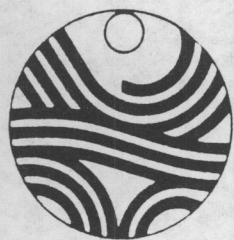


INTERNATIONAL HYDROLOGICAL PROGRAMME



IHP INFORMATION



N° 26

April/June 1991

CONTENTS

| | <i>Page</i> |
|---|-------------|
| • News from the IHP Secretariat | 1 |
| • Regional and IHP National Committees activities | 9 |
| • Cooperation with Non-Governmental Organizations... | 19 |
| • Cooperation with Governmental Organizations..... | 20 |
| • New IHP publications | 21 |
| • Recent meetings related to IHP | 24 |
| • Future meetings related to IHP..... | 25 |
| • List of Unesco-sponsored postgraduate courses..... | 31 |

This information letter is issued by the Division of Water Sciences and any enquiries should be addressed to:

*The Director
Division of Water Sciences
UNESCO
B.P. 3.07
75700 PARIS*



IHP INFORMATION



APPLICANTS ONLY

NO. 2

CONTENTS

IHP INFORMATION is now available in SPANISH. Copies may be obtained from our Regional Office for Science and Technology for Latin America and the Caribbean (ROSTLAC), 1320-24 Blv. Artigas, P.O. Box 859, Montevideo, Uruguay.

A RUSSIAN version of IHP INFORMATION is being prepared by the IHP National Committee of the USSR.

NEWS FROM THE IHP SECRETARIAT

IHP Staff

The following staff members of UNESCO are involved in IHP activities:

Division of Water Sciences

- Mr. A. Szöllösi-Nagy, Director
- Mr. W.H. Gilbrich, Programme Specialist
- Mr. J.S. Gladwell, Programme Specialist
- Mr. H. Zebidi, Programme Specialist
- Mr. A. Becker, Programme Specialist (temporary)
- Mr. S. Bruk, Consultant
- Ms. A. Aureli, Associate Expert
- Mr. F. Radstake, Associate Expert
- Ms. A. Apffel, Documentalist.
- Ms. M. Bastide, Newsletter Editor.

Regional Office for Science and Technology for Africa (ROSTA) P.O. Box 30592, Nairobi, Kenya

- The post of Regional Hydrologist is temporarily vacant.

Regional Office for Science and Technology for the Arab States (ROSTAS) 8 Abdul Rahman Fahmy Street, Garden City, 11511, Cairo, Egypt.

- Programme Specialist in Water Resources (*Position temporarily vacant*). Water resources activities are being handled temporarily by Mr. Tahseen Alkoudsi.

Regional Office for Science and Technology for Latin America and the Caribbean (ROSTLAC) 1320-24 Blv. Artigas, P.O. Box 859, Montevideo, Uruguay.

- Mr. C. Fernández-Jáuregui, Programme Specialist in Environmental Sciences (Hydrology).

Regional Office for Science and Technology for South and Central Asia (ROSTSCA) 8 Poorvi Marg, Vasant Vihar, New Delhi 110057, India.

- Mr. L. Mandalia, Regional Hydrologist.

Regional Office for Science and Technology for South and East Asia (ROSTSEA) United Nations Building, 2nd Floor, Jalan Thamrin 14, 273/JKT Tromolpos, Jakarta, Indonesia.

- Programme Specialist in Water Resources. (*Position temporarily vacant*). Water resources activities are being handled temporarily by Mr. S. Malling.

- Mr. H. Wasser, Associate Expert.

International Research & Training Centre on Urban Drainage (IRTCUD) (Belgrade, Yugoslavia)

Introduction and Objectives

The *International Research & Training Centre on Urban Drainage* was founded at the Institute of Hydraulic Engineering, Faculty of Civil Engineering, University of Belgrade (Yugoslavia), pursuant to a Resolution adopted by the UNESCO General Conference at its 24th Session in October 1987.

Intensive international activities in urban drainage preceded the establishment of the Centre, mainly in connection with the foundation of the international factual Urban Drainage Bibliographic Data Base (UDBB) which contains rainfall and runoff data from worldwide catchments. Numerous universities, research institutes, governmental and municipal agencies have contributed to the UDM Data Bank by providing data and other factual information.

IRTCUD obtained support and endorsement from several professional associations such as: the International Association for Hydraulic Research (IAHR), the International Association for Water Pollution Research and Control (IAWPRC), the International Association for Hydrological Sciences (IAHS). IRTCUD activities include cooperation with the above-mentioned associations, UN agencies (UNESCO, UNDP, UNIDO, UNEP, WMO and WHO), worldwide universities and research institutes, governmental agencies, numerous users of its services, etc.

The main objective of the Centre is to act catalytically in research and in implementation of its results in the area of urban drainage and in the related fields such as integrated management of urban waters, assessment of the impact on and

protection of the receiving water bodies, etc. It acts on a global scale, by making use of the achievements of higher levels of information processing based on the application of high technologies.

Bearing in mind the significant worldwide problems of frequent flooding in urban areas and in the related fields, high damage costs incurred, continuous efforts in research and development of appropriate techniques for coping with these problems, high investment and maintenance costs of the systems for control of urban floods and protection of environment against hazardous effects from urban water, the existence of valuable knowledge and information, the following objectives of IRTCUD can be singled out:

- collecting relevant information and knowledge and storing them in standardized formats, and forming the relevant bibliographic and factual data bases and banks and enabling their rapid use and dissemination
- undertaking commissioned research and development projects, and assisting in planning and coordination of research activities in other countries
- assisting in education for professionals coping with urban drainage and related problems, by providing the appropriate training tools, by running the training courses even in local languages and by training the trainers
- assisting in solving the real life problems by making use of the available sources and knowledge, and by establishing the appropriate techniques based upon the achievements of modern high technologies and higher level of information processing
- assisting in directing international sources of technical and financial aid to urban drainage and relevant areas
- raising the level of awareness of the importance of the problem and the overall level of urban drainage techniques and culture and its interactions with the water use and protection in urban areas

Concept of IRTCUD Activities

Resources, Actions, Users, Dissemination

The full benefit of its existence could be achieved in the wide scope of IRTCUD activities if a proper balance of available resources, actions embarked on, and knowledge and information dissemination among its users could be kept.

Sources

The possible resources for IRTCUD activities are: knowledge, information (primary sources and processed information), technical resources (equipment, hardware), financial resources, manpower, educational premises etc. Endorsement and support are to be sought from different sources, such as:

- cooperating countries and their governmental agencies, universities, research institutions and individuals (lecturers, authors, correspondents), governmental bodies-professional associations (IAHR, IAWPRC, IAHS, etc.), international governmental organizations (UNESCO, UNIDO, UNDP, UNEP, WMO, WHO)
- international data bases and banks, libraries, publishers, regional subcentres and their partners, equipment manufacturers, donors, etc.

Actions

The actions envisaged follow the logical steps from primary sources of information to the training of trainers and transfer of knowledge. The main activities are:

- Accumulation of the library of primary sources of information: books, reports, papers, abstracts, theses, diskettes etc., and formation of computerized Urban Drainage Bibliographic Data Base (UDBB), using the UNESCO developed CDS/ISIS software.
- Support to the measurements on the existing experimental catchments and encouragement of the establishment of new ones (both field and laboratory catchments) covering areas with various climatic, urban geographical and other conditions. Data standardization and transfer to UDM factual Data Bank, and its update and widening.
- Forming and making use of the collection of educational tools, such as educational software, video tapes, films, slides, small educational rigs etc.
- Planning, coordination and joint undertaking of research and expertise in both fundamental and applied disciplines.
- Advising, consulting and supervising the full scale projects.
- Running international scientific and professional meetings and cooperating with other organizations, and training
 - Planning, organization and running of local, regional and international training

courses (in English and/or other languages) in cooperation with local universities or other institutions. Lecturers selected from IRTCUD list of international experts. Duration of courses could be from one to four weeks. A course programme could be adjusted to the needs of local attendants, and official language could be both English and a local one.

- Training for degrees: graduate, specialist, M.Sc., Ph.D., postdoctoral, and training of trainers.
- Training of engineers and other specialists as users of software packages for specific problem-solving.
- Other activities relevant to urban drainage and related areas.

Principal Cooperating Subcentres

The current and future plans of IRTCUD are based on the proper balance between the available sources, actions to be undertaken and kept running, and the users of knowledge and information. The planned concept of activity is based on close cooperation with several centres in different countries and/or cooperation with subcentres differing of two main types:

- subcentres for particular climates (Oslo for cold and Sao Paulo for tropical climates);
- cooperating institutions for specific technical problems.

Most of the existing information, knowledge, computer programmes, techniques etc. are based on ordinary, temperate climates. There is a wide gap and lack of information, knowledge and appropriate techniques for urban drainage in specific climates such as tropical and subtropical, arid and semi-arid, cold and coastal. To fill this gap, principal cooperating subcentres for particular climate conditions have been established in Oslo, Norway for cold climates, and in Sao Paulo, Brazil, for tropical and subtropical climate conditions. The regional subcentres are undertaking research and information activities pertinent to their climate and relevant problems, and provide the flow of information and knowledge through IRTCUD activities. They would also play an important role in training of both local users in all aspects of urban drainage and training of all users on a worldwide basis on their specific problems.

The Centre relays on the cooperation with contribution of the world leading experts in the

areas of its activity.

How to contact IRTCUD

Head of Centre: Prof. C. Maksimovic
Mailing address: IRTCUD, Institute of Hydraulic Engineering
Faculty of Civil Engineering, P.O. Box 895
11000 Belgrade, Yugoslavia.
Phone: Intl 38 11 329 190
Fax: Intl 38 11 320 237

International Research and Training Centre on Erosion and Sedimentation (IRTCES) (Beijing, China)



The *International Research and Training Centre on Erosion and Sedimentation (IRTCES)* was set up by the Government of China on 21 July 1984, in Beijing, under the auspices of, and with support from UNESCO.

Objectives

IRTCES aims at the promotion of international exchange of knowledge and cooperation in the study of erosion and sedimentation problems.

The focus of the Centre's work is on sediment-related problems pertaining primarily to rivers, including not only their courses from source to estuary, but also their entire watershed. In all its activities, priority is to be given to the problems related to river regulation, control of soil erosion, rational management and utilization of water and land resources, and protection of the environment.

Main Activities, Past and Future

1. International and regional training courses
 - International training course on reservoir sedimentation, China (1985)
 - International training course on environmental impacts of reservoirs, China (1987)

- Advanced course on mathematical modelling for alluvial rivers, China (1987)
 - International training course on soil erosion and its control, China (1988)
 - Advanced course on sediment hydraulics, China (1989)
 - Regional training course on soil erosion and its control, China (1990)
 - Regional training course on economics of conservation, China (1991) (planned).
 - Regional training course on reservoir sedimentation and its control, India (1991) (planned)
2. International and regional workshops/seminars and symposia
- Water management seminar, China (1985)
 - International workshop on flow at hyperconcentration of sediment, China (1985)
 - IWRA Seminar on inter-basin water transfer, China (1986) (IRTCES as co-sponsor)
 - Third international symposium on river sedimentation, USA (1986)
 - International symposium on hydraulics for high dams, China (1988) (IRTCES as co-sponsor)
 - Workshop on soil conservation research in the loess areas of China, China (1989)
 - First colloquium of UNDP regional project: *Regional Training Programme on Erosion and Sedimentation for Asia*, China (1989)
 - Fourth international symposium on river sedimentation, China (1989)
 - Regional workshop on field measurement of sediment in rivers and reservoirs, Thailand (1991) (planned)
 - International symposium on debris flow and flood disaster protection, China (1991) (planned)
 - Regional symposium on special problems of alluvial rivers, including international rivers, Republic of Korea (1991) (planned)
 - Workshop on soil erosion and debris flow control, Indonesia (1991) (planned)
 - Seminar on methods for preservation of useful reservoir storage on heavily sediment-laden rivers, Malaysia (1992) (planned)
 - Seminar/workshop on mathematical modelling of alluvial rivers, Nepal (1992) (planned)
- Fifth international symposium on river sedimentation, Federal Republic of Germany (1992) (planned)
 - Colloquium for high-level decision makers on the problems of erosion and sedimentation management, China (1993) (planned)
 - Sixth international symposium on river sedimentation, India (1995) (planned).
3. Publications
- International Journal of Sediment Research, a quarterly journal published by IRTCES with an international editorial board consisting of 25 scientists
 - IRTCES Circulars N° 1, 2, 3, 4
 - IRTCES Monographs N° 1, 2, 3
 - IRTCES Newsletters twice a year
 - Lecture notes of training courses, approximately in total 2,300 pages
 - Proceedings of workshops/seminars, 4 sets in total 2,500 pages.
4. Information and documentation
- Abstracts of Chinese Literature on Erosion and Sedimentation (1949-1974), (1975-1984) in Chinese and English. From 1985 on, it is issued annually.
 - Information on Erosion and Sedimentation Research, a quarterly in Chinese.
5. Cooperative research
- Bilateral and multilateral cooperative research has been widely developed with domestic and overseas institutions. A UNDP Regional Project (1990-1993) entitled: *Regional Training Programme on Erosion and Sedimentation for Asia* (RAS/88/026) is under implementation. The executing agency is UNESCO. IRTCES functions as the managing unit of the project.
- Expertise and Facilities**
- IRTCES plays an important role in promoting regional and/or international cooperation in erosion and sedimentation studies, in all aspects of sediment-related fields of planning, feasibility study, design, testing and research, engineering supervision and management. IRTCES is capable of providing consultative services to all countries.

The headquarters of IRTCES is well equipped with all facilities for conferences, training courses and information services.

In addition, many modern Chinese laboratories and field stations that are run by other institutions, such as central and provincial research institutes, universities and colleges, cooperate closely with IRTCES. Hence a good deal of potential for conducting laboratory and field studies is available through the collaboration and coordination of IRTCES.

For News on IRTCES, see under the Regional Section for South and Central Asia.

THE CDS/ISIS SUCCESS STORY

Up-to-the-minute Software

By René Lefort Editor-in-Chief, UNESCO Sources

International organizations churn out masses of documents. In order to sift its way through them, UNESCO has designed a software programme, CDS/ISIS, which has become a hit even outside its precincts.

"I should like a list a authors of journals, newsletter, magazines and other publications - excluding books - dealing with water resources management in Africa: And I'm only interested in material published prior to 1975 in Spanish by publishers in Latin America."

The documentalist on the receiving end of this request - an imaginary one, of course - can either cast his/her eyes to heaven in despair at the gigantic scale of the task, or deliver the answer within a few seconds. The former reaction will be prompted by the daunting prospect of wading through all publications meeting some of the criteria or - a scarcely less laborious task - working through the file cards compiled for each publication. In the second case, a computer within reach of the documentalist will display the list of requested authors on its screen almost instantaneously in response to an input of *key words* from the request (non-book publications, water resources, Africa, etc.) provided, of course, that the documentation centre is computerized with a programme (*software*) designed for that kind of use.

Fits the Bill

CDS/ISIS fits the bill perfectly. It corresponds to the official if somewhat enigmatic definition of *non-numerical data base management software*. Translated into everyday language, CDS/ISIS is a means of compiling information (data) chiefly in textual form, unlike the type of software that is more partial to numbers.

In a library, a documentation or archives centre, the CDS/ISIS product is used to compile a *record* for each work, containing information ranging from the title to a summary of content and based on previously selected key words. These records can then be assessed for purposes of selective research, as in the above example.

Quantity is not an obstacle: CDS/ISIS can manage up to 16 million records containing up to 8,000 characters each, provided that the computer on which it is installed is sufficiently powerful. At the same time, a business executive with a particularly well-stocked address book can use CDS/ISIS to keep track of a wide range of acquaintances and have fun compiling a list of, for example, all those whose first name begins with M and whose telephone number includes the figure 45 ...

The history of CDS/ISIS is bound up with its name and with the career of the man who was its sole progenitor. When Gianpaolo Del Bigio, an electrical engineer of Italian nationality, left the International Atomic Energy Agency in 1973 to join UNESCO, he brought with him the know-how he had acquired through the automated processing of the Agency's documentation. On arrival, he discovered the CDS (Computerized Documentation System) software that UNESCO had developed for the same purpose.

But the Organization decided two years later to replace its central computer by a model identical to that on which the International Labour Organization had developed a documentary management software system dubbed ISIS (Integrated Set of Information Services). As strength lies in unity, CDS/ISIS was born in 1986.

Probably because the market for this type of product is relatively limited, CDS/ISIS has no competitor. The grapevine does the rest - requests have been streaming in. Since 1977, UNESCO has been supplying software to Member States for the large computers - 130 to date - installed in their documentary institutions.

Mutatis mutandis, the production and distribution of CDS/ISIS followed the same

pattern after micro-computers came on the market in the early 1980s. UNESCO's Regional Offices were keen to manage their documents on site. A micro version of the software was therefore launched in 1984 to meet the Organization's internal needs. Outside users, too, soon began to show an interest. In the meantime, over 10,000 CDS/ISIS software programmes have been distributed to over 130 countries at a rate that now exceeds 2,000 copies a year. The third version, for use in micro-computers forming part of a network, will be launched shortly. CDS/ISIS is available not only in English, Spanish and French but also in Thai, Polish and Arabic.

User Training

Eighty per cent of users are libraries and documentation centres, a third of these being located in the industrialized countries of Europe and North America, a third in Latin America, a fifth in Asia, the rest in Africa and the Arab States. Demand is so brisk that a network of 80 voluntary distributors has had to be set up, each of them operating at the regional or national level, or a supplier to its partners, in the framework of its own data exchange network. As direct user training now far exceeds the limited capabilities of the unit in charge of CDS/ISIS in Paris, the latter confines itself to the training of teacher instructors, for whom two or three courses are organized each year.

Mr. Raymond Gimilio, who is fond of recalling that he was the first to work with the software outside UNESCO is so appreciative that he is the founder and President of the French Association of Users of CDS/ISIS. In his view, there are several simple reasons for the success of UNESCO's homemade product: *"It is a software designed and regularly updated by documentation professionals; it is the only one to take account of international standards, which makes data exchange that much easier.. And, he adds in an undertone, it's free..."*

For further information contact: *General Information Programme, UNESCO, 7 Place de Fontenoy, 75700 PARIS, France.*

Implementation of IHP Projects

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



The latest document to be produced is entitled *The Disappearing Tropical Forests*. It is the first in a planned series of popularized documents in the IHP Humid Tropics programme. The series will be co-sponsored by the UNESCO's Man and the Biosphere (MAB) programme.

Single copies are available at no cost upon request. Those of you who have previously identified yourself as having a professional interest in the Humid Tropics programme will receive a copy automatically.

Future issues now under preparation will deal with the water-related issues and problems of urban areas, small islands, and health aspects. If you have writing talents, and have an idea for a future issue, we would be glad to hear from you. While we are not in a position to offer honoraria for the effort, we will provide professional editorial assistance, and of course the authorship will be identified.

The project officer, John S. Gladwell, and Dr. Low Kwai Sim of Malaya University, Kuala Lumpur, Malaysia co-authored a paper that was recently presented at a Conference of the American Society of Civil Engineers (with the particular session co-sponsored by the International Water Resources Association). Single copies of the paper, *Urban Water Issues/Strategies in the Humid Tropics*, are available free upon request.

The IHP will be providing an expert for a meeting on groundwater quality and monitoring in Asia, to be held at ESCAP in Bangkok, Thailand, 26-30 August 1991. One of the documents to be used at that meeting will be a recently published Technical Document in Hydrology, *Integrated Land-Use Planning and Groundwater Protection in Rural Areas*.

The Humid Tropics Center in Kuala Lumpur is now official. We are now working on the details for the establishment of a similar center in Panama. The Project Officer recently spent a week in Washington, D.C. visiting various possible funding agencies. The concept of the centers was well received, and proposals for center administered activities (research, seminars, training courses, symposia, etc.) will soon be developed.

The Project Officer and the ROSTLAC Regional Hydrologist (Carlos Fernandez-Jauregui) also went on mission to Panama to speak with government officials, including Vice-President Guillermo Ford, on the details of the regional Center that Panama had already offered to host. It is expected that UNESCO will give its official auspices to the two Centers during the coming session of UNESCO's General Conference to be held in Paris from 15 October to 7 November 1991.

The Universities Council on Water Resources (an organization of universities in North America that offer graduate programmes in water resources) has volunteered to act as a scientific backup for the Panama Center, and to work with the U.S. IHP/NC in making contributions, as may be requested, to the Centers activities. We look forward to a long and fruitful collaboration.

If you have a project or concept of a project that you believe might make a contribution toward the success of the Humid Tropics programme, we would be pleased to hear from you. We are always looking for scientifically sound publications that might be published under the auspices of the programme. If acceptable in topic, they will be peer reviewed before the final decision on publication is made. May we suggest, however, that the offer be made through your own National Committee for the IHP. Assistance by that IHP/NC in the publication, as was gratefully received from The Netherlands IHP/NC in the recent publication, *Hydrology of Moist Tropical Forests and Effects of Conversion: A State-of-Knowledge Review*, by L.A. Bruijnzeel, would always be welcomed.

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

Following the success of FRIEND/Western Europe, launched in 1985 and developed with IHP-IV Project H-5-5, it is UNESCO's intention to launch a similar project in Southern Africa.

A meeting was therefore organized in Harare, from 20 to 22 February 1991 with the assistance of the Institute of Hydrology, Wallingford (UK) and the participation of two representatives from each of the following 9 African countries: Botswana, Lesotho, Malawi, Mozambique, Namibia, Swaziland, Tanzania, Zambia, Zimbabwe. A representative from CIEH also attended the meeting.

The participants expressed their interest in the project and selected in particular the following subjects to focus on: low-flow studies, flood studies, water quality. They also considered two other topics of importance: creation of a common hydrological data base, and the training element.

With regard to the implementation, the participants expressed their willingness to participate in the future activities of the project but recognized at the same time the limits of their possible contribution.

Taking this into account, it was decided that a feasibility study should be prepared before launching the South African FRIEND project. An Interim Working Committee (IWC) was nominated for this purpose and its terms of reference and schedule of work established. The feasibility study will be submitted to UNESCO for approval and transmission to SADCC (Soil and Water Conservation Unit) for endorsement, as this organization plays a key role in Southern Africa, and to seek its cooperation.

The framework of this future project was established with the nomination of a Steering Committee and the proposal of the University of Dar-es-Salaam as the Coordination Centre of the project.

Sub-Project M-1-2a: Preparation of a guidebook for mapping groundwater resources and their vulnerability

A joint IAH/IHP working met met at Tampa, Florida, USA, from 22 to 26 April 1991 and prepared an annotated outline for a guidebook on aquifer vulnerability mapping, to be compiled in 1992/1993. All planned book chapters have been assigned to authors.

Project M-2-3: The use of geographic information systems in hydrological and water resources studies

A Workshop on geoinformation for resources management of biosphere reserves was held in May 1991 in Nairobi, Kenya. It is a major activity of the joint project IHP/MAB/ITC (International Institute for Aerospace Survey and Earth Sciences) in the Ambolesi biosphere reserve, focussing particularly on the identification of management problems encountered in the reserve and their interrelationships. It also aims at determining priority issues which could be addressed by using the Geographic Information System (GIS) on the basis of present available data and local staff capacity. Thirty-five specialists coming from various governmental organizations and local authorities participated.

The MAB Programme contributed US \$ 10,000 and the IHP US\$5,000. The UNESCO Regional Office for Science and Technology in Africa, Nairobi provided the *in situ* organization. The Kenya Wildlife Service actively participated in the organization of the workshop.

With regard to the hydrology component of the Ambolesi project, contacts have been established to involve the Ministry of Water Development which has recently launched a water resources survey project for the Kajiado district. Moreover, ITC is considering introducing some water body monitoring equipment to the Park/core of the reserve to collect data so that the mechanism of the water system can be better analyzed.

According to the project workplan, the data collection should start following the workshop. Water management and overgrazing problems will be given high priority.

Project E-4-1: Policies for and establishment of continuing education systems

A workshop on continuing education at all levels in hydrology was held at the premises of the University Foundation in Brussels from 10 to 11 June 1991. The workshop discussed the particular features of continuing education as related to hydrology and decided to prepare a report suitable for those wishing to benefit from continuing education, for employers, funding agencies and for organizers of training activities. A first draft will be prepared by the end of this year.

National Committees having material or suggestions are invited to send their contributions to the IHP Secretariat *before the end of this year*.



REGIONAL AND IHP

NATIONAL COMMITTEE ACTIVITIES

ARAB STATES

ROSTAS awarded Eng. Mohsen M. Sherif, Faculty of Engineering, Cairo University, Egypt, a travel grant to enable him to present a paper entitled *A two-dimensional finite difference model for groundwater pollution from surface disposal* in the European Conference *Advances in Water Resources Technology* (Athens, 20-23 March 1991).

The conference was attended by about 300 scientists and provided a forum for presentation of technological advances in the field of water resources, with the objectives to:

1. assess the current state-of-the-art in a number of listed subject
2. improve scientific and technological cooperation
3. enhance interdisciplinary interaction
4. produce directions for further technological research.

During the course of the conference, 17 technical papers were presented in surface water, 10 in groundwater, 21 in water resources conservation, 12 in water quality and re-use, 10 in computer modelling and simulation, 11 in real time control of water resources systems and 3 in institutions and methods for technology transfer.

ROSTAS completed the translation into Arabic of the IHP publication *Water and Development: Managing the Relationship*, by William E. Cox.

ROSTAS finalized its working document on *Training in water resources exploration, development and management*. The paper is being translated into French and Arabic for dissemination in the Arab Region.

ROSTAS is in contact with the Syrian IHP National Committee and officials at the Ministry of Irrigation to finalize logistics concerning the forthcoming regional seminar on *Simulation Techniques in Hydrology*.

The *Symposium on Efficient Water Use and Conservation is a Must for Survival* was held in Tunis, Tunisia, 27-29 May 1991. This symposium was jointly organized by UNESCO/ROSTAS and

ALECSO and supported by the Tunisian IHP National Committee. 22 participants attended, representing 5 Arab countries, and 8 papers were presented and discussed, in addition to several other documents distributed as background papers. The meeting was followed by a one-day field trip to visit some surface water works NW of Tunis. Participants valued the efforts of ALECSO and UNESCO/ROSTAS as well as their support in the advancement of Water Sciences in the Arab region, and several recommendations were made, among which the organization of a meeting of an expert group to be set up by ROSTAS for the establishment of a detailed plan of action to attain water sustainability, security and agricultural security in the Arab region.

EUROPE

Belgium

★ *Management of Information in Science and Technology (MIST)*

Training activities and courses will take place during the period 2 September - 29 November 1991 in Brussels, Belgium, on management of information in science and technology, with an emphasis on information related to water and the environment (*without charge for participants from developing countries*). These activities are approved by the Flemish Interuniversity Council and sponsored by the Belgian General Administration of Cooperation for Development and the IHP.

The participants will have the opportunity to participate also free of charge to the 2-day 3rd International Seminar on Management of Information related to Water and the Environment (see below).

15 travel and accommodation grants are foreseen for information intermediaries, with at least five years experience and a university degree, from developing countries, but participants from other countries and with other backgrounds and interest can also be accepted for the whole period or for selected activities.

Contributors are information experts, librarians and engineers from Belgium, The Netherlands, U.K., Yugoslavia and UNESCO.

The aims are to stimulate the use of internationally available information systems (Which systems are available and how to use them?); to stimulate the development of local and national information and documentation systems (How to build a bibliographic data base?).

Some travel and some limited grants for accommodation can be awarded by the Belgian General Administration of Cooperation for Development (ABOS).

Further information can be obtained from: P. Vanouplines or P. Nieuwenhuysen, University Library 8, Free University Brussels, Pleinlaan 2, B-1050 Brussels, Belgium.

★ *Third International Seminar on Management of Information related to Water and the Environment*

In the framework of the IHP and in collaboration with the Belgian National Committee for the IHP, the VUB Free University of Brussels is organizing this seminar which will take place from 14-15 November 1991 (attendance free of charge) at the Royal Museum for Central-Africa Tervuren near Brussels, Belgium.

The IHP-IV projects M-2-1 and M-2-2 are dealing with water-related information in a broad sense and concentrate on:

- Promoting, explaining, and using internationally available bibliographic data bases related to water and the environment. This includes the use of data bases on CD-ROM (Compact Disk Ready Only Memory) and by online access.
- Guiding those who are planning to set up their own (national) water-related information systems, perhaps in a later stage to be connected with international information systems. The use of Micro CDS/ISIS software plays a major role here, including the handling of factual data bases.

UNESCO-IHP offers a series of seminars to inform and/or train end-users or intermediaries, and to exchange information among people in the field of water and the environment. Previous seminars were organized in London, U.K. (1989), and in Dubrovnik, Yugoslavia (1990).

Further enquiries should be sent to: W.W. de Mes, Rapporteur UNESCO-IHP, Loevestein 27, 2403 JC Alphen a/d Rijn, The Netherlands.

France

★ *What Future for Large Rivers?*

At the initiative of the French Minister of State for the Environment an international conference entitled *What Future for Large Rivers?* will be held at the University of Orléans from 23 to 27 September 1991.

Under the high patronage of the President of the French Republic, sponsored by the Commission of the European Communities, the Council of Europe, the World Wildlife Fund for Nature (WWF) and the International Union for the Conservation of Nature (IUCN), this high level conference will be attended by some 500 participants, experts, managers, scientists and policy-makers from 20 countries in Europe, Asia, America and Africa.

Ecology is not presently seriously considered in the management of major river systems and the preservation of the natural aquatic environment, as well as economics, law and sociology. These concerns will be in the forefront of the discussions and visits will be arranged during the five days in Orléans.

This international meeting will conclude the *Year of Water*, which has been marked by a number of important events all contributing to the formulation of a new water policy for the coming decade.

For further information please contact: *Colloque international: Quels fleuves pour demain, Conseil supérieur de la pêche, 134, avenue de Malakoff, 75016 PARIS (France), Tél. (33) 1 45 62 62 95, Fax. (33) 1 45 63 33 73.*

★ *HYDROTOP 92*

An international *Water Week* (Hydrotop 92) will be organized in Marseilles, France, from 7 to 10 April 1992. During this week, a professional exhibition will be presented and an international scientific and technical colloquium on the theme: *Water and the City* will take place. The subjects of the colloquium will cover a wide range of problems and issues which water experts whether they belong to local authorities or to private companies have to face in their daily work. Around 1000 participants are expected, from all over the world. For further information, please write to: SAFIM, Parc Chanoit, B.P. 2, 13266 Marseille Cedex 08, France.

The Netherlands

We are informed that Prof. Dr. Ir. Reinder A. Feddes has succeeded Prof. Adriaan Volker as Chairman of the IHP National Committee for Netherlands. Prof. Feddes is a Professor in soil physics and agrohydrology at the Wageningen Agricultural University of Wageningen, Netherlands.

LATIN AMERICA AND THE CARIBBEAN

Regional activities

Preparation of the UNDP/UNESCO V Programming Cycle 1992-1996

In accordance with the resolutions approved by the UNDP Governing Council it was decided to prepare the V Programming Cycle concentrating actions in the following areas:

1. poverty eradication and grass-roots participation in development;
2. environment problems and natural resource management;
3. management development;
4. technical cooperation among developing countries;
5. transfer and adaptation of technology for development;
6. women in development.

In this connection ROSTLAC/HYD sent letters to all IHP/NCs and focal points of the region (with copy to all planning ministries or equivalent) requesting submission of lists of projects their countries wished to execute with UNESCO technical assistance in the field of environmental problems and natural resource management. Results obtained so far: ROSTLAC received 233 project proposals of which 41% concern our field of competence. At present the corresponding project documents are in preparation according to the guidelines distributed by UNESCO. Projects to be highlighted are: Master Plans on water resources management, diagnosis of national water-resource assessment activities and water resource assessment in general.

Regional Directory of hydrologists and hydrogeologists

Following the recommendation of the meeting of IHP/NCs of South America, Central America and Mexico a regional Directory is in preparation with the objective of channelling information on available human resources by main field of specialization as well as type of

work carried out and other relevant data. In order to standardize the specific area of knowledge at continental level the American Institute of Hydrology's classification code has been adopted. The questionnaire has been distributed through IHP/NCs and focal points and to specific project counterparts and water resources research centres of the region.

Postgraduate courses in hydraulic engineering (M.Sc. and Ph.D.)

The Mexican IHP/NC and UNESCO are sponsoring the M.Sc. and Ph.D. courses given by the Postgraduate Studies Division of the School of Engineering of the National Autonomous University of Mexico (UNAM) in Cuernavaca and Mexico City. The study programme includes 24 obligatory subjects and 6 complementary ones. The faculty is composed of 28 professionals and the course coordinator at the Mexican Institute of Water Technology (IMTA) is Mr. Javier Aparicio Mijares (Cuernavaca) and at the School of Engineering, UNAM, Mr. Jesus Gracia Sanchez (Mexico City).

Short courses at ERIS/USAC

The Guatemalan IHP/NC and the School of Engineering of San Carlos University of Guatemala are sponsoring a subregional short course on formulation and evaluation of water resources development projects to be dictated at the Escuela Regional de Ingenieria Sanitaria (ERIS) between 21 and 25 October 1991. The course will be supported by UNESCO, UNDP/Guatemala and the Inter-American Development Bank. The course coordinator is Mr. Pedro Saravia.

Roving course in Central America (CRICA)

During its session of 13 to 16 March 1991 the Regional Committee on Water Resources of Central America approved the following subjects for implementation in the region:

- use of groundwater resources
- dissemination of HEC models

Postgraduate course on water resources management and conservation in development strategies

The Latin American Faculty of Environmental Sciences (FLACAM) is giving the first course on environmental education and

water resources in Buenos Aires, Argentina, under the coordination of Mr. Ruben Pesci. The 18-month course which started on 15 April 1991 and will not have a permanent venue is sponsored by UNESCO and other environment-related institutions.

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

A meeting will be held in Argentina in September 1991 to review the information compiled on national experiences and to propose a future course of action.

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

The regional sub-group has been established with scientists from Argentina, Brazil, Chile and Uruguay and it is planned to discuss the work schedule and specific projects to be executed such as:

- Hydro-ecological model of savannahs;
- Methodology and instrumentation for hydro-ecological studies in water environments and other flood-prone areas of the Third World;
- 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.

IHP-IV Project E-1-3 Regional networks of technician training courses in hydrology and water resources

The first meeting will take place in Bolivia in November 1991 with the objective of defining a mechanism to enable national training courses to constitute subregional or regional networks and of strengthening regional training organizations and institutions. The expected results are: establishment of subregional and regional networks. The following course coordinators are expected to participate in the meeting: CRICA (Central America), Andean hydrology (Bolivia), Hydrology and environment (Argentina), Water resources (Mexico), ERIS (Guatemala), Water, life and development, CIDIAT (Venezuela), U.S. National Committee on Scientific Hydrology (USA) and UNESCO/ROSTLAC.

National Activities

Argentina

★ Surface water balance: The balance is executed under the coordination of Ms. Cristina Moyano of the INCYTH Hydrology Research Centre and will be concluded in December 1991 with technical and financial support from UNESCO and INCYTH.

★ Hydrogeological map: Subsequent to the project's conclusion under the coordination of Mr. Hugo Bitesnik UNESCO is supporting the publication of the descriptive memory which is scheduled to be printed in October 1991.

★ The international seminar on *Engineering and the environment*, sponsored by the School of Engineering of the University of Buenos Aires and UNESCO, will take place from 18 to 20 September 1991. The meeting will discuss the subject of integrated planning: Industry and the environment.

★ Second encounter of hydraulics professors: The meeting to be held on 10 and 11 October 1991 is sponsored by the School of Engineering of the University of Buenos Aires and UNESCO.

★ Pilot project *Water supply for isolated rural communities of the Province of Mendoza*, executed in the framework of the Major Regional Project (MRP/LAC) under the coordination of Mr. Eduardo Torres of IADIZA. Having considered that this constitutes a positive pilot experience UNESCO is providing technical and financial assistance to the coordinator for the preparation of a project document to be submitted to external funding agencies by the end of the year.

★ Project *Sustained living with drought: the green plains of La Rioja*. The project document was elaborated in the MRP/LAC framework with technical support from EMBRAPA/CPATSA of Brazil and FAO funding. The project was approved by the Argentine central government and has now been submitted by UNESCO to an external development bank for its study and funding.

Chile

★ Workshop on water resources use and conservation, La Serena, 7-10 August 1991: This meeting is organized by the Chilean IHP/NC and will take place at the University of La Serena. The following subjects will be discussed: national water policies (Dirección General de Aguas), basis for a geographic information system on water resources management (CIREN/ CORFO), natural pollution and anthropogenic pollution of industrial type (Universidad de Chile) and first results of the EULA project on water pollution (Universidad de Concepción).

Costa Rica

★ Surface water balance: A working group was established with Enrique Rafael Chacon of the Instituto Costarricense de Electricidad (coordinator), Claudia Solera of Agua y Alcantarillados and Maria Ester Suarez of the Instituto Meteorológico Nacional. They have defined the period of the balance from 1971 to 1989 and have access to 500 stations. The project will be concluded in July 1992.

★ Hydrogeological map: The project is coordinated by Ms. Alicia Gomez of SENARA and executed as established during the last workshop held in Costa Rica in 1988. The project will be concluded in 1992.

★ Preparation of development projects for

UNDP/UNESCO V programming cycle. The following projects have been approved by the IHP/NC and support is being sought for their implementation in the framework of the V Cycle:

- Diagnosis of national water resources assessment activities
- Drinking water supply and environmental sanitation in isolated rural communities
- Small hydropower development.

El Salvador

★ Surface water balance: Under the coordination of Mr. Jaime Miguel Arce and with UNESCO technical and financial assistance the following activities were concluded:

- Water balance of the Rio Grande de Sonsonate basin, executed by Messrs. Herbert Rolando Melgar Ramos and Teodoro Adonil Marroquin Garcia (232 pages) with the support of the Universidad Tecnológica de El Salvador
- Water balance of the Rio Jiboa basin, executed by Mr. Herbert Giovanni Carcamo Torres (306 pages) with the support of the Universidad Occidental de El Salvador.

Guatemala

★ Surface water balance: The project has been divided into three main basins and 35 sub-basins and the corresponding data has been collected. This activity will be concluded by July 1992 under the coordination of Mr. Sergio Hernandez, chief of the INSIVUMEH hydrology section.

★ Hydrogeological map: The new coordinator is Mr. Roberto Valdizan, chief of the INSIVUMEH groundwater section. A work plan is being established in order to define the duration of the project.

★ Integrated development project in Azacualpilla: The pilot project was executed under the coordination of Mr. Oscar Flores and its demonstration stage has been concluded. A development project is now under preparation and will be submitted to the Italian cooperation for funding.

★ Preparation of development projects for UNDP/UNESCO V programming cycle. The following projects have been approved by the General Secretariat of the Consejo Nacional de Planificación Económica:

- Diagnosis of national water resources assessment activities
- National water resources plan
- Cooperation programme between universities in different countries (UNITWIN).

Trinidad and Tobago

★ The Water Resources Agency of Trinidad and Tobago has published the hydrogeological map and explanatory note (19 pages and 12 colour maps) following the recommendations of the workshops on the hydrogeological atlas of the Caribbean islands held in the Dominican Republic (1986) and Venezuela (1988). This activity was coordinated by Ms. Sherryl Gopeesingh.

Uruguay

★ On 19 February 1991 the Italian General Directorate for Cooperation to Development approved the development project prepared by the National Mining and Geology Service (DINAMIGE), entitled *Programme on environmental sanitation and drinking water supply for rural areas in Northern Uruguay*. The project's coordinator in DINAMIGE is Mr. Enrique Massa. The implementation of this project will start in September 1991 and UNESCO will participate in monitoring activities.

★ Mr. Carlos Serrentino of the Uruguayan IHP/NC and national coordinator of the joint UNESCO/University of Padova project *Development of an integrated agro-meteorological system to forecast and control floods for the Santa Lucia river basin* paid a visit to the University of Padova (Italy) from 19 to 23 May 1991 with the objective of discussing the details of the project which has been submitted to the EEC for funding.

Venezuela

★ Pilot project for using ERS-1 radar data for delineating the hydrographic network in tropical forest areas of Venezuela. The project was proposed to UNESCO by the National Cartographic Service and subsequently after preparation of the project document it was submitted by UNESCO to the European Space Agency (ESA) which accepted it for funding support. Ms. Alicia Moreau director of the Cartographic Service will be responsible for its technical coordination.

★ UNESCO co-sponsored the participation of the director of the Centro Interamericano de Desarrollo Integral de Aguas y Tierras (CIDIAT), Mr. Tomas Bandes, in the postgraduate course on environmental training offered by FLACAM (Argentina).

SOUTH AND CENTRAL ASIA

Regional Workshop on Salt Water Intrusion Problems, Lahore, Pakistan, 19-28 May 1991

A regional workshop was organized by the Pakistan Council of Research in Water Resources (PCRWR). The workshop basically focussed on the problems in the inland aquifers. The whole of the Indus plain was underlain by sea water during the geologic times. With the deposition of silt from the mountains in the North and recession of the sea, the fresh water in the rivers displaced the native saline ground water which, by way of hydrological processes, accumulated in the centre of the doabs. The areal distribution of salt water became more complex later due to the introduction of recharge from the canal system. In general, highly saline water underlies virtually all of the relatively fresh water throughout the aquifers. Near the river and canals where a supply of fresh surface water is available, the saline water exists only at greater depths. Near the Centre of the doabs between the major tributaries of the Indus, a zone of the relatively fresh water, less than 30 m thick, commonly overlies a zone of highly saline water.

The workshop covered the following themes: occurrence of ground water; ground water movement; ground water equations; ground water modelling; theories for sea water intrusion in coastal aquifers; theories for saline water intrusion in inland aquifers; skimming well technology; salinity control and reclamation projects; water quality standards for irrigation; application of remote sensing techniques; practicals with computer applications; case studies.

The following activities are being sponsored by ROSTSCA:

- A *Second Consultative Meeting of the Regional Working Group on Mountain Hydrology* is likely to be held in September/October 1991 with a view to formulating a regional project on Himalayan hydrology. This meeting will be held in cooperation with the International Centre for Integrated Mountain Development (ICIMOD), Nepal.

- The *20th International Post-Graduate Diploma and Master's Course in Hydrology* will start on 17 July 1991 at the Department of Hydrology, University of Roorkee, India.
- A *Regional Hydrology Technicians Training Course* will be organized in Dhaka, Bangladesh, from 19 October 1991. The duration of the course is 9 weeks.
- A *Regional Workshop on Hydrology and Water Resources of Arid and Semi-Arid Zones* will be held in Tehran, Iran from 7 to 11 December 1991 in cooperation with the Iranian National Commission for UNESCO, the Iranian National Committee for Hydrology, and the Iranian Water Resources Agency.
- A *Regional Course on Consideration of Problems of Water Resources in Arid and Semi-Arid Regions* will be held from 22 November 1991 to 11 January 1992 in Tehran, Iran.
- 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 at New Delhi, India, from 9 to 22 December 1991. The course is jointly organized by the Fluvial Hydraulics Centre (Civil Engineering Department, University of Roorkee) and Central Water Commission (Government of India) with UNDP/UNESCO/IRTCES support (*Regional Training Programme on Erosion and Sedimentation in Asia RAS/88/026*).
- A *Regional Course on Water Logging and Drainage* will be organized by the Indian National Committee on Hydrology (INCOH) at Roorkee.
- The *Indo-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 cosponsored by UNESCO, UNDP, IWSA and the International Water Supply Association of South Central West Asian Countries (ASCEW). The subthemes of the conference will be: operation and maintenance of water supply and drainage systems; upgrading and rehabilitating water treatment and distribution systems; water resources: development and environmental

impact; industrial water management; fire fighting systems; water and sanitation in slum areas; urban environmental health; management development, financial control and consumer relation.

An International Conference on Land - Water Interactions is being organized by the National Institute of Ecology (NIE) jointly with the International Society for Tropical Ecology (ISTE) in New Delhi, under the sponsorship of the International Association for Theoretical and Applied Limnology (SIL) and cosponsored by UNESCO within the framework of the Man and the Biosphere Programme (MAB) and the IHP.

The main objective of the Conference 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.

The Conference Secretariat has specified 15 September 1991 as the deadline for submission of two copies of papers abstracts to: *The Convenor, International Conference on Land-Water Interactions, School of Environmental Sciences, Jawaharlal Nehru University, New Delhi-110067, India.*

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

A Regional Training Course will be organized within the framework of the UNESCO IHP (IHP-IV Project H-3-2). The course will take place at the S.J. College of Engineering, Mysore.

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

National Activities

A *National Seminar on the Use of Computers in Hydrology and Water Resources* (CHWR Seminar), organized by the Central Water Commission and supported by ROSTSCA which was scheduled to take place at the Indian Institute of Technology, New Delhi from 21 to 23 February 1991 has been postponed.

The *Centre of Excellence in Water Resources Engineering*, University of Engineering and Technology, Lahore, Pakistan, is offering a short Course on Computer Applications in Land and Water Resources Management. The course duration is two weeks and it will be held in February 1992.

The objectives of the course are to provide training in computer applications in soil moisture, water balance and salt balance studies by using packages such as Lotus 123 and Lindo in water resources.

THE 1991 CYCLONE IN BANGLADESH

By L.A. Mandalia, Regional Hydrologist,
ROSTSCA

Situated at the northern, narrow end of the Bay of Bengal, Bangladesh is directly in the path of the pre-and post monsoon cyclones that are generated in tropical atmospheric conditions out at sea. The country's vulnerability to these tropical storms is aggravated by the nature of its low-lying coast line, which forms the mouth of the world's largest river delta draining the Ganges, the Brahmaputra, the Meghna, their tributaries and distributaries. With its numerous offshore islands that are continuously in the process of formation and barely stand above sea level, separated by sea arms, tidal inlets and creeks, and with extensive mud flats, the entire coastal area is open to the fury of cyclones. As the Bay of Bengal is at its narrowest here, cyclones are usually accompanied by tidal surges which cause further devastation.

Bangladesh has long experienced cyclones and frequent river flooding which often exact a heavy toll on human life and economic assets. Infrastructure, the economy and national morale are still recovering from the two worst floods in living memory that occurred consecutively in 1987 and 1988.

The 30 April 1991 Disaster

The cyclone that struck Bangladesh in the early hours of 30 April 1991 was however a disaster of exceptional intensity. Although almost the entire coastal belt felt its effects, the northeastern part suffered the most. Winds gusting at up to 145 mph, torrential rains and a tidal surge between 20 to 25 feet high in places lashed an area about 100 miles long, stretching from Sandwip in Noakhali to south of Cox's Bazaar. Rising waters submerged the densely populated

islands of Sonadia, Moheshkali, Matarbari, Ujantia, Koriardia, Kutubdia and Sandwip. Of these, the last two were the most affected. Of the total of 140,000 people who perished, on Sandwip alone, 20,000 people died, 19,500 were injured and some 2,000 people are still missing. Only 62 per cent of its population survive today.

A number of features coincided to exacerbate the destructive power of the cyclone event, notably the ferocity of its tidal attack. First, the movement of the cyclone north-eastward to the head of the Bay of Bengal was relatively slow. Direct onshore winds were thus maintained for many hours, setting up high waves. Second, the central pressure of the cyclone was very low (950 mbs): in passing over the coast somewhere between Cox's Bazar and Noakhali, this in itself would have raised sea level over one metre. Third, the night of 28-29 April, twenty-four hours before landfall, was full moon and tides were already at their highest range. Finally, the movement of the low pressure centre and the direction and exceptional strength of the winds caused the sea to pile up in the constricted north-east funnel of the Bay of Bengal, producing a powerful tidal surge.

Much of the death and destruction was caused by this tidal surge which began to swell about the time the cyclone centre made landfall. Rising to 20 to 25 feet at some points, it swamped the offshore islands, submerging them, and then raced inland, bursting across the shore line. The presence in this area of a dense rural population living in extreme poverty and with little protection makes the impact of such events on people especially catastrophic.

On 25 April, immediately after the first danger signs became apparent, the Government cyclone warning system went into effect. Evacuations to shelters and protected areas were ordered and the Government estimates that some 3 million people shifted to safer places. Without these early measures, many thousands more would have died. Many, however, chose to stay to protect their meagre dwellings, holdings, livestock, foodstores and other possessions, letting only their families seek refuge in overcrowded cyclone shelters. And so thousands lost their lives.

Communications between the stricken areas and the capital Dhaka were cut, and power and water supplies disrupted. The heavy rains, rough seas and serious flooding that followed in the cyclone's track made the worst hit areas

inaccessible for days. In these conditions, even preliminary assessments of damage were virtually impossible.

At the end of the first week of May, weather conditions started improving and major serial surveys and helicopter relief sorties commenced. Only then did the nature of the wreckage along the coast become apparent. Another fortnight elapsed however before detailed information could be assembled. It is estimated that as many as 12 million people in 16 districts had been affected in varying degrees and many had been injured. More than 1.75 million homes, 5,148 primary schools and 1,693 secondary schools had been damaged or destroyed. Some 155,600 acres of the standing winter rice crop (boro) had been inundated, as had an estimated 23,200 acres of aus, a later crop. Fisheries and shrimp hatcheries had sustained heavy losses. Between 7,000 to 8,000 vessels were reported lost or missing. Miles of roads and embankments in the affected region had been washed away or needed repair. Worst hit of all had been the major industrial units, communications facilities and basic utilities concentrated in the coastal region, many of which had been put out of commission. Chittagong port, the country's only deep water harbour, had been battered, with 23 sunken vessels and wrecked equipment choking port operations.

The nation and the world could only guess at the terror and despair of the estimated 140,000 people who perished facing a catastrophe of unimaginable ferocity, and mourn their loss. But attention had now to turn to the more than 2 million survivors facing acute deprivation.

The Ministry of Environment and Forest of the Government of Bangladesh has commissioned a study to assess the environmental damage resulting from this Cyclonic event. A preliminary report has been issued.

An Inter-Agency Task Force comprising representatives of all relevant agencies of the UN System was constituted to prepare a consolidated report on the short and medium term needs to the donor community. ROSTSCA proposes to fund selected studies and sponsor an International Workshop on Coastal Zone Management in Bangladesh. The workshop will be interdisciplinary and will be organized jointly by the Inter-Governmental Programmes such as the IHP, IOC, MAB, Natural Hazards.

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



In response to the letter from Mr. Tatit Holtz, Chairman of the IHP Council to IHP National Committees calling for new ideas and concepts for the IHP, the IRTCES Secretariat organized a symposium on *Hydrological expectation of China 2000*, which was held in Nanjing from 4 to 7 April 1991 with the participation of 73 young and middle-aged hydrologists from institutions and departments of provinces in the fields of water, geography, geology, transportation, agriculture and environment. The Secretariat received 83 contributions, 41 of which were presented orally by their authors. These covered a wide range of subjects such as: assessment, planning and management of water resources; basin yield and concentration models; flood frequency analysis and computation; drought monitoring and prediction; reliability for flood forecasting; urban hydrology; hydrological research scales; fuzzy theory, grey systems, non-parametric theory, fractals and their applications; remote sensing and measuring techniques; computer application and data base, as well as environment, ecology, water-saving agriculture, etc. All of which aroused strong interest on the part of participants. The symposium proceedings will be published in Chinese in October 1991.

With the support of UNESCO and the Chinese government, another international training course on advanced hydrology was held from 2 April to 10 May 1991. It was organized by the Hohai University and the Chinese National Committee for the IHP. The course was designed for university lecturers and government officials whose daily work involves hydrological analysis and computation. The programme included lectures, practices and field visits to selected important hydrological works and water projects. There were 15 participants, 2 from the Democratic People's Republic of Korea, 1 from Iran, 1 from Pakistan, 1 from Nepal, 2 from Thailand, 2 from the Philippines, 1 from the USSR and 5 from China.

SOUTHEAST ASIA

Activities

Center for the Humid Tropics Programme in Southeast Asia

Finally the approval on governmental level from the Philippines, Thailand, Indonesia and Malaysia was given to the Regional Humid Tropics Initiative and the related center in Kuala Lumpur, Malaysia. The project proposal is now officially forwarded to AIDAB, Australia for request of funding.

XVII Pacific Science Congress

From 27 May to 2 June 1991 the XVII Pacific Science Congress convened in Honolulu, Hawaii, USA. About 1200 scientists from all over the Pacific Rim were gathered. A large delegation was present from the Southeast Asian countries, among them two sponsored by IHP. Five members of the professional staff of UNESCO/ROSTSEA attended as well.

WFP-UNESCO Cooperation

A joint evaluation mission of the World Food Programme of the United Nations (WFP) and UNESCO took place from 12 to 21 May 1991 on WFP project INS 3768 *Surface Water Management in the Drought affected Areas of West Nusa Tenggara, Central Java and Yogyakarta, Indonesia*. UNESCO was providing the hydrological inputs for the evaluation report, whereas study of the economical benefits was done by a WFP hired consultant.

Future Activities

CO2 Workshop in Kuala Lumpur

A *Workshop on regional aspects of the global carbon cycle* will be organized in Kuala Lumpur, Malaysia from 24-26 October 1991. This workshop is organized by DID (Malaysian Department of Irrigation & Drainage) and will coincide with the United Nations Environment Day, which is traditionally in October. UNESCO will contribute to this activity through IHP-IV Project H-5-1. UNEP has also pledged a contribution.

Conference on Weather & Climate

The *Conference on South Pacific Environments: Interaction with Weather and Climate* is to be held in Auckland, New Zealand between 2 and 7 September 1991 and is organized by the University of Auckland. UNESCO will sponsor the travel of at least ten participants from Thailand, Malaysia, Indonesia, and the Pacific countries under IHP-IV Project H-2-1.

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:

1. practical applications of optimization theory,
2. DSS and expert systems,
3. dryland salinity and surface subsurface management,
4. water supply in semi-arid areas,
5. public participation in decision-making.

A pre-symposium tour will be organized for a maximum of 90 participants from 28 to 30 September.

The symposium is organized by the Division of Water Resources of the Commonwealth Scientific and Industrial Research Organization, Australia (CSIRO) and UNESCO is one of the co-sponsors in the framework of IHP IHP-IV Project M-3.

Workshop on Erosion & Sedimentation

A workshop on *Soil Erosion and Debris Flow Control* will be held in Yogyakarta, Indonesia, from 5-8 November 1991, which will be organized by LIPI, the Indonesian Institute for Sciences. The workshop is sponsored by UNESCO, Beijing in the framework of IHP-IV Project H-1-2.

COOPERATION WITH NON GOVERNMENTAL ORGANIZATIONS

International Association of Hydrological Sciences



IAHS/IHP * Corner



Land Subsidence is a phenomenon that occurs in many part of the world. The subsidence results from the heavy withdrawal of ground water, geothermal fluids, oil, and gas; the extraction of coal, sulphur, and other solids through mining; the hydro-compaction of sediments; oxidation and shrinkage of organic deposits; the catastrophic development of sinkholes in karst terrain, and other phenomena.

The problems of land subsidence were among those included in the list of research projects recommended by UNESCO's International Hydrological Decade, which began in 1965, and the International Hydrological Programme. The continuing Working Group for IHP-IV project M-3-5c: *Ground Water Assessment and Environmental Impact due to Over-Development -- Land Subsidence* presently consists of A. Ivan Johnson, Chairman (USA), Laura Carbognin (Italy), Joseph F. Poland (USA), Seki Yamamoto (Japan), and German Figueroa Vega (Mexico). The land subsidence research needs stated in the IHD/IHP project documents have resulted in IAHS/UNESCO sponsorship of the International Symposium on Land Subsidence in 1969 in Tokyo, Japan; the Second International Symposium on Land Subsidence in 1976 in Anaheim, California, USA; the Third International Symposium in 1984 in Venice, Italy.

The Fourth IAHS/UNESCO International Symposium on Land Subsidence was held in Houston, Texas, USA from 12 to 17 May 1991. The symposium was convened by the IAHS Ground Water Commission and UNESCO. It was cosponsored by the U.S. Geological Survey, U.S. Bureau of Mines, Harris-Galveston Coastal Subsidence District and U.S. National Committee for Scientific Hydrology.

All four symposia have been held in locations of major subsidence problems. Papers presented in the four symposia were published as IAHS Publications N° 88/89, 121, 151 and 200 respectively.

The 62 papers published in the Houston Proceedings are divided into the following groups:

- Groundwater withdrawal
- Oil and Gas withdrawal
- Mining
- Theory and Modelling
- Earth fissures
- Sinkholes and organic deposits
- Environmental factors
- Coastal and inland flooding
- Instrumentation and measurement
- Remedial measures

General Chairman for the Houston Symposium was Ivan Johnson, Honorary President of IAHS. Ronald Neighbors, Harris-Galveston Coastal Subsidence District, acted as Chairman of the Local Organizing Committee and he and his colleagues did an excellent job.

Finally it is worth mentioning that the Houston Proceedings, as Publication N° 200 in the *IAHS Red Book Series*, represent a significant landmark in the history of IAHS publishing. (See under *Publications* below). It is only seven years ago that N° 150 was published, whereas a period of 10 years elapsed between N°s 150 and 100, and between N°s 100 and 50 there was a period of 15 years. These figures clearly demonstrate the increased activities of IAHS in distributing scientific and technical information on a global scale.

A fully updated Catalogue of IAHS Publications has been published in May 1991. This Catalogue and all IAHS reports may be ordered from: *IAHS Press, Institute of Hydrology, Wallingford, OX10 8BB, United Kingdom; or Office of the IAHS Treasurer, 2000 Florida Avenue NW, Washington DC 20009, U.S.A.*

COOPERATION WITH GOVERNMENTAL ORGANIZATIONS

International Commission for the Hydrology of the Rhine Basin (CHR)

One of the international organizations which owe their existence to UNESCO and IHP is the Commission for Hydrology of the Rhine basin (CHR). It was established as a result of the International Hydrological Decade (IHD, 1965-1975), which in 1965 adopted a resolution recommending that regional cooperation in the field of hydrology should be encouraged. When IHD had ended, the Commission continued its activities within the framework of IHP and the Operational Hydrology Programme of WMO.

Current Programme

After more than 20 years of hydrological cooperation in the Rhine basin, the CHR has grown into a hard-working, fruitful commission which keeps track of the developments in hydrological research and provides a hydrological basis for the other aspects of international river management, including water quality control and ecological rehabilitation. The current research programme features some very topical items, such as:

Influence of climatic changes on the discharge of the Rhine:

The aim of this study is to develop a computer model to quantify future changes in hydrological characteristics due to climatic changes (e.g. caused by the greenhouse effect) and changes in land use. The project started with the study of small tributary basins, which results in submodels. They will provide elements for an overall model covering the entire Rhine basin. Different scenarios for climate and land use will be used as input for the model.

Anthropogenic influences on the discharge regime of the Rhine:

The first phase of this study concerned a description of the changes that have occurred in the Rhine basin up till 1800, the major hydraulic engineering works realized in the past two centuries and a brief review of the management of the river in different riparian states. Upon completion of this report, the second phase will be started: a study of the influence of all these

changes on the discharge regime of the Rhine.

Alarm model for the Rhine:

After the Sandoz accident in 1986, and as a result of the Rhine Action Programme, the CHR, in cooperation with the International Rhine Commission (IKSR/CIPR), developed an alarm model for the Rhine. This computer model calculates the propagation of the pollution wave in the Rhine. In case of an accidental spill, the model forecasts when the pollutant will arrive at any point downstream and what its maximum concentration will be. The model was calibrated by means of extensive tracer tests carried out in international cooperation and is now used by the different services responsible for the management of the Rhine.

Sediment transport in the Rhine:

The development of sediment transport in the Rhine will be examined and changes in the longitudinal profile of the whole river will be studied. This will also benefit water quality research where pollutants attached to sediment are concerned.

Relationship between forest decline and hydrology:

An examination of the literature in this field indicates that the effects of forest decline of the Rhine discharges are negligible, provided the forest soil remains covered with vegetation.

Basic Data

These studies would not be possible without a sound basis in the form of an inventory of all important hydrological data available in the Rhine basin. The compilation of such an inventory was the first activity of the CHR. The result of this work was the Monography of the Rhine basin, which appeared in 1978. It consists of three parts: a textbook containing a detailed description of the entire Rhine basin; tables providing information on precipitation and discharge, hydrological networks etc.; maps and graphs supporting and illustrating the text.

The coordinated collection and easy exchange of hydrological data is, however, a current concern of the Commission. A catalogue of all the important monitoring stations along the Rhine and its tributaries was published and is

now kept up-to-date. Moreover, recommendations are made to improve international data exchange.

Completed Studies

After the monography has appeared, the Commission began work on a new research programme. One of the CHR-studies concerned the differences that kept occurring between the discharges measured on either side of the German-Dutch border. The study resulted in a considerable improvement of the situation.

Another successful project was an intercalibration exercise concerning current meters. Two current meters were both calibrated in five different institutions in four different Rhine riparian countries. The results of the exercise showed clearly that inaccuracies in calibration can lead to inaccurate discharge figures.

The project *Hydrological forecasts* has resulted in an examination of all forecasting models currently in use in the Rhine basin. The possibility of developing an international forecasting model is being studied.

One of the permanent tasks the Commission has adopted is to describe the major hydrological events that occur in the Rhine. The reports on the 1976 drought and the floods of 1983 describe the meteorological conditions leading to these events and the resulting hydrological response. The most recent report, on the 1988 flood, also contains information about the consequences for water quality and sediment transport.

CHR Reports

All the described projects are the result of a close cooperation between hydrological institutes in the six member states of the CHR: Austria, France, Germany, Luxembourg, The Netherlands and Switzerland. The results of most studies are published in one of the CHR series of reports. Up till now 13 reports have been published and more are in preparation. The reports are mostly bilingual (German and French, which are the working languages of the Commission) with a summary in English. Information can be obtained at: *The CHR Secretariat, P.O. Box 17, 8200 AA Lelystad, The Netherlands.*

NEW IHP PUBLICATIONS

Technical Documents in Hydrology

Integrated Land-Use Planning and Groundwater Protection in Rural Areas. A Comparative Study of Planning and Management Methodologies. By J. Vrba, et al, Groundwater Protection Commission of the International Association of Hydrogeologists. Technical Documents in Hydrology series of the International Hydrological Programme. UNESCO, 1991. 102 pp. Single copies free upon request.

The document deals mainly with the qualitative aspects of groundwater resources protection resulting from inadequate land-use management. Quantitative depletion of groundwater resources is also covered, with falling groundwater levels due to overdevelopment of aquifers the most common problem. But the consequences for groundwater

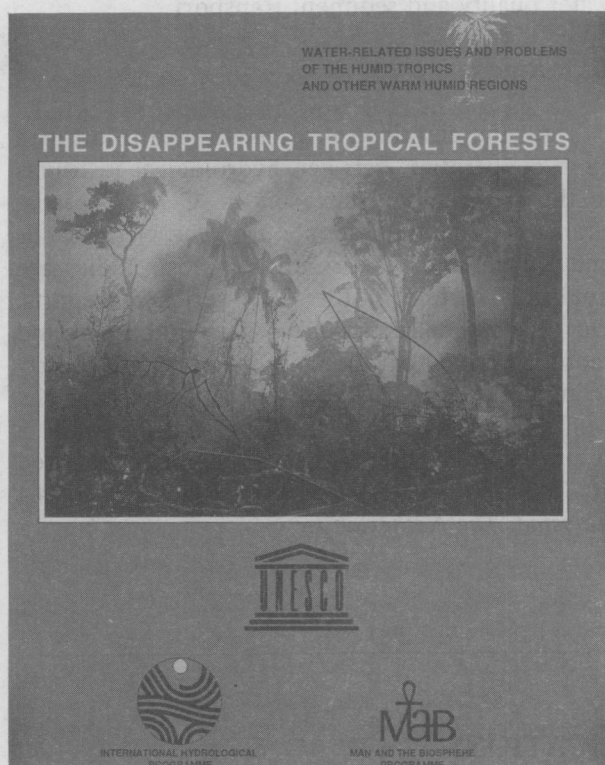
quality of poor management and uncontrolled land-use are much more complicated, long-term and may be very difficult to remedy.

Land-use planning in relation to groundwater protection is seen as a dynamic process, within which hierarchical interests may conflict and priorities change in terms of time and space. Discussed are the need to balance land-use needs and groundwater protection; the consequences of land-use for groundwater resources; data requirements and database management; land-use planning and groundwater protection management; legislation and regulations; implementation of groundwater protection management; and public information and education.

Keywords: Groundwater; groundwater protection; groundwater management; legislation; data management; public information; land-use.

Other Publications

The Disappearing Tropical Forests. Text and design by David C. Flaherty and Associates, Pullman, WA, USA. IHP Humid Tropics Programme Series N° 1, May 1991. © UNESCO. 49 pp. Single copies free upon request from the Division of Water Sciences.



A transformation of the landscapes is now underway in many of the earth's tropical regions. Long-established tropical forests are vanishing as various exploitation or conversion scenarios are devised and implemented. However, in doing so, we may be fatally ignoring the interconnectedness of our water supply, our vegetation, and our biological processes. Changing from a tree-covered land surface to a pasture or urban landscape will affect the solar radiation input/output balance. Changing this balance in turn will modify the atmospheric recycling of the water which the solar heat has evaporated from the vegetation or land and water surfaces. Alterations in the atmospheric recycling of the water will then also affect the movement of water in the streams, in the water bodies and eventually, in the underground aquifers.

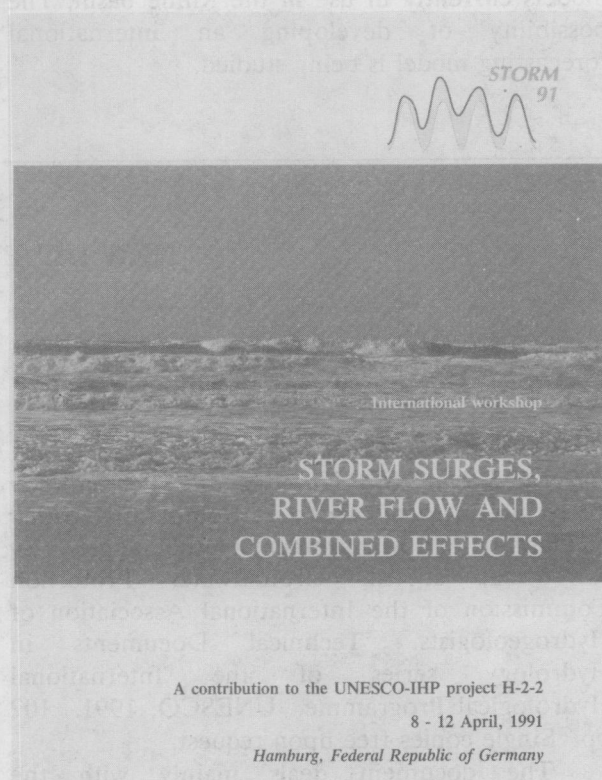
While the perspective of this document is generally from that of water resources, it is evident that all aspects of the land, water, and air interact. It therefore has been felt to be necessary to take a broad view of the problems of vanishing tropical forests. And while maintaining

scientific integrity, the document is written in a popularized style for an audience of non-technically educated persons.

Keywords: Tropical forests; humid tropics; hydrology; water resources; erosion; greenhouse effects; agroforestry; sustainability; climate change; debt swaps; population.

Storm Surges, River Flow and Combined Effects Within IHP Project H-2-2, three international workshops are foreseen. The first one was held in Hamburg, Germany from 8 to 12 April 1991, jointly organized by the Dutch and German IHP National Committees. The proceedings of this international workshop have been issued by the German IHP National Committee, describing:

- storm surges, high river floods and their joint probability
- forecasting
- defence measures, estimation of storms defence levels, warning systems, probability of overflow.



WMO/UNESCO Report on Water Resources Assessment. Progress in the Implementation of the Mar del Plata Action Plan and a Strategy for the 1990s. English. 64 pages. Available free of charge from the Division of Water Sciences.

This report aims at establishing the progress made since the UN Water Conference (Mar del

Plata, 1977) in the field of water resources assessment (WRA) and identifying key issues as the foundation of a strategy for water in the 1990s and beyond.

The need for reliable data and information is pointed out as the basis for an appropriate WRA and the implementation of sustainable water development; a serious concern is the ability of WRA National Agencies to meet the related growing needs, since they are confronted with a number of challenges in the 1990s, in particular: growth in water demand, WRA cost, WRA as a long-term endeavour, problems arising in international river basins and aquifers.

A recent assessment of WRA capabilities at national and regional levels underlined the deterioration in reliable data and information in this field in many regions, due to poor financial allocation (ECA, ECLAC), shortage of training and difficulties in retaining technical personnel (ECA, ESCWA, ESCAP), fragmented nature of institutional arrangements, insufficient groundwater and water quality data.

The strategy for the 1990s is proposed, based on four components:

- more appropriate financial allocation for WRA;
- proper institutional arrangements;
- WRA technology transfer;
- human resources development, education and training.

A wide number of actions is proposed for the implementation of the above strategy, to be carried out by national agencies, regional and international organizations, and donor countries.

Keywords: *Geographical:* ECA, ESCWA, ESCAP, ECLAC, ECE. *Technical:* Mal del Plata Action Plan (MPAP), Water resources assessment, hydrologic networks, data base, water resource information, human resources, education and training, institutional arrangements, technology transfer.

IHP-Related Publications

Land Subsidence. Edited by A.I. Johnson. A contribution to IHP-IV Project M-3-5c. 690 + xiv pages. IAHS Publication N° 200. 1991. English. ISBN 0-947571-92-2. Price: US \$ 65.

Available from: *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]

Subsidence, a phenomenon that occurs in many parts of the world, results from operations such as the heavy withdrawal of groundwater, geothermal fluids, oil and gas; the extraction of coal, sulphur and other solids through mining; the hydro-compaction of sediments; oxidation and shrinkage of organic deposits; the catastrophic development of sinkholes in karst terrain. Over 50 areas of contemporary subsidence are known, some with as much as 10 m in countries such as Mexico, Japan and the U.S.A.

This publication contains over 60 papers for the Fourth International Symposium on Land Subsidence held at Houston, Texas in May 1991. (Also see under *IAHS/IHP * Corner.*) The papers are arranged in 10 topics: *groundwater withdrawal; oil and gas withdrawal; mining; earth fissures; sinkholes and organic deposits; environmental factors; coastal and inland flooding; instrumentation and measurement; remedial measures; and theory and modelling.*

The symposium was the fourth in a series of international symposia on land subsidence organized by IAHS and UNESCO; it was a contribution to IHP-IV Project M-3-5c. This symposium was broader and more interdisciplinary in coverage than the previous symposia. In addition a number of mathematical analyses and modelling techniques useful in predicting the amount of subsidence that may result from certain actions were discussed. The papers also showed the potential inter-relationships of subsidence characteristics, methods of study, and means of remedial work, whether the subsidence is due to withdrawal of fluids or solid matter.

The publication may be ordered from the following addresses: *Office of the Treasurer IAHS, 2000 Florida Avenue NW, Washington, DC 20009, U.S.A.; or IAHS Press, Institute of Hydrology, Wallingford, Oxfordshire OX10 8BB, U.K..*

Keywords: Land subsidence; groundwater withdrawal; mining earth fissures; groundwater overpurgung; coastal and inland flooding; modelling and prediction.

RECENT MEETINGS RELATED TO IHP

International Symposium on Hydrology and Water Resources Education and Training and Second North American Water Management Seminar, Chihuahua, Chih., Mexico (15-19 April 1991)

Water, one of the most important elements for the very survival of the human beings, is the subject matter in study in hydrology and water resources engineering. The processes of education and training play a key role in the transfer and improvement of water knowledge from one generation to another. In the current times, there exists a movement within the academic medium which is questioning the effectiveness of such processes.

The *International Symposium on Hydrology and Water Resources Education and Training: The Challenges to Meet at the Turn of the XXI Century* was organized to provide a forum for the interdisciplinary exchange of views on all aspects of the education and training in hydrology and water resources.

The *Second North American Water Management Seminar* was organized to be a channel of exchange of experiences, problems and their feasible solutions to water management problems in North America. The seminar was the mechanism that promoted the acquaintance between scientists, practising engineers and government officials from the three countries involved: Canada, Mexico and the United States of America.

The opening ceremony was headed by the Honorables Fernando Baeza-Melendez, Governor of the State of Chihuahua, and Rodolfo Torres-Medina, Mayor of Chihuahua City, among other civil authorities.

Twenty institutions and professional organizations supported the organization of the symposium. Among the funding sponsors were: UNESCO, the Government of the State of Chihuahua and the Universidad Autonoma de Chihuahua, the symposium host institution.

The symposium was attended by 78 experts from 12 countries from Africa, America and Europe.

Four symposium keynote lectures were delivered by Professor Nathan Buras, University of Arizona, Mr. W. Gilbrich, UNESCO, Professor James E. Nash, National University of Ireland, and Professor Vujica Yevjevich, Colorado State University.

A special seminar keynote lecture was jointly delivered by the Honorables Dr. Narendra Gunaji and Eng. Jose A. Herrera-Solis, USA and Mexico Commissioners, respectively, of the International Boundary and Water Commission.

The 1991 American Water Resources Association (AWRA) Outstanding Water Resources Achievement Award was presented by AWRA President Dr. Peter Black during the seminar to the International Boundary and Water Commission.

The symposium was organized in 8 technical sessions and two panel discussions:

1. On the role of professional organizations as a conduit for international technical information exchange
2. Symposium and seminar conclusions.

Twenty-eight papers were presented in the technical sessions and a computer workshop was held to demonstrate three personal computer user-friendly packages.

The seminar was organized in 7 technical sessions. Eighteen papers were presented in the technical sessions.

The symposium and seminar provided a good forum to share experiences and knowledge about the education and training of hydrologists and water resources engineers. The final balance is very promising to promote future editions of both events.

VII World Congress on Water Resources, Rabat, Morocco (13-18 May 1991)

The VII Congress of the International Water Resources Association (IWRA) was held in Rabat on the subject of *Water for Sustainable Development in the 21st Century*.

Some 600 participants attended, half of them from foreign countries.

UNESCO contributed largely to the meeting by covering the participation costs of 12 representatives from Africa and the Arab States.

The Congress was organized around 3 main items:

- water policy
- water resources management
- institutional and financial aspects of water resources development

Six Special Sessions were also convened on particular items: lakes management, information systems, re-use of waste-water after treatment,

water resources in Africa, strategies for the sustainable development of water in the 21st Century, the woman, water and the development.

About 230 papers were presented and discussed in plenary and special sessions. Among the main problems arising in the perspective of the 21st Century, the Congress underlined in particular:

- *The reduction in the availability of water resources*, resulting from the growth of population; appropriate measures should be taken for saving water, re-use of waste water after treatment before arriving at the seawater desalination solution.
- *The management of international rivers and aquifers*, the subject of possible conflicts in the coming years; significant contributions should

be provided in this concern to improve the situation.

As for special events, the Ven Ti Chow memorial lecture was delivered by Prof. M. Falkenmark (Sweden) on the subject of: *Environment and development: urgent need for a water prospective*.

Dr. Abdul Mageed (Sudan) was attributed the IWRA 1991 award of the *Cristal Drop* for his contribution in the field of water resources.

Finally, the IWRA General Assembly was held during the Congress and Dr. Mahmoud Abu Zeid (Egypt) was designated the new President-elect. It was also decided that the next two Congress would be held in Cairo (1994) and Australia (1997).

FUTURE MEETINGS RELATED TO IHP

International Symposium

Transboundary River Basin Management

(Delft - Rotterdam, The Netherlands,
18-22 May 1992)

This symposium is sponsored by UNESCO and the International Water Resources Association (IWRA) and is connected to the 150th anniversary of Delft University of Technology.

In our rapidly shrinking world many economic, environmental and ecological aspects are related to our transboundary rivers. Instead of being sources of conflict, they should become objects of cooperation between all parties concerned. The management of these rivers should be dealt with in accordance with the global responsibility of mankind for sustainable development of its water resources. The symposium will cover various aspects of such sustainable development and aims to learn from actual river basin management practice in a number of basins. The topics will be the following:

- transboundary river basin management and water quality control
- transboundary river basin management and polluted sediment
- planning for transboundary river development and conservation
- environmental impact assessments in transboundary river basins
- project studies of transboundary rivers.

Further information can be obtained from: *International Symposium Transboundary River Basin Management, c/o Eurocongress, Koningslaan 52, NL 1075 AE Amsterdam, The Netherlands.*

Joint UNESCO/IAHS Scientific colloquium on space/time/scale variability and interdependence for various hydrological processes (Paris, France, 3-4 July 1992)

As a contribution to the International Hydrological Programme and related projects of the World Climate Programme and the International Geosphere-Biosphere Programme, this colloquium will be held at UNESCO Headquarters from 3 to 4 July 1992 in connection with the 10th Session of the IHP Council (6-11 July 1992). Around ten leading scientists will be invited to present their ideas and results of research in this field which has gained increasing importance for world climate, global change and other large scale investigations.

SEACHANGE '93'

International Workshop on Sea Level Changes and their Consequences for Hydrology and Water Management. Fundamental Aspects, Policy and Protection in Low Lying Coastal Regions and Deltaic Areas. (Noordwijkerhout, Netherlands, 19-23 April 1993)

This international workshop is convened by the IHP National Committees of the Netherlands and the Federal Republic of Germany, and the Operational Hydrology Programme of WMO. It is organized jointly with UNESCO, in cooperation with WMO, UNEP, IAHS and IAHR.

The workshop is the second one of a series of three workshop which form part of the IHP Project H-2-2: *Hydrology, water management and hazards reduction in low lying coastal regions and deltaic areas, in particular with regard to sea level changes.*

These workshops, held during the period 1990-1995, covering the fourth phase of the IHP, concern:

- Storm surges, river floods and combined effects (Hamburg, 1991)
- Sea level changes and their consequences for hydrology and water management (the here announced workshop)
- Hydrological regimes of coastal areas (also water quality and sediment) (1995).

This workshop intends to exchange views between experts active in the field of the impact of sea level changes on hydrology and water management in deltaic and coastal zones. During the workshop the participants should consider the presented material and make recommendations for various climatical and geographical zones. A general introduction will be given in which also some attention will be paid to possible human impacts on sea level changes and to climatic change related impacts in general. This workshop is also a contribution to the International Decade for Natural Disaster Reduction (IDNDR).

The programme includes the following items:

1. Sea level changes in the geological past
2. Observed recent changes of sea level
3. Natural and human induced land subsidence
4. Impact of sea level change and human activities on river flow
5. Ecological aspects
6. Salt water intrusion into rivers and groundwater
7. Economic aspects (impacts on industry, agriculture, recreation etc.)
8. Impact on water management; shoreline protection
9. Safety aspects: disaster preparedness, monitoring guidelines, structural and non-structural measures
10. Coastal zone and deltaic areas management; zoning and planning.

A first information note and call for papers has been issued. Deadline for submission of paper abstracts is *1 February 1992*. Further information can be obtained from: *Dr. J.W. van der Made, Tidal Waters Division,, Rijkswaterstaat, P.O. Box 20907, 2500 EX The Hague, Netherlands.*

CALENDAR OF MEETINGS RELATED TO IHP

| IHP PROJECT | TITLE | CONVENER/PLACE/DATE |
|-------------|---|---|
| -- | IAHS symposia at the XXth Assembly of the IUGG | See below Vienna, Austria 11-24 August 1991 |
| M-5-2 | • H1 Hydrology for water management of large river basins | IAHS/WMO |
| M-3-1 | • H2 Hydrological basis of ecologically sound management of soil and groundwater | IAHS/UNESCO |
| H-1-2 | • H3 Sediment and stream water quality in a changing environment: trends and explanation | IAHS |
| H-1-1 | • H4 Hydrological interaction between atmosphere, soil and vegetation | IAHS/UNESCO/WMO |
| H-4-2 | • H5 Snow, hydrology and forests in high alpine areas | IAHS/IUFRO |
| M-5-1 | • H6 Hydrology of natural and man-made lakes | IAHS/WMO |
| -- | IAHS workshops at the XXth Assembly of the IUGG | See below Vienna, Austria 11-24 August 1991 |
| -- | • HW1 Effects of atmospheric deposition on the hydrology of forested areas | IAHS |
| H-1-1 | • HW2 Interactions between surface water and groundwater: Basic processes at the interface | IAHS |
| -- | • HW3 Irrigation induced physical and chemical changes in soil, groundwater and surface water | IAHS |
| -- | • HW4 Snow chemistry and surface water quality | IAHS |
| -- | • HW5 Bayes statistics in hydrology and water resources management | IAHS/IUFRO |
| E | • HW6 Education in hydrology | IAHS |
| -- | • HW7 Intercomparison of remote sensing algorithms in hydrology | IAHS/WMO |

| | | |
|-------|--|--|
| -- | UNESCO meetings at the XXth Assembly of the IUGG | See below Vienna, Austria 11-24 August 1991 |
| H-1-1 | • Working group on interface processes of water transport through the atmosphere-vegetation-soil system... | UNESCO/IAHS |
| H-2-1 | • Working group on relationship between climate change (and climate variability) and hydrological regimes... | UNESCO 19-22 August 1991 |
| M-4-3 | Working group on water resources planning and management methods taking into account risk factors | UNESCO/IIASA Laxenburg, Austria August 1991 |
| M-1-4 | 2nd International Conference on computer methods and water resources - CMWR 91 | CNCPRST-Morocco/UNESCO Marrakech, Morocco dates to be defined |
| M-3-5 | Efficient water use and conservation is a must for survival | UNESCO/ROSTAS/ALECSO Tunis, Morocco dates to be defined |
| -- | What future for large rivers? | CEC/Council of Europe/ WWF/IUCN Orléans, France 23-27 September 1991 |
| -- | International hydrological and water resources symposium, 1991 | Institute Eng. Australia/ UNESCO/WMO/IAHS Perth, Western Australia 2-4 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 7-11 October 1991 |
| M-3 | International seminar on efficient water use | CNA/IMTA/IWRA/ ROSTLAC Mexico City, Mexico 21-25 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 IIInd 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-5-2 | 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 |
| -- | 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 |
| 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 |
| -- | International symposium on erosion and sediment transport monitoring 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 |
| -- | 1st 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 (Dept. of Hydrology and Meteorology)/WMO/UNESCO/ICIMOD 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 |
| 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 river and lake systems | 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 |
| -- | IAH XXIVth Congress: Hydrogeology of hard rocks | Committee of Norwegian Hydrogeologists & NHK on behalf of IAH Oslo, Norway 28 June-2 July 1993 |

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 groundwater | 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. Maria C. Donoso Coordinadora General CRICA Centro de Investigaciones Hidráulicas e Hidrotécnicas Apartado 6-2894 Agua PANAMA |
| 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 | 11 months | 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 |

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

| | | | | | | |
|----------------------------|--|---------------------------------|------------------------------------|---|--|---|
| KENSINGTON (Australia) | Hydrology, covering principles, practices and applications of surface and ground water hydrology | 3 months | annually | 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 1991 | 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 | Soon | CREUFOP (J.C. Legars) 99, Avenue d'Occitanie 34096 MONTPELLIER Cedex 5 |

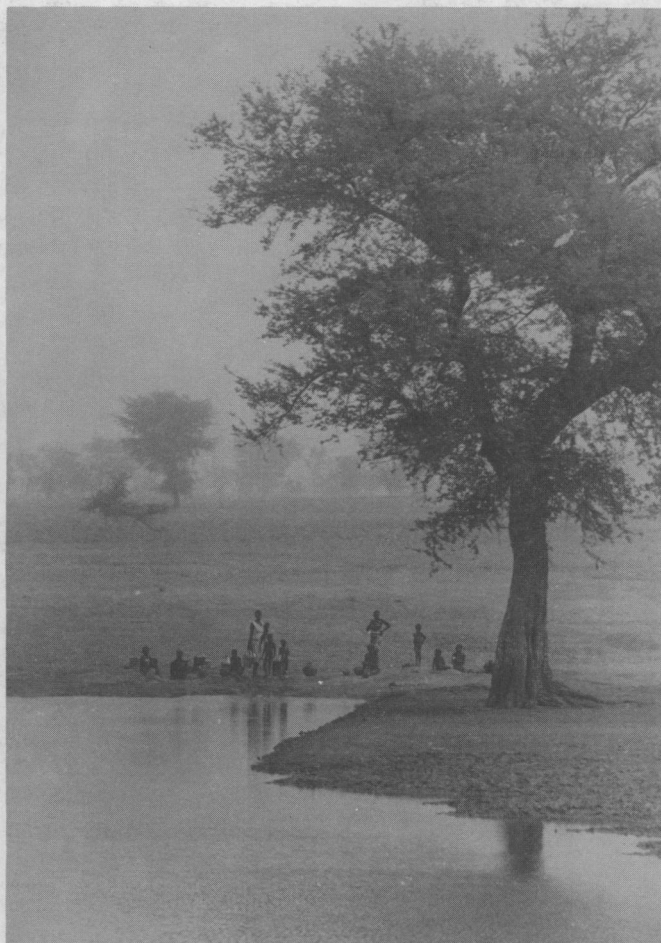
*E = English, F = French, P = Portuguese, R = Russian, S = Spanish

| | | | | | | |
|--|--|--|--|---------------------|--|--|
| MOSCOW (USSR) | 1992: Scientific ** basis of research and utilization of groundwater resources | 2 months | annually, begins in June | E R | | 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 | 11 June- 23 August | E | | U.S. Geological Survey Water Resources Division 436, National Center RESTON, Va. 22092, USA |

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

** Previously announced 1991 session postponed to 1992

**To ensure
that the public
is better informed
on WATER ISSUES,
the I H P Secretariat**



*Ghana (Doba), a rain water reservoir
Photo: M. and E. Bernheim*

We look forward to receiving your contributions on any subject related to water. Credits will be given.

*Please mail to Martine Bastide
UNESCO, Division of Water Sciences
7, Place de Fontenoy, Paris, France
tel.: 33 (1) 45 68 40 96
fax.: 33 (1) 45 67 58 69*

**is in most urgent need of
PHOTOS.**

Please send us, as soon as possible,

AND REGULARLY

*black and white photos,
preferably with their negatives
as well as slides,
together with information
on what they illustrate
(areas, problems, etc.) and
the name of the photographer.*

**We do hope that
the National Committees
will have their word to say
through IHP Information
and other publications**