IHP INFORMATION

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International Hydrological Programme

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IHP GENERAL

Implementation of IHP Projects

Project H-1-1: Review of the scientific aspects of the interface processes of water transport through the atmosphere-vegetation-soil system at an elementary, catchment and grid size scale

The IHP-IV Project H-1-1 (UNESCO / IGBP) Working Group met in Paris from 28 to 29 September 1992 to develop a a long-term strategy for the coordination of the LACHYCOS (Latin American and Caribbean hydrological cycle and water resources activities observation and information system), GEF (Global Environmental Facility), LAMBADA (Large-Scale Amazonian Study) and Greenbelt projects. The main results of the meeting were:

* Sound coordination between research activities and development (extrabudgetary) projects.
* Scientific and technical assistance to LACHYCOS projects to be provided by the working group.
* Development of three new studies on: catchment-scale studies; land cover detection systems; continent-wide information systems).

* * *

The joint IHP Project H-1-1 and IGBP / BAHC (International Geosphere-Biosphere Programme / Biospheric Aspects of the Hydrological Cycle) Working Group met in Toulouse, France, from 19 to 20 November 1992. The meeting was structured on two levels: the first were a series of scientific presentations encompassing the 4 foci of the IGBP/BAHC. *viz*:

1. patch (< 1 km)
2. regional (10-100 km)
3. continental
4. global climatic model scale.

The second component of the meeting concerned the revision and updating of the Science and Implementation Plan for IGBP / BAHC as part of a submission to UNEP for external funding for future meetings and national-funded projects.

The programme was as follows:

* Preparatory meeting on special problems in the BAHC context
* Presentation of the research concept of BAHC in the framework of the IGBP, and presentation of plans for the implementation of the 4 BAHC-Foci
* Working group meetings for the 4 BAHC Foci
* Plenary meeting: key reports and scientific contributions
* ***Thematic Sessions*** (Parallel):

  Session 1: Process studies and advances in SVAT modelling at patch scales (Focus 1)

  Session 2: Complex BAHC-related national and regional research projects and programmes

  Session 3: Meso- to macroscale hydrological studies and modelling (Foci 2 and 3)

  Session 4: Achievements and requirements in estimating areal evapotranspiration (Foci 2 and 3)

  Session 5: Down-scaling of climate information (Focus 4).

Further information on the IGBP / BAHC Core Project can be obtained from: *The BAHC Core Project Office, Free University of Berlin, Institute of Meteorology, Dietrich-Schaefer Weg 6-10, D-1000 Berlin 41, Germany.*

(General information on IGBP is given under Section **Cooperation with NGOs** below.)

* * *

An IAEA (International Atomic Energy Agency)/ UNESCO expert group met in Vienna from 14 to 16 December 1992 to discuss the application of isotope techniques in lake hydrology. Various applications to determine the flow regime, the age of waters and the fate of organic substances were assessed and the group formulated a number of recommendations on the application of isotopes in studying the flow pattern of water and of pollutants in lakes. It was pointed out that in many cases isotopes are the only reliable means for such studies. The IAEA will publish a report in 1993.

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

The Division was sorry to witness Jack Gladwell's recent retirement, but arrangements have already been made for him to continue being active in the Humid Tropics Programme. He will continue to be involved in the editing and preparation of the new Popularized Monograph series. Also, his knowledge and experience will prove invaluable during the early days of operation of the Panama Centre.

In mid-November, the Agreement between the Government of the Republic of Panama and UNESCO for the setting up of a Regional Centre for the Latin America and Caribbean region was signed in Paris (see separate section below). This is the first of three centres intended as regional focal points for the day to day operation of the Humid Tropics Programme. It is clear, however, that extrabudgetary funding beyond UNESCO's financial contribution will be required for the successful operation of these centres. In the case of the Panama Centre, the Government of the Republic of Panama is making the largest contribution, which will be used for the salaries of the Secretariat. That Government will also generously provide the necessary physical facilities. The United States IHP National Committee and the International Water Resources Association (IWRA) will also have close connections with the operation of this centre.

So far, no initiatives have been made for the African region. A preliminary meeting, chaired by Mike Bonell, was held at UNESCO Headquarters in Paris in mid-December with representatives from African countries, the French IHP National Committee, ORSTOM (French institute of scientific research for development in cooperation) and the Institute of Hydrology, UK. A strategy for extra-budgetary funding was developed for both the holding of a regional meeting and possible activities in the region.

A series of meetings have been held in Paris since August concerning possible future IHP activities in the Amazon basin in cooperation with IGBP / BAHC (International Geosphere-Biosphere Programme / Biospheric Aspects of Hydrological Cycles). Such activities would incorporate elements of both the Humid Tropics programme and IHP-IV Project H-1-1 (Review of the scientific aspects of the interface processes of water transport through the atmosphere-vegetation-soil system at an elementary, catchment and grid size scale). Extrabudgetary funding is currently being sought for this development through the initiatives of the Regional Hydrologist for the Latin America and the Caribbean region.

The long-awaited technical book on the Humid Tropics was submitted to Cambridge University Press for publication in December (see separate section below). Meanwhile, various popularized documents in different stages of preparation continue after the recent releases of ***Small Tropical Islands*** in August and ***Water and Health*** in December. The themes of some of the other popularized documents expected to appear over the next two years include:

1. Tropical Cities - Managing their Water.
2. Tropical Reservoirs.
3. Groundwater in the Tropics.
4. Women in the Tropics.

The United States IHP National Committee is also funding the following titles:

1. Integrated Water Management in the Tropics, and
2. Karst in the Caribbean.

In addition, the Netherlands IHP National Committee is also contributing funds to help the IHP publish possibly up to three documents written by L.A. Bruijnzeel on various aspects of hydrology - land management issues related to conversion of tropical moist forests.

There are a few international meetings scheduled to be held in 1993 (see IHP Calendar) which will be of interest to scientists in the Humid Tropics programme. The highlight, however, will be the IAHS (International Association for Hydrological Sciences) component of the Yokohama meeting in July 1993, of which Jack Gladwell is the Convenor.

Signing of the Agreement for the establishment of the Humid Tropics Water Centre in Panama (CATHALAC)

On 13 November 1992, the Agreement between the Republic of Panama and UNESCO for the establishment and operation of a Regional Centre on Waters of the Humid Tropics of Latin America and the Caribbean (CATHALAC - Centro del Agua del Trópico Húmedo de América Latina y el Caribe) was signed on behalf of Panama by Mr. A. de la Guardia, Ambassador, Permanent Delegate of the Republic of Panama to UNESCO (right on the photo) and on behalf of UNESCO by Mr. A. Badran, Assistant Director-General for Science (left on the photo).

On 1 December 1992, the Government of Panama intends, with UNESCO's approval, to appoint Ms. María Concepción Donoso as the inaugural Director of the Centre from January 1993. She will be assisted by Mr. Jakob Wasser, who was formerly a Netherlands-sponsored Associate Expert for two years at the UNESCO Regional Office in Jakarta. He assisted in the preparation of the Humid Tropics policy document for research / training activities in the South-East Asian region arising out of the June 1990 Regional Meeting in Kuala Lumpur. The Netherlands IHP National Committee continues to support Mr. Wasser in his new position.

The Centre will be placed under the auspices of the IHP and will promote research on the specific water problems of the region's humid tropics.

Besides leading research in hydrology, the centre will be a centre of exchanges for all humid tropics countries in Latin America and the Caribbean.

CATHALAC will invite researchers from inside and outside the region to spend a few months doing research, and will organize workshops and seminars, produce and disseminate literature, promote technology transfer and organize training courses. It will also serve to coordinate cooperative regional studies.

CATHALAC will work on the numerous water-related problems that are shared by the countries in the region; deforestation, water pollution, erosion, etc. The Centre will also work with the Caribbean region, where the countries face the whole range of water problems affecting islands: saltwater intrusion, water shortages, disposal of waste on a small area, coastal degradation, etc.

Launching of a new International Hydrology Book Series with Cambridge University Press

Mr. Mike Bonell (*right on the photo*) presents to Mr. Simon Milton (*left on the photo*), of Cambridge University Press, one of the folders containing the cartographic art work for the Humid Tropics technical book on 4 December 1992. (The cartographic work was prepared by Mr. John Ngai and Mr. Edward Rowe, from the Department of Geography, James Cook University of North Queensland, Townsville, Australia.)

In accordance with Resolution X-6 adopted by the Intergovernmental Council of the IHP at its Tenth Session, a new series of technical monographs aimed for the research / university postgraduate market has been initiated through an agreement between the IHP and Cambridge University Press. The first monograph of the series is connected with the Humid Tropics Programme technical book which has been edited by M. Bonell, M. Hufschmidt and J.S. Gladwell. The book, entitled ***Hydrology and water management in the Humid Tropics - Hydrological research issues and strategies for water management***, is scheduled for publication in July 1993 and there are plans for a formal launch at the IAHS / IAMAP Yokohama meeting coinciding with the IAHS Symposium ***Hydrology of Warm Humid Regions*** (H.3).

The July 1989 Humid Tropics Colloquium held in Townsville formed the basis of the book, but all authors who contributed to that meeting were requested to revise (in some cases very extensively) their manuscripts over the 1990-91 period following the first meeting of the Editorial Committee in February 1990. In addition, several topics not covered at the Townsville Colloquium were identified and invitations to a second group of authors were made to participate in the preparation of this book. The net result is a sizeable volume which is expected to be in the region of 640 pages, 27 chapters, 4 appendices and in excess of 200 diagrams. All royalties earned from sales will be used to distribute a limited number of free copies of the book to selected individuals / organizations in various developing countries of the humid tropics. There are already plans to release other titles in this new IHP / Cambridge University Press series at the average rate of one monograph per year. The next volume release in 1994 is expected to be based on the George Kovacs Colloquium held in July 1992 at UNESCO headquarters entitled Space and Time Scale Variability and Interdependencies in Various Hydrological Processes, edited by R.A. Feddes, from the Agricultural University of Wageningen, Netherlands. The IAHS, a joint partner in that colloquium, will also be a sponsor of the second publication.

Other possible titles from IHP-IV Project H-1-1 (Review of the scientific aspects of the interface processes of water transport through the atmosphere-vegetation-soil system at an elementary, catchment and grid size scale) in cooperation with IGBP / BAHC and from IHP-IV Project H-4-1 (The effect of large-scale snow and ice covers on global and regional precipitation systems) in cooperation with IAHS / ICSI (International Commission on Snow and Ice) are presently under consideration but plans for additional themes are expected to emerge in 1993.

The IHP / Cambridge University Press series also signals a new orientation in the publications policy of the International Hydrological Programme, in accordance with the relevant

Programme, in accordance with the relevant resolution of the Intergovernmental Council of the IHP, aimed at making the IHP more relevant to active researchers, many of whom belong to the younger spectrum of the hydrological community at large. Through this new book series the IHP is seeking to encourage a higher quality of product, in particular from the IHP Working Groups activities, by using a refereeing system to maintain standards.

András Szöllösi-Nagy and Mike Bonell will be the Associate Editors, but it is intended to set up an international Editorial Advisory Board over the next 12 months.

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

FRIEND Western and Central Africa (FRIEND / AOC)

A new FRIEND Group for Western and Central Africa was launched at a meeting held in Ouagadougou (Burkina Faso) from 3 to 5 November 1992, with the participation of Benin, Burkina Faso, Cameroon, Central African Republic, Côte d'Ivoire, Guinea, Guinea Bissau, Mali, Chad, Niger Basin Authority (ABN), Lake Chad Basin Commission (LCBC), CIEH Comité inter-africain d'études hydrauliques (CIEH - Inter-African Committee of Hydraulic Studies), School of Engineers in Rural Engineering (EIER) and ORSTOM (French institute of scientific research for development in cooperation). Representatives from FRIEND / Northern and Western Europe and FRIEND / AMHY also attended the meeting.

Four themes were selected:

1. Data Base - Leader: CIEH, with contribution from ABN, ORSTOM and ARGHYMET (Agro-Hydro-Meteorology Centre, Niger).
2. Hydrological modelling and parameter regionalization - application to ungauged basins: Leader: Benin and ORSTOM, with contribution from Cameroon, Guinea, Mali, ABN and LCBC.
3. Study of low flows for the management of small surface impoundment: Leader: Cameroon, with contribution from Benin, Côte d'Ivoire, LCBC, CIEH and ORSTOM.
4. Training - Leader: EIER, with contribution from CIEH, ORSTOM and AGRHYMET.

The project will be organized as follows:

* CIEH will host FRIEND / AOC and provide the Secretariat Services.
* A Steering Committee of six members was designated, with the following composition: CIEH, Leader Theme 2, Leader Theme 3, EIER, ORSTOM, UNESCO.

The activities are expected to start in April 1993 after the preparation of project summaries and designation of national correspondents.

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

The joint IAH/IHP working group on mapping the vulnerability of aquifers held its second session in Torino, Italy from 14 to 18 September 1992 and reviewed a first draft of a planned guidebook. Completion of the manuscript is expected for 1993 and printing by IAH is foreseen for 1994.

Project M-5-2: Cooperation in the management of international water systems

As already reported, the **15th Forecasting Conference of the Danubian Countries** was held in Kelheim, Germany from 18 to 22 May 1992. The German IHP/OHP National Committee has now issued the full proceedings in German with English summaries. Copies can be obtained from the *German IHP / OHP National Committee, P.O.B. 309, 5400 Koblenz, Germany.*

Project E-2-1: Model curricula for water-related courses in university programmes

The authors of the Model curricula for water-related courses in university programmes held their fifth meeting in Berlin, Germany from 31 August to 4 September 1992 and prepared the complete draft of the recommended curricula and syllabi. The meeting was fully financed by the German IHP / OHP National Committee. Editorial work on the publication will be carried out during the winter of 1992/93 for printing in 1993.

Implementation of IHP-related extrabudgetary projects

UNESCO Chernobyl Project

The international ***Workshop on the hydrological impact of nuclear power plant systems*** jointly organized by UNESCO, the Commission of European Communities and the United Nations Environment Programme, which was held at UNESCO headquarters from 23 to 25 September 1992 issued the following statement:

The Paris Workshop Statement on the Hydrological Impact of Nuclear Power Plant Systems

About fifty participants, including internationally known experts in the various fields of hydrology, and representatives of the United Nations and intergovernmental organizations, attended the Paris workshop and adopted this Statement.

The Chernobyl accident demonstrated that human health and welfare, food security and the ecosystems on which they depend can be adversely affected, in the event of a severe nuclear accident.

The participants discussed various hydrological aspects of nuclear power plan siting, nuclear power plant risk assessment of surface and underground water pathways and emergency actions to be applied in cases of accidents, to ensure water quality. Various conclusions were reached and recommendations for future activities have been made during the workshop with respect to these issues.

The current approaches to the hydro-ecological assessment, emergency response and potential remediation should be reviewed for their adequacy, in the light of the Chernobyl accident.

The workshop participants called for a review of the hydrological aspects of the approaches to the siting, risk assessment, and detailed planning and execution of remedial actions in the case of accidents. It is also recommended that an international task group be established to organize and lead the implementation of an international cooperative research programme on these issues.

In approving this Statement, the workshop participants urge involved governments, UN and other international agencies to provide the means required for the implementation of this research programme. Relevant funding agencies are called upon to give a high priority to the support of the proposals related to the recommendations of this workshop.

Preparation of IHP-V

The second meeting of the Ad Hoc IHP-V Planning Group took place at UNESCO Headquarters in Paris from 9 to 11 September 1992. The Chairman of the IHP Council, Mr. I. Shiklomanov took part in the meeting, on behalf of the Council.

The meeting noted that the Ninth Session of the IHP Council had approved the concept for the next phase of the IHP. Based upon the deliberations of the Council and on the comments received from the IHP National Committees, the Planning Group prepared a more detailed outline of IHP-V (***Hydrology and Water Resources Development in a Vulnerable Environment***) which will be tabled at the UNESCO / WMO/ ICSU International Conference on Hydrology in March 1993 and also be sent to the IHP National Committees for further suggestions.

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

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IRTCES has carried out the following activities in 1992:

- **Regional Training Programme on Erosion and Sedimentation for Asia (RTPESA):**

The Regional Seminar on Mathematical Modelling of Alluvial Rivers was held at Kathmandu, Nepal, from 14 to 18 April 1992. The participants suggested that the project be continued and expanded for the benefit of member countries.

The Regional Symposium on Methods for Preservation of Useful Reservoir Storage on Heavily Sediment-laden Rivers was held in Kuala Lumpur, Malaysia from 13 to 16 October 1992. Mr. Takei, UNESCO Representative in Beijing and Mr. Lin Bingnan, Manager of RTPESA attended the symposium. Mr. Lin presented a keynote speech on the Permanent Preservation of a Large Portion of Storage for the Three Gorges Project. Mr. Xu Mingquan, Secretary-General of IRTCES was country participant and presented a lead paper on Reservoir Sedimentation Control Strategies in China.

- **Symposium and Seminar sponsored and co-sponsored by IRTCES:**

Fifth International Symposium on River Sedimentation

It was held from 6 to 10 April, and was hosted by the Institute of Hydraulic Structure and Agricultural Engineering, University of Karlsruhe, and sponsored and co-sponsored by UNESCO, IAHS, IRTCES, the German Research Foundation (DFG), the German Association for Hydrology and Rural Engineering (DVWK), the Federal Ministry of Transportation, the Baden-Wurttemberg State Ministry for Science and Art, and the Federal Hydraulic Laboratory (BAW).

As the permanent secretariat of this symposium, IRTCES organized a 7-member group of Chinese scholars and engineers to attend the symposium. Mr. Lin Bingnan presented a general report in a plenary session on watershed and sediment management.

International Symposium on Erosion, Debris Flows and Environment in Mountain Region

This symposium was jointly organized by the IAHS and the Institute of Mountain Disasters and Environment of the Chinese Academy of Sciences, with the collaboration of IRTCES, from 5 to 9 July 1992 in Chengdu, China.

Seminar on Mathematical Modelling for Reservoir Sedimentation and Alluvial Rivers

This seminar was organized in Beijing by IRTCES in cooperation with the Central Design and Planning Institute of Water Resources and Hydropower from 6 to 20 July 1992. The participants greatly appraised the seminar because the content was not only theoretical but also highly practical.

From 20 to 24 October 1992, Mr. Bingnan Lin attended the ***8th Congress of the Asian-Pacific Division of IAHR*** in Pune, India, in his capacity as Chairman of that Division and presented a keynote address on flood control in China. The trip was sponsored by the Indian Government. Mr. Bingnan Lin was nominated to another term as Chairman of IAHS-APD by the Executive Committee convened during the Congress.

- **IRTCES Publications**

In 1992, IRTCES has published:

1. 3 issues of the *International Journal of Sediment Research*
2. 2 issues of the IRTCES Newsletter.

- ***International Journal of Sediment Research (Vol. 7, N° 1, 1992)***

This issue covers a variety of topics in the domain of erosion and sedimentation studies. It contains the following papers:

* Forecasting impacts of hydraulic structures on an alluvial river, by Lin Bingnan. This article highlights the recent advances in

mathematical and physical modelling techniques in China, particularly the successful verification against prototype data of durations up to 18 years. The data were obtained at Gezhouba and Danjiangkou projects of China.

* On the dynamic mechanism of erosion process, by Xu Jianhua and Ai Nanshan. In this study, the authors expound how the endogenic and exogenic agents function in the erosion process and what role the human activities play in the evolution of landform. A schematic diagram showing input-output relationship has been established to predict quantitatively the changes in soil erosion process when various conservation measures are applied.
* Velocity profiles of sediment-laden flow, by Wang Xingkui and Qian Ning (N. Chien). The velocity profiles developed in this study conform well to the experimental data of other researchers such as Elata and Ippen and Einstein and Chien as well. The large amount of flume data given by the authors may be useful to those working in this field.
* Field study on wind erosion in the Northwest Shanxi Province, by Li Jianhua. This study reveals the good effects of wind-break forest in the reduction of wind velocity and the wind-borne sediment load.
* Effect of dune migration on the scour at bridge piers, by Chiew Yee-Meng. This study presents some experimental results of model studies. The author suggests to predict the scour depth by using a time-average scour depth plus half of the fluctuation of the scour depth due to dune migration.
* Sedimentation in rivers and associated water bodies in Indonesia with a special note on the volcanic debris deposits, by Otto S.R. Ongkosongo, Sarwono Sukardi and Mohammad Arfief Ilyas. This study describes the sedimentation problems in Indonesia featured by the eruption of volcanoes and deposits of debris flows. Experiences of countermeasures in Indonesia are briefly summarized.

- ***International Journal of Sediment Research (Vol. 7, N° 2, 1992)***

This issue contains the following papers, covering a range of rather diversified topics:

* Analysis of soil erosion characteristics and sediment sources for the Three Gorges region, by Shi Deming, Yang Yanshend, Lu Xixi and Liang Ying. The analysis reports on the annual soil loss in the region and reviews the historical evolution of ground vegetation and identifies farming activity as the main factor causing increased soil erosion. The authors stress the importance and urgency of soil conservation in this region.
* Experimental study on siltation of solid grains in flowing water, by Hu Chunhong, Hui Yujia and Xia Zhenhuan. In this article, the authors feature the use of high speed photographing and advanced data processing techniques used to obtain a detailed picture of the interaction between solid particles and the flow in the neighborhood of the bed.
* Analysis of settling characteristics of spherical particles in the Binghan fluid, by Xu Mingquan and Wu Deyi. Applying dimensional analysis, the authors propose in this article a set of semi empirical formulae to predict resistance coefficient to the Binghan fluid in various flow regions. These formulae are checked with experimental data from various sources.
* Longitudinal dispersion in open-channel flow, by U.P. Singh, R.J. Garde and K.G. Ranga Raju. This article points out that the result of applying the Fickian concept in the study of longitudinal dispersion is doubtful. Based on some similarity curves, the authors recommend a set of semi empirical predictors fitting the experimental data from various sources.
* The source of cohesive sediment and its transport in the Yangtze Estuary and the near sea, by Lin Changkun. This study stresses that cohesive sediment in the Yangtze Estuary comes mainly from the main stem and that it is partly replenished from the now abandoned old Yellow River delta and partly transported to the Hangzhou Bay. The computed results are verified by bathemetric maps and nautical chart.
* The state and the perspective of the direct sediment removal methods from reservoirs, by Yoon Yong Nam. This study, which should be of interest to practical engineers, presents an overview of the available experience in dealing with sediment problems in reservoirs. Special attention is paid to sediment sluicing and dredging operation.

• *International Journal of Sediment Research (Vol. 7, N° 3, 1992)*

This issue contains the following papers and reports:

* Analysis on the variation of sediment yield in Sanchuanhe River basin in 1980s, by Zhao Wenlin, Jiao Enze, Wang Guangren and Meng Xiaoren.
* Modelling sediment processes on small watershed. A conceptual framework - Broad shallow flow processes, by V. Lopes and P. F. Folliott.
* Transport of suspended sediment in the Changjiang Estuary, by Shen Huanting, Li Jiufa, Zhu Huifang, Han Mingbao and Zhou Fugen.
* An important problem in the physical modelling of suspended sediment, by Tang Cunben.
* Sediment management in Manqin Reservoir, by Chen Jinliang and Zhao Keyu.
* Reports on the following conferences: (a) 2nd National Conference and 2nd Symposium on Soil Conservation in China, Beijing, May 1992. (b) International Symposium on Erosion, Debris Flows and Environment in Mountain Regions, Chengdu, China, June 1992.

Subscription rate for Volume 8 is US $60 for 3 issues with postage for surface mail included, or US $69 for airmail. Payment must not incur bank charges for IRTCES. Remittance to be sent to *Account N° 71403370, IRTCES, Bank of China, Fuchengmen, Beijing, China.*

Orders to be sent to: *Department of Information and Documentation, IRTCES, P.O. Box 366, Beijing 100044, China. Fax: 861 8411174. Tlx: 22786 itces cn.*

REGIONAL AND IHP NATIONAL COMMITTEES

EUROPE

France / Romania

The ***Second Franco-Romanian Hydrological Gathering*** will be held in Tulcea, Romania, from 6 to 9 September 1993. This meeting, organized jointly by the IHP National Committees of France and Romania in collaboration with the autonomous organization *Apele Romane* (Romanian Waters), will be sponsored by the French and Romanian Ministries of the Environment. After the success of the first Gathering (Paris, 2-5 September 1991) the Proceedings of which are being published by UNESCO, the IHP/NCs of France and Romania decided to continue their collaboration. This gathering will be directed towards the relations between water sciences and environmental management.

The objectives of the meeting will be centered around the following themes:

1. Collection and assessment of base line hydrologic data in order to establish a framework for hydrology research and/or water resources management.
2. Pollutant propagation modelling in the hydrosphere directed to the management of pollution problems (point-source or diffuse, accidental, long-term, etc.).
3. Case studies on a basin scale. Operational problems of hydrologic problems is based upon a knowledge of the physical, economic and social factors as well as a knowledge of proper tools, measures to be taken, etc. Specific, European examples are being sought here, where contributions could serve as models for the problems of pollution control. A round table will be organized in order to draw useful conclusions and priority directions for future study and collaboration.

Interested persons wishing to contribute to the themes of this meeting should submit a susbtantial resume in French or English (maximum 3 pages including figures) which will be collected and distributed as a separate volume. A designation of oral or poster presentations will be made by a scientific committee.

No registration fees are required.

Two days will be dedicated to the three themes listed above, each of which will be introduced by an invited speaker. These conferences and communications will be followed by a round table. An excursion will be organized, proposed by *Les Eaux Roumaines*, an independent authority which will allow the participants to discover the different aspects of the Danube delta, *territory between the water*, according to the Romanian denomination, which is an exceptionally rich ecological domaine: fish, birds and other forms of wildlife abound there in great variety.

For further information, please write to: *Mr. Petru Serban, Apele Romane, Str. Edgar Quinet no. 6, Sector 1, Bucaresti 70106, Romania. Tel. (400) 15 13 01.* Or: *Mr. Jean-Pierre Carbonnel, Université Pierre et Marie Curie, Case 123, 4 Place Jussieu, 75252 Paris Cedex 05, France. Tel. (33) 1 44 27 63 26*

LATIN AMERICA AND THE CARIBBEAN

Regional Activities

XXVI Ordinary Meeting of the Regional Water Resources Committee (CRRH) and XXVII Meeting of Directors of Meteorological Services of the Central American Isthmus

The meeting took place in Managua, Nicaragua from 27 to 29 July 1992 under the coordination of the Nicaraguan Institute of Territorial Studies (INETER). This provided an opportunity for the gathering of all Chairmen and Focal Points of the IHP National Committees as well as the coordinators of the UNESCO-sponsored training courses of the subregion. The meeting adopted the following resolutions:

* Resolution N° 415 which ensures continuing support to the Regional Roving Course in Hydrology and Water Sciences for the Central American Isthmus and the Dominican Republic (CRICA) sponsored and co-funded by UNESCO.
* Resolution N° 416 which ensures continuing support to the short postgraduate course in hydraulic engineering sponsored and co-funded by UNESCO and organized by the Regional School of Sanitary Engineering (ERIS) of the San Carlos University of Guatemala.
* Resolution N° 421 in which the Committee defines an action plan for 1992-1993 which includes the execution of the following UNESCO-sponsored projects and activities: Surface water balance of Central America; Hydrogeological map of Central America; Formulation of a project on *Application of geographic information systems to the geomorphologic study of basins*; Technical assistance to obtain and implement the Micro CD ISIS and IDAMS software developed by UNESCO.
* Resolution N° 424 in which the Committee expresses its gratitude to UNESCO for its support to the subregion in the field of hydrology and water resources.

The meeting was attended by representatives of all the Central American countries, WMO, UNESCO, PRIMSCEN, Finland, CCAD, CEPREDNAC and INF.

Action Plan for the Implementation of the Regional Network of Postgraduate Training Courses in Hydrology and Water Resources

As a result of the meeting held in Cochabamba, Bolivia in October 1991 in the framework of IHP-IV Project E-3-1 *Regional network of postgraduate training courses in hydrology and water resources*, UNESCO / ROSTLAC / IHP with the technical assistance of a regional consultant produced a document for the network including: 1. Background; 2. Objectives (General and Specific); 3. Network structure (Council of national coordinators; Permanent Secretariat of the network; Regional coordinators; Academic Council of the network; Consultants); 4. Work plan for network implementation; 5. Consultations and timetable (IHP / ROSTLAC consultation to national IHP committees and/or focal points concerning the general action plan; Consolidation of the general action plan; Designation of national and regional coordinators; List of candidates for the Academic Council; First organizational meeting; Establishment of the Academic Council; Diagnosis of available human resources; Diagnosis of human resources requirements; Review and harmonization of plans and programmes; Consultations to the countries; Implementation of new plans and programmes; Follow-up); 6. Complementary programmes for the establishment of the network (Exchange of publications and scientific and teaching material between research and postgraduate training centres in the region; Exchange of researchers and teachers between research and postgraduate

training centres in the region; Implementation of short training courses aimed at executive and decision-making levels; Establishment of a *sandwich* programme; Establishment of agreements with foundations from outside the region).

The project is presently surveying the region's postgraduate training capabilities and requirements, on the basis of a questionnaire distributed to all IHP National committees. This stage will be concluded by March 1993.

Short Regional Course on the Practical Control of Eutrophication in Lakes and Reservoirs

The course was held from 2 to 11 November 1992 in Corrientes, Argentina, with technical assistance from ROSTLAC / IHP and funding from DANIDA / MAB. 29 professionals from 18 countries of the region attended the course which was conducted by Professors Sven Olof Ryding (Sweden), Walter Rast and Jeffrey Thornton (U.S.A.). The course's national coordinator, Mr. Juan Jose Neiff, Director of the Centre for Applied Ecology of the Littoral (CECOAL), was responsible for the dissemination of the programme in the province of Corrientes and for the coordination of the course's different aspects. The participants received a book prepared by a UNESCO working group under the guidance of the three course professors. It was decided to prepare projects on the subject in 1993 with support and sponsoring from UNESCO and international cooperation.

Recognition to ROSTLAC / IHP

The Latin American Association of Groundwater Hydrology for Development (ALHSUD) presented an award to UNESCO / ROSTLAC / IHP in recognition of its contribution to the development of groundwater use and protection in Latin America. The Regional Hydrologist received a bronze plaque engraved with the names of ALHSUD Chairman Aldo da Cunha Reboucas and Jorge Alvarado for the Organizing Committee.

Short Regional Course on Irrigation and Drainage in Small Tropical Land Plots (ERIS)

The course was held in Guatemala City from 28 September to 2 October 1992 under the coordination of the Regional School of Sanitary Engineering (ERIS) of the San Carlos University of Guatemala with financial support from UNESCO / ROSTLAC. The participants were 25 professionals from the Central American subregion and 10 professors.

National Activities

Argentina

- ***Flood Alert and Forecast System for the Panana-Paraguay Rivers***

In August 1992 a project document was prepared for the Argentine Operational Centre for Hydrological Alert by Mr. Marcelo Gaviño of the National Water Resources Directorate and National Institute for Water Science and Technology (INCYTH) jointly with UNESCO and the World Bank in the framework of the LACHYCOS project. The project is divided in three stages:

1. diagnosis of the situation (following the UNESCO / WMO manual);
2. design of the forecast and alert system;
3. criteria for intervention in the river system.

The project will be executed through a World Bank loan to Argentina for the establishment of flood protection infrastructure.

- ***Concept Document on Flood Phenomena in the Region***

At the request of UNESCO / IHP an Argentine specialist is preparing a base document as support to the development of the flood alert and forecast system for the most important basins of the region from the socio-economic point of view. Publication is scheduled for September 1993.

- ***Career in Environmental Sciences and Technology***

The Faculty of Engineering of the University of Buenos Aires, on the basis of its Resolution N°CD 3749/92, established the career of Specialist in Environmental Sciences and Technology, in collaboration with the University of Venice (Italy).

• ***IHP / MAB Seminar on Ecotones***

In the framework of IHP-IV Project M-3-3 the Permanent Secretariat of the Argentine MAB Committee held a seminar on 18 November 1992 with the objective of making an analysis of hypotheses on ecotones, selection of criteria and establishment of working groups.

Bolivia

• ***Water Week***

As announced in the previous IHP Bulletin, the Water Week took place in Bolivia from 29 October to 6 November 1992 under the general organization of the Bolivian IHP National Committee and through the Ministry of Urban Affairs, the Secretariat for the Environment, SAMAPA and ANESAPA. The programme was sponsored by ORSTOM, GTZ, WHO / PAHO, UNESCO, SENAMHI, IHH-UMSA and ABIS.

The Water Week consisted of a variety of activities such as seminars, symposia at different decision-making levels and countrywide exhibits for the general public. The following events are worth highlighting:

* Cycle of conferences at the Bolivian National Academy of Sciences on the subject of water resources in Bolivia and the region.
* Poster exhibit under the theme: ***Water and Life must be taken care of.***
* Various TV programmes for the general public.

• ***Seminar on the Hydrological and Climatological Programme of the Bolivian Amazon Basin (PHICAB)***

This seminar was organized by ORSTOM, SENAMHI, IHH-UMSA, CONAPHI-Bolivia and UNESCO during the Water Week (5 and 6 November) for the presentation of the main results of the agreement established ten years ago between the governments of Bolivia and France with the support of UNESCO / IHP. Around 180 specialists and special guests from Brazil, Chile, Ecuador, Peru, Venezuela, Belgium, France and the U.S.A. participated in the seminar.

• ***Synthesis of the Water Balance of Bolivia***

After Bolivia completed the execution of its water balance by individual basins in 1986, CONAPHI-Bolivia decided to prepare a synthesis of the project with the support of UNESCO and ORSTOM. The document is now concluded and was presented officially to the Vice-President of the Republic Mr. Ossio Sanjinés and the Ministers of the Environment and of Transport, as well as to the Rector of the University of San Andrés.

The document comprises a 17-page explanatory note in A3-2 format and 7 coloured maps plus 4 pages of tables with the numerical summary of the water balance of Bolivia. CONAPHI-Bolivia and UNESCO will undertake the dissemination of the document through IHP National Committees and Focal Points.

Chile

• ***Second Seminar of the Chilean International Hydrological Programme***

With sponsoring from CONAPHI-Chile and in coordination with the Chilean water-related institutions the seminar was held in Concepción from 21 to 23 October 1992. ROSTLAC supported the participation of the IHP chairmen of Bolivia and Uruguay.

• ***Hydrology of the Chilean-Bolivian Altiplano***

During the Water Week a meeting sponsored by the Chilean and Bolivian IHP National Committees and financially supported by ORSTOM and UNESCO, was held in La Paz, Bolivia from 3 to 5 November 1992. The objective of the meeting was to prepare jointly with ORSTOM a project document to be submitted to the European Community for funding.

Cuba

• ***Technical assistance from the Cuban IHP National Committee to the University of Uruguay***

UNESCO and the National University of Uruguay sponsored and funded the mission undertaken by Professor Jorge Ruiz Ibarra of the Geophysics Department of the Cuban Polytechnical Institute *Jose Antonio Echeverria,*

who conducted a 120-hour postgraduate course on geophysical research in wells applied to hydrogeology and geological engineering at the School of Engineering in Montevideo during October and November 1992.

Ecuador

- ***Surface Water Balance of Ecuador***

The project has been concluded by the National Meteorology and Hydrology Institute (INAMHI) with technical and financial support from UNESCO / ROSTLAC / IHP.

The project took two and a half years to complete and was coordinated by Mr. Gustavo Gomez of INAMHI with the participation of 6 hydrologists from this institution. The water balance covers the period from 1964 to 1982 and is published in two volumes: Volume I: Final report and explanatory note (30 pages); Volume II: Isoline maps and balance (5 national maps).

El Salvador

- ***Surface Water Balance of the Pampe River***

The surface water balance of the Pampe river basin has been completed under the coordination of Mr. Jaime Miguel Arce of PLANSABAR and the collaboration of Mr. Carlos Alfredo López Vega of the Technological University of El Salvador. The document comprises 282 pages and 5 maps. The project was partially funded by UNESCO / ROSTLAC / IHP.

Guatemala

- ***Surface Water Balance of Guatemala***

The project has been concluded by the National Institute of Seismology, Vulcanology, Meteorology and Hydrology (INSIVUMEH) with technical and financial support from UNESCO / ROSTLAC / IHP.

The project was executed in two years under the coordination of Mr. Sergio Hernandez with the participation of 6 Guatemalan professionals from INSIVUMEH. The water balance covers the period from 1965 to 1982 and is published in three volumes: Volume I: Technical note (100 pages); Volume II: Isoline maps by basin and sub-basin (70 maps); Volume III: Water balance maps and tables (80 pages).

- ***Water Resources Assessment Activities - Handbook for National Evaluation***

After Guatemala concluded its surface water balance and as a result of the President of Guatemala's decision to create the Water Resources Secretariat, UNESCO established an agreement with INSIVUMEH and the official responsible for the launching of the new Secretariat to carry out a diagnosis of the country's water resources using the Manual prepared by UNESCO and WMO. The project will be concluded by September 1993.

Paraguay

- ***Surface Water Balance of Paraguay***

The project was executed in two and a half years by the National Meteorology and Hydrology Service with technical and financial support from UNESCO / ROSTLAC / IHP. It was coordinated by Mr. Wilfrido Castro with the collaboration of three Paraguayan professionals and technical assistance from the IHP National Committees of Bolivia and Agentina.

The water balance covers the period from 1968 to 1984 and is presented in a 70-page technical note and 40 pages of maps and tables.

Peru

- ***Surface Water Balance of 53 Basins of the Pacific Ocean Hydrographic Drainage System***

A framework agreement was established with the Peruvian National Meteorology and Hydrology Service (SENMAHI), the Ministry of Agriculture (Water and Soils Directorate) and the University of Piura with the objective of executing the surface water balance in three years. The total budget for the project is US$ 532,000 of which the Peruvian government will cover US$ 332,000. The institutional agreement became effective in July 1993 upon its signature by the three participating Peruvian authorities. The project will be implemented through the executing agencies designated for this purpose. UNESCO / ROSTLAC will assist in obtaining funding from the international cooperation community.

- ***Roving Seminar on Rational Use of Fog Water (Camanchaca) in the Peruvian-Chilean Desert***

During August a series of roving seminars on the subject were held in Tacna, Moquegua and Arequipa under the coordination of Messrs. Cristobal Pinche (Peru) and Claudio Masson (Chile). This activity will be continued in 1993 in the southern coast of Peru in order to promote the use of this alternative technology for the rural areas.

Uruguay

- ***Hydrology and Water Resources Development in Uruguay***

On the basis of the action plan established by the Uruguayan IHP National Committee together with ROSTLAC, discussions are underway with three international bodies (World Bank, Inter-American Development Bank and European Community) to obtain funding for projects on water resources use and conservation in the country's main hydrographic basins.

- ***Insurance on Groundwater Availability***

With ROSTLAC's technical assistance the National Insurance Bank prepared a project document with the precise objective of providing services to all groundwater resources users in the country, based on the establishment of an insurance premium o n groundwater availability and/or minimum required discharge. This premium will make the Bank responsible for paying drilling costs to be clearly defined in an insurance policy. The project consists of the following stages: i) hydrogeological study including water quality and quantity according to UNESCO / WHO-PAHO / UNEP standards; ii) formal education of producer communities on the importance of water resources; iii) formal education at primary and secondary school levels through workshops and seminars.

The project will be entirely funded by the National Insurance Bank as a pilot activity in eight national sub-basins.

Venezuela

- ***Surface Water Balance of the 31 Basins of the Northwestern Region, Amazonas Federal Territory, Western Plains and Central Guarico Region***

The project was concluded by the Ministry of the Environment and Renewable Natural Resources (MARNR) and its Coordination Office for UNESCO / IHP activities under the leadership of Ms. Carmen Fermin and with the collaboration of four national professionals. The four documents include an explanatory note and tables for the surface water balances by sub-basin.

SOUTH & CENTRAL ASIA

International Symposium on Snow and Glacier Hydrology (ISSGH'92)

Final Report and Recommendations

The International Symposium on Snow and Glacier Hydrology (ISSGH'92) was held in Kathmandu, Nepal from 16 to 21 November, 1992. It was organized by the Nepal Department of Hydrology and Meteorology and the German Technical Cooperation (GTZ), and sponsored by WMO, UNESCO, the International Centre for Integrated Mountain Development (ICIMOD) and IAHS through its International Commission on Snow and Ice. The Symposium was attended by 54 participants from 11 countries, the sponsoring organisations and 19 observers from 3 countries.

38 papers were presented, divided into the following themes:

1. Cooperation in Snow and Glacier Hydrology (4 papers).
2. Data bases and their application for water resources management (7 papers).
3. Climate, climatic changes and their response to snow and glaciers and the hydrological cycle (5 papers).
4. Processes and models in snow and glacier hydrology (11 papers).
5. Floods, debris flows and avalanches (7 papers).
6. Glacio-chemical studies related to snow and ice (4 papers).

The papers of the Symposium will be published by IAHS in the Red Book Series.

Recommendations

The Hindu Kush-Himalaya is a unique region of critical importance to the people of the Central Asian Region. It is of particular importance as a source of water for surrounding areas. The Symposium participants recommended that:

1. Scientific studies to further the understanding of snow and ice processes including glacier dynamics and atmospheric processes influencing them in the high mountain environment be promoted and encouraged in the Hindu Kush-Himalaya region.
2. Long term monitoring programmes on snow and ice resources as well as on changing climatic conditions based on already existing programmes, taking account local conditions and utilising local expertise, be actively promoted.
3. Models for forecasting water supply, sediment load and flood hazards relative to the HKH region be further developed and applied with particular attention to glacier lake outburst floods.
4. Data bases on snow and glacier hydrology be developed for practical end uses and be made freely available so that rational water management decisions may be made.
5. Innovative techniques including remote sensing and GIS be encouraged in order to collect, store and analyze data efficiently.
6. Consideration be given by the countries of the region, in cooperation with the international agencies, in conducting a Himalayan Experiment similar to the ALPEX initiative in the Alps.
7. The setting up of experimental watersheds to include glacierized areas be actively encouraged to promote integrated watershed management and to facilitate environmental impact assessments.
8. A dialog between scientists and water managers be encouraged through the holding of meetings, workshops and symposia on a regular basis.
9. The training of technicians and managers be undertaken on an on-going basis and in a structured programme.
10. The coordination of scientific monitoring and training activities be promoted at a central location with the active involvement of ICIMOD, WMO, UNESCO, governments and institutions of the region and external support agencies as appropriate.

An ***International Workshop on Coastal Zone Management***, organized by the Bangladesh National Commission for UNESCO and the IHP and MAB National Committees, will be held in Dhaka, Bangladesh from 27 to 31 December 1992. The management of the coastal zone is a priority area for Bangladesh. The coastal environment has to be protected from both natural calamities and human activities which have adversely affected the coastal environemnt. There is a great need for an integrated coastal zone management strategy.

The workshop will cover the following topics:

1. Coastal environment and ecology, cyclone and storm surges, coastal meteorology, oceanography, soil and coastal hydrology, salinity intrusion, flood management.
2. Mangrove and coastal afforestation, agriculture, fisheries and aquaculture, livestocks, wildlife.
3. Human resources, housing and shelter, drinking water, sanitation and public health, education.
4. Land use planning, communication and transport, tourism, disaster warning and public awareness, disaster preparedness.

For further information, please contact: *Member Secretary, Workshop on Coastal Zone Management in Bangladesh, c/o Bangladesh National Commission for UNESCO, 1, Asian Highway,Nilkhet-Palassey, Dhaka 1--5, Bangladesh. Phone: 508422, 506143, 863010, 505104. Telex: 632294 BNC BJ. Fax: 980 - 2 - 863420.*

An ***International Conference on Sustainable Development Strategies and Global / Regional / Local Impacts on Atmospheric Composition and Climate*** will be held in New Delhi from 25 to 30 January 1993. This Conference is organized by the Indian Institute of Technology, Delhi in collaboration with ROSTSCA / UNESCO, the American Meteorological Society, the International Development Research Centre of Canada and the Department of Science and Technology & Ministry of Environment and Forests, Govt. of India. The scientific programme includes the following subjects:

* Diagnosis of observed global and regional climate variability and trends.
* Diagnosis of observed global tropospheric and stratospheric pollutant concentration variability and trends.

* Modelling the current and future atmospheric composition / climate system.
* Impacts of global, regional and local atmospheric composition / climate changes on physical and biological environments.
* Sustainable development and energy use.

Further information can be obtained from: *Prof. M.P. Singh, Centre of Atmospheric Sciences, Indian Institute of Technology, New Delhi-110016, India.*

An ***International Seminar on Hydrology*** with a ***Spècial Colloquium on Environmental Problems and Water Resources of the Himalayan Region*** will be organized by the Association of Hydrologists of India and the Nepal Geology Society from 19 to 21 April 1993 in Kathmandu, Nepal.

Further information in this regard can be obtained from: *Prof. V.V.J. Sarma, Secretary and Treasurer, Association of Hydrologists of India Department of Geophysics Andhra University Visakhapatnam - 530 003, India.*

An ***International Symposium on Water Resources in Karst Area with special emphasis in Arid and Semi Arid Zones***, will be held in October 1993 in Shiraz, Iran. The hydrological study and exploration in karstic resources and method of their study, calculation of water potential and balance, and its effects on alluvium aquifers is an important task in karst study phenomenon, especially, in arid and semi arid zones and in the countries where due to water scarcity problems, the demand for exploitation from karst aquifers is daily increasing and as such the need for universal research is understood. The symposium will be followed by excursions through some of the most spectacular Karst terrain in south Iran (Zagros range).

The syposium will cover the following topics:

1. Geological studies, including geomorphology, tectonic, petrology and speleology.
2. Water balance estimation including hydrogeology, hydrology and climatology.
3. Investigation and exploration methods of Karst water resources including geophysics, drilling, well logging, pumping and tracing.
4. Geo-chemical process in karst aquifer and environmental impact.
5. Planning, management and protection of Karst water resources.
6. Implementation of hydrogeological and hydraulic models in Karst aquifers.

Further information can be obtained from: *Ministry of Energy, Water Research Organisation (TAMAB), Karst International Symposium, P.O. Box 15875-3584 Tehran, Iran.*

Education and Training

The 21st International Post-graduate diploma and Master's course in Hydrology at the Department of Hydrology, Roorkee University, India, commenced on 17 July 1992. A total of 37 trainees are attending. Two trainees are conducting their Ph.D. studies with UNESCO assistance.

Regional Activities

A ***Regional Seminar on Hydraulic and Hydrologic Modelling of Water Resources Management*** will be organized by the Pakistan Council of Research in Water Resources, Islamabad from 9 to 13 January 1993. The main topics to be covered at the course are:

* Hydrologic Modelling for Irrigation Water Management.
* Hydraulic Modelling for Irrigation Water Management.
* Hydrodynamics of Farm Irrigation.
* Soil Water Plant Fertilizer.
* Environmental Considerations.

Further information can be obtained from: *Mr. Munir A. Bhatti, Chief (Research), Pakistan Council of Research in Water Resources, 4, Street N° 41, F-6/1, Islamabad, Pakistan.*

A ***National Seminar on Irrigation Management Policy***, organized by the Indian Water Resources Society, University of Roorkee, will take place at Betwa Club, Jhansi from 11 to 13 February 1992. For further information, please contact: *Mr. S.K. Tripathi, Organizing Secretary, National Seminar on Irrigation Management Policy, Water Resources Development Training Centre, University of Roorkee, Roorkee - 247 667, India.*

A ***Regional Course on Hydrology of Humid Tropics***, organized by the National Institute of Hydrology, Roorkee and sponsored by UNESCO, will be held from 15 to 26 Februry 1993 in Goa.

A ***Regional Hydrology Training Course for Technical Officers*** will be organized by the Institute of Flood Control and Drainage Research, Bangladesh University of Engineering and Technology, Dhaka from 14 March to 12 May 1993.

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- **Associate Expert in Hydrology appointed at ROSTSCA**

Mr. Bas Kotterink, Associate Expert in Hydrological Sciences, from The Netherlands, has taken up his duties in the New Delhi Regional Office as from September 1992.

A ***Workshop on Small Islands Hydrology*** will be held on Batam Island, Indonesia, from 16 to 19 February 1993. This regional workshop is organized by the Indonesian IHP Committee in cooperation with UNESCO / ROSTSEA, LIPI (Indonesian Institute of Science), RIWRD (Research Institute Institute for Water Resources Development) and BDA (Batam Development Authority), in the framework of IHP-IV Project H-5-1.

SOUTHEAST ASIA

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Activities

A ***Southern Hemisphere Regional Workshop*** was held in Barmera in the Riverland of South-Australia from 12 to 15 October 1992. The workshop was organized by the South Australian Department of Environment and Planning, the South Australian River Murray Wetlands Management Committee and the Murray-Darling Freshwater Research Centre.

A seminar on ***Methods for Preservation of Useful Reservoir Storage on Heavily Sediment-Laden Rivers***, organized by the Malaysian IHP National Committee, was held in Kajang, Malaysia, from 13 to 16 October 1992. The seminar was sponsored by UNESCO, in the framework of IHP-IV Project H-1-2, UNDP and IRTCES. Among the discussed topics are: prevention of sedimentation; sediment control strategies; restoration of reservoir storage by flushing and mechanical means.

Future activities

A ***Regional Groundwater Contamination Workshop*** was convened in Bangkok, Thailand, from 14 to 18 December 1992. This workshop is sponsored by UNESCO in the framework of IHP-IV Project H-5-1. Participants from Indonesia, Malaysia, Philippines, Vietnam and China were sponsored to participate in the workshop.

From 18 to 22 January 1993, a ***Regional IHP Meeting for Southeast Asia*** will be held in Manila, the Philippines. At this meeting, for which all the UNESCO members in Southeast Asia have been invited, the past activities will be evaluated and a strategy / activities for the coming years will be developed.

UNESCO Office for the Pacific States in Apia, Western Samoa

The UNESCO Office for the Pacific States in Apia, Western Samoa, has a Science Adviser, Mr. Trevor Sankey whose task is to promote all aspects of UNESCO's science programmes in the Pacific, including the IHP, in liaison with water science specialists at Headquarters and at ROSTSEA, Jakarta. Water specialists working in the region are invited to contact him for an exchange of information at the following address: *Mr. Trevor Sankey, Science Adviser, UNESCO Office for the Pacific States, P.O. Box 5766, Matauta uta P.O., Apia, Western Samoa. Phone: + 685 24276. Fax: + 685 22253. Telex: 209 UNESCO SX.*

China

As a contribution to the International Hydrological Programme, the Chinese IHP National Committee endorses the scientific journal ***Advances in Water Science***. The September 1992 Issue (Vol. 3, N° 3) contains the following papers:

* On the mass balance of 50 mountain glaciers in the Northern Hemisphere, by Yang Daqing

* A preliminary study on the process about the influence of antarctic sea ice on the Northwest Pacific Subtropical High, by Qiqn Budong, Peng Gongbing, Fan Zhongxiu and Zhou Enji

* A flood frequency HSPPC model and its application, by Xu Zongxue and Zeng Guangming
* Optimization of real-time hydrothermal system operations, by Wen Depu and Liu Jianmin
* A study on the decision support system of the water resource planning in the Jing Jin Tang Economic District, by Weng Wenbin and Cai Ximing
* An optimal irrigation model for conjunctive operation of canals and wells in the Hetao Irrigation District, by Pen Shizhang, Zhang Yuying, and Shen Juqin
* A multi-objective decision model for water resource comprehensive utilization of the irrigation reservoir, by Bai Ziantai, Huang Yunguang, Zhou Shunqi and Sun Xibin
* Hamiltonian principle for curve fitting and its applications in the drag coefficients of sediment particles, bu Guo Junke and Zhang Baoyu
* Historial sources of flooding and waterlogging calamities in the Taihu Lake Basin and their countermeasures, by Chen Jiaqi
* Evaporation properties and estimates in the landlocked arid region in Xinjiang, China, by Zhang Guowei and Zhou Yuchao
* Reviews of flood forecasting theory based on runoff formation principle, by Rui Xiaofang.

COOPERATION WITH NON GOVERNMENTAL ORGANIZATIONS

International Geosphere-Biosphere Programme (IGBP)

The International Geosphere-Biosphere Programme was formally established by the International Council of Scientific Unions (ICSU) in 1986, and approved by a Resolution of the United Nations General Assembly on 17 December 1989. The Science Plan with the research strategy for the next decade was published in 1990 as IGBP Report N°12.

By definition, the IGBP is comprehensive, interdisciplinary, large scale (up to global) and wide in scope with regard to the subjects considered and the spatial extension of investigations. This is well illustrated by the names of the six IGBP Core Projects:

* International Global Atmospheric Chemistry (IGAC)
* Global Change and Terrestrial Ecosystems (GCTE)
* Biospheric Aspects of the Hydrological Cycle (BAHC)
* Land-Ocean Interactions in the Coastal Zone (LOICZ)
* Joint Global Ocean Flux Study (JGOFS) - including a Global Ocean Euphotic Zone Study (GOEZS)
* Past Global Changes (PAGES).

and the Task Force on Global Analysis, Interpretation and Modelling (GAIM) with the Global Data and Information System called IGBP-DIS.

It was clear from the beginning that the IGBP had to include aspects of the hydrological cycle since it forms an integral part and a key subject in world climate and global research.

As far as the terrestrical hydrosphere is concerned, the IGBP-Core Project BAHC is expected to coordinate and stimulate related research world wide, with a main emphasis on the biospheric aspects of the hydrological cycle. This core project is structured into 4 Foci:

* Focus 1: Studies of water, energy and carbon transfer between soil, vegetation and the atmosphere at patch scales.
* Focus 2: Regional-scale studies and land-surface properties and fluxes: experiments, interpretation and modelling.
* Focus 3: Interactions among the biosphere, water resources, and climate - regional and continental scale.
* Focus 4: The *weather-generator* project (to down- scale climate information derived with GCM's for ecosystem studies).

The basic strategy of the IGBP in general is to cooperate with specialists of the different disciplines and related organizations and to coordinate respective activities and projects as closely as possible.

The main partners and partner programmes of the IGBP are:

1. The World Climate Research Programme (WCRP).
2. The Human Dimensions of the Global Environmental Change (HDGEC) programme.
3. UNESCO, including its Intergovernmental Oceanographic Commission (IOC), its International Hydrological Programme (IHP) and its programme Man and the Biosphere (MAB).

IGBP has also initiated a programme called START (System for Analysis, Research and Training). The main aim of this programme is to promote appropriate interdisciplinary studies on a regional basis which help identify and understand global change processes and contribute to the development of methodologies and tools required for making predictions and deriving conclusions on necessary measures to avoid or reduce negative consequences of ongoing and expected climate changes, land use changes and other related changes. This system, which will also consider hydrological and water related subjects, will consist of regional networks, regional centres and sites.

Fourteen regions have been identified for the establishment of such networks, covering all continents. In some regions - in particular in the Tropical Asian Monsoon Region and in Equatorial South America - the establishment of regional research centres is already at an advanced stage.

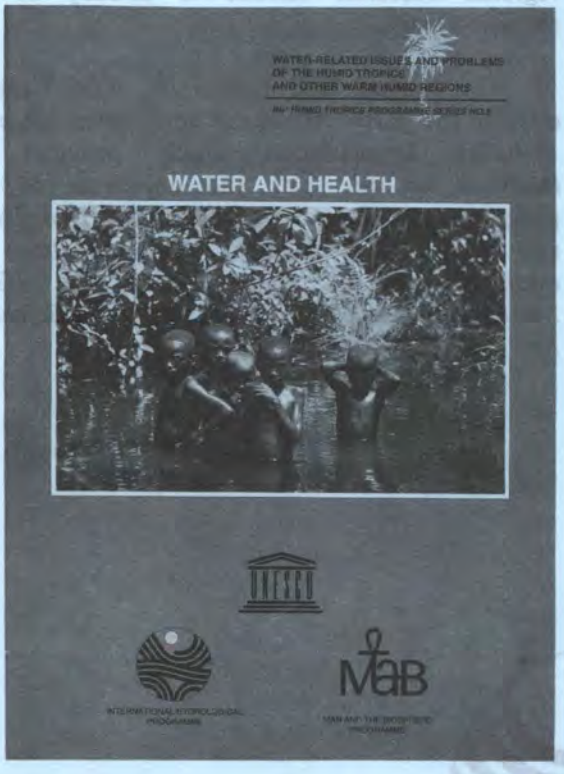
For further information on IGBP, please consult the IGBP Brochure on ***Global Change: Reducing Uncertainties***, which provides an overview of the aims and objectives of the programme, the six Core Projects, the Task Force and the START system. This brochure is available free of charge from the *IGBP Secretariat, Royal Swedish Academy of Sciences, Box 50 005, S-10405, Stockholm, Sweden.*

NEW PUBLICATIONS

IHP Publications

Humid Tropics Series

□ **Water and Health.** Water-related issues and problems of the humid tropics and other warm humid regions. IHP Humid Tropics Series N° 3, UNESCO, May 1992. English. 47 pp. Individual copies free of charge from: *The Division of Water Sciences.*



Water-borne diseases are the main cause of 14.6 million deaths annually in developing countries of children under the age of five years and out of the total, 3.6 to 4 million are diarrhoea- related. The humid tropics are made up mostly of developing countries, and 50 per cent of the people still have *no reasonable* access to a safe water supply and approximately 75 per cent have inadequate sanitation facilities. The continued escalation in population increase will only exacerbate the problem. Consequently, the publication of this document is a timely reminder of probably **the** most critical people-water issue in the humid tropics.

The document systematically covers the various water-borne diseases in detail, the role of health care, the linkage between demography and the declining potable water supply and the prospects for sustainable health through better water management, community awareness and participation.

Keywords: Tropical water supply, health and water cycle, water-borne diseases, population growth, community participation, community awareness.

Technical Documents in Hydrology

□ **Information related to water and the environment: databases available online and on CD-ROM**, by F. Provost, P. Nieuwenhuysen and W.W. de Mes. IHP-IV Projects M-2-1 and M-2-2. UNESCO, 1992. English. 136 pp. Individual copies free of charge from: *The Division of Water Sciences.*

This publication includes a directory of water-related databases. It is divided into two categories: the CD-ROM databases and accessible online data bases. Several databases, including full-text, bibliographic, referral and numeric databases are considered. This publication demonstrates the wide variety of water-related databases available. Each database has its own literature sources, but there is extensive overlapping of sources between databases.

Keywords: Databases, mega databases, online databases, water-databases, CD-ROM.

□ **Recommendations to water-related database designers aiming at bibliographic database design and creation based on the Micro CDS/ISIS and the CCF**, by Mirjana Sicevic. IHP-IV Project M-2-1. UNESCO, 1992. English. 42 pp. Individual copies free of charge from: *The Division of Water Sciences.*

This publication contains a number of recommendations intended to help the database designers who are confronted with the problem of designing a bibliographic database using the micro CDS/ISIS software and the international standard exchange format, Common Communication Format (CCF).

The recommendations include:

1. methodological aspects of a bibliographic database design, including the aspects pertaining to the possibility of an international exchange of information;

2. a very concise survey of the most prominent features of the CDS/ISIS software;
3. a survey of the features of the standard exchange format CCF;
4. an assessment of the correspondence of the CDS/ISIS software to the CCF;
5. the design of a model database based on data elements defined by the CCF and on the micro CDS/ISIS as the software tool.

Keywords: Bibliographic databases, water sciences, mega databases, water databases, CD-ROM.

Non Serial Publications in Hydrology

□ **International glossary of hydrology.** Published jointly by UNESCO and WMO. © UNESCO/WMO 1992, xxiv + 414 pp. English / French / Russian / Spanish. ISBN: 92-3-002745-6. Available for purchase from:

* *UNESCO: Press Commercial Services, Place de Fontenoy, 75700 Paris, France* - Price: FF 200.
* *WMO: P.O. Box N° 2300, CH-1211 Geneva 2,Swizterland* - Price: SF 62.

This is the second revised edition of the International Glossary of Hydrology published jointly by UNESCO and WMO in 1974. The main emphasis is still on surface-water and groundwater hydrology but new scientific developments such as the greater use of remote sensing are taken into account. The second edition contains approximately 1800 terms (1600 terms in 1974); many of the terms contained in the first edition have been eliminated as they became obsolete which means that there are some 400 new terms. The terms are based, whenever feasible, on internationally-accepted definitions contained in existing publications, particularly those of UNESCO, WMO and ISO (International Organization for Standardization), as well as definitions from other glossaries and dictionaries. The glossary is divided into three main parts:

* equivalent terms in English, French, Russian and Spanish, with their definitions;
* alphabetical indexes in the same four languages;
* the Universal Decimal Classification (UDC) for hydrology.

The entries are arranged alphabetically according to the principal term in English and identified by serial numbers; synonymous terms are given the same number as the corresponding principal terms. Users of the glossary are directed to the alphabetical indexes in the four languages, which also include all the synonymous terms.

□ **International Hydrological Programme (IHP). Tenth session of the Intergovernmental Council.** Paris, 6-11 July 1992. Final report. English / French / Russian / Spanish. Available from: *The Division of Water Sciences.*

IHP-Related Publications

□ **Climate change and evapotranspiration modelling.** Proceedings of the ***Nordic seminar on evapotranspiration models for simulating climate change impact on the catchment water balance,*** Vettre, Norway, 16-17 March 1992. Edited by Lena Tallaksen and Karin Anker Hassel. Nordic Hydrological Programme Report N° 31. The Nordic Coordinating Committee for Hydrology (KOHYUNO), 1992. (IHP-IV Project H-2-1).

This report contains the papers and sums up the discussions from this seminar, which focussed on the possibilities of bridging the gap between plot scale evapotranspiration models and catchment water balance models - with emphasis on climate change modelling. The seminar is one in a series of seminars and meetings arranged or supported by the Nordic project *Climate change and energy production*, with the purpose to explore the state of art of hydrological models, and the need for model improvement in order to make climate change impact analysis on runoff in the Nordic countries.

Keywords: Climate chage, evapotranspiration, models, NOPEX (NOrdic hydrologic - meteorological Pilot EXperiment), Scandinavia.

□ **International Conference on Water and the Environment: *Development issues for the 21st century.*** 26-31 January 1992, Dublin, Ireland. **The Dublin Statement and Report of the Conference.** For further information, please contact: *Director, Hydrology and Water Resources Department, WMO, 41, Avenue Giuseppe-Motta, Case Postale 2300, CH-1211 Geneva 2, Switzerland. Tel. +41 22 730 81 11. Fax. +41 22 734 2326. Tlx. +41 41 99 OMM CH.*

The International Conference on Water and the Environment (ICWE) was held in Dublin, Ireland, from 26 to 31 January 1992. ICWE provided the major input on freshwater problems to the United Nations Conference on Environment and Development (UNCED), convened in Rio de Janeiro,

Brazil, June 1992. It was also the most significant global conference on water since the UN Water Conference held in Mar del Plata, Argentina, in 1977. Hosted by the Government of Ireland and convened by WMO on behalf of more than 20 bodies and agencies of the UN system (including UNESCO), the conference was attended by 500 participants from 114 countries, 38 non-governmental organizations, 14 inter-governmental organizations and 28 UN bodies and agencies. The main objectives of the Conference were:

1. To assess the current status of the world's freshwater resources in relation to present and future water demands and to identify priority issues for the 1990s;
2. To develop coordinated inter-sectoral approaches towards managing these resources by strengthening the linkages between the various water programmes;
3. To formulate environmentally sustainable strategies and action programmes for the 1990s and beyond to be presented to the UNCED Earth Summit;
4. To bring the above issues, strategies and actions to the attention of governments as a basis for national programmes and to increase awareness of the environmental consequences and developmental opportunities in improving the management of water resources.

The major part of the work of the Conference was undertaken within six Working Groups which addressed:

1. Integrated Water Resources Development and Management;
2. Water Resources Assessment and Impacts of Climate Change on Water Resources;
3. Protection of Water Resources, Water Quality and Aquatic Ecosystems;
4. Water and Sustainable Food Production and Rural Development and Drinking Water Supply and Sanitation in The Rural Context;
5. Mechanisms for Implementation and Coordination at Global, National, Regional and Local Levels.

RECENT MEETINGS

GCOS/JSTC Task Group on Land Surface Processes (Geneva, 13-16 October 1992)

Concern about the possibility of significant global climate change has arisen because of the observed increases in concentrations of greenhouse gases in the atmosphere. The Second World Climate Conference (SWCC) held in Geneva in 1990 recognized the urgent need for better understanding of global climate and recommended the establishment of a Global Climate Observing System (GCOS) as a vital step toward achieving such understanding. An ***ad hoc*** meeting, sponsored by WMO, IOC and ICSU, was convened in Winchester, U.K. in January 1991 to consider the objectives of a global observing system. Following the signature of a Memorandum of Understanding in early 1992 establishing a Joint Scientific and Technical Committee (JSTC), the inaugural meeting of the JSTC was held in April 1992 in Geneva. The consensus from these meetings was that GCOS should be an on-going system designed to promote and coordinate the collection, processing, and archival of the data descriptive of global climate and constituent processes.

The data to be collected by GCOS are intended to enable and improve, in order of priority:

1. prediction of global climate,
2. monitoring of global climate,
3. detection of global climate change,
4. monitoring of the effects of climate change, especially on terrestrial ecosystems, and
5. planning and decision-making for economic development.

Upon the recommendation of the JSTC, task groups with special expertise in the different components of the Earth's climate system were organized to formulate initial specific plans for realizing the GCOS concept. Recent research has shown the need for an interdisciplinary approach to the study of climate variability and predictability.

A meeting of the GCOS Task Group on Land Surface Processes (LSP-TG) was held at the World Meteorological Organization in Geneva from 13 to 16 October 1992. The purpose of the meeting was to:

1. identify the properties and processes of the global land surface that should be included in GCOS to meet its objectives,
2. develop a suitable strategy for GCOS implementation with respect to land surface processes, and
3. recommend to the JSTC a programme of short and long-term actions to realize the proposed strategy.

Conclusions and Recommendations

The data needs and uses of land surface process-related data identified for GCOS are often different from, and more demanding than, those addressed by existing observation systems. Thus for GCOS to be effective in achieving its objectives, the existing systems must in many cases be enhanced both in scope and performance. Recommendations for action on immediate and short term and longer time scales are presented below.

Short-Term Actions

1. Detailed requirements for system enhancements should be based on an explicit, well-founded experimental design. Development of such an experimental design should be a addressed as a next step in the GCOS plannng process.
2. Maintain Existing Global Observation Networks and Systems.
3. Enhance Existing Networks.
4. Enhance Other Observation Networks and Systems.

Longer-Term Actions

1. Update and augment GCOS by including new observation types and algorithms as their utility is demonstrated in process studies such as WCRP (World Climate Research Programme) and IGBP (International Geosphere-Biosphere Programme).
2. Encourage that GCIP (Continental-scale International Project) and HAPEX (Hydrological / Atmospheric Pilot Experiment) focus on area-average rainfall estimates using multiple data sources.
3. Soil moisture is an essential hydrological variable for climate prediction but no reliable, global data source currently exists. Space agencies should be encouraged to develop improved statellite techniques.

FUTURE MEETINGS

UNESCO / WMO / ICSU International Conference on Hydrology - Towards the 21st Century: Research & Operational Needs

(Paris, 22-26 March 1993)

The UNESCO / WMO / ICSU *International Conference on Hydrology - Towards the 21st Century: Research & Operational Needs*, will be held at UNESCO Headquarters, Paris, from 22 to 26 March 1993.

1. Background

Approximately every six years, UNESCO and WMO have jointly convened international conferences to coordinate their activities in hydrology and water resources. In view of the increasingly important role being played by non-governmental scientific and technical organizations in this field, the two conference convenors have been joined by ICSU for this, the fourth joint conference in the series.

This conference will help to develop a coordinated approach for the future water-related programmes of UNESCO, WMO and ICSU, taking into account recent developments in the fields of environment, development and water resources.

2. Objectives

The purpose of the conference will be:

* To follow-up on UNCED (United Nations Conference on Environment and Development, Rio de Janeiro, June 1992) and its AGENDA 21.

* To offer a forum for the free exchange of views on the current status and future direction of hydrological sciences, operational hydrology, interdisciplinary activities involving hydrology, and related education, training and capacity building activities.

* To encourage the development of innovative proposals for future activities under international programmes in hydrology.

* To review past activities and propose long-term priorities in order to help draw up the agenda for the hydrological programmes of UNESCO and WMO and related activities under ICSU, as an aid to the coordination of the relevant programmes of the three bodies.

3. Main Themes of the Conference

Four themes will be discussed:

* Hydrological Research
* Operational Hydrology
* Interdisciplinary Activities in Hydrology
* Capacity Building, Training and Education.

4. Organization

The conference will be conducted at two levels:

* *Plenary Sessions*:

Presentation and discussion of the international programmes of UNESCO's International Hydrological Programme (IHP), WMO's Operational Hydrology Programme (OHP) and ICSU's relevant programmes. Three documents will be introduced by the convening organizations. In addition, there will be a series of scientific and technical papers presented by keynote speakers to set the scene for the discussions.

* *Group Sessions*:

The main work of the conference will be conducted by small working groups which will discuss the themes considered and present recommendations for future activities to the plenary.

5. Output

The conference will produce and approve a report summarizing the discussions on the four themes considered and proposing recommendations for future action for both research and operational hydrology.

6. Languages

The working languages of the conference will be English and French. No interpretation will be provided for group sessions.

For further information please contact the IHP Secretariat. It should be noted that the budgets of the three convening organizations provide no funds for support to participants. All who plan to attend must therefore arrange their own funding.

* * *

The American Institute of Hydrology (AIH) will organize the second **USA / Russia Joint Conference on Industrial and Agricultural Impacts on the Hydrologic Environment** in Washington, D.C., USA from 16 to 20 May 1993. Further information on this conference can be obtained from: *The American Institute of Hydrology, Administrative Office, 3416 University Ave, S.E., Minneapolis, Minnesota 55414, USA.*

* * *

International Symposium on Water Resources Planning in a Changing World

(Karlsruhe, Germany, 28-30 June 1994)

Convened by UNESCO and organized by the IHP National Commmittee of Germany for the International Hydrological Programme (IHP) of UNESCO and the Operational Hydrological Programme (OHP) of WMO in cooperation with the Institute for Hydrology and Water Resources

Planning (IHW), Karlsruhe University, this symposium is sponsored by WMO, IAHS, IAHR and IWRA. It is implemented within the framework of IHP-IV Project M-4-3 (Study experiences with modern water resources planning and management methods taking into account risk factors) and represents a contribution to the UN International Decade for Natural Disaster Reduction (IDNDR).

Scope of the Symposium

The concept of sustainable development as pronounced by the World Commission on Environment and Development (the Brundtland Commission) and strongly emphasized in the Agenda 21 of the Rio Conference on Environment and Development (UNCED). It adds a new dimension to water resources planning and operation, by requiring an integrated approach by means of which a balance is obtained between environment, ecology, and socio-economics. And it includes the need to incorporate risk and uncertainty in water resources analysis, in particular as caused by changes in populations, land use and climate.

Participants of the symposium are challenged to contribute new ideas and methods as well as application examples, for successfully generating sustainable water resources systems. They should present criteria to be met, and they are invited to report on recent developments on decision aids, ranging from basic philosophical concepts to computer based expert systems.

The main topics of the symposium are:

* Sustainable development: examples and issues
* Risk and uncertainty in water resources development
* Decision support systems for sustainable development
* Integration of development and environment.

The working languages of the symposium will be English and German. Simultaneous interpretation will be provided. The proceedings of all accepted papers and posters will be available to the participants at the beginning of the symposium. A study tour (1 day) to the Upper Rhine valley development project will be organized on 1 July 1994.

The fee for participation in the symposium will be 150 Deutsche Mark covering the costs of the proceedings, secretariat and working material. There will be an extra charge for the study tour.

Those who are interested in presenting a paper or a poster should submit an abstract before 31 July 1993.

Tentative Time Schedule

* Deadline for submission of abstracts (not exceeding 500 words): 31 July 1993
* Notification of acceptance of abstracts (oral presentation or poster session): 30 September 1993
* Information Note 2: December 1993
* Receipt of full papers and poster descriptions, both in English only: 28 February 1994.

Correspondence

Please address all correspondence to: *IHP/OHP-Sekretariat, c/o Bundesanstalt fur Gewaesserkunde, Postfach 309, D-5400 Koblenz, Germany. Fax + + 49 (0) 261 / 1306 302.*

IHP CALENDAR

Recent and Forthcoming Meetings

IHP PROJECT	TITLE	CONVENER/PLACE/DATE
--	Ist Latin American congress of groundwater hydrology for development	ALHSUD Caracas, Venezuela October 1992
M-3-2	Ecotone Regional Workshop	UNESCO/Australia NatCom Barmera, South Australia 12-15 October 1992
--	World congress for education & communication on environment & development (ECO-ED)	UNESCO/ICC/UNEP Toronto, Canada 17-21 October 1992
H-4-2	International symposium on snow and glacier hydrology	Nepal (Min. of Water Resources, Dept. of Hyd. & Meteo.)/WMO/ UNESCO/ICIMOD/IAHS Kathmandu, Nepal 16-21 November 1992
H-2-2	Workshop on coastal zone management in Bangladesh	Bangladesh NatCom/UNESCO Dhaka, Bangladesh 27-31 December 1992
H-5-1	Technical workshop on ground water contamination in sub-humid and humid tropical Asia	ROSTSEA Bangkok, Thailand December 1992
H-5-1	Technical workshop on hydrological research in a changing environment in sub-humid and humid tropical Asia	ROSTSEA Kuala Lumpur, Malaysia 12-15 January 1993
H-2-1	International conference on sustainable development strategies and global/regional/ local impacts on atmospheric composition and climate	Indian Institute of Technology New Delhi, India 25-30 January 1993
H-5-2	International workshop on hydrogeology of deep karstic formation	UNESCO/IHP-NC Tunisia/ Univ. of Montpellier, France Tozeur, Tunisia

		8-12 February 1993
M-5-1	International symposium on the limnology and paleo-climatology of the East African lakes	IDEAL/UNESCO Jiuja, Uganda 18-21 February 1993
--	International conference on hydrology - Towards the 21st century: Research and operational needs	UNESCO/WMO/ICSU Paris, France 22-26 March 1993
M-3-3a	International workshop on the role of water in urban planning (HYDROPOLIS)	IHP-NCs of Netherland & Germany Wageningen, Netherlands 28 March-3 April 1993
M-3-5	International seminar on environmental assessment and management of irrigation and drainage projects for sustainable agricultural growth	Centre Exc. WR Engineer. Lahore, Pakistan April 1993
M-2-3	International conference on: Application of geographic information systems in hydrology & water management (HYDROGIS 93)	BOKU/IAHS/UNESCO Baden (Vienna), Austria 19-22 April 1993
H-2-2	International workshop on sea level changes and their consequences for hydrology and water management (SEACHANGE '93)	UNESCO/WMO/UNEP/IAHS/IAHR Noordwijkerhout, Netherlands 19-23 April 1993
H-1-1	Symposium on applications of isotope techniques in studying past and current environmental changes in the hydrosphere and atmosphere	IAEA/UNESCO Vienna, Austria 19-23 April 1993
--	USA/Russia Joint Conference on industrial and agricultural impacts on the hydrologic environment	AIH/USA/Russia Washington D.C., USA 16-20 May 1993
M-2-2	Workshop on computer-oriented water data information systems	IAH/UNESCO/USGS/WMO Washington D.C., USA 19-20 May 1993
H-3-2	International symposium on hydrological, chemical and biological problems of contaminant transformation and transports in aquatic environments	Russia NC/UNESCO/IAHS Rostov-on-Don, Russia 24-29 May 1993

H-5-2	IAH XXIVth Congress: Hydrogeology of hard rocks	Committee of Norwegian Hydrogeologists & NHK on behalf of IAH Oslo, Norway 28 June-2 July 1993
M-3-2	International workshop on groundwater / surface water ecotones: Biological & hydrological interactions & management options	UNESCO (MAB/IHP)/IAHS Lyon, France 5-9 July 1993
H-1-1,H-2-1 H-5-1 & others	Fourth scientific assembly of the IAHS and Sixth scientific assembly of the IAMAP	IAHS/IAMAP/UNESCO/WMO Yokohama, Japan 11-23 July 1993
--	15th International congress on irrigation and drainage	ICID The Hague, Netherlands 6-11 September 1993
--	Franco-Romanian hydrological gathering	IHP-NCs France/Romania Tulcea, Romania 6-9 September 1993
M-2-3	Worshop on GIS for hydrology and water resources management in a changing environment (*for invited speakers only*)	Univ. of Cagliari/IHP Cagliari, Italy September 1993
H-5-1	East Asia regional workshop on typhoon-related floods	China IHP-NC/UNESCO/ESCAP Guangzhou, China September 1993
H-5-2	International symposium on water resources in Karst with special emphasis on arid and semi-arid zones	Iran Min. of Energy/ UNESCO Shiraz, Iran October 1993
H-5-5	2nd International conference on FRIEND	German IHP-NC/UNESCO/ WMO/IAHS Braunschweig, Germany 11-15 October 1993
H-5-2	Workshop on groundwater recharge	UNESCO/IAH/NGRI Hyderabad, India 18-20 January 1994

M-	International conference on efficient utilization and management of water resources in Africa	IAHR/Sudan/UNESCO Kartoum, Sudan 1-4 February 1994
H-3-1	International symposium on suspended particulate matters in rivers, estuaries and coastal waters	GKSS/UNESCO Hamburg, Germany 21-25 March 1994
M-1-4	International symposium on runoff computation for water projects	UNESCO/Russian IHP-NC St. Petersburg, Russia May 1994
H-1-2	International symposium on the state of the art in river engineering methods and design philosophies	Russian IHP-NC/UNESCO/ IAHR/IAHS/UNEP St. Petersburg, Russia 16-20 May 1994
M-3-3	Workshop on urban hydrology	German IHP/OHP-NC/UNESCO Gelsenkirchen, Germany 28 May-1 June 1994
M-4-3	Symposium on water resources planning in a changing world	UNESCO/German IHP-NC Karlsruhe, Germany 28-30 June 1994
E-3-1	Workshop on post-graduate education in hydrology	Czechoslovak IHP-NC/ UNESCO/WMO/IAHS Prague, Czechoslovakia 29 August-2 September 1994
H-5-2	International symposium on flash floods in arid and semi-arid zones	China IHP-NC/UNESCO Xi'an, China early Sept 1994
H-5-2	IAH XXVth Congress: Management to sustain shallow groundwater systems	IAH Adelaïde, Australia 21-25 November 1994
H-5-4	Second symposium on regionalization in hydrology	German IHP/OHP-NC Germany 1995
M-	IAH XXVIth Congress: Managing the effects of man's activities on groundwater	IAH Edmonton, Canada 4-10 June 1995

H-3-1	Conference on time scales of human loading and quality response of large water bodies	Swedish National Science Research Council Linkoping, Sweden August 1995
H-5-2	International symposium on hydrological research and water resources management in arid and semi-arid zones	UNESCO/IHP-NC Uzbekistan Tashkent, Uzbekistan September 1995

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	annually begins mid-June	E	10 April	Dr Ergun Demiroz DSI Teknik Arastirma ve Kalite Kontrol Daiseri Baskanligi 06100 ANKARA
ARGENTINE: Buenos Aires, Santa Fé, Mendoza, San Juan	General hydrology with emphasis on the environment	6 months	Inquire	S	Inquire	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, begins in January	S	30 Sept.	Curso Internacional de Hidrología Subterranea Calle Beethoven 15, 3° 08021 BARCELONA
BELGIUM	Hydrology and hydrogeology - *French language programme*	10 months	annually, begins in October	F	1 Sept.	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
	- *English language programme*	1 or 2 years	annually, begins in September	E	1 Febr.	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	Inquire	E	Inquire	"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 announcements	E	Inquire	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	30 Sept.	Dr. G. Kienitz Research Centre for Water Resources Development (VITUKI) International Postgraduate Course in Hydrology, P.O. Box 27 H-1453 BUDAPEST 92
CAIRO (Egypt)	Environmental hydrology for arid and semi-arid zones	2 months	annually, May-June	E	Inquire	Prof. Dr. Mostafa M. Soliman Course Manager International Course on Hydrology for Arid and Semi-arid Regions P.O. Box 5218 Heliopolis-West CAIRO
CRICA (Central America and the Caribbean)	Changing subjects (for subject and date inquire with organizer)	4 weeks	annually	S	Inquire	Ing. Juan Luis Guzmán Coordinador General del CRICA Esc. Regional de Ingen. Sanitaria Univ. de San Carlos de Guatemala Ciudad Universitaria, Zona 12 GUATEMALA
DAR-ES-SALAAM (Tanzania)	Water resources engineering	18 months	annually, begins in October	E	1 May	Mr. F.W. Mtalo Disciplinary Area Coordinator for Water Resources Engineering P.O. Box 35131 DAR-ES-SALAAM
DELFT (Netherlands)	Hydrology, with specialization in: - surface water - groundwater - water resources management	11 or 18 months	annually starting in October	E	30 June	IHE Westvest 7 P.O. Box 3015 2601 DA DELFT
GALWAY (Ireland)	Hydrology	1 year	annually, begins in October	E	No deadline Apply early	Dr. K.M. O'Connor Dept of Engineering Hydrology University College Galway GALWAY
GRAZ (Austria)	Groundwater tracing techniques	5 weeks	1993, 1995, etc. begins in August	E	15 April	Dr. H. Zojer Postgraduate Training Course on Groundwater Tracing Techniques Institute for Geothermics and Hydrogeology Elisabethstrasse 16/II A-8010 GRAZ
GUATEMALA	Hydraulic resources	1 week	annually	S	Inquire	Ing. Arturo Pazos S., Director Escuela Regional de Ingeniería Sanitaria y Recursos Hidráulicos Facultad de Ingeniería Ciudad Universitaria, Zona 12 GUATEMALA CITY

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

KENSINGTON (Australia)	Hydrology, covering principles, practice and applications of surface and ground water hydrology	3 months	annually, begins in March	E	December	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, begins in Sept.	E	30 June 1993 for 1993 session	The Director Centre of Excellence in Water Resources Engineering University of Engineering and Technology LAHORE 31
LAUSANNE (Switzerland)	Hydrology	15 months	annually, begins end Sept.	F	1 May	Cycle postgrade inter-universitaire en hydrologie et hydrogéologie EPFL-IATE CH-1015 LAUSANNE
NEUCHATEL (Switzerland)	Hydrogeology	15 months	annually, begins in October	F	1 May	Cycle postgrade inter-universitaire en hydrologie et hydrogéologie CHYN 11, rue Emile-Argand CH-2007 NEUCHATEL
LISBON (Portugal)	Operational hydrology	2 months	annually, begins mid-October	P	1 Sept.	Curso Internacional de Hidrología Operativa Direcçao-Geral dos Recursos Naturais Av. Almirante Gago Coutinho, 30 1000 LISBOA
MADRAS (India)	Hydrology and water resources engineering	1 year	annually, begins mid-August	E	15 May	Centre for Water Resources College of Engineering Anna University 600 025 MADRAS
MADRID (Spain)	General and applied hydrology	6 months	annually, begins in January	S	30 June	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	Course Director Department of Civil Engineering Monash University Clayton 3168 VICTORIA
MONTPELLIER (France)	Hydrogeology of fissured rocks	2 weeks	September	F	Inquire	CREUFOP (J.C. Legars) 99, Avenue d'Occitanie 34096 MONTPELLIER Cedex 5
MOSCOW (Russia)	1993: Hydrological aspects of rational use of water resources	2 months	annually, begins mid-June	E R	28 Febr.	International Higher Hydrological Course Geography Department Moscow State University Lenin Hills MOSCOW 119899

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

NAIROBI (Kenya)	Hydrology	9 months,	annually begins September	E	15 July	The Principal, Institute for Meteorological Training & Research Dagoretti Corner Ngong Road P.O. Box 30259 NAIROBI
NANJING (China)	Hydrology (advanced)	2 months	Special announce-ments	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, begins in October	E	31 May	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	Inquire	E	Inquire	Centro Internazionale di Idrologia "Dino Tonini" Via Sette Chiese 35043 MONSELICE
PORTO ALEGRE (Brazil)	Hydrology		Special announce-ments	P	Inquire	The Director Instituto de Pesquisas Hidraúlicas (IPH) Universidade do Rio Grande do Sul Caija Postal 9509 PORTO ALEGRE
PRAGUE (Czecho-slovakia)	Hydrological data for water resource planning	6 months	1994, 1996, etc., begins in February	E	Autumn	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, begins mid-July	E	31 March	Head of Department of Hydrology University of Roorkee ROORKEE 247667, U. P.
U.S.A.	Techniques of hydrologic investigations for international participants	2 months	annually, begins early June	E	31 March	U.S. Geological Survey Water Resources Division 436, National Center RESTON, Va. 22092, USA

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