national language).

The following activities are being sponsored by UNESCO/ROSTSCA.

★ A *Regional Working Group on Mountain Hydrology* was constituted as a follow-up of the Regional Workshop on Hydrology in Mountainous Areas held in Kathmandu, Nepal, in December 1989.

With the financial assistance of ROSTSCA and in cooperation with the International Centre for Integrated Mountain Development (ICIMOD)

and the Department of Hydrology and Meteorology, Government of Nepal, the Second Consultative Meeting of the working group will be held in Kathmandu, Nepal from 2 to 4 December 1991. The main task will be to finalize a project proposal for a *Regional Project on Himalayan Hydrology*.

★ Taking into consideration reviews of methods of describing erosion, sediment transport and river-bed deformations, a *Regional Training Course on Reservoir Sedimentation and Control* will be held in New Delhi, India, from 9 to 22 December 1991.

★ The *IInd Afro-Asian Conference on Urban Water Management 1991-2010* will be held in Bombay from 25 to 28 November 1991. It is organized by the Indian Water Works Association and co-sponsored by UNESCO, UNDP, IWSA and ASCEW. The sub-themes of the conference will be:

1. Operation and maintenance of water supply and drainage systems
2. Water resources; development and environmental impact
3. Industrial water management
4. Fire fighting systems
5. Water and sanitation in slum areas
6. Urban environmental health
7. Management development, financial control and consumer relation.

★ With the financial support of UNESCO a *Regional Hydrology Training Course for Technical Officers* will be held at the Bangladesh University of Engineering and Technology, Dhaka, Bangladesh, from 19 October 1991.

★ An *International seminar on sustainable development of land and water resources related to irrigated agriculture* will be held during the SAARC summit in Colombo from 7 to 9 November 1991.

★ An *International symposium on snow and glacier hydrology* will be held in Kathmandu, Nepal from 16 to 21 November 1992. The symposium, organized by the Snow and Glacier Hydrology Project, Department of Hydrology and Meteorology of Nepal, is sponsored by UNESCO and the German Technical Cooperation (GTZ) of the Federal Republic of Germany, with expected co-sponsoring from WMO and ICIMOD.

The objectives of the symposium are:

1. To focus on the challenge to incorporate the vast potentiality of snow and glaciers into the use and management of water resources
2. To highlight the studies carried out on the best understanding of the hydrological characteristics of the snow and glacier dominated mountain watersheds
3. To provide a forum for the exchange and transfer of the current information of studies made in the field of glaciers and climate
4. To study the possible effects of climate change on snow and glaciers
5. To foster linkages between the active participants involved in the field of snow and glacier hydrology and to provide a common platform to relate their experiences and share their knowledge.

For further information, please write to: *The Secretary of the Organizing Committee (Mr. A.P. Pokhrel), Department of Hydrology and Meteorology, P.O. Box 406, Babar Mahal, Kathmandu, Nepal. [Tel: +977-1-226374, Telex NP 2334 GTZ KTM, Fax +977-1-521982].*

★ The Physical Research Laboratory, Ahmedabad, the Arid Zone Research Association of India, Jodhpur and the Deccan College, Pune, are organizing an *International Symposium on the Evolution of Deserts* to be held at the Physical Research Laboratory, Ahmedabad from 11 to 19 February 1992.

★ An *International Symposium on Hydrology of Mountainous Areas*, sponsored by UNESCO, will be organized by the National Institute of Hydrology at Shimla, India, in April 1992. The objective of the symposium is to bring together various experts from several countries dealing with mountainous areas to a common platform and thereby provide an opportunity for exchanging knowledge on the various problems of mountainous areas in different parts of the world. The following themes will be discussed:

- Instrumentation and measurement techniques
- Network design for hydrological observations
- Hydrological balance in mountainous areas
- Man's influence on hydrological regime
- Modelling of stream flow and flood estimation
- Modelling of snowmelt and glacial melt

- Study of lakes and of springs
- Soil erosion and sedimentation
- Groundwater in mountainous areas.

For further information please contact: *Mr. K.S. Ramasastri, Organizing Secretary, National Institute of Hydrology, Roorkee-247 667 (U.P.), India.*

★ The Indian Water Works Association, Research and Development and Nagpur Centre will be organizing in cooperation with a number of engineering and technical institutions and non-governmental professional societies, an *International Conference on Rural Water Supply and Sanitation for Developing Countries* in Nagpur, India, from 4 to 7 January 1992.

The Institution of Engineers, Bangladesh, will be organizing in cooperation with the Federation of Institutions of Engineers in South and Central Asia (FIESCA) a *Regional Seminar on Water Management Practices* in Dhaka, Bangladesh from 21 to 22 November 1991. The theme will be *Water management practices for sustainable development towards the 21st Century.*

The Committee for International Commission on Large Dams, India (INCOLD) and the Central Board of Irrigation and Power are organizing the *First Conference on Research Needs in Dam Safety* from 3 to 6 December 1991 in New Delhi.

#### National Activities

★ The *National Seminar on the Use of Computers in Hydrology and Water Resources* (CHWR Seminar), organized by the Central Water Commission, supported by UNESCO/ROSTSCA, at the Indian Institute of Technology, New Delhi, scheduled for 21-23 February 1991 had to be postponed until further notice.

★ The *National Symposium on Remote Sensing of Environment and Annual Convention of Indian Society of Remote Sensing* will be held at the College of Engineering Campus, Madras, India from 10 to 12 December 1991.

*International Conference on Land-Water Interactions*, New Delhi, India, 8-12 December 1991.

This conference is organized by the National Institute of Ecology (NIE) jointly with the International Society for Tropical Ecology

(ISTE), sponsored by the International Association for Theoretical and Applied Limnology (SIL) and cosponsored by UNESCO with the Man and the Biosphere (MAB) Programme and the International Hydrological Programme (IHP).

Its main objective is to review the state of our knowledge of different kinds of interactions, their impact on the structure and dynamics of various freshwater, estuarine and coastal ecosystems, and their value to management of water quality and conservation of aquatic resources.

*Regional Training Course on Water Quality Management*, Mysore, India, 11-25 November 1991.

This training course is being organized within the framework of IHP-IV Project H-3-2 and engineering network programme, in cooperation with the Indian National Committee on Hydrology, the Centre for Mathematical Modelling and Simulation, NAL, Bangalore, Ganga Project Directorate, Central Water Commission and other concerned Indian institutions and organizations.

The objectives of the training programme are to deal with various aspects of water quality assessment in rivers, lakes and estuaries. The training will focus on: (a) studying various sources of water pollution and their cause/effect relations, (b) understanding water quality processes (c) reviewing various types of water quality models, and (d) applying mathematical models in decision-making.

#### SOUTHEAST ASIA

##### Activities

- *Groundwater quality and monitoring*

The ESCAP expert group meeting on Groundwater Quality and Monitoring in Asia and the Pacific was organized in Bangkok, Thailand from 26-30 August 1991. In this meeting 25 participants of 15 countries of the region attended. After the presentation of the country reports the meeting discussed at length the recommendations for further action to be presented to their respective governments. The result of the discussions was summarized in the *Bangkok Action Plan for Regional Groundwater Quality.*

National governments are recommended to support inventories of pollution sources, assessments of future water use and to upgrade the institutional, legal and administrative framework for control of groundwater quality. Base line data are required to define the existing situation and continuous monitoring is needed to assess trends. The monitoring could be financed through support of the industry, municipal, provincial, national and international levels. However, protective measures depend on public awareness which determines to which extent they can be implemented. Non-governmental organizations can play a significant role in the popularization and dissemination of the available knowledge.

Furthermore the meeting recommended that mitigation measures be introduced or strengthened to improve the serious and growing problem of saline intrusion and man-made contamination (notably effluent disposal from small-scale industries and sewage systems) in many countries of Asia and the Pacific. Also diffuse contamination, including absence of mains sewerage in cities and agricultural pollution in rural areas has to be controlled.

Appropriate laboratories, trained personnel and sound methodologies are needed to address these problems adequately. Co-operation among neighboring countries is needed, because of the many similarities of groundwater regimes and management problems. The international agencies could play a major role in this respect. UNESCO is specifically invited to support training courses and assist in the preparation and dissemination of training manuals.

The meeting also identified priority topics for applied research:

1. Pollution indicator parameters for tropical groundwater environments.
2. Appropriate technological methods for groundwater quality monitoring.
3. Improved understanding of processes of movement of various contaminants through tropical soils, to better define vulnerability.
4. Leaching processes in typical agricultural situations.
5. Appropriate technology for groundwater treatment at the village level.
6. Assessment of the relationship between industrial pollution loads and groundwater quality.
7. Development of appropriate methods to reduce pollution load from urban and industrial activity on vulnerable aquifers.

Lastly the meeting formulated a message for the International Conference on Water and the Environment (Dublin, January 1992) and the UN Conference on Environment and Development (Rio de Janeiro, June 1992) in which it stressed the importance of addressing the issue of protection of aquifers and groundwater quality deterioration in developing nations.

#### • *Conference on Weather & Climate*

The *Conference on South Pacific Environments: Interaction with Weather and Climate*, organized by the University of Auckland, was held in Auckland, New Zealand from 2 to 7 September 1991. UNESCO sponsored the attendance of 12 participants from Southeast Asia and the Pacific. A more elaborate report of this meeting will be presented in the next issue of IHP Information.

### Future Activities

#### • *Symposium on Alluvial Rivers*

From 16 to 19 September 1991 the Symposium on *Special Problems of Alluvial Rivers* is being convened in Seoul, Republic of Korea. Among the topics of discussion are the reservoir deposition and its control, including the mitigation of any adverse effects on the riparian area; river processes downstream of a reservoir; bank protection; sedimentation aspects of flood-plain management and institutional aspects of international rivers. The symposium is organized by the Korea Institute of Construction Technology and sponsored by UNESCO (IHP-IV Project H-1-2), UNDP, IRTCES, the Ministry of Construction, Republic of Korea, and the Korea Water Resources Corporation.

#### • *Symposium on Water Resources*

The *International Hydrological & Water Resources Symposium 1991* will be held in Perth, Australia, from 2 to 4 October 1991. Six workshops are organized on 1 October and the following topics will be addressed : a) Practical applications of optimization theory, b) Decision support and expert systems, c) Dryland salinity and surface subsurface management, d) Water supply in semi-arid areas, e) Public participation in decision-making.

The symposium is organized by the Division of Water Resources of the Commonwealth Scientific and Industrial Research Organization

(CSIRO) and UNESCO is one of the co-sponsors in the framework of IHP-IV Theme M-3.

• *CO2 workshop in Kuala Lumpur*

A workshop on *Regional Aspects of the Global Carbon Cycle* will be organized in Kuala Lumpur, Malaysia from 24 to 26 October 1991. Several internationally noted resource persons are invited and the topic will be dealt with in several sessions. Status of present knowledge of carbon sequestering; historical processes affecting carbon movement; climatological theories relating to past environments; status of present climatological models and setting of priorities and coordination of research activities. The workshop is organized by the Ministry of Environment, Malaysia and co-sponsored by UNESCO and UNEP. IHP is involved through IHP-IV Project H-5-1.

• *Sound Development of Water Resources*

ESCAP will hold a workshop on *Sustainable and Environmentally Sound Development of Water Resources* in Bangkok, Thailand from 29 October to 1 November 1991. The concept and principles of such development will be discussed as well as the sustainability and soundness of water reservoirs. The participants from 17 developing countries will discuss their experiences at the national and international level. UNESCO is likely to support the workshop with one or two resource persons through IHP-IV Theme M-4.

• *Workshop on Erosion & Sedimentation*

A workshop on *Soil Erosion and Debris Flow Control*, organized by LIPI, the Indonesian Institute for Sciences, will be held in Yogyakarta, Indonesia, from 5 to 8 November 1991. The workshop is sponsored by UNESCO, in the framework of IHP-IV Project H-1-2, UNDP and IRTCES. Among the topics which will be discussed are: mechanism of soil erosion, sedimentation and debris flow; control of watershed erosion under the conditions of the Asian region; forecasting and warning system for debris flow and institutional and legal aspects of upstream erosion and debris flow control.

*China*

At the invitation of the Ministry of Water

Resources of the People's Republic of China, Mr. A. Szöllösi-Nagy, UNESCO Director of the Division of Water Sciences, made a formal visit to China from 17 to 29 July 1991. In Beijing, he was received by Mr. Yang Zhenhuai, Minister of Water Resources, and had talks with him and officials of the Department of Foreign Affairs of the Ministry. He attended the inauguration ceremony of the new building of the International Research and Training Center on Erosion and Sedimentation (IRTCES) in Beijing and discussed the activities of the Center with officials concerned. In Nanjing, he met with Professor Liang Ruiju, Chairman of the Chinese National Committee for the IHP, and the Secretariat, and discussed several projects to be undertaken by the Chinese National Committee in cooperation with UNESCO.

During his talks with Professor Liang Ruiju and the Secretariat of the Chinese IHP National Committee, the following points were agreed upon:

1. With the support of UNESCO it is foreseen that IHP INFORMATION will have an edition in Chinese published and distributed by the Chinese National Committee for the IHP from the March 1992 issue.
2. With the support of UNESCO and Chinese institutions and departments concerned, the International Symposium on Flash Floods in Arid and Semi-Arid Zones will be held in early September 1994, tentatively in Lanzhou, China (IHP-IV, H-5.2, convenor: the Chinese National Committee for the IHP).
3. It is foreseen that a Regional Workshop on Typhoon Floods in East Asia will be held in Xiamen, China, September 1993.
4. The Chinese Journal *Advances in Water Science* is a contribution to the International Hydrological Programme and is endorsed by the Chinese National Committee for the IHP. The table of contents will be published in IHP INFORMATION.
5. The Chinese National Committee for the IHP expresses its wish to take an active part in the project of IHP-IV on the impacts of global and regional climate changes on water resources. Concrete arrangements will be made when detailed requirements are known.

## News from the International Research and Training Centre on Erosion and Sedimentation (IRTCES, Beijing)



The new building of IRTCES, constructed as a contribution of the Chinese authorities, was inaugurated on 19 July 1991 during a ceremony honored by the presence of Her Excellency Qian Zhengying, Vice-Chairperson of the Chinese People's Political Consultative Conference, Honorable Yan Keqiang, Vice-Minister of the Ministry of Water Resources, and attended by high level officials (also see above).

On this occasion, the Secretary of the IHP recalled that IRTCES had been set up on 21 July 1984 under the auspices of, and with support from UNESCO, at the proposal of the government of the Peoples' Republic of China. He stressed the fact that among the many environmental problems with which our planet is faced, *erosion* had perhaps not been given sufficient attention in the past as it was not a major problem in the industrialized countries with a temperate climate. However, in many countries, and in China, in particular, where the climate is less mild and rainfall heavy, the effects of erosion have been drastic. He highlighted the remarkable achievements of IRTCES in all aspects of sediment-related fields of planning and research and the provision of consultative services to a large number of countries and underlined the major role of the Center which is now both regionally and internationally known not only for erosion and sedimentation research,

but also as a training institute.

### International Journal of Sediment Research

This scientific journal is published by IRTCES in one volume (3 issues) a year. The subscription price for 1991 is US \$ 60 for 3 issues, postage of surface mail included. Mail order and enquiries to: *The Chief Editor (Mr. Bingnan Lin) IRTCES, P.O. Box 366, Beijing 100044, China.* It covers a wide range of topics including not only the mechanics of sediment transport and fluvial processes, but also what is related to geography, geomorphology, soil erosion, sediment yield, soil conservation, environmental and ecological impact of sedimentation, social and economical effect of sedimentation and its assessment.

*International Journal of Sediment Research.* (Vol. 6, N° 1, 1991). This issue contains papers reporting on important recent advances in sedimentation, drawing heavily on the use of field data.

The paper *A numerical model for sedimentation in the Fenhe Reservoir and the adjoining reaches*, by Guan Yexiang et al describes a model where the method of optimization in nonlinear programming is applied to determine the basic parameter, applying a concept of fuzzy mathematics. Another feature of this model is that the main channel is not confined between fixed banks. The computed results are in good agreement with the observed field data.

Prof. Lee Hong Yuan and Yu Wei Sheng's paper, *Velocity profile of sediment-laden open channel flow*, presents an in-depth discussion on existing models for velocity profiles of open channel flow for both clear water and sediment-laden water. The paper should be of particular interest to readers in theoretical research.

Another paper by Zhou Jianjun et al, *A new mathematical model for 2-D flow*, suggests a new model applicable to the more stringent case of flow in an elongated space of river reaches with very complicated bed topography.

Two of the 3 papers awarded by the *Qian Ning Memorial Foundation for Erosion and Sedimentation* in 1989 are also published in this issue, one reporting on the result of comparison between model tests and field data of the Gezhouba Project concluding that the criteria of model design were correct, and the other dealing with the analysis of hydrotransport, a new

method being developed to construct the Jm-U relationship for designing pipeline system.

#### *Regional Training Programme on Erosion & Sedimentation for Asia*

On 6 June 1991, UNDP convened a trilateral meeting with representatives from UNESCO and IRTCES to discuss and evaluate the implementation of this project. After reviewing the Project Performance Evaluation Report, the UNDP Headquarters in New York expressed their satisfaction that the project had so far fully achieved its objectives. Regarding the proposed continuation of the project, consultations with specialized agencies including UNESCO and with governments of the region are now underway.

#### *Policy Workshop on Investment Priority for Watershed Management in National Periodic Plans in Asian Region*

In the framework of the FAO/UNDP project *Support to Watershed Management in Asia*, IRTCES was entrusted by the Ministry of Water Resources the organization of this workshop, which was held from 11 to 14 June 1991 in Beijing. A total of 32 participants attended,

including representatives of 10 member countries and observers from the Ministry of Water Resources. In addition to presentations and discussions in session groups, the workshop also included a visit to the *Soil and water conservation project* in the Miyun Reservoir Area. While assessing the present status of investment in watershed management, the workshop stressed the need to emphasize soil and water conservation, inviting planners and policy-makers to give priority to investments in watershed management within national period plans.

The research project on *Mathematical Model of Sedimentation Problems and Channel Roughness* has been checked and accepted by the State Commission for Science and Technology.

*Changes in runoff and sediment load on the Yellow River and its tributaries.* The research work on this project has been basically completed. Final research reports should be finalized by the end of this year. The Foundation Committee has compiled the final general report to the Ministry of Water Resources.

## COOPERATION WITH NON GOVERNMENTAL ORGANIZATIONS

### International Association of Hydrological Sciences



IAHS/IHP \* Corner



### IHP-Related Activities during the XX General Assembly of the IUGG

The close and fruitful collaboration and co-ordination of activities between UNESCO/IHP and IAHS was highlighted during a number of joint events held in the framework of, or in connection with, the XX General Assembly of the International Union of Geodesy and Geophysics (IUGG), which took place from 11 to 24 August 1991 in Vienna, Austria.

★ *Meetings of the IAHS-Core Group for IHP-IV Project H-1-1: Scientific aspects of the interface processes of water transport through the atmosphere-vegetation-soil system at an elementary, catchment and grid size scale, held on 20 and 23 August 1991 in conjunction with the UNESCO-sponsored IAHS Symposium H4: Hydrological interactions between atmosphere, soil and vegetation.*

In addition to matters related to the convening of Symposium H4, the following IHP-related topics were discussed and activities initiated:

1. Based on the 1991 Action Plan of the group a first evaluation was made of the scientific results of Symposium H4, and also of related activities within on-going International



Programmes (IHP, IGBP/BAHC, WCRP/GEWEX, HAPEX/FIFE, EOS, OHP). This evaluation will be sent to UNESCO in October 1991 and will then be published. It will be used for the planning of further activities within IHP-IV Project H-1-1, and also as a basis for a more lengthy report to be prepared in 1992.

2. The draft programme for the Joint IAHS-IAMAP Symposium on *Measurement and modelling of exchange processes at the land surface for a range of space and time scales*, to be held at Yokohama, Japan in July 1993 was discussed in depth and finalized. The necessary organizational arrangements were also made for the preparation of this Symposium, which is expected to form another significant contribution to IHP-IV Project H-1-1, and also to the IGBP Core Project BAHC.

★ *Meeting of the Working Group for IHP-IV Project H-2-1 - Study of the relationship between climate change (and climate variability) and hydrological regimes affecting water balance components.*

The Working Group held its first meeting from 19 to 22 August 1991, parallel to the Vienna IUGG Assembly.

The Working Group discussed the objectives of the project, its relation to other international programmes and activities (IPCC, WCP/WCRP/GEWEX/GSIP, IGBP/BAHC), and drafted a programme of work as follows:

- To collect information and material on the scientific bases in the field of hydrology and water science which may be used for climate related investigations and climate change impact studies.
- To prepare a monograph based on this information which will be issued in 1995 as a UNESCO-IHP publication.
- To advise on the implementation of important large scale hydrological pilot experiments, in particular the GSIP, the continental pilot project within the GEWEX for the Mississippi river basin, and the related project for the South American continent recently initiated by UNESCO/IHP.
- To organize an International Symposium in May/June 1994 in St. Petersburg, USSR.

★ *Meetings on IHP-IV projects H-4-1: The effect*

*of large-scale snow and ice covers on global and regional precipitation systems and H-4-2: Snow and ice hydrology in specific areas and regions with special attention to long-term variations in water storage* were held from 15 to 21 August 1991 in conjunction with the Bureau meeting of the International Commission on Snow and Ice (ICSI) of the IAHS.

During these meetings the long standing and continuing close collaboration between ICSI and UNESCO/IHP was again highlighted. The following activities and results of discussions at Vienna need to be emphasized:

- The issuing of Bulletin No. 1 of the *Glacier Mass Balance Bulletin* (1988-89) as a joint IAHS(ICSI)/UNEP/UNESCO publication.
- The holding, on 19 August 1991, of an Open Meeting of the ICSI Working Group for IHP-IV Project H-4-2 on a *Series of regional projects on snow and ice in high mountainous areas*, with conclusions and proposals for future action.
- The decision to prepare in 1992, as a contribution to the IHP, a report for one of the IHP publication series on *Variations of snow and ice in the past and at present on a global and regional scale*.
- The preparation of two international symposia, one on *Snow and glacier hydrology* from 16 to 21 November 1992 in Kathmandu, Nepal, the other on *Seasonal and long-term fluctuations of nival and glacial processes in mountains at different scales of analysis*, in September/October 1993, in Tashkent, USSR.

★ *Meetings of an Ad-Hoc Working Group on IHP-IV Project M-3-1: Hydro-ecological models and bio-monitoring for environmental evaluation and prediction of impacts of natural and man-made changes and hydro-ecological classification of fresh water bodies* were held from 19 to 22 August 1991 in conjunction with the UNESCO-sponsored IAHS Symposium H2 *Hydrological basis of ecologically sound management of soil and ground water*.

In addition to matters related to the convening of Symposium H2, extended discussions took place on the preparation of a report to be published in one of UNESCO's IHP publication series on the results of Symposium H2, the conclusions drawn, the identified research needs and proposals for further activities. The report will also be used to

define more clearly the scope and contents of *ecohydrology* and to stress the need for closer collaboration between hydrologists and ecologists in different fields of joint interest.

★ *A first meeting of the Working Group for IHP-IV Project M-4-3: Study experiences with modern resources planning and management methods taking into account risk factors* was held from 16 to 18 August 1991, in Laxenburg, Austria, parallel to the Vienna IUGG Assembly.

The group discussed in depth the objectives, scope and contents of a monograph to be prepared as a contribution to IHP-IV Project M-4-3 and to be issued in 1995 as a publication entitled *Development and management of sustainable water resources systems: Decision support methods and experiences*. It was agreed that the central keywords for the book's content should be *Sustainability* and *Decision Support Systems*. A detailed outline of contents was prepared, together with a programme of work defining responsibilities and a calendar of activities.

### International Association for Hydraulic Research

**Hydraulic Research in a World that needs Water: The XXIVth Congress of the International Association for Hydraulic Research (IAHR)**

The Congress was held in Madrid, Spain, 9-13 September 1991, and was devoted to the theme *Hydraulic Research in a World that needs Water*. During the opening ceremony, Mr. S. Dumitrescu, former Director of UNESCO's Division of Sciences as well as former Secretary of the International Hydrological Programme, was awarded by the then acting President of IAHR, Mr. T. Carstens, the *Extraordinary Membership of Distinction*. The Congress was also addressed by Mr. Szöllösi-Nagy, current Secretary of the IHP. Following are excerpts of his statement:

*Although in name IHP is a hydrological programme, in reality it is a lot more - water science and technology as well as its transfer through education and training in order to meet the challenges water problems pose throughout the World. A World that needs water. A World*

*where hydraulic research has a very important role to play. Therefore, the title and leitmotiv of your Congress, "Hydraulic Research in a World that needs Water" was an extremely timely and excellent choice.*

*It is indeed an opportune moment to reconsider principles and execution and to ask ourselves whether we are responding adequately to the demands made upon us. We should look together towards the future, using all the possibilities at our disposal, and try out new ways and means to resolve the problems with which we are faced. The magnitude of the work before us is both daunting and exciting and in order to obtain our common goals it is necessary to enlist the co-operation of states, organizations, national institutions and the scientific community as a whole. IHP offers a mechanism for this and I am positive IAHR will make good use of it. As you may know the fourth phase of IHP covers the period 1990-1995 and is devoted to "Hydrology and Water Resources for Sustainable Development in a Changing Environment". IAHR has been invited to take part in IHP-IV and I am glad to say the response was extremely positive. Let me briefly mention a few current IHP projects in which IAHR participates:*

- *Study of erosion, river bed deformation and sediment transport in river basins (in this connection let me also mention the role IAHR did and does play in creating and managing the International Research and Training Center for Erosion and Sedimentation established in Beijing under the auspices of UNESCO).*
- *Hydrology, water management and hazard reduction in low lying coastal areas in particular with regard to sea level changes. (This project is a contribution to IDNDR). We are very pleased to note that the entire XXVth IAHR Biennial Congress will be devoted to this important activity of the UN.*
- *Yet another common interest lies in the humid tropics hydrology as well as in integrated water management in urban areas.*

*As in the coming years one of the priority areas of IHP will deal with, what we loosely call today, *ecohydrology* - I am sure IAHR will also be involved. Perhaps we could also do something together to allay the suspicions certain pressure groups have generated regarding hydraulic structures and systems. For example, the public should know the real truth with respect to*

hydropower development schemes, that is, whether they are indeed monuments of nature destroying megalomania, as they have sometimes been labelled or whether hydropower is a clear source of renewable energy with no greenhouse impact. It is sure that proper attention has to be paid to mitigating negative environmental impacts. But this is what environmental hydraulics is all about. I believe we still have a lot to do in this respect, including the transfer of science into technology as well as the transfer of theory into practice, along with helping the participation of an educated public in water resources decision making.

There are many other things I ought to have

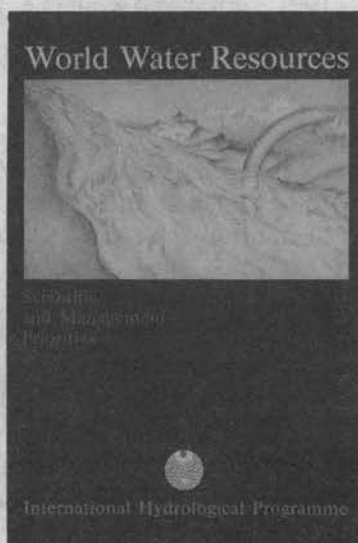
mentioned, such as, for example, the IHP/IAHR lectureship for developing countries, or the initiative IAHR has taken within COWAR (Committee for Water Research) to write the missing chapter of the Brundtland report on water - time does not permit me to go into detail. Finally, let me briefly touch upon a new initiative IHP made together with UATI (Union of Technical International Associations) and WFEO (World Federation of Engineering Organizations). This initiative is related to the disastrous flooding problem in Bangladesh. I am sure this will be of interest to IAHR as well and, as always, we can count upon their active participation.

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## NEW IHP PUBLICATIONS

### IHP Publications

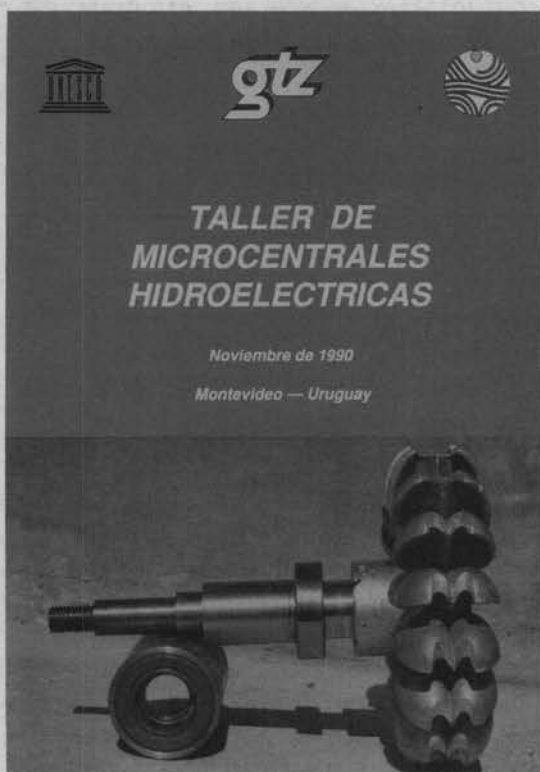
**World Water Resources. Scientific and Management Priorities.** The International Hydrological Programme. 30 pp. English. © UNESCO, 1991. Available free of charge from the Division of Water Sciences.



The International Hydrological Programme (IHP), working simultaneously through national governments and through the scientific community, is well placed to contribute to the solution of the world's environmental problems. It promotes the research that gives understanding of basic hydrological principles and processes, and it then supports the use of this knowledge in ways that lead to more rational management of the earth's freshwater resources. These are necessary first steps in achieving sustainable development and the promise of a better life for all. This information brochure outlines the action of the International Hydrological Programme around the following themes:

- Too much water, not enough water
- Erosion and sedimentation
- Humid Tropics
- Arid lands
- Cities
- Information for managers
- Climate change.

**Taller de Microcentrales Hidroeléctricas.** (Workshop on Small Hydropower Development). Edited by Carlos A. Fernández-Jáuregui, Helmut Lauterjung and Martin Viaene. A Contribution to the Major Regional Project on Use and Conservation of Water Resources in Rural Areas of Latin America and the Caribbean (MRP/LAC). Published in Spanish. ISBN 92-9089-015-0, 260 pages. © UNESCO, 1991. Single copies available free of charge from: *Programme Specialist Water and Environmental Sciences UNESCO/ROSTLAC Casilla 859 Montevideo, Uruguay.*



The document includes the most relevant papers presented at the Subregional Workshop on Small Hydropower Development held in Uruguay in November 1990 with sponsoring and financial support from UNESCO and GTZ (German Technical Cooperation Agency) as well as the workshop discussions and conclusions. The main subjects are: experiences of national programmes on small hydropower plants in Argentina, Bolivia, Brazil, Chile, Colombia, Paraguay, Peru and Uruguay, studies on offer and supply, design of hydraulic elements and waterworks, economic feasibility studies and criteria for design and construction of the different elements of a mini-hydropower plant.

**Keywords:** Hydraulics, energy technology, hydropower, small hydro-power plants, case studies.

## IHP-Related Publications

***Humid Tropics Hydrology. An Annotated Bibliography*** Compiled by L. Stephen Lau, Ryland L. Moore and Patricia Y. Hirakawa. English. 352 pp. © Water Resources Research Center, 1990. Price: US \$20 plus postage. Available from: *Water Resources Research Center, University of Hawaii at Manoa, 2540 Dole Street, Honolulu, Hawaii 96822, USA [Tel. 808 956 8272; Fax. 808 956 5044].*

This bibliography of the hydrology of the humid tropics includes about 1,850 entries grouped geographically, by region and nation, and presented in alphabetical order according to the author's surname. The criteria used to delimit the humid tropics are the amount and seasonal distribution of the rainfall and temperature. This publication is a contribution to the *Humid Tropics Programme* of the UNESCO/IHP.

**Keywords:** Precipitation, evaporation, evapotranspiration, rivers, lakes, groundwater, water supply, irrigation, navigation, hydroelectric power, wastewater management, deforestation, manpower, education, institutions.

***Carbon, nutrient and water balances of tropical rain forest ecosystems subject to disturbance.*** Management implications and research proposals. By Jonathan M. Anderson and Thomas Spencer. *MAB Digest 7.* UNESCO, Paris, 1991. 96 pp. © UNESCO, 1991. English. Available from: *The Director, Division of Ecological Sciences, UNESCO, 7 place de Fontenoy, 75700 Paris, France.*

The processes of logging and timber removal in tropical forests ecosystems, or conversion of forest to other land uses, involve gross disruptions of nutrient cycles and water balances. The extent to which these practices result in losses of soil and nutrient affecting subsequent regrowth of vegetation depends upon the severity of disturbance and the degree to which the difference between the depletion of the capital and plant demands is made up by weathering and/or atmospheric inputs. The objective of this joint MAB/IHP digest is to identify these critical changes in soil properties and processes in forest ecosystems after logging and their effects on natural tree regeneration or growth of plantation forests. Priorities for ecological research in rain forest ecosystems are also identified which would contribute to the management or rehabilitation of logged forests.

**Keywords:** Tropical forests, ecosystems, biomass, carbon, nutrient cycle water balance, climatic changes, forest management, soil conservation, forest regrowth.

*Plant-Water Interactions in Large-Scale Hydrological Modelling.* Global Change (IGBP) Report N° 17. The International Geosphere-Biosphere Programme: A Study of Global Change (IGBP) of the International Council of Scientific Unions (ICSU). English. 44 pp. © IGBP 1991. Available from: *IGBP Secretariat, Royal Swedish Academy of Sciences, Box 50005, S-10405 Stockholm, Sweden.*

This report summarizes the scientific issues addressed at a workshop held in Vadstena, Sweden from 5 to 8 June 1990. The workshop was organized as a contribution to the IGBP and the IHP by IGBP, IAHS and IHP, with additional financial assistance from the Swedish Natural Science Research Council and the Swedish National Environmental Protection Board.

Four topics were focused on during the workshop:

1. the spatial pattern at landscape level of the dynamics of water flows and waterborne fluxes of dissolved and suspended matter
2. plant/vegetation characteristics and regolith properties affecting return flow to the atmosphere, in particular, water-use by vegetation
3. observational and scaling-up methodological issues to support large-scale modelling, and
4. plans for focused research in three major hydroclimatic regions: humid tropical, semi-arid, and temperate zones.

*Hydrological basis of ecologically sound management of soil and groundwater.* Edited by H.P. Nachtnebel & K. Kovar. IAHS Publication N° 202 (published August 1991). ISBN 0-947571-03-5. 386 + x pages. Price US\$ 55.

The preservation of wetlands and habitats interrelated with the quantity and quality of underground water has been considered as an important objective in several countries. The purpose of the *Symposium on the hydrological basis of ecologically sound management of soil and groundwater* held in Vienna, August 1991, was to bring together leading scientists, engineers and officials of environmental agencies to present state-of-the-art methodologies for ecologically sound management of soil and groundwater. The symposium was held during the XXth General

Assembly of the International Union of Geodesy and Geophysics (IUGG). An important objective of the symposium was to improve knowledge of the relationships between the hydrological change in the soil and groundwater system and their effects in ecosystems.

This book contains 36 papers arranged under four topics:

- Modelling of water flow and contaminant transport in the saturated and unsaturated zones in relation to ecology
- Physical and hydrochemical processes, especially the dynamic aspects, in interface zones and their implications for ecology
- Methodology for the identification of hydrological and biotic parameters and the design, operation and applicability of field monitoring networks
- Case studies with respect to ecologically sound management under various land use practices (preservation of wetlands, forestry, agriculture, etc.).

The symposium was strongly related to IHP Project M-3-1: *Hydro-ecological models and bio-monitoring for environmental evaluation and prediction of impacts of natural and man-made changes and hydro-ecological classification of fresh water bodies.*

*Hydrological interactions between atmosphere, soil and vegetation.* Edited by G. Kienitz, P.C.D. Milly, M. Th. van Genuchten, D. Rosbjerg & W.J. Shuttleworth. IAHS Publication N° 204 (published August 1991). English. ISBN 0-947571-13-2. 494 + x pages. Price US\$ 60.

The *Symposium on hydrological interactions between atmosphere, soil and vegetation* was organized by the newly-formed IAHS International Committee on Atmosphere-Soil-Vegetation Relations and held during the XXth General Assembly of the International Union of Geodesy and Geophysics (IUGG) at Vienna, August 1991.

Land surface processes play an important role in climate studies. Therefore the interaction between atmosphere, soil and vegetation should be studied thoroughly. Hydrological processes are influenced by moisture, radiation and temperature. The scope of the papers in these proceedings includes solute movement in the soil, and the physiological behaviour of plants in relation to the supply of water and chemicals as a function of radiation and temperature conditions. The 45 papers included in this proceedings volume have been divided into four topics:

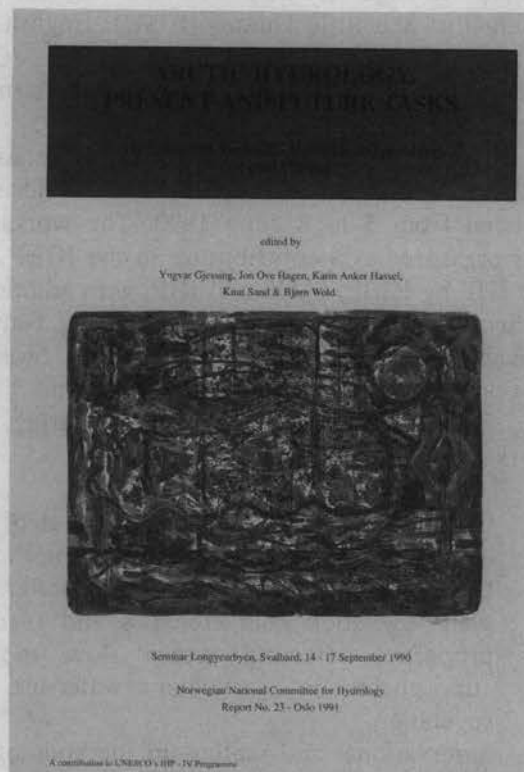
- Moisture, radiation and temperature fluxes at the atmosphere, soil and vegetation interfaces
- Modelling of water movement and chemicals in the soil
- Physiological behaviour of plants in relation to water and chemicals
- Case studies and field investigations at plot and catchment scales.

The importance of the subject has been fully recognized by the IHP which included it under its Project H-1-1: *Water transport through the atmosphere-vegetation-soil system*. IAHS has been entrusted with the execution of this project. Invited keynote papers present the scope of each topic.

The above two publications may be ordered from the following addresses:  
*Office of the Treasurer IAHS, 2000 Florida Avenue NW, Washington, DC 20009, USA [Telephone: +1 202 462 6900; telex: 7108229300; fax: +1 202 328 0566] or, IAHS Press, Institute of Hydrology, Wallingford, Oxfordshire, OX10 8BB, U.K. [Telephone: +44 (0) 491 38800; telex: 849365 hydrol g; fax: +44 (0) 491 32256].*



*Arctic Hydrology. Present and Future Tasks.* Hydrology of Svalbard - Hydrological problems in cold climate. Edited by Yngvar Gjessing, John Ove Hagen, Karin Anker Hassel, Knut Sand & Bjorn Wold. A contribution to the IHP by the Norwegian National Committee for Hydrology. Report N° 23, Oslo, 1991. English. 224 pp. Available from: *Norwegian National Committee for Hydrology, P.O Box 5091, Majorstua, 0301, Oslo 3, Norway.*



The Norwegian National Committee for Hydrology (NHK) has during the last 5 years given priority to research programmes in polar hydrology. This volume presents the programme and proceedings of the Conference organized in Longyearbyen, Svalbard from 14 to 17 September 1990, on the occasion of the 25 year anniversary of NHK.

The Conference was attended by 66 participants. 25 papers dealing with various aspects of polar hydrology were presented by scientists from Norway, Canada, Denmark, Iceland, Japan, Poland, Soviet Union and United Kingdom. It has provided an opportunity to underline the importance of polar research as polar regions represent major environmental systems both in their own right and in a global perspective.

**Groundwater Modelling in the Nordic Countries.** Nordic Hydrological Programme NHP Report N° 27. Edited by Oystein Aars, 314 pp. English. ISBN 82-410-0118-5. Oslo, 1991. Available from: *The Norwegian National Committee for Hydrology, P.O. Box 5091, Majorstua, 0301 Oslo 3, Norway*

This publication contains the papers presented at the Nordic Seminar on Groundwater Modelling which took place at Randsvangen, Norway 26-27 April 1989. This Seminar was organized by the *Working group on groundwater models* established in 1986 by the Coordinating Committee for Hydrology in Norden (KOHUNO). The seminar attracted 40 researchers in the various fields of geohydrology. Almost all Nordic countries were represented.

**Journal of Hydraulic Research. Hydraulics and the Environment.** IAHR Journal, Volume 29 - 1991, Extra Issue. English. 77 pp. Available from: *IAHR/AIRH Journal, P.O. Box 117, 2600 MH Delft, Netherlands.*

This extra issue of the IAHR Journal contains the Proceedings of the IAHR Workshop on *Matching Hydraulics and Ecology in Water Systems* which took place in Utrecht, Netherlands, from 14 to 16 March 1991. The contributions, synthesized by the authors on the basis of the discussions during the workshop, are organized around the following themes:

- Relating hydraulics and ecological processes
- Involvement of ecology in the decision process
- The subsystems: (a) Rivers, (b) Lakes, (c) Estuaries, (d) Groundwater
- The uncompromising involvement of ecology

This extra issue is a contribution of IAHR to IHP Theme M-3: *Evaluation of social and environmental aspects of fresh water systems and prediction of impacts of man's activities.*

We are pleased to announce that a limited stock of paying publications have been donated to the IHP Secretariat for free distribution by the UNESCO Sales Division and the IAHS. If you wish to receive one of these publications, please contact: *UNESCO, Division of Water Sciences, 75700 Paris, France.* These are listed below:

#### UNESCO Publications:

- Fluctuations of glaciers (Vol. 03, 1970-1975)
- Tropical grazing land ecosystems - a state of knowledge report (UNESCO/UNEP/FAO)
- Fire and fuel management in mediterranean climate ecosystems: research priorities & programmes
- Case studies on desertification
- Population-environment relations in tropical islands: the case of Eastern Fiji
- Ecosystèmes forestiers tropicaux - un rapport sur l'état des connaissances (ref. RRNAT 14)
- Ecosystèmes pâturés tropicaux - un rapport sur l'état des connaissances (UNESCO/PNUE/FAO) (ref. RRNAT 16)
- Discharge of selected rivers of the world - Mean monthly and extreme discharges: Vol. 3, Part 3 (1972-75) and Vol. 3, Part 4 (1976-79)
- Hydrological problems arising from the development of energy - a preliminary report
- Urban hydrological modelling and catchment research: international summary
- Predicting effects of power plant
- Once-through cooling on aquatic systems
- Casebook on methods of computing quantitative changes in the hydrological regime of river basins due to human activity
- Application of results from representative and experimental basins
- Research on urban hydrology, Vol. 03 - a contribution to the IHP
- Experimental facilities in water resources education
- Guidebook to studies of land subsidence due to ground water withdrawal

- Methods of computation of the water balance of large lakes and reservoirs, vol. 02 - case studies
  - Teaching aids in hydrology (second revised edition)
  - Water and energy: demands and effects.
- IAHS Publications:
- Groundwater pollution (1971)
  - Hydrology of lakes (1973)
  - Flash floods (1974)
  - Effects of man on the interface of the hydrological cycle with the physical environment (1974)
  - The hydrological characteristics of river basins (1975)
  - Hydrogeology of great sedimentary basins (1976)
  - Erosion & solid matter transport in inland waters (1977)
  - Effects of urbanization & industrialization on the hydrological regime & on water quality (1977)
  - Modelling the water quality of the hydrological cycle (1978)
  - Hydrology of areas of low precipitation (1979)
  - Hydrological aspects of Alpine and high mountain areas (1982)
  - Dissolved loads of rivers and surface water quantity/quality relationships (1983).

## IHP CALENDAR

IHP PROJECT	TITLE	CONVENER/PLACE/DATE
--	International hydrological and water resources symposium, 1991	Institute Eng. Australia/ UNESCO/WMO/IAHS Perth, Western Australia 2-4 October 1991
M-1-4	2nd International Conference on computer methods and water resources - CMWR 91	CNCPRST-Morocco/UNESCO Rabat, Morocco 7-11 October 1991
M-3	International seminar on efficient water use	CNA/IMTA/IWRA/ ROSTLAC Mexico City, Mexico 21-25 October 1991
M-5-1	Workshop on importance of external perturbations for short and long-term changes in large lake ecosystems	SFB (Germany)/ UNESCO/IHP/MAB Konstanz, Germany 21-26 October 1991
--	Effects of climatic changes on the hydrological regime	-- Perth, Western Australia October 1991
M-2-2	Congress on management of information in science and technology (MIST)	UNESCO/ABOS/ULIR Univ. of VUB, Brussels, Belgium 14-15 November 1991



M-3-3	The IInd Afro-Asian conference on urban water management 1991-2010	IWWA/ROSTSCA Bombay, India 25-28 November 1991
M-3-5	International conference on appropriate waste management technologies	IAWPRC Murdoch University Perth, Western Australia 27-28 November 1991
H-5-6	Second workshop on Andean hydrology	ROSTLAC Venezuela 1991
H-5-6	2nd consultative meeting of the regional working group on mountain hydrology	UNESCO/Nepal Ministry Water Resources/ICIMOD Kathmandu, Nepal 2-4 December 1991
H-5-2	Regional workshop on hydrology and water resources in arid and semi-arid zones	Iran Nat.Com./ROSTSCA Tehran, Iran 7-11 December 1991
H-1-1	International conference on land water interactions	ROSTSCA/NIE/ISTE/SIL New Delhi, India 8-12 December 1991
--	International conference on water and the environment	WMO on behalf UN system Dublin, Ireland 26-31 January 1992
H-1-1 H-2-1 H-5-2	International symposium on the evolution of deserts	ROSTSCA/PRL/IGCP-252 Ahmedabad, India 11-19 February 1992
--	European international space year conference (ISY)	CEC/ESA/DARA (German Space Agency) Munich, Germany 30 March - 4 April 1992
H-1-2	Fifth international symposium on river sedimentation <i>Sediment management</i>	IRTCEs/IAHR/UNESCO Karlsruhe, FRG 6-10 April 1992
H-5-6	International symposium on the hydrology of mountainous areas	Indian National Institute of Hydrology Shimla, India April 1992
M-5-2	International Symposium on transboundary river basin management and sustainable development	RBA/Netherlands/UNESCO Delft, Netherlands 18-22 May 1992
--	UN Conference on Environment and Development	United Nations Rio de Janeiro, Brazil 1-12 June 1992

--	Joint UNESCO/IAHS Scientific colloquium on space/time/scale variability and interdependence for various hydrological processes	UNESCO/IAHS Paris, France 3-4 July 1992
--	Tenth Session IHP Intergovernmental Council	UNESCO Paris, France 6-11 July 1992
H-1-2	International symposium on erosion, debris flows and environment in mountain regions	IAHS Chengdu, China 5-9 July 1992
H-1-2	International symposium on erosion and sediment transport monitoring programmes in river basins	IAHS/NVE(Norway)/WMO Norway 24-28 August 1992
M-3-1	International workshop on biodegradation of toxic contaminants in groundwater	IAHS/UNESCO Canada September 1992
--	Ist Latin American congress of groundwater hydrology for development	ALHSUD Caracas, Venezuela October 1992
--	Meeting of IHP national committees of Mediterranean countries	UNESCO/French IHP/NC Montpellier, France 5-7 November 1992
H-5-6	International symposium on snow and glacier hydrology	Nepal (Min. of Water Resources, Dept. of Hyd. & Meteo.)/WMO/UNESCO/ICIMOD/IAHS Kathmandu, Nepal 16-21 November 1992
E-2-1 E-3-1 E-4-1	International symposium on education and training in water resources	IPH/COBRAPHI/UNESCO Porto Alegre, Brazil 1992 or 1993
M-2-2 M-2-3	Workshop on computer-oriented water data information systems	IAH US Comm./IHP Tucson, Arizona, USA 22-23 January 1993
H-2-2	International workshop on sea level changes and their consequences for hydrology and water management ( <i>SEACHANGE '93</i> )	UNESCO/WMO/UNEP/IAHS/IAHR Noordwijkerhout, Netherlands 19-23 April 1993
H-3-2	International symposium on hydrological, chemical and biological problems of contaminant transformation and transports in aquatic environments	USSR NC/UNESCO/IAHS Rostov-on-Don, USSR 24-29 May 1993
--	Fourth UNESCO/WMO International conference on hydrology and scientific bases of water resources management	UNESCO/WMO Paris, France 21-26 June 1993

H-5-2	IAH XXIVth Congress: Hydrogeology of hard rocks	Committee of Norwegian Hydrogeologists & NHK on behalf of IAH Oslo, Norway 28 June-2 July 1993
H-1-1 H-2-1 & others	Fourth scientific assembly of the IAHS and Sixth scientific assembly of the IAMAP	IAHS/IAMAP/UNESCO/WMO Yokohama, Japan 11-23 July 1993
M-2-3	GIS for hydrology and water resources management in a changing environment	Univ. of Cagliari/IHP Cagliari, Italy September 1993
H-1-1	International symposium on the application of isotope techniques in studying environmental changes in the hydrosphere	IAEA/UNESCO Vienna, Austria 1993
H-5-2	IAH XXVth Congress: Management to sustain shallow groundwater systems	IAH Adelaide, Australia September 1994



**LIST OF UNESCO-SPONSORED POSTGRADUATE COURSES  
IN HYDROLOGY AND WATER RESOURCES**

The list below contains the Unesco-sponsored postgraduate hydrology courses. The Division of Water Sciences supports a number of these courses financially and candidates may apply directly to the course organizer to request a fellowship or travel support. There are no other funds at Unesco for individual hydrology fellowships except within the framework of Unesco's Participation Programme for which requests can only be submitted by the National Commission for Unesco of the trainee's country.

*All requests for admission and fellowships or enquiries should be addressed to the course organizer and not to Unesco.*

Place	Subject of course	Duration	Frequency	L *	Deadline	Address
ANKARA (Turkey)	Sediment technology	4 weeks	20 May- 14 June 1992	E		Dr Ergun Demiroz DSI Teknik Arastirma ve Kalite Kontrol Daiseri Baskanligi 06100 ANKARA
ARGENTINE: Buenos Aires, Santa Fé, Mendoza, San Juan	General hydrology with emphasis on the environment	6 months	Inquire	S	Inquire	Sr. M.C. Fuschini Meijia Director del Curso Comité Nacional para el Programa Hidrológico Internacional Av. 9 de Julio 1925 - 15° Piso 1332 BUENOS AIRES
BARCELONA (Spain)	Groundwater hydrology	6 months	annually, January- July	S	30 Sept. 1991	Curso Internacional de Hidrología Subterranea Calle Beethoven 15, 3° 08021 BARCELONA
BELGIUM	Hydrology and hydrogeology  <i>- French language programme</i>	10 months	annually, begins in October	F	1 Sept. 1991	Professeur Dr. ir. A. Monjoie Directeur des Laboratoires de Géologie de l'Ingénieur, d'Hydrogéologie et de Prospection géophysique - Bâtiment B19 Faculté des Sciences appliquées Université de Liège SART TILMAN B - 4000 LIEGE
	<i>- English language programme</i>	1 or 2 years	annually, begins in September	E	1 Febr. 1992	Interuniversity Postgraduate Programme in Hydrology (IUPHY) Programme Director: Prof. A. Van der Beken Vrije Universiteit Brussel Laboratory of Hydrology Pleinlaan, 2 B-1050 BRUSSELS
BELGRADE (Yugoslavia)	Water resources engineering	3 months	annually, from June	E		"Jaroslav Cerni" Institute for the Development of Water Resources Postanski Fah 530 Beli Potok BELGRADE

*\*E = English, F = French, P = Portuguese, R = Russian, S = Spanish*

BIRMINGHAM (United Kingdom)	Water resources engineering in developing countries	9 months	special announcement	E	Apply soon	The Graduate School Secretary School of Civil Engineering University of Birmingham P.O. Box 363 BIRMINGHAM B15 2TT
BUDAPEST (Hungary)	Hydrology	6 months	annually, from January	E	15 Sept. 1991	Dr. G. Kienitz Research Centre for Water Resources Development (VITUKI) International Postgraduate Course in Hydrology P.O. Box 27 H-1453 BUDAPEST 92
CAIRO (Egypt)	Environmental hydrology for arid and semi-arid zones	2 months	annually, May-June	E	Inquire	Prof. Dr. Mostafa M. Soliman Course Manager International Course on Hydrology for Arid and Semi-arid Regions P.O. Box 5218 Heliopolis-West CAIRO
CRICA (Central America and the Caribbean)	Changing subjects (for subject and date inquire with organizer)	4 weeks	annually	S	Inquire	Ing. Juan Luis Guzmán Coordinador General del CRICA Esc. Regional de Ingen. Sanitaria Univ. de San Carlos de Guatemala Ciudad Universitaria, Zona 12 GUATEMALA
DAR-ES-SALAAM (Tanzania)	Water resources engineering	18 months	annually, begins 1 October	E	1 May 1992	Mr. F.W. Mtalo Disciplinary Area Coordinator for Water Resources Engineering P.O. Box 35131 DAR-ES-SALAAM
DELFT (Netherlands)	Hydrology	11 or 18 months	annually	E	30 June 1992	IHE Oude Delft 95 P.O. Box 3015 2601 DA DELFT
GALWAY (Ireland)	Hydrology	1 year	annually, begins in October	E	No deadline Apply early	Professor J.E. Nash Department of Engineering Hydrology University College Galway GALWAY
GRAZ (Austria)	Groundwater tracing techniques	5 weeks	1991, 1993, etc.	E	15 Apr. 1993	Dr. H. Zojer Postgraduate Training Course on Groundwater Tracing Techniques Institute for Geothermics and Hydrogeology Elisabethstrasse 16/II A-8010 GRAZ
GUATEMALA	Hydraulic resources	1 week	annually	S	Inquire	Ing. Arturo Pazos S., Director Escuela Regional de Ingeniería Sanitaria y Recursos Hidráulicos Facultad de Ingeniería Ciudad Universitaria, Zona 12 GUATEMALA CITY

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KENSINGTON (Australia)	Hydrology, covering principles, practice and applications of surface and ground water hydrology	3 months	annually, next course 2 March- 12 June 1992	E	December 1991	Course Director Graduate Course in Hydrology School of Civil Engineering The University of New South Wales P.O. Box 1 KENSINGTON New South Wales 2033
LAHORE (Pakistan)	Water resources management. Various options: - post-graduate - M. Sc. - M. Phil	12 mo. 16-1/2 mo. 2 years	annually, beginning in Sept.	E	30 June 1991	The Director Centre of Excellence in Water Resources Engineering University of Engineering and Technology LAHORE 31
LAUSANNE (Switzerland)	Hydrology	15 months	annually, beginning in Oct.	F	1 May 1992	Cycle postgrade inter-universitaire en hydrologie et hydrogéologie EPFL-IATE CH-1015 LAUSANNE
NEUCHATEL (Switzerland)	Hydrogeology	15 months	annually, beginning in Oct.	F	1 May 1992	Cycle postgrade inter-universitaire en hydrologie et hydrogéologie CHYN 11, rue Emile-Argand CH-2007 NEUCHATEL
LISBON (Portugal)	Operational hydrology	2 months	annually	P	1 Sept. 1991	Curso Internacional de Hidrologia Operativa Direcção-Geral dos Recursos Naturais Av. Almirante Gago Coutinho, 30 1000 LISBOA
MADRAS (India)	Hydrology and water resources engineering	1 year	annually, mid-August	E	15 May 1992	Centre for Water Resources College of Engineering Anna University 600 025 MADRAS
MADRID (Spain)	General and applied hydrology	6 months	annually, from January	S	30 June 1992 for 1993 course	Centro de Estudios y Experimentación de Obras Públicas Alfonso XII, Num. 3 MADRID 28014
MONASH (Australia)	Hydrology and water sciences	1 year	annually	E	Selection takes place in December 1991	Course Director Department of Civil Engineering Monash University Clayton 3168 VICTORIA
MONTPELLIER (France)	Hydrogeology of fissured rocks	2 weeks	12-20 September 1991	F	Closed for 1991 session	CREUFOP (J.C. Legars) 99, Avenue d'Occitanie 34096 MONTPELLIER Cedex 5

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MOSCOW (USSR)	1992: Scientific ** basis of research and utilization of groundwater resources	2 months	annually, begins in June	E R	Apply soon	International Higher Hydrological Course Geography Department Moscow State University Lenin Hills MOSCOW 119899
NANJING (China)	Hydrology (advanced)	2 months	Special announcements	E	Inquire	International Activities Office East China Technical University of Water Resources 1, Xikang Road NANJING 210024
NEWCASTLE- UPON-TYNE (United Kingdom)	(a) Hydrology (b) Water resources	1 year	annually, from October	E	31 May 1992	The Registrar Department of Civil Engineering University of Newcastle-upon-Tyne NEWCASTLE-UPON-TYNE
OUAGA- DOUGOU) (Burkina Faso)	(a) Mobilization of water resources (b) Agriculture hydraulics (c) Sanitary engineering	9 months 9 months 11 months	annually annually annually	F F F	Inquire	Mr. le Directeur de l'EIER Ecole Inter-Etats d'Ingénieurs de l'Equipement rural B.P. 7023 OUAGADOUGOU
PADOVA (Italy)	Hydrology	6 months	annually, from December	E	15 Oct. 1991	Centro Internazionale di Idrologia "Dino Tonini" Via Sette Chiese 35043 MONSELICE
PORTO ALEGRE (Brazil)	Hydrology		Special announcements	P	Apply soon	The Director Instituto de Pesquisas Hidráulicas (IPH) Universidade do Rio Grande do Sul Caixa Postal 9509 PORTO ALEGRE
PRAGUE (Czecho- slovakia)	Hydrological data for water resource planning	6 months	1990, 1992, etc. from February	E	30 Sept. 1991 for the 1992 session	International Postgraduate Course in Hydrology Department of Water Resources Prague Agricultural University 160 21 PRAHA 6 SUCHDOL
ROORKEE (India)	Hydrology (and several addi- tional options)	1 year	annually, beginning mid-July	E	31 March 1992	Head of Department of Hydrology University of Roorkee ROORKEE 247667, U. P.
U.S.A.	Techniques of hydrologic investigations for international participants	2 months	In summer	E	Inquire	U.S. Geological Survey Water Resources Division 436, National Center RESTON, Va. 22092, USA

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\*\* Previously announced 1991 session postponed to 1992

