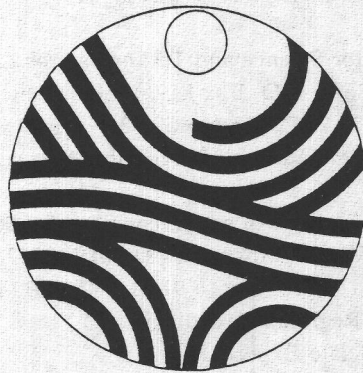


# IHP INFORMATION

N° 38

April/June 1994



*International Hydrological Programme*

## Contents

- 1 IHP General
- 9 Regional and IHP National Committees
- 15 Cooperation with Non Governmental Organizations  
and Organizations of the United Nations System
- 17 New Publications
- 18 Future Meetings
- 23 IHP Calendar
- 27 UNESCO-Sponsored Postgraduate Courses

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- The Spanish edition is produced and distributed by ROSTLAC

*This issue reports on the period April - June 1994.  
A list of acronyms can be found at the end of this newsletter*

## IHP GENERAL

### 21st Session of IHP Bureau

(Paris, 14-16 April 1994)

The Twenty-first Session of the Bureau of the Intergovernmental Council of the IHP was held at UNESCO Headquarters in Paris from 14 to 16 April 1994. The meeting was chaired by Mr I. Shiklomanov, Chairman of the Council, and attended by the past Chairman, Mr A.C. Tatit Holtz, and the following vice-chairmen: Mr M. Bacha, Mr A. Mercado, Mr A. Nanizeyi Kindudi.

The main task of the Bureau was to review the status of implementation of the fourth phase of the IHP and the *Updated Outline* of the fifth phase (1996-2001) of the IHP, taking into

account the comments and suggestions received from the IHP National Committees. (The status of IHP-IV activities as of 1 March 1994 is reproduced as an annex to this newsletter).

A *Revised Outline* of the IHP-V plan has been prepared by the Secretariat on the basis of the Bureau deliberations and sent to the IHP National Committees, intergovernmental and non-governmental organizations inviting them to provide additional contributions to the planning process by **15 September 1994** at the latest. The Secretariat will then prepare the *Draft Plan for the IHP-V* to be submitted to the **Eleventh Session of the IHP Council** which will take place at UNESCO Headquarters in Paris from 30 January-4 February 1995.



Left to right: Mr A. Askew (WMO), Mr H. Zebidi, Ms B. Malm, Mr M. Bonell, Mr A. Mercado, Mr I. Shiklomanov, Ms A. Aureli, Mr A. Szollosi-Nagy, Mr M. Bacha, Mr A. Tatit Holtz, Mr A. Nanizeyi Kindudi, Mr W. Gilbrich

The Bureau approved the preliminary programme of the **Second IHP/IAHS Kovacs Colloquium** which will be held at UNESCO Headquarters from 26-28 January 1995, prior to the IHP Council Session. (For more details about this colloquium, see under Section **Future Meetings**).

The full report of the Bureau meeting is being translated into French/Spanish/Russian and will be sent to all IHP National Committees.

The 11th session of the Intergovernmental Council of the IHP will be held at UNESCO Headquarters, Paris, France from 30 January-4 February 1995.

## IHP Staff

### Emmanuel Naah Regional Hydrologist for ROSTA



Mr Emmanuel Naah (Cameroon) took up his duties as Programme Specialist in Hydrology and Environmental Sciences at the UNESCO Regional Office for Science and Technology for Africa (ROSTA) in Nairobi, Kenya on 17 April 1994. Mr Naah was born

in Douala, Cameroon, in March 1947. He holds a diploma in Hydrogeological Advanced Studies from the University of Paris VI (Jussieu), 1974. He is a hydrological engineer (graduated from ORSTOM, 1976) and holds a post-university Doctorate in Water Sciences from the University of Paris VI, 1979 and a "State Doctorate" in Sciences from the University of Yaoundé, 1990.

He started his career as a hydrologist at the National Office for Scientific and Technical Research (ONAREST) in 1976. From 1980 to 1993 he has occupied the function of officer-in-charge at the Centre for Hydrological Research of the Institute of Geological and

Mining Research (IRGM). His duties were to approve, direct and co-ordinate the activities of research in hydrology for Cameroon, to orient the Hydrological Programme of IRGM and to assess the work of the researchers of the Centre.

In 1993 he was appointed to the Ministry of Scientific and Technical Research as officer in charge of studies in the Division of Scientific and Technical Co-operation, a post which he occupied until he joined UNESCO.

From 1979 to 1994, Mr Naah has executed several projects, studies and hydrological works on various themes, such as, inventories, monitoring and management of water resources, study of hydrological processes and water quality.

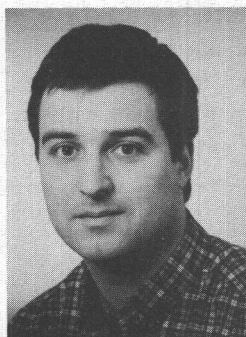
"Master of Research", he is the author and co-author of several publications and scientific articles and has trained researchers and technicians in operational hydrology. He also supervised several students from Cameroon in the preparation of their Hydrology Masters and Doctorates. He has taken part in several thematic research activities developed by the research units at ORSTOM.

### Frédérique Willard Associate Expert at Headquarters



Ms Frédérique Willard (France) joined UNESCO as an Associate Expert in the Office of the Co-ordinator for the Environment in October 1992. She has collaborated with the Division of Water Sciences since May 1993 and has now joined the IHP Secretariat.

Ms Willard holds an degree in Advanced Agronomical Sciences from the National Institute of Agronomy Paris-Grignon (INAP-G), (1989), a M.Sc. in Agricultural Economics (INAP-G) (1987) and a M.Sc. in Environmental Sciences from the University of Paris VII (1986). From 1991-92 she worked as a consulting engineer at SAFEGE (French water and environment French agency), and in 1989 she was an assistant researcher on field diagnosis at INRA (French National Institute for Agronomic Research).

**Bert Vos****Associate Expert for ROSTSCA**

Mr Bert Vos (The Netherlands) joined the Regional Office for Science and Technology for South and Central Asia in New Delhi, India as an Associate Expert in Hydrology and Environmental Sciences in June 1994. Mr Vos holds a diploma in civil engineering

(with a specialisation in water management/hydrology) from the Delft University of Technology. From 1989-1992 he worked as a teaching assistant and project co-ordinator at the Section "Civil Engineering Project Education" at his faculty and from 1992-1993 as an Associate Expert Geohydrology in the project "Control of Waterlogging and Salinization" in Cairo, Egypt.

At the end of June, the contract of Mr Johan Verboom, Associate Expert from the Netherlands, expired and he will return to his home-country after a two-year stay at ROSTSEA.

## Implementation of IHP Projects

*Project H-1-2: Study of erosion, river bed deformation and sediment transport in river basins as related to natural and man-made changes*

- the International Research and Training Centre on Erosion and Sedimentation (IRTCES).

A fifth organization, the International Association on Water Quality (IAWQ) joined ICCORES in June 1993.

The purpose of ICCORES is to develop information on the consequences of reservoir sedimentation and to collect case histories and state-of-the-art reports to enable planners, designers, managers and engineers to improve the design, construction and operation of dam reservoirs in order to ensure operation on a sustainable basis.

UNESCO welcomed the co-operation of ICCORES in the implementation of IHP Project H-1-2.

An international workshop was organised by ICCORES, with UNESCO's participation, during the international symposium on the "State-of-the-art in river engineering methods and design philosophies" which was held in St. Petersburg, Russia, from 16-20 May 1994.

Twenty papers were presented at this workshop, underlining the main problems of reservoir sedimentation and illustrating the need to consider information also on upstream and downstream of the dam to better understand the impact of the sedimentation process.

During the workshop UNESCO/IHP co-operation with ICCORES was examined and it was decided to publish the proceedings in the IHP series *Technical Documents in Hydrology*. It is also planned to prepare a state-of-the-art report on reservoir sedimentation and to organise an international conference on reservoir sedimentation in the USA in 1996.

### *Co-operation with ICCORES*

The International Co-ordinating Committee on Reservoir Sedimentation (ICCORES) was established in Bergamo, Italy in December 1992 by an agreement signed by four international non-governmental organizations:

- the International Association of Hydraulic Research (IAHR);
- the International Commission on Large Dams (ICOLD);
- the International Association of Hydrological Sciences (IAHS);

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



A workshop on "*Pacific water sector planning research and training*" was held from 1-8 June 1994, in Honiara, Solomon Islands. It was organised by UNESCO, UNDP/DDSMS\*

Regional Water and Sanitation Programme and the South Pacific Applied Geoscience Commission (SOPAC).

The aims of the workshop were:

1. to identify critical research and training needs for water management, as perceived by representatives of Pacific Island countries and regional organizations;
2. to initiate carefully-targeted applied research and training activities within the Pacific Islands to address these needs;
3. to bring together water and sanitation planners to discuss:
  - water resources planning and management in Pacific Island countries;
  - the role of master plans, and sector strategy and action plans;
  - the importance of water quality monitoring and management;
  - related institutional, legislative and social issues.

The workshop included two sessions on the following themes:

- "Strategies for developing Pacific water resources research and training";
- "Pacific water and sanitation sector planning".

The meeting requested UNESCO, in consultation with the proposed Water and Sanitation Programme, to co-ordinate applied research projects and training into key hydrology and water resources issues on small islands of the Pacific Island Countries.

These projects should build on results obtained from and methods used in studies from within and outside the region (technology transfer). Each research project should have a high training component. The participants called on UNESCO to consider social/cultural values, including the active participation of women, which would then be linked with the scientific issues in all projects. Public education should be an integral component during and after each project.

The meeting recommended that UNESCO form a working group to prepare brief project outline documents. It recommended the following broad applied research areas and the Pacific Island countries recommended a location for each research project. The meeting requested that project outline documents referring to each of the preferred countries identified be presented for consideration and endorsement at the Water Policy Meeting to be held in conjunction with the 1994 SOPAC Governing Council meeting scheduled in Majuro, from 15-22 September 1994.

- Project 1 - Catchment study on a high volcanic island to collect baseline water balance data for watershed management; evaluate impacts of different land use practices (e.g. deforestation and mining) on water quantity and quality. Preferred location: Solomon Islands. Alternative location: Western Samoa.
- Project 2 - Water management study of a freshwater lens on a low lying coral island to: collect baseline water balance data (including rainfall and other meteorological parameters); quantify the interception and evapotranspiration components; assess groundwater recharge from water balance and groundwater table movement data. Preferred Location: Kiribati. Alternative location: Tuvalu.
- Project 3 - Groundwater pollution transport study to: investigate the linkage between water supply and sanitation/waste disposal sites; develop guidelines for use by islands and aid donors for appropriate siting and spacing between water supply and sanitation/waste disposal sites. Preferred location: Tonga. Alternative location: Niue.
- Project 4 - Community level studies to establish and update baseline information on: knowledge and attitudes of families on safe water and adequate sanitation; assessment of family utilisation and

\* UN Department of Development Support and Management Services (ex UNDTCD)

sanitation practices; impact on families from community water and sanitation systems. Preferred locations: Communities in the study locations for projects 1, 2 and 3.

Taking into account the decisions of the Water Policy Meeting in Majuro, the meeting recommended that UNESCO/IHP prepare full project proposals for extra-budgetary funding of the selected applied research projects, through the working group, and in collaboration with SOPAC. The submission by Member States of a UNESCO Participation Programme grant requests (up to a maximum of US\$26,000) to assist in the implementation of the above projects within the named countries is also encouraged.

*Project H-5-2: Hydrological research and water resources management strategies in arid and semi-arid zones*

and

*Sub-Project M-1-1b: Preparation of guidance material on integration and co-ordination of soil water monitoring systems to support groundwater resources assessment*

UNESCO, together with IAH, sponsored the "International Workshop on Groundwater Monitoring and Recharge in Semi-arid Areas" organised by the National Geophysical Research Institute in Hyderabad, India, from 16-23 January 1994.

The sessions during the first two days devoted to groundwater monitoring and groundwater recharge were introduced by the contributions from the working group members and followed by presentations on the related topics:

- Groundwater monitoring in semi-arid areas:
- background monitoring of groundwater systems;
  - groundwater monitoring tools and observation density; groundwater data bases;

Groundwater recharge in semi-arid areas:

- recharge of phreatic aquifers due to precipitation;
- recharge of phreatic aquifers due to ephemeral and perennial flow conditions.

On the third day, the participants discussed during the plenary session the main outputs of the workshop and made recommendations on a number of topics to be addressed in the future, in particular artificial recharge of phreatic aquifers due to its increasing importance in the management of groundwater resources in arid and semi-arid areas.

Two meetings of the working group related to each of the IHP projects were also held. They considered the proposals suggested by the workshop for inclusion in the technical documents, and established a schedule for the completion of their work. The two technical documents are expected to be ready before the end of 1994 and published in 1995.

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

A Joint IHP/IAH Panel of Editors met at Rinteln, Germany from 15-17 June 1994 in order to review the draft of the planned "Guidebook on Hydrogeological Maps". The book will contain a description of thematic hydrogeological maps, instruction on the design of maps and the revised "UNESCO Legend for Hydrogeological Maps of 1984". It is expected to be published by IAH in 1995.

*Project M-1-3: Updating of IHP publications related to water resources assessment*

*Monograph on World Water Resources at the Beginning of the XXIst Century*

UNESCO and the State Hydrological Institute, St. Petersburg, Russia, organised a workshop in

the framework of this project in St. Petersburg from 9-11 March 1994.

The detailed outline of the monograph was thoroughly discussed with the State Hydrological Institute staff. Specialists from the international scientific community were invited by UNESCO. The discussions lead to a definition of the monograph format and the main contents of its four different parts:

- Part I: Modern hydrology and the hydrosphere of the terrestrial globe
  1. Hydrography (physiographic characteristics of the continents, regions, largest river basins, lakes and reservoirs, hydrological knowledge)
  2. Hydrosphere (water reserves on Earth, hydrological cycle)
- Part II: The methods for studying and assessing water resources and their changes
  1. The methods for studying and assessing renewable water resources of regions, countries, river basins and lakes
  2. The methodological bases for studying water river regimes
  3. The methods for studying multi-year indicators of water resources
  4. The method for assessing man's impact on river runoff and water resources
  5. The methods for studying and assessing relationships between climate and resources
- Part III: Water resources of the continents (Europe, Asia, North America, South America, Africa, Australia and Oceania) - for each continent:
  1. General geographical and hydrographical information
  2. Renewable water resources
  3. River water regime
  4. Multi-year variations in water resources
  5. Man's impact, water consumption
  6. The dynamics of water availability
  7. The most important water problems
- Part IV: Water resources of the Earth
  1. Water resources in the past and present: inflow to the world ocean
  2. The dynamics of water consumption and water availability in the world
  3. Anthropogenic climate change and world water resources
  4. The measures to be taken to face water resources deficiency.

Some of the completed results of the monograph were presented by Mr Shiklomanov and his team. Examples of monographs on the water resources of the Mediterranean basin, the

Arab region and Africa were also discussed.

During the workshop, a decision was also made with regard to the monograph on "Groundwater resources of the earth and their use" which will be prepared as a separate monograph, but whose main outputs will be included in the "World Water Resources Monograph". The contents of this second monograph was also discussed and a new outline established. A working group was set up to act as editorial board and assist in the collection of information.

*Project M-2-3: The Use of Geographic Information Systems (GIS) in hydrological and water resources studies*

The first meeting of the working group was convened in Cagliari, Italy, from 6-9 April 1994 to prepare recommendations for implementing GIS programmes during the fifth phase of the IHP (1996-2001)(IHP-V). Recognizing the usefulness of the activities in the field of GIS carried out during the fourth phase of the IHP (1990-1995), the working group recommended that GIS and its related activities, such as remote sensing, be expanded during IHP-V. The working group recognized that GIS methodology could be applied to most of the topics proposed in IHP-V. It noted, in particular, that GIS was one of the most useful tools for assisting in the handling of integrated water resources management and associated risks. The working group suggested that IHP-V should provide a framework to significantly expand the awareness and use of GIS techniques and suggest future advanced research programmes oriented towards sustainable development. It recommended that active collaboration be established with the other environmental programmes of the UN system, in particular with FAO, UNEP and WMO.

The working group recommended priority GIS application areas which are closely linked to the priority areas of IHP-V, i.e. global hydrological and geochemical processes, eco-hydrological processes in the surficial environment, ground water resources at risk and strategies for water resources management in emergency and conflicting situations.



*Sub-Project M-3-3a: The use, planning and treatment of water and waste water in urban areas*

An *International Workshop on Integrated Water Resources Management in Urban and Surrounding Areas* was held at Gelsenkirchen, Germany from 30 May to 2 June 1994.

IHP Sub-Project M-3-3a foresees the compilation of a manual on integrated water resources management in urban and surrounding areas. For this purpose a first workshop was held at Essen, Germany in June 1992 which resulted in a draft report written by a team of authors.

A second workshop was organised in Gelsenkirchen under the chairmanship of Prof. Geiger. It was convened by the National Committee of Germany for the IHP of UNESCO and the Operational Hydrology Programme of WMO, and the IHP National Committee of The Netherlands and was sponsored, among others, by UNESCO.

The workshop was attended by 30 participants from 12 countries. The participants presented a large number of case studies in order to enable the selection of those which can be incorporated into the manual. The workshop also discussed the case studies with a view to improving the text part of the manual. It decided on the procedure for finalizing it. The participants considered the workshop as a link within a long procedure for producing the manual rather than as a conference on urban water problems and this explains the absence of proceedings.

The next step will be devoted to further refining the case studies and to the final editing of the text part. It is expected that the manual will be published by UNESCO in the series *Technical Documents in Hydrology* in 1995.

*Project E-3-1: Improvement of the system of postgraduate courses in hydrology and water resources through better topical, geographical and language distribution*

and

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

The Association of Austrian/German/Swiss Universities on Postgraduate Education in Hydrology and Water Resources held its biennial meeting in Lochau, Austria on 28 April 1994. The Association organises annually a postgraduate course in German consisting of 4 semesters at different universities and composed of learning phases at home (long-distance education by correspondence and short classroom phases). The annual output is approximately more than sixty students. The Association maintains close co-operation with universities in the Czech Republic, Hungary and Poland where similar activities have become operational. The 1994 meeting established links with the TEMPUS programme of the European Community.



## REGIONAL AND IHP NATIONAL COMMITTEES

### AFRICA

**Second Workshop on the Use of Geophysical Methods for Groundwater exploration** (Nairobi, Kenya, 15-26 November 1993)

This workshop was held in Nairobi and included field work implemented in Nakuru for the benefit of 10 African specialists representing 8 African countries (Botswana, Eritrea, Kenya, Malawi, Sudan, Rwanda, Tanzania and Zambia).

Its objective was to upgrade the capabilities of African specialists in the use of geophysical methodologies for groundwater exploration, to improve their contribution at national level for solving the problem of groundwater exploration to provide drinking water in rural areas.

After two days of theoretical introduction as a refresher course, the participants took part in the field measurements using geophysical methods and collection of hydrological data. They participated in the interpretation of the data sets collected with the identification of the most successful area for ground water drilling.

The workshop was conducted under the direction of scholars from the Faculty of Science of the University of Dar-es-Salaam.

### ARAB STATES

**Updating of IHP National Committees and Focal Points in the Arab Region**

The composition of the IHP National Committees/Focal Points of the following countries has changed (the relevant pages of the Directory of National Committees for the IHP containing their full composition have been corrected and are being sent to all National Committees):

#### *National Committees:*

- Egypt - chairman: Eng. Ahmed Ali Kamal, private sector;
- Iraq - chairman: Nazar Gomaa, Minister of Irrigation;
- Jordan - chairman: Minister of Water and Irrigation;
- Syria - chairman: Eng. Barakat Hadid, Deputy Minister of Irrigation;
- Tunisia - chairman: M. M. Bacha, General Engineer of Water Resources.

#### *Focal Points:*

- Lebanon - Mr Ali Munthir, Engineering Sciences Unit, National Council of Scientific Research;
- Libyan Arab Jamahiriya - chairman: Eng. Omar Salem, Director-General of Water Resources, Water Resources Authority;
- Qatar - Mr Abdelrahman M. Y. Al-Mahmoud, Department of Agriculture and Water Research.

#### **Co-operation with the Sahara and Sahel Observatory (SSO)**

The "Second SSO Workshop on Aquifers of the Major Sedimentary Basin of the Sahara" was held in Cairo, Egypt, from 3-5 May 1994. It considered the establishment of a framework of concertation for the common management of the shared aquifers North of the Sahara, to combat desertification.

The workshop was attended by 5 Saharian countries in addition to 6 UN and other international organizations involved, including UNESCO and FAO.

The results of a questionnaire on the state of knowledge of the aquifers of the region were reviewed. They showed a discrepancy between the activities of the countries involved in the study, monitoring and management of the aquifers.

In order to strengthen their co-operation and to develop basin consciousness the countries recommended the establishment of a *consultation structure* to co-ordinate the exchange of information, harmonize their data bases, identify their training requirements and possible sources of funding for the updating of the existing models.

#### **First Biennial Conference of the African Division of the International Association for Hydraulic Research (IAHR-AD)**

This conference was held in Khartoum, Sudan from 1-4 February 1994. It was attended by over 300 participants: top officials representing nine Nile countries, Chairmen of IAHR, IWRA and ICID, representatives of UNESCO, WMO, FAO, CIDA and the World Bank. Five renowned keynote speakers from universities in the Netherlands, USA, United Kingdom and India

participated. Seventy papers were presented covering the three main themes of the conference, namely "Applied Hydraulics, Water Resources Management and Hydrology".

The most outstanding areas of priority in the water sector in Africa, as suggested by the participants are:

- Capacity building;
- Water quality protection and environmental impact assessment;
- Holistic approach and sustainable development;
- Importance of ground water;
- Efficient utilization (water saving and population growth management);
- Augmentation of supply through rainfall management (evaporation reduction, rain harvesting);
- Public awareness programmes;
- Support of research in the water sector problem.

The conference was preceded by the Nile 2002 Conference which was attended by almost all the participants of the above conference.

#### **The Nile 2002 Conference (29 January-February 1994)**

This is the second of a series of ten annual conferences to be held in one of each of the ten Nile countries. Two of the most important meetings were the one held between representatives of funding agencies, UN representatives (including UNESCO) and chairmen of scientific NGOs (IAHS, ICID and IWRA) to investigate ways and means of helping the Nile countries, and a second meeting which included the first group as well as heads of the delegations from the nine Nile countries. An agreement was reached on priorities and ways of channelling assistance from funding agencies.

#### **ROSTAS Planned Activities**

##### *Working Group on Groundwater Protection*

This working group will meet in Damascus, Syria, jointly with ACSAD from 16-18 October 1994. It will be composed of three to four renowned experts in the region who will serve as regional nuclei for a wider contribution and dissemination of knowledge on groundwater protection. Their activities will include individual reports, a group meeting and the preparation of a state-of-the-art report on the subject as well as outlining follow-up activities.

##### *Working Group on Rainfall Water Management*

This similar group on a different topic will meet from 15-17 November 1994 in Cairo, Egypt.

##### *The International Post-graduate Training Course on Environmental Hydrology*

This course was held in May-June 1994 in Cairo, Egypt.

##### *Special Session on "Conflict Analysis and Resolution"*

This session will be held during the VIIth Congress of IWRA from 21-25 November 1994 in Cairo, Egypt.

##### *Support to develop indigenous capabilities in the region among priority to Palestinian territories*

Contacts are under way with Mr Riyadh Al-khodary, Head of the Palestinian delegates to peace talks on water resources, for participation in ROSTAS activities.

## **EUROPE**

#### **Danube Co-operation**

##### *Eighth Working Session of the Representatives of the National Committees of the Danubian Countries for the IHP within the Framework of the Third Stage of Co-operation between Danubian Countries in the Field of Hydrology*

This meeting took place in Maly Vozokany, Slovakia and Vienna, Austria, from 11-15 April 1994. It was organised by the IHP National Committees of Slovakia and Austria. Representatives from the IHP-NCs of Austria, Bulgaria, Croatia, the Czech Republic, Hungary, Romania, Slovakia, Slovenia attended the session and Poland sent an observer. UNESCO was represented by the Director of the Division of Water Sciences.

A report on the activities during the second stage of the regional co-operation was presented. It was agreed that most of the ongoing projects were completed or would be completed in the near future. The outcome was considered of great interest and it was decided to publish the results and disseminate them to a wide audience (in specialised journals, at symposia).

The participants agreed to define the third stage of co-operation from 1994 until 1998 and sub-projects or new projects will be proposed for this period.

The following projects have been completed:

- Distribution between suspended matters and bedload in the Danube and its most important tributaries;
- Relationship between temperature and ice in the Danube and its most important tributaries.

The project manager of the project "Long-term Fluctuations and Precipitation in the Danubian River Basin" informed the participants that the final report would be available by the end of 1994.

The following projects have to be elaborated for the third stage (1994-1998):

- Updating the hydrological monograph of the Danube (register of the most important hydraulic engineering constructions in the Danubian river basin; updating the evaluation of the runoff regime; updating the water balance);
- Analysis of the Danubian river bed (geomorphology, geometry, fords regulations);
- Regional analysis of the annual extreme runoff events;
- Bibliography concerning the hydrology of the Danubian river basin.

#### *Co-operation in IHP-V*

The representatives of the IHP-NCs expressed their interest in continuing regional co-operation during the fifth phase of the IHP (1996-2001) (IHP-V). They accepted the proposal to include their contribution in Theme 4 "Strategies for water resources management in emergency and conflict situations". They were of the opinion that a sub-project 4.1 should be created entitled "Development of integrated hydrological information and decision systems for international river basins".

#### *Date and venue of the ninth working session*

The ninth working session is foreseen to be held between March and May 1995. The exact date and venue have not yet been decided upon.

For further information, please write to: *Dr O. Behr, Technische Universitaet Wien, Institut fur Hydraulik, Gewaesserkunde und Wasserwirtschaft, Karlsplatz 13/223, A-1040 Wien.*

## **Croatia**

A meeting of the Croatian National Committee for the IHP was held in Zagreb on 7 June 1994. Mr Oscar Behr, from the Technical University of Vienna, who is the co-ordinator of Danubian countries co-operation with the framework of the IHP, was also present. Since the Croatian National Committee was established in April 1993, numerous activities have been agreed upon to involve the Croatian IHP National Committee in international co-operation. One of these activities is the project "Drought Analysis in the Danube River Basin" which is a joint Croatian-Austrian project, co-ordinated by Mr. Bonacci and Mr Behr. The members of the Committee expressed Croatia's interest in getting involved in other regional hydrological programmes and activities, as one half of its territory belongs to the Danube basin and the other half to the Adriatic Sea basin. The Croatian IHP National Committee therefore invites all interested parties to contact them for proposals of co-operation. Please write to the following address: *Prof. Ognjen Bonacci, Croatian National Committee for the IHP, Faculty of Civil Engineering, Matice hrvatske 15, 58000 Split, Croatia.*

## **LATIN AMERICA AND THE CARIBBEAN**

### **Regional Activities**

#### • *Course on Integrated Basin Development*

This subregional course was held in Guatemala City from 18-21 January 1994 with the participation of 35 specialists from all Central American countries. The course was delivered by Mr Luis Garcia and the programme focused on the concept of sustainable development, management and conservation, economic use of resources and investment projects. The course was co-ordinated by the San Carlos University of Guatemala and its Regional School of Sanitary Engineering and Hydraulic Resources (ERIS) through Mr Pedro Saravia, and sponsored and funded by UNESCO/IHP.

#### • *International Botucatu Aquifer*

The co-ordinator of the working group, Mr Albert Mente, concluded the preparation of the

first draft of the project document. The objective of the project is to study the aquifer's hydrogeological potential. The representatives of the four countries involved in the project (Argentina, Brazil, Paraguay and Uruguay) are now reviewing the project document. The elaboration of the project document was supported by the National Committees of the four participating countries and funded by UNESCO/IHP/LAC.

- **CATHALAC**

The contracting parties signed the contract establishing the Centre for humid tropic waters of Latin America and the Caribbean (CATHALAC) in Panama on behalf of the Board, its chairman, Mr Luis Narvaez, its new director Ms María Concepción Donoso and for UNESCO the Director, ROSTLAC, Mr Martín del Campo. Ms Donoso started her activities on 1 June 1994. Her official address is: *Ms María Concepción Donoso, Directora, Centro del Agua del Trópico Húmedo para América Latina y el Caribe (CATHALAC), P.O. Box 873372, Panama 7, República de Panama.*

## National Activities

### Argentina

- *Seminar on Water Law Facing the Challenges of Agenda 21*

The National Institute of Water Sciences (INCYTH) is organising this seminar in Mendoza from 20 to 30 September 1994 under the co-ordination of the Centre of Water Economy, Legislation and Administration (CELAA) and the auspices of the Argentine National IHP Committee.

### Bolivia

- *Micro-systems for the Rational Use of Small-scale Water Resources in the Department of Chuquisaca*

The first phase of this project started with the objective of studying the technical feasibility of drinking water production for the Department of Chuquisaca; small-scale hydropower generation;

evaluation and control of degradation of solid waste; and improvement of irrigation conditions. The project is being executed by the University of San Francisco Xavier and Profesionales Asociados SRL. UNESCO provides technical and financial support, sharing costs in the project's first phase which should lead to the preparation of a project document for the implementation of infrastructure works.

### Colombia

- *Basic Course on Limnology*

This course will be held in Havana from 15 to 30 September 1994 under the co-auspices of the Cuban IHP National Committee, the Centre for Hydrology and Water Quality and the National Institute of Hydraulic Resources. *Course co-ordinator: Joaquín Gutiérrez Díaz, Vice-Director CENHICA/INRH, Apartado Postal 23, La Habana. Phone: (537)71059. Fax: (537)331976.*

### Uruguay

- *Project on Drinking Water Supply for Rural Schools and Communities in Northeast Uruguay*

This development project is being executed by the National Mining and Geology Directorate (DINAMIGE), CISS (Co-operazione Internazionale Sud-Sud)/Italian NGO and UNESCO. The first evaluation of the project has now been concluded by the Italian counterpart and UNESCO, under the co-ordination of Prof. Valerio Agnesi. Main results:

- 30 deep wells have been drilled
- the DINAMIGE team has been trained in the operation of equipment incorporated by the project;
- new counterparts have joined the project: CODICEN (National Education Council) and the Municipalities of Tacuarembó and Rivera;
- the results of the new drillings will be included in the project document in preparation by UNESCO for the study of the International Botucatu Aquifer (Argentina, Brazil, Paraguay and Uruguay);
- a project extension (1995-1996) is foreseen.

## SOUTH & CENTRAL ASIA

UNESCO will be co-sponsoring an *International Symposium on Snow-related Manifestations* which will be organised by the Snow and Avalanche Study Establishment (SASE) under the Defence Research and Development Organisation of the Ministry of Defence, New Delhi. The symposium will be held in Himachal Pradesh, India, from 26-28 September 1994.

The symposium aims at bringing together scientists, engineers and users on a common platform to take stock of the growth of snow science, delineate the direction in which the research is heading and detail the future course of research.

The themes to be covered are:

- Physics of snow;
- Mechanics of snow;
- Avalanche dynamics;
- Snow drift;
- Avalanche forecasting;
- Artificial triggering of avalanches;
- Avalanche control measures;
- Snow removal;
- Instrumentation.

Local tours and treks into the Himalayas will also be arranged.

For more details please write to: *Lt. Col. S.G. Nair, Headquarters, Snow and Avalanche Study Establishment (SASE), Manali, Kullu Distt. Himachal Pradesh, India. Phone: +91 01901 8223. Fax: +91 01901 2406. Tlx: 03904-210 sase in.*

UNESCO is sponsoring the *23rd International Post-Graduate Diploma and Masters' Course in Hydrology* which is scheduled to commence from July 1994 at the Department of Hydrology, University of Roorkee, U.P. 247677. Admission is restricted due to the scarcity of financial resources.

UNESCO will sponsor the *Hydrology Technical Training Course*, which will be held from October to December 1994 at the Institute of Flood Control and Drainage Research, 5th Floor, Civil Eng. Building, Bangladesh University of Engineering and Technology, Dhaka - 1000, Bangladesh.

A *National Symposium on Development of Water Resources in Mine Areas*, organised by the Natural Resources Development Foundation, and sponsored by the National Institute of Hydrology,

Roorkee and the Council of Scientific and Industrial Research, New Delhi, was held in New Delhi from 1-2 June 1994.

The symposium aimed at assessing the quality of water in different types of mines in India and suggesting ways and means to treat and utilise them for drinking and other purposes.

ROSTSCA made a presentation on "Some Impacts of Mining on Water Resources", based on the results of IHP-III Project 8.2(a) on *Assessment of the impact of trace metals and other contaminants produced by industry and mining in the freshwater hydrosphere.*

"World Environment Day" was celebrated by the Indian Institute of Ecology and Environment, New Delhi on 5 June 1994, in association with the Delhi Pollution Control Committee.

## SOUTH-EAST ASIA

### Activities

From 25 April to 6 May 1994, the *UNESCO/IHP Computer Assisted Training Course on Groundwater Contamination* was held in Bangkok, Thailand, in the framework of IHP-IV Project H-5-1. The course was jointly organised with the Department of Mineral Resources of Thailand, and ESCAP. More than 20 Thai experts working in the field of groundwater contamination were introduced to: types of contaminants and their sources, pollution migration, and modelling of groundwater contamination transport. The course was given by experts from AIT, ESCAP and UNESCO.

\* \* \*

### China

As planned at the 3rd meeting of the National Network for Science and Technology in Hydrology and Water Resources organised in Nanjing from 18-22 May 1993 by the Nanjing Research Institute of Hydrology and Water Resources, Secretariat of the Chinese National Committee for the IHP (CNC/IHP), a meeting of the Sub-network for Central and Southern China and Heads of other networks was held in Nanning, Guangxi, from 12-15 April 1994. This meeting, which was organised by the Hydrology Bureau of the Pearl River Water Commission

together with the Guangxi General Hydrological Service, was attended by 53 delegates including Mr. Xing Yingguang, Secretary of the CNC/IHP and Deputy Chief of the Network.

Mr. Liang Zhixin, Deputy Secretary General of the CNC/IHP presented a report on the IHP and the CNC/IHP calling on them to take an active part in the implementation of present and future IHP projects and to co-operate with neighboring countries such as Vietnam, Laos and Myanmar in the field of hydrological research and operation. Later a letter was written by Mr. Liang Zhixin to Prof. Ngyen Viet Pho introducing the leaders of the Guangxi General Hydrological Service to the Vietnamese side, calling for co-operation.

During the meeting a number of issues were discussed such as: composition of the network, scientific information exchange, publication of the network newsletter, and other future activities with emphasis on how to adapt the network to the development of market economy. The organiser received 13 papers of which 9 were presented orally at the meeting. A visit was arranged to Beihai City, a promising development area in the Beibu Gulf between Vietnam and China.

#### Advances in Water Science

As a contribution to the International Hydrological Programme, the Chinese IHP National Committee endorses the scientific journal **Advances in Water Science**. The June 1994 Issue (Vol. 5, N° 2) contains the following papers:

- Quantitative analysis of chaotic characters for the Yangtze River flow time series, by Wang Wenjun, Ye Min and Chen Xianwei.
- Run and run-length characteristics of stochastic sequences, by Ma Xiufeng.
- Soil erosion formula and its application in sediment yield calculation, by Tang Liqun and Chen Guoxiang.
- Stochastic simulation on scouring and armoring for river bed, by Leng Kui and Wang Mingfu.
- A mathematical model for fluvial erosions and deposits processes of the lower Yellow River, by He Qing and Wan Zhaohu.
- Estimation of large area evapotranspiration by thermal infrared satellite data, by Chen Ming and Pan Zhidi.
- A recursive optimal algorithm for the operation of multireservoir flood control systems, by Du Jinkang and Zhou Guangan.

- Study on application of newly water-saving irrigation control, by Su Chen, Sun Yiyuan and Chen Yong.
- Review on investigation into laws of motion for saline wedges, by Tan Weiyan.
- *In Memoriam* of Bryan Roger Payne, water scientist, founder of the World Isotope Hydrology, by Jiakui Yen and Weizu Gu.

\* \* \*

#### Republic of Korea

The Ministry of Construction of the Republic of Korea has issued a summary report of 94 pages on its IHP activities in 1993. The report contains the following papers:

- Simulation of precipitation series in small watershed, by Kwan Won Kang.
- The prediction of sediment deposit and spatial distribution in Korea reservoirs, by Kwan-Soo Lee.
- Effect of farming practices on water quality, by Ye Hwan Choi.
- Assessment of sediment discharge formulas and development of empirical sediment discharge relation, by Hyseop Woo and Kwonkyu Yu.
- Development of a computer simulation programme for prediction of river-bed variation due to floods, by Jung Eung Park.
- Collection and fundamental analysis of hydrologic data of the representative basins, by Sun Woo Nahm, Sang Jin Ahn and Soon Tak Lee.



## CO-OPERATION WITH NON GOVERNMENTAL ORGANIZATIONS AND ORGANIZATIONS OF THE UNITED NATIONS SYSTEM

### International Association of Hydrological Sciences



IAHS/IHP \* Corner



A well attended IAHS Bureau meeting was held in Karlsruhe on 24 and 25 June 1994. In addition to the Bureau officers, representatives of all IAHS Commissions and Committees took part. UNESCO was represented by the Secretary of the IHP and WMO by Mr Z. Kundzewicz. Mr A. Maximov, Secretary of the Russian IHP National Committee also participated in order to discuss some Russian research proposals. The meeting, hosted by Mr E. Plate at the Karlsruhe University, dealt with a number of important issues.

Besides the usual IAHS press and financial matters, one of the main issues on the agenda was the election of IAHS officers at the General Assembly in Boulder (USA) in 1995. The establishment of a Nomination Panel for the Bureau Nominations Groups for the nine Commissions and Committees was discussed. These bodies are responsible for the preparation of lists of recommended candidates.

The programme of the Boulder Assembly was also discussed. For all the symposia with pre-published proceedings, a satisfactory number of abstracts has been received and for the other scientific events much interest is expected.

The Bureau examined the activities of the various Commissions and Committees. Quite a number of them are related to the fourth phase of the IHP (1990-1995). The Bureau decided to make available small research grants to initiate new, multi-disciplinary projects which will link the work and interests of the IAHS Commissions and Committees, and integrate across hydrological systems. In this respect, the Secretary of the IHP informed the meeting of the status of the fifth phase of the IHP (1996-2000) and stated that it was the right time for the Commissions/Committees to inform the IHP Secretariat of their interest and willingness to

contribute to certain projects. He also mentioned a number of other joint IHP/IAHS activities, for instance the Second Kovacs Colloquium, which will be held at UNESCO in Paris at the end of January 1995.

Another important agenda item dealt with the setting up of three Task Groups: one on scientific programmes, one on administrative matters and one on publications. Mr G. Golubev reported on the Task Force Group on Developing Countries. The main activity of this group is the distribution of IAHS publications, free of charge, to developing countries and other countries in need.

It was decided to ask this group to also consider the implementation of two new initiatives: (1) Fellowships/travel awards to young graduate students and post-doctoral fellows from developing countries so that they may visit and be linked to scientists elsewhere; (2) Fellowships for visiting lecturers at hydrological research centres in developing countries to provide short training courses.

Mr G. Schultz discussed the activities of the IAHS/WMO Working Group on GEWEX (Global Energy and Water Cycle Experiment). Rapporteurs for certain specific topics were nominated at the IAHS Assembly in Yokohama.

Mr Kundzewicz underlined the important liaison between WMO and IAHS. The Association is generally represented at the meetings of the WMO Commission for Hydrology and at the meetings of the Commission for Hydrology Working Groups. He would be pleased to see a further strengthening of this co-operation between WMO and IAHS.

A final issue worth mentioning is the venue of the next IAHS Scientific Assembly. Upon the invitation of the Moroccan Authorities the Assembly will be held in Rabat in 1998, most probably in April/May.

#### 1995 Election of IAHS Officers

An important matter during the IUGG General Assembly in Boulder (USA) in July 1995 will be the election of new officers for the IAHS Bureau and for the IAHS Commissions and Committees.

The establishment of a Nomination Panel (NP) for the election of officers for the Bureau of the Association and Nomination Groups (NGs) for the Commissions/Committees will be finalized in the summer of 1994. The Secretary-General will inform the National Committees (NCs) of IAHS of the composition of the NP and NGs nine months before the election (i.e. by 1 October 1994). The NCs have to submit their nominations for officers to the NP Chairman by 31 December 1994. The current IAHS Bureau and Commission/Committee can also make proposals. Based on the nominations received, the NP and NGs will then prepare a list of recommended candidates, seeking a reasonable geographical and professional distribution. The NCs will consult with the NP Chairman when preparing their lists to achieve an overall balance among the officers of the Commissions/Committees and the Association. The proposed lists of candidates for the elections (with normally more than one nominee for each office) will be distributed by the NP Chairman to all NCs by 31 March 1995. A list of all other proposed candidates should also be submitted. The voting in the Plenary Administrative Session of IAHS in Boulder is by countries, each country having one vote. The NCs of countries which do not intend to vote at the Assembly may do so by mail in advance. The elections this time are of a special nature, since in the years 1995 to 1997 there will be a transition from the present terms of office of the Presidents of the Association and of the Commissions/Committees to the new terms of President-Elect, President and Past-President. Following the decisions taken in Yokohama, the mode of the transition was left for the consideration of the NP and NGs, and the recommended slates should include an explicit plan for transition, which may be different for each of the Bureaus. The officers of IAHS are the ones who determine to a large extent the conduct of the Association. It is therefore crucial that the best possible candidates be elected.

### International Atomic Energy Agency (IAEA)

Possible areas of collaboration between UNESCO and the IAEA Isotope Hydrology Section were discussed in a meeting held in April 1994 at the Agency's Headquarters in Vienna with the Director, Division of Water Resources, UNESCO, and staff of the Isotope Hydrology Section, IAEA.

It was recognized that collaboration between the Isotope Hydrology Section and UNESCO will ensure that the fifth phase of the IHP (1996-2001) can take full advantage of the potential of isotope techniques in water resources development and associated environmental studies.

Four areas of collaboration were envisaged: *one* is on UNESCO training programmes which can incorporate topics on isotope hydrology. The Isotope Hydrology Section will provide the expertise through lectures. A *second* one is on **water resources in the arid zone**, which is a priority programme for both institutions. Isotope techniques have proved to be unique tools for evaluating the recharge of ground water, palaeo-water resources, surface water/ground water relationships, and other issues relevant to the sustainable development of water supply in arid and semi-arid regions.

*Two further* areas of co-operation are **environmental changes** and **soil erosion and sedimentation processes** which are expected to have a great impact on water resources management.

During the meeting, specific topics of collaboration, including the preparation of joint publications and the organization of joint meetings, were discussed.

## NEW PUBLICATIONS

### IHP Publications

□ **Modelling Water Resources and Water Demand in Semi-arid Areas: Data Integration and Analysis Using a Geographic Information System.** *UNESCO-ITC Demonstration Programme - Geo-information for the Sound Management of Natural Resources.* By Gerardo Bocco, Hans de Brouwer and Francis Karanga. English. 62 pp. UNESCO, 1994. Single copies available free of charge from the Division of Water Sciences.

This publication prepared for the International Institute for Aerospace Survey and Earth Sciences (ITC) presents a demonstration programme prepared in the framework of the UNESCO/ITC programme "Geo-information for the Environmentally-sound Management of Natural Resources", based on a case study in the Samburu District of Northwestern Kenya. The objective of the programme is to demonstrate the usefulness of the application of modern technologies, especially GIS (Geographic Information Systems) and remote sensing in the environmentally-sound management of natural resources.

*Keywords:* *Geographic Information System..*

□ **Using Archival Resources for Climate History Research.** By Catherine Dhérent and Gérard Petit-Renaud. English. 72 pp. UNESCO 1994. Single copies available free of charge from the Division of Water Sciences.

The knowledge of the climate in a global perspective depends critically on the amount and reliability of observational and other data available for studies of historical and current climate variability and changes. Regular instrumentation observations of climate and weather parameters on the global scale do not have a long history. It is therefore necessary to complement them by various sources of climate data including, for instance, those to be obtained from tree ring or isotopic analyses.

The documentary sources have already been sporadically utilised. The written sources are sometimes ancient instrumental measurements, and therefore they often represent qualitative information. They offer the possibility, however, of studying climatic fluctuations over a period extending to the past, beyond the hundred years of meteorological observations carried out on the surface of the globe.

A joint study carried out since 1990 by several international organizations (ICA, ICSU, UNESCO, WMO) has led to the implementation of an archive study on the history of climate. This report describes the different phases of this study, the research methods used, and the preliminary results obtained in a delimited area of Europe. The climatological utilisation of the archive data is also described.

*Keywords:* *global change, climatology, proxy data, archives.*

### Technical Documents in Hydrology

□ **Curriculum for Long-term Training of Hydrology Technicians.** *IHP-IV Project E-1-1.* By Theresa Winkler, Canada. 74 pp. UNESCO. 1994. English and French. Single copies available free of charge from the Division of Water Sciences.

This report describes the structure and contents of a training programme for hydrology technicians in Canada. The Canadian model contains both indoor and outdoor training as well as a career development programme which allows monitoring of the training activity. Stress has been given to the linkage between theory, laboratory and field demonstrations and the application of knowledge and skills in practice. The report has been conceived in such a way as to demonstrate its applicability to other countries after adaptation to local conditions.

This long-term training programme completes the report entitled "Model Curriculum for Short-term Training Courses for Senior Hydrology Technicians" by U. Maniak, published in the same series (UNESCO, 1989).

*Keywords :* *technician training, training requirements, field training, classroom training, course logistics, course organization, course schedules.*

### Studies and Reports in Hydrology

□ **Discharge of Selected Rivers of the World (1980-1984), Volume III, Part V..** English/French/Spanish/Russian. 126 pp. © UNESCO 1992.. Single copies available free of charge from the Division of Water Sciences.

This is Part V of Volume III of a publication containing the measurements of the discharge of a number of rivers selected from different parts of the world. Volume I is an introductory volume, giving the list of 1,000 stations originally selected. Volume II establishes a network of approximately 200 stations chosen from those which are most regionally characteristic and have the longest and most valid data series. Volume III consists of periodically published separate parts, giving the data for stations selected from Volume I. The present work presents the measurement of the annual and extreme daily discharge of the selected rivers for the period 1980-1984.

**Keywords:** *global data sets, annual discharge, extreme daily discharge.*

### IHP-Related Publications

□ **Water and Environment - Key to Africa's Development.** International Institute for Infrastructural, Hydraulic and Environment Engineering (IHE), Delft, The Netherlands. IHP Report Series 29. English. 204 pp. © 1994. ISBN/CIP Ref.: 90-73445-07-8. Orders from: *IHE, P.O. Box 3015, 2601, DA, Delft, The Netherlands.*

This publication is the proceedings of the Conference "Water and Environment - Key to Africa's

Development" which was held in Delft from 3-4 June 1993. This conference, which marked the 35th anniversary of IHE, was organised in co-operation with UNESCO, WMO and ICSU. It was attended by 300 participants from Sub-Saharan Africa, Europe and multilateral organizations. The objectives of the conference were:

- to formulate concrete lines of action and proposals to enhance the capacity of African countries to solve the huge environmental and development problems they face;
- to create concrete investment opportunities;
- to improve the capacity of African countries to investigate and analyse their own problems, to define their own development objectives and criteria, to develop possible solutions, and to formulate and implement strategies for improving the living standards of their own peoples.

The conference comprised policy-related and technical contributions, and a series of working group sessions. This publication contains the results of these sessions, entitled "The Delft Agenda", which provides recommendations for capacity building in the areas of water and environment in Sub-Saharan Africa, and the corresponding background paper. The keynote speeches and invited technical papers are included, as well as the list of participants.

**Keywords :** *capacity building, climate, land use, biodiversity, nutrient mining, wetlands, sanitation.*

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## FUTURE MEETINGS

### 2nd IHP/IAHS George Kovacs Colloquium "Subsurface Flow and Transport: The Stochastic Approach" (Paris, 26-28 January 1995)

#### Aim

The hydrologic properties of geologic media are known to be highly non-uniform. This non-uniformity makes the analysis of flow and transport in such media difficult. Since measurements are limited to discrete scales and selected locations, there is uncertainty about material properties on other scales and at other locations. During the last two decades, there has

been a growing recognition that such uncertainty is often amenable to analysis by means of geostatistical and stochastic methods. The corresponding theories and tools have been advanced to a sufficient extent that they can be used to help solve problems of practical relevance. They are proving especially useful in the context of contaminant transport in alluvial, fractured and unsaturated soils and rocks. A growing number of carefully-designed and executed field studies are providing experimental support for the approach. These developments are viewed as sufficiently broad and fundamental to constitute the separate new subdiscipline of Stochastic Subsurface Hydrology. It appears that

the time may be ripe to pause, take stock of what has been accomplished, and assess the needs and prospects for further advances in this area. The Second Kovacs Colloquium is intended to help serve this purpose.

#### Format

The Colloquium will consist of state-of-the-art presentations by leading specialists and extensive free exchange of ideas among them and an actively participating audience. The proceedings will be published in book format.

#### Preliminary Programme

##### Thursday 26 January

- 9.00: Opening - Director-General of UNESCO and President of IAHS
- 9.30-10.30: Opening Lecture - G. Dagan, Stochastic Modeling of Flow and Transport: The Broad Perspective

##### *Session 1: Subsurface Characterization and Parameter Estimation*

- 10.30-11.30: M.P. Anderson, Geological Characterization of Heterogeneity
- 11.30-12.30: J. Samper, Application of Geostatistics in Hydrology
- 12.30-13.30 J. Carrera, Inversion of Random Fields : Applications and Experiences in Hydrogeology

##### *Session 2: Flow Modeling and Aquifer Management*

- 15.00-16.00: P. Kitanidis, Groundwater Flow in Heterogeneous Formations
- 16.00-17.00: R.E. Ewing, Aspects of Numerical Methods for Multiphase Flows
- 17.00-18.00: S. Gorelick, Incorporating Uncertainty into Aquifers Management Models

##### Friday 27 January

##### *Session 3: Transport in Heterogeneous Aquifers*

- 9.30-10.30: Y. Rubin, Convective Transport in Heterogeneous Porous Media: An Overview
- 10.30-11.30: V. Cvetkovic, Transport of Reactive Solutes
- 11.30-12.30: J. Cushman, Nonlocal Transport: Theory and Supportive Evidence
- 12.30-13.30: L.W. Gelhar, Perspectives on Field-Scale Applications of Stochastic Subsurface Hydrology

##### *Session 4: Fractured Rocks and Unsaturated Soils*

- 15.00-16.00: J.C.S. Long, Flow and Transport in Fractured Rocks
- 16.00-17.00: D. Russo, Stochastic Analysis of Solute Transport in Partially Saturated Heterogeneous Soils
- 17.00-18.00: J. Parker, Field Scale Modeling of Multiphase Flow and Transport

##### Saturday 28 January

- 9.30-10.30: Closing Lecture - S. Neuman, A View to the Future
- 10.30-13.30: Open Discussion on Future Developments
- 13.30: A. Szollosi-Nagy - closing the Colloquium.

**REGISTRATION FORM**

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Second IHP/IAHS George Kovacs Colloquium  
on "Subsurface Flow and Transport:  
The Stochastic Approach"  
(UNESCO Headquarters, Paris  
26-28 January 1995)

*Please use capital letters*

Family name

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First name

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Title

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Organization

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Address

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Phone N°

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E-Mail

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Fax N°

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*Please make a cross in the appropriate box*

I intend to participate in the Colloquium

My participation is still uncertain but I wish  
to receive further information

Date

Signature

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**Note: No registration fee is required**

*Please return this form to*  
UNESCO - Division of Water Sciences  
1, rue Miollis, 75732 PARIS Cedex 15, France  
Phone: +33 1 45 68 40 02 / Fax: +33 1 45 67 58 69  
E-Mail: schy5@frunes21

**METEOHYTEC 21**  
**(Geneva, Switzerland,**  
**22-26 May 1995)**

The World Meteorological Organization (WMO), in collaboration with other intergovernmental organizations and the private sector, will convene the conference on Meteorological and Hydrological Technology and its Management METEOHYTEC 21 in Geneva from 22-26 May 1995. The conference is intended to provide a platform for high-level decision-makers from Ministries, Meteorological and Hydrological Services, Academia and Industry to address new technologies and systems management issues. Experts with senior level experience in the design, acquisition, implementation and management of new technologies will be the primary speakers.

The conference themes will be:

- Modern meteorological, hydrological and environmental technology;
- Management and utilisation of modern technology with modest resources;
- Training in the use of modern technology;
- Satellite operations and satellite technology;
- Data management - requirements, specifications, evolution;
- Applications of high-tech systems for training;
- Systems management and organization of a high-tech environment;
- Impact of applications of high-tech systems on National Meteorological and Hydrological Services;
- Outlook for future high-tech systems.

A special exhibition will complement the conference through the display of systems and technological solutions that relate to the conference themes.

Experts wishing to present papers should submit an abstract of 500 words or less in English to the WMO Secretariat by **1 October 1994**. The International Programme Committee will select papers from among the submitted abstracts for presentation. Authors of the selected abstracts will be expected to submit their final paper to the WMO Secretariat by **15 January 1995**. Presentations at the conference may be given in English, French, Spanish or Russian. Simultaneous interpretation will be provided for these four languages. Conference proceedings will be published by WMO which will contain the papers in their original languages and abstracts in English.

For further information on specific requirements for the papers to be presented, please contact *the WMO, World Weather Watch, Case postale 2300, CH-1211 Geneva, Switzerland. Phone +41 22 730 8244. Fax: +41 22 734 2336. Tlx: 41 41 99 OMM CH.*

**International Conference on**  
**Long-term Changes of**  
**Large Water Bodies**  
**(Visby, Gotland, Sweden**  
**22-25 August 1995)**

This conference is convened by the Swedish IHP committee of the Natural Science Research Council, the Department of Water and Environmental Studies, Linköping University, Sweden and the Swedish Meteorological and Hydrological Institute, Norrköping, Sweden. It is organised in co-operation with UNESCO and the International Association on Water Quality (IAWQ).

*Objectives*

The conference has been arranged to promote a better understanding of the causes for the large-scale and long-term changes observed in most of our large water bodies and of the possible impacts of reinitiation. It will bring together environmental scientists working with processes in the water bodies and on their catchments. Focus is on the temperate region including water bodies such as the Great Lakes, Lake Balaton, the Baltic Sea, the Aral Sea and the Bajkal Sea, just to mention a few, and on hydrological changes, and changes of water quality, particularly nutrients and organic micropollutants.

*Suggested topics*

1. Observed hydrological changes
  - Human impact and natural variability of water partitioning in the drainage area
  - Human impact and natural variability of water circulation and exchange in the water bodies
  - Assessment of methods used for detection of changes in time series
2. Observed water-quality changes
  - Human impact and natural variability of concentrations in the drainage area

- Human impact and natural variability of concentrations in water bodies
  - Use of environmental archives for estimating past loads
  - Assessment of methods used for detection of changes in time series
3. Links between water quality and spatial distribution of sources of pollutants
    - The importance of atmospheric deposition
    - Impact of land use and point sources
    - Influence of physiographic factors and water pathways
  4. Long-term retention of elements
    - Transit times of different elements in the terrestrial environment
    - The importance of coastal zones for transformation of elements
    - Processes determining the long-term retention of elements in sediments
  5. Prediction of future changes
    - Use of water partitioning models for quantification of possible future changes
    - Use of water quality models for quantification of possible future changes
    - Evaluation of performed remediation programmes
    - Assessment of possible impacts of proposed remediation programmes.

### Sessions

The conference programme will comprise plenary sessions for oral presentation, and specific times reserved for poster sessions. Poster papers will be given equal prominence, and ample time will be allowed for the presentation of these. The official language of the conference will be English.

### Submission of abstracts and papers

Papers within the themes described are welcome. Authors must submit an abstract of no more than 300 words by **1 July 1994**. Completed manuscripts must be submitted by **1 December 1994**. The manuscripts will be peer reviewed before acceptance for publication.

All accepted papers will be included in an issue of the IAWQ publication *Water Science and Technology*. This issue will be included in the registration fee.

### Conference location

The conference is located in the mediaval town of Visby on the Swedish island Gotland in the middle of the Baltic Sea.

### Registration fees

The registration fee includes admission to all sessions and poster presentation, the final programme, proceedings, a reception and refreshments during breaks:

- before 1 April 1995: full-paying part: US\$400/students:\$175
- after 1 April 1995: full-paying part: \$450/students: \$200.

Some travel grants may be made available upon request.

### Secretariat

For further information please write to: *IHP/IAWQ Int. Conference Secretariat, Dept of Water and Environmental Studies, Linköping University, S-581 83 Linköping, Sweden. Phone: +46 13 28 22 86. Fax: +46 13 13 36 30.*



## IHP CALENDAR

IHP PROJECT	TITLE	CONVENER/PLACE/DATE
--	21st Session of the Bureau of the IHP Intergovernmental Council	UNESCO Paris, France 14-16 April 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 integrated water resources management in urban and surrounding areas	German IHP/OHP-NC/UNESCO Gelsenkirchen, Germany 30 May-3 June 1994
H-5-1	Workshop "Pacific water sector - planning, research and training"	UNESCO/UNDDSM/SOPAC Solomon Islands 1-8 June 1994
H-3	International conference on future groundwater resources at risk	Finland/IAHS/IAH/ UNESCO Helsinki, Finland 13-16 June 1994
M-4-3	Symposium on water resources planning in a changing world	UNESCO/German IHP/OHP-NC Karlsruhe, Germany 28-30 June 1994
M-3-5	Modelling, testing and monitoring for hydro powerplants	Int'l Journal Hydropower & Dams/UNESCO/IAHR Budapest, Hungary 11-13 July 1994
--	UNESCO/World Bank/WMO Workshop on Sub-Saharan African Hydrology	UNESCO/World Bank/WMO Paris, France 26-27 July 1994
M-3-2	First symposium on Habitat Hydraulics	IAHR/SINTEF/NTH Trondheim, Norway 18-20 August 1994

--	Northern Research Basins tenth international symposium and workshop	Norway/UNESCO Spitsbergen, Norway 28 August-3 September 1994
E-3-1	Workshop on post-graduate education in hydrology	Czech IHP-NC/ UNESCO/WMO/IAHS Prague, Czech Republic 29 August-2 September 1994
--	XVIIth Conference of the Danube countries	Hungarian IHP-NC/ UNESCO/WMO Budapest, Hungary 5-9 September 1994
--	International colloquium "The Biobio coastal basin"	EULA/Chile/Italy/ UNESCO Paris, France 12-14 September 1994
H-5-5 H-5-6	International conference on development in hydrology of mountainous areas	Slovak IHP-NC/UNESCO High Tatras, Slovakia 12-16 September 1994
--	The European conference and exhibition on "Remote sensing and GIS in urban waters" UDT'94	IAHR/WMO/ITWH/ ADS/TECHWARE Moscow/Volga River, Russia 12-16 September 1994
H-3-2--	International symposium on assessing and managing health risks from drinking water contamination: Approaches and applications	IAHS/ISS Rome, Italy 13-17 September 1994
-- --	Symposium on glacier mass balances: measurements and reconstructions	ICS/IAHS/UNESCO Innsbruck, Austria 14-16 September 1994
--	First international conference on HYDROINFORMATICS	IHE/UNESCO/IAHR Delft, Netherlands 19-23 September 1994
H-4-2 H-5-6	International symposium on snow-related manifestations	SASE (India) Manali, India 26-28 September 1994

H-5-2	International symposium on flash floods in arid and semi-arid zones	China IHP-NC/UNESCO Xi'an, China 26-29 September 1994
--	International workshop on development and use of water resources and environmental protection in karst areas	China Guilin, China 4-19 October 1994
H-5-1 H-5-5	Humid Tropics Programme and FRIENDS for West Africa	UNESCO/ORSTOM Abidjan, Cote d'Ivoire 24-28 October 1994
H-5-2	IAH XXVth Congress: Management to sustain shallow groundwater systems	IAH Adelaide, Australia 21-25 November 1994
H-5-4	Second symposium on regionalization in hydrology	German IHP/OHP-NC Germany 1995
--	Second IAHS/IHP George Kovacs colloquium "Stochastic subsurface hydrology"	IAHS/UNESCO Paris, France 26-28 January 1995
--	Eleventh Session of the Intergovernmental Council of the IHP	UNESCO Paris, France 30 Jan-4 Feb 1995
H-3-1	International conference on groundwater quality remediation and protection (GQ 95)	IAHS/Czech Rep. Prague, Czech Rep. 15-18 May 1995
M-4-1 M-4-2	International symposium on environment and socio-economic consequences of water resources development and management	Russian IHP-NC/CASPY/UNESCO Moscow, Russia 15-20 May 1995
M-	IAH XXVIth Congress: Managing the effects of man's activities on groundwater	IAH Edmonton, Canada 4-10 June 1995
--	XXI General Assembly of IUGG with IAHS symposia & workshops	IUGG/IAHS Boulder, Colorado (USA) July 1995

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H-3-1	International conference on long-term changes of large water bodies	Swedish National Science Research Council Linköping, Sweden 22-25 August 1995
H-5-2	Fifth international symposium on karst water and environmental impacts	UKAM (Turkey)/IAH/ IAHS/UNDP/UNEP/UNESCO Antalya, Turkey 10-20 September 1995
M-4-3	International conference on statistical and Bayesian methods in hydrological sciences	UNESCO/WMO/IAHS Paris, France 11-13 September 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 25-30 September 1995
M-3-3	International symposium on integrated water management in urban areas	Swedish IHP-NC/UNESCO Univ. of Lund Lund, Sweden 26-30 September 1995
M-3-5c	Fifth international symposium on land subsidence	IAHS/UNESCO The Hague, Netherlands 16-20 October 1995
M-1-4	International symposium on runoff computation for water projects	UNESCO/Russian IHP-NC St. Petersburg, Russia 30 October-3 November 1995
H-2-2	International workshop on water-related problems in low-lying coastal areas (HYDROCOAST '95)	Dutch/German IHP/OHP-NCs/ UNESCO/WMO/ESCAP/IAHS/ IAHR/AIT (South-East Asia) 12-17 November 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
ADELAIDE (Australia)	Master programme in hydrology and water resources	1 year	annually begins in February	E	Inquire	Program Administrator Joint Universities' Masters Program in Hydrology and Water Resources School of Earth Sciences Flinders University of Sth Australia GPO Box 2100 ADELAIDE, South Australia 5001
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 (Brussels / Leuven)	Water resources engineering	2 years	annually, begins mid- September	E	As soon as possible	Interuniversity Programme in Water Resources Engineering Prof. A. Van der Beken Vrije Universiteit Brussel Laboratory of Hydrology Pleinlaan, 2 B-1050 BRUSSELS or Institute for Land and Water Management Katholieke Universiteit Leuven Vital Decosterstraat 102 3000 LEUVEN

*\*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)	several courses per year in diff. countries. Inquire.	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 Department of Engineering Hydrology University College Galway GALWAY
GRAZ (Austria)	Groundwater tracing techniques	5 weeks	1995, 1997, 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; begins end September	S	Inquire	Ing. Arturo Pazos S., Director Escuela Regional de Ingeniería Sanitaria y Recursos Hidráulicos Facultad de Ingeniería Ciudad Universitaria, Zona 12 GUATEMALA CITY

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KENSINGTON (Australia)	Hydrology, covering principles, practice and applications of surface and ground water hydrology	3 months	annually, 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	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 Direcção-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 Dept. 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)	1995: Scientific and engineering limnology	2 months	annually, begins mid-June	E R	28 Febr.	International Higher Hydrological Course Geography Department Moscow State University Lenin Hills MOSCOW 119899

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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 announcements	E	Inquire	International Activities Office East China Technical University of Water Resources 1, Xikang Road NANJING 210024
NEWCASTLE- UPON-TYNE (United Kingdom)	(a) Hydrology (b) Water resources	1 year	annually, begins in October	E	31 May	The Registrar Department of Civil Engineering University of Newcastle-upon-Tyne NEWCASTLE-UPON-TYNE
OUAGA- DOUGOU (Burkina Faso)	- Sanitary engineer- ing - Agricultural hydraulics - Water resources mobilization - Energetics & indus- trial refrigeration engineering - Informatics applied to water sciences	10 mois - - - -	annual, begins in October	F	1 March - - -	M. le Directeur de l'Ecole Inter-Etats d'Ingénieurs de l'Equipement rural 03 B.P. 7023 OUAGADOUGOU 03
PADOVA (Italy)	Hydrology	6 months	Inquire	E	Inquire	Centro Internazionale di Idrologia "Dino Tonini" Via Sette Chiese 35043 MONSELICE
PRAGUE (Czech Republic)	Hydrological data for water resource planning	6 months	1996, 1998, 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

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## Acronyms

<b>AIT</b>	Asian Institute of Technology
<b>CATHALAC</b>	Centre for Humid Tropic Waters of Latin America and the Caribbean
<b>CIDA</b>	Canadian International Development Agency
<b>ESCAP</b>	Economic and Social Commission for Asia and the Pacific
<b>FAO</b>	Food and Agriculture Organization
<b>GEWEX</b>	Global Energy and Water Cycle Experiment
<b>GIS</b>	Geographic Information System
<b>IAEA</b>	International Atomic Energy Agency
<b>IAH</b>	International Association of Hydrogeologists
<b>IAHR</b>	International Association for Hydraulic Research
<b>IAHS</b>	International Association of Hydrological Sciences
<b>IAWQ</b>	International Association on Water Quality
<b>ICCORES</b>	International Coordinating Committee on Reservoir Sedimentation
<b>ICID</b>	International Commission on Irrigation and Drainage
<b>ICOLD</b>	International Commission on Large Dams
<b>ICSU</b>	International Council of Scientific Unions
<b>IHD</b>	International Hydrological Decade
<b>IHE</b>	International Institute for Hydraulic and Environmental Engineering (Delft)
<b>IHP</b>	International Hydrological Programme
<b>IHP-NC</b>	National Committee for the IHP
<b>IRTCES</b>	International Research and Training Center on Erosion and Sedimentation
<b>IUGG</b>	International Union of Geodesy and Geophysics
<b>IWRA</b>	International Water Resources Association
<b>LACHYCOS</b>	Latin American and Caribbean Hydrological Cycle and Water Resources Activities Observation and Information System
<b>NGO</b>	Non-Governmental Organization
<b>ORSTOM</b>	French Institute of Scientific Research for Development in Co-operation
<b>ROST</b>	Regional Office for Science and Technology
<b>ROSTA</b>	ROST for Africa
<b>ROSTAS</b>	ROST for the Arab States
<b>ROSTLAC</b>	ROST for Latin America and the Caribbean
<b>ROSTSEA</b>	ROST for South-East Asia
<b>ROSTSCA</b>	ROST for South and Central Asia
<b>SADC</b>	Southern Africa Development Cooperation
<b>SOPAC</b>	South Pacific Applied Geoscience Commission
<b>SSO</b>	Sahara and Sahel Observatory
<b>UN</b>	United Nations
<b>UN/DDSMS</b>	UN Department of Development Support and Management Services (ex. UNDTCD)
<b>UNDP</b>	United Nations Development Programme
<b>UNESCO</b>	United Nations Educational, Scientific and Cultural Organization
<b>UNEP</b>	United Nations Environment Programme
<b>WMO</b>	World Meteorological Organization

THE HISTORY OF THE

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**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**

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

IHP support for the Scientific Conference and First Open Meeting on the IGBP-Core Project "Biospheric Aspects of the Hydrological Cycle" (BAHC), 16-18 November 1992, Toulouse, France and UNESCO IHP-IGBP (BAHC) Working Group meeting, 19 November 1992, Toulouse, France. An IHP proposal for up-grading the existing IHP State-of-the Art Report into a volume of the new Cambridge University Press-UNESCO series was considered and accepted by the Working Group.

UNESCO IHP was a co-sponsor of IAHS Symposia "Exchange Processes at the Land Surface for a Range of Space and Time Scales", at the joint Scientific Assembly of IAMAP and IAHS, Yokohama, Japan, 11-23 July 1993.

IGBP(BAHC)-IHP Working Group meeting, Yokohama, Japan, 15 July 1993. The principal point of discussion was the up-grading of the State-of-the-Art Report to a Cambridge University Press-UNESCO series volume.

UNESCO IHP was a co-sponsor to the initial planning meeting of the joint WCP/IGBP Working Group on the large-scale land surface experiment (known as LAMBADA, Large Scale Atmospheric Moisture Balance of Amazonia using Data Assimilation) for the Amazon basin, held in Sao Jose dos Campos, Brazil, 8-11 September 1993. IHP supported five scientists to the meeting, some of whom spoke to a pre-prepared document by IGBP (BAHC)-UNESCO IHP, entitled "Hydrological Investigations in the Framework of a Large-Scale Biosphere-Atmosphere Field Experiment in the Amazon Basin - A Contribution to the Preliminary Science Plan of the LAMBADA/BATERISTA Field Campaign", which was well received and the principal elements were suggested for inclusion in the revised version of the science plan.

Co-sponsor for IGBP (BAHC)/UNEP Workshop on Climate-Hydrology-Ecology Interrelations in Mountain Areas, 2-5 December 1993, St. Moritz, Switzerland.

**Activities foreseen until the end of 1995**

- Second planning meeting of the joint WCP/IGBP Working Group on LAMBADA scheduled for Brazil in October 1994.
- A joint IGBP (BAHC)/LOICZ-UNESCO workshop on "Delivery of terrestrial material to freshwater and coastal ecosystems", University of New Hampshire, USA, 3-5 October 1994.
- Two meetings on 30 June 1994 (Paris, HQ) and 6-7 October 1994 to develop a joint UNESCO-IGBP (BAHC)-IAHS book proposal based on project H-1-1 for the Cambridge University Press-UNESCO series. A third meeting is planned to coincide with IAHS (Boulder, USA) Symposium, July 1995.

**PROJECT H-1-2:**  
**Study of erosion, river bed deformation and sediment transport in river basins as related to natural and man-made changes**

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

UNESCO sponsored the 5th International Symposium on River Sedimentation, held in Karlsruhe, Germany (6-10 April 1992) and organized a special workshop on sediment quality on the theme: "Activation of chemical processes in contaminated sediments due to re-suspension of the river bed". The proceedings were published and distributed to the IHP/NC's. During the Symposium two Working Group meetings were held:

- Working Group meeting on project H-1-2

The composition of the Working Group was extended to 2 new members - the Working Group reviewed its activities and planned to meet again during the Symposium of St. Petersburg (May 1994) organized in the framework of project H-1-2, to coordinate the contributions and finalize the technical document.

- UNESCO also participated in another meeting aimed at the launching of a mega project on reservoir sedimentation, in the framework of project H-1-2. This initiative of IAHR led to the establishment in 1993 of the International Coordination Committee on Reservoir Sedimentation (ICCORES), with the contribution of five Non-Governmental Organizations (IAHR, IAHS, IRTCES, ICOLD, IAWQ). ICCORES will hold a workshop during the H-1-2 Symposium in St. Petersburg to launch a project in connection with IHP.

In February 1994, Professor B. Snishchenko, organizer of the above symposium, visited the Division of Water Sciences to discuss the preparation of the meeting. The second circular was prepared, printed and distributed, and agreements made with regard to the schedule, presentation of papers and publication of the proceedings. It was also agreed to have, in parallel with the symposium, two other meetings - one for the H-1-2 Working Group, and the other for the ICCORES Workshop.

**Activities foreseen until the end of 1995**

- Organization with the State Hydrological Institute, St. Petersburg and the Russian IHP/NC of the International Symposium on "East-West, North-South Encounter on the State-of-the-art in River Engineering Methods and Design Philosophies" to be held in St. Petersburg from 16 to 20 May 1994.
- During this symposium, a meeting of project H-1-2 Working Group will be held to review the contributions made and coordinate the technical document which constitutes the main output of project H-1-2. This document will be published by UNESCO in 1995.
- UNESCO will also attend the ICCORES Workshop on reservoir sedimentation to consider the cooperation with ICCORES in the implementation of a project on this topic in the framework of IHP-IV.

**PROJECT H-2-1:**  
**Study of the relationship between climate change (and climate variability)  
 and hydrological regimes affecting water balance components**

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

Presentation of Draft Report entitled "The Impact of Climate Variations on Water Management Systems and Related Socio-Economic Systems" by Arie S. Issar with the collaboration of Zhang Peiyuan, H. Bruins, M. Wolf and Z. Ofer. A revised document has been requested prior to publication in the Technical Documents in Hydrology series.

Meeting at HQ, March 1993, of the Working Group connected with the preparation of a Technical Document for publication in the Studies and Reports in Hydrology series, and the initial planning of the hydrological component of the International Symposium on Anthropogenic Climate Change, Hydrology and Water Resources at the State Hydrological Institute, St. Petersburg, Russia, 1995.

The Historical Archives Climate Project is designed as a joint project of WMO, UNESCO, ICSU and ICA (International Council of Archives), with the objective of expanding man's current knowledge of the past climates of the world. The test phase was completed by gathering information from the archives of selected European countries and subsequently has been provided to the meteorological evaluators.

**Activities foreseen until the end of 1995**

- Working Group meeting, 11/12 April 1994, to plan the International Symposium on Anthropogenic Climate Change, Hydrology and Water Resources, 1995.
- Publication of the document by A. Issar et al.
- Completion of the Technical Document prepared by Project H-2-1 Working Group as a contribution towards Studies and Reports in Hydrology series (including the incorporation of outputs from the St. Petersburg Symposium).
- Working Group meetings in 1995 for the planning and financial contribution towards the hydrology component of the St. Petersburg Symposium, October 1995.
- Outputs from the St. Petersburg Symposium will also be used in the proposed Cambridge University Press-UNESCO book entitled, "World Water Resources for the 21st Century" (Shiklomanov et al).
- The Historical Archives Climate Project, designed as a joint UNESCO/WMO/ICA project, will be continued in Latin America and the Caribbean. The monograph on the European Test Phase will be published by the IHP in 1994 in its "Technical Documents in Hydrology" series.

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

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

Workshop 2 "Sea-level changes and their consequences for hydrology and water management, SEACHANGE '93" was held in Noordwijkerhout, the Netherlands, 19-23 April 1993. Two reports were published by the Dutch IHP National Committee containing scientific case studies, results of research as well as a state-of-the-art. This IHP project is being executed jointly by the IHP National Committees of Germany and Netherlands, in co-operation with UNESCO and IAHS. The two countries largely finance the project.

**Activities foreseen until the end of 1995**

- Preparation of a third workshop to be held in Thailand, in 1995.
- Elaboration in 1995/96 of a synthesis report on the basis of the findings of the three above workshops.

**PROJECT H-2-3:  
Extraordinary rainfall and snowmelt floods in rivers of the world**

**Activities performed since the 10th session of the IHP Council (until 31 March 1994)**

Because of lack of funds, there has been no activities performed.

**PROJECT H-3-1:  
Prediction of hydrological, chemical and micro-biological processes of  
contaminant transport and transformation through the hydrological cycle**

**Activities performed since the 10th session of the IHP Council (until 31 March 1994)**

Merged with H-3-2

**PROJECT H-3-2:  
Hydrological, chemical and micro-biological processes of contaminant  
transport in river, reservoir and lake systems**

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

Symposium on hydrological, chemical and micro-biological processes of contaminant transport in river, reservoir and lake systems. The symposium was organized by the Russian IHP National Committee and co-organized by UNESCO, WHO, WMO and IAHS in Rostov-on-Don, 24-28 May 1993. The proceedings have been published by the IAHS.

Publication of a state-of-the-art report, "Hydrological, chemical and biological processes of contaminant transformation and transport in river and lake systems" by G. Jolankai as a Technical Document in Hydrology series.

**Activities foreseen until the end of 1995**

- Holding of a symposium on particulate matter in estuaries, Hamburg/ Germany, 21-25 March 1994;
- Holding of a symposium on time scales of human loading and quality response of large water bodies, Sweden, 1995;
- Workshop on lake sediment core analyses, Paris, France, 1995.

**PROJECT H-4-1:**  
**The effect of large-scale snow and ice covers on global and regional precipitation systems**

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

- Continuation of the compilation of a world atlas of snow and ice resources under the leadership of the Russian IHP/NC.
- Presentation of a draft report on "Past and present variations of snow covers on the earth in global and regional scales" based on a IAHS/ICSI contract. ICSI is currently editing the document for publication in the Technical Documents in Hydrology series.
- Completion of "Fluctuation of Glaciers 1985-1990 Vol. VI", a joint publication of IAHS (ICSI)-UNEP-UNESCO IHP.
- ICSI Bureau meeting, Paris, France, 24/25 September 1992.
- ICSI Bureau meeting, Yokohama, Japan, 16/17 July 1993.

**Activities foreseen until the end of 1995**

- Continuation of the compilation of a world atlas of snow and ice resources under the leadership of the Russian IHP/NC.
- Preparation and Publication of Glacier Mass Balance No. 3
- Preparation of publication in the Studies and Reports in Hydrology series based on the 1-2 December 1994 World Glacier Monitoring Workshop entitled, "Into the 21st Century of World Glacier Monitoring: Prospects and Strategies for Global Warming and Climate Change Detection", to be held at the Swiss Federal Institute of Technology, Section of Glaciology, VAW/ETHZ, Zurich, Switzerland.
- Co-sponsor of 100 Year ICSI Anniversary Symposium on Glaciology, Past, Present and Future, Zurich (Switzerland) and Innsbruck (Austria), 6-8 September 1994. IHP will co-sponsor the symposium publication as a special issue of *Zeitschrift für Gletscherkunde und Glazialgeologie*.
- ICSI-UNESCO IHP Working Group on Glacier Mass Balance Measurements, 9 September 1994.
- IAHS Snow and Ice Symposia, Boulder, USA, July 1995.

**PROJECT H-4-2:**  
**Snow and ice hydrology in specific areas and regions with special attention to long-term variations in water storage**

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

Support for IAHS/ICSI International Symposium on Snow and Glacier Hydrology, Kathmandu, Nepal, 16-21 November 1992.

An IAHS workshop convened by the Japanese IHP/NC held at the joint IAHS/IAMAP Symposium, Yokohama, July 1993 entitled, "Role of Snow and Ice in the Water Cycle of High Mountains".

**Activities foreseen until the end of 1995**

Activities for H-4-2 will be combined with H-4-1 at the IAHS Snow and Ice Symposia, Boulder, USA in July 1995.

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

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

The formal agreement for the establishment of the Panama Center (known as CATHALAC, Centro del Agua del Tropic Humedo para America Latina y el Caribe) between the Government of Panama and UNESCO was signed in November 1992 and renewed for a further 2 years commencing 1 January 1994. The Government of Panama, in January 1994, contributed \$158,073 towards the establishment of the Center supplemented by \$20,000 from the USA IHP/NC for a CATHALAC data base project. The Director, Dr. Maria C. Donoso will be appointed on 1 June 1994. Following her appointment, amongst the first priorities will be the preparation of Draft Programme and Budget for the first session of the Governing Board, scheduled for late May 1994. Future priorities include: Water Management of Small Islands, Water Quality Control, Urban Hydrology, Workshop on Karst Hydrology, Training activities for managers and policy makers. A Dutch Associate Expert (J. Wasser) has played a critical role in maintaining the establishment process of the Center in the absence of the Director. His appointment is scheduled to expire and a replacement from the Netherlands has been requested. Despite an allocation of UNESCO funds from the 26 C/5 General Conference, the proposed regional center in Malaysia has not materialised. ROSTSEA is continuing to act as the regional center until an alternative venue is found.

The formal agreement between UNESCO and IGBP (BAHC) is active in the Latin American region in connection with planning of the Large-Scale Field Experiment for the Amazon basin (see Project H-1-1). The Humid Tropics programme is contributing towards the development of ideas for a surface water hydrology component following more traditional catchment hydrology methods. In addition, the LACHYCOS ( Latin American and Caribbean Hydrological Cycle and Water Resources Activities Observation and Information System) initiative through ROSTLAC is also being consulted in this process. The Panama Center will also assist in LACHYCOS.

The first technical volume of the new Cambridge University Press-UNESCO International Hydrology Series entitled, "Hydrology and Water Management in the Humid Tropics - Hydrological Research Issues and Strategies for Water Management" by M. Bonell, MM. Hufschmidt and J.S. Gladwell (Eds.) was published.

L.A. Bruijnzeel's monograph, "Hydrology of Moist Tropical Forests and Effects of Conversion: A State of Knowledge Review", published in 1990 went into a second reprint with the support of the Netherlands IHP/NC because of heavy demand. Further issues of the Popularised series have been released on the topics: Small Tropical Islands; Water and Health; Tropical Cities: Managing Their Water; Integrated Water Resources Management (with the support of the USA IHP/NC); and Women in the Humid Tropics. It is also expected that there will be a heavy demand on the latter issue, and initiatives for its translation into French and Spanish have already been taken.

An inaugural meeting to develop a strategy for the African region of the IHP Humid Tropics was held in Paris, 15-18 December 1992.

UNESCO was a co-sponsor to an International Symposium at San Juan, Puerto Rico, 31 May-5 June 1993, connected with the Tropical Montane Cloud Forests. A State-of-the-Art report entitled, "Tropical Montane Cloud Forests", Editors: L.S. Hamilton, J.O. Juvik and F. Scatena was co-sponsored by IHP in collaboration with the East-West Center, Program on Environment, Honolulu and the International Institute of Tropical Forestry.

UNESCO was a co-sponsor to the IAHS Symposia entitled, "Hydrology of Warm Humid Regions" held at the joint IAHS/IAMAP Symposium, Yokohama in July 1993, of which J.S. Gladwell was a Convenor. IHP was also invited to the first planning meeting on Long Term Ecological Research Monitoring Sites



hosted by the newly established Center for International Forestry Research (CIFOR), Bogor in November 1993.

#### Activities foreseen until the end of 1995

1. Since the last Council meeting there has also been some shift in emphasis towards this IHP project encouraging greater involvement in applied research/training connected with land and water management issues in the field.
2. A joint regional Workshop with UNDDSMS for the South Pacific Islands entitled, "Strategies for Developing Pacific Water Resources Research and Training". The Workshop will be held in the Solomon Islands, 1-4 June 1994 and the objective is to initiate applied research/training activities. Also the development of an extra-budgetary proposal will be a mandate of the workshop. External support for this meeting has already been received from France and Australia, with an additional contribution from New Zealand being likely. There has been excellent co-operation between HQ and the Apia Office in the preparatory work for this Workshop. The acquisition and assistance received from a French Associate Expert at HQ has also been crucial in these preparations.
3. A combined regional meeting with project H-5-5 (FRIENDS) for the West African region is scheduled to be held in Abidjan, 24-29 October 1994 at ORSTOM. UNEP will jointly fund this activity. The objective will be to decide on the future of a regional programme of coordinated research. In preparation for the meeting, a Consultant (Dr. J. Balek) is being hired, using H-5-1 funds decentralised to the Nairobi office, to visit institutions in the West African region and prepare a report of proposals for consideration.
4. As part of the policy in encouraging greater involvement in applied research/training in field land and water management issues, a joint IHP/MAB field project will commence in January 1995 on forest hydrology/ecology in the Western Ghats in co-operation with the Karnakata Forestry Department and ROSTSCA connected with rehabilitation of degraded lands.
5. Contributions to the next planning meeting of LAMBADA project for the Amazon basin (see project H-1-1).
6. Completion of the technical monograph entitled, "Environmental Hydrology of Humid Tropic Islands, with Emphasis on Caribbean Karst Terrains" by Bill Back, John Chilton, Nick Robbins and Joe Troester (Eds.), for the Cambridge University Press-UNESCO International Hydrology Series.
7. Publication of the following additional Popularised documents: Groundwater in the Humid Tropics; Environmental Impacts of Selective Logging in Tropical Rain Forests; Reservoirs; Natural Disasters in the Humid Tropics; Soil and Water Impacts of Tropical Forest Disturbance.

<p><b>PROJECT H-5-2:</b> <b>Hydrological research and water resources management strategies</b> <b>in arid and semi-arid zones</b></p>
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The activities under this project are divided into 7 sub-projects related to the following topics:

- Major deep aquifers
- Hard rock aquifers
- Groundwater recharge
- Flash floods
- Hydrological aspects of droughts and evaporation control
- Water harvesting techniques, including recycling

- Land and water management and its impacts on society in arid and semi-arid regions.

#### **Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

From the beginning of IHP-IV, great interest was expressed in the first 4 sub-projects since the 3 remaining ones received limited contribution proposals. Despite several contacts with UN agencies and NGO's, and also some countries, the situation did not improve and we were obliged to freeze these 3 sub-projects.

The activities related to the first 4 projects are presented hereafter in detail.

An international symposium on the whole subject area was also planned for 1995 in Tashkent, Uzbekistan, to present the main findings of project H-5-2 and prepare the arid-zone hydrology programme to be developed during IHP-V (1996-2001). A meeting was held in Paris on 24-26 June 1992 with the representative of the host centre in Tashkent, to prepare the first circular. A long exchange of letters followed with the new Uzbek authorities to obtain their acceptance to organize the symposium. The confirmation arrived only in March 1994 and the first circular and call for papers is being published now.

#### **Activities foreseen until the end of 1995**

Organization of the Tashkent Symposium on the hydrology of arid and semi-arid zones and publication of the proceedings.

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#### ***SUB-PROJECT: Major deep aquifers***

##### **Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

A meeting of the Working Group was held in Cairo in November 1992 during a workshop organized by the Sahara and Sahel Observatory (OSS); a new detailed outline was discussed and finalized and the contributions distributed among the participants; an implementation schedule was also drawn up.

##### **Activities foreseen until the end of 1995**

Meeting of the members of the Working Group during the second OSS meeting planned for the beginning of May 1994 in Cairo, to review and co-ordinate the contributions.

The Rapporteurs will be requested to prepare a draft technical topic paper on the basis of the contributions received.

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#### ***SUB-PROJECT: Hard rock aquifers***

##### **Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

During the IAH Congress in Oslo (June-July 1993), a meeting of the Working Group was held chaired by the Rapporteur; the outline prepared for the technical report which is the main output of the sub-project, was reviewed and discussed. A revised detailed outline was drawn up, as well as the distribution of tasks; a schedule for the submission of contributions.

A group within IAH who participated in the Working Group meeting proposed to initiate a new activity, related to a monograph on hard rock aquifers; to avoid duplication with IHP, it was suggested that this proposal be considered a complementary activity and the monograph appear as a second volume to

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UNESCO's technical report on hard rock aquifers.

**Activities foreseen until the end of 1995**

Meeting of the Working Group members during the IAH Congress of Edmonton (June 1995) to finalize the technical report before publication.

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***SUB-PROJECT: Groundwater recharge***

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

A short meeting was held in UNESCO/Paris on 16-17 September 1992 with the Rapporteur of the project, the Co-Rapporteur of IHP project M-1-1/b and some members of the H-5-2 Working Group to revise the outline proposed initially, and coordinate their respective activities. New detailed outlines were established for both projects, with provisional distribution of tasks among Working Group members, which was confirmed afterwards. The organization of the Hyderabad workshop on both project themes was discussed.

In the framework of projects H-5-2 - Groundwater recharge; and M-1-1/b, an International Workshop was organized in Hyderabad, India (18-20 January 1994) at the Geophysical Research Institute (NGRI) to present and discuss the main contributions prepared by the Working Group members of both projects, for the IHP technical reports. These reports will be modified and improved, taking into account the outstanding papers presented by the participants, particularly from India.

The Working Group on project H-5-2 - Groundwater recharge also met in Hyderabad to consider the harmonization of the different chapters of the technical report under preparation; this report will be published by IAH toward the end of 1994.

**Activities foreseen until the end of 1995**

UNESCO will obtain copies of the document on groundwater recharge to be published by IAH for distribution to all the IHP National Committees.

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***SUB-PROJECT: Flash floods***

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

A preliminary meeting could not be held, due to reductions in the budget, which made it difficult to set up a Working Group for the preparation of a technical report. Nevertheless a small Working Group was subsequently set up, and this enabled the revision and adoption of the outline of the technical report. WMO was involved in the Working Group and presented documents as a scientific contribution to the preparation of this report.

The organization of the international symposium on flash floods to be held in Xi'an was also difficult to organize because of the aforementioned budgetary constraints. The first circular was subsequently published in February 1994 and distributed to Member States.

**Activities foreseen until the end of 1995**

- The international symposium on flash floods in China (Xi'an, 26-29 September 1994).
- organization of a meeting of the IHP Working Group in charge of the preparation of the technical report.

**PROJECT H-5-3:  
Strategies for the hydrological and related environmental investigations  
of water resources in large flatlands**

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

The preparation of a popularized document on the hydrology of flatlands was completed in Spanish in camera-ready form was sent to our Regional Office in Montevideo (ROSTLAC) for harmonization of the contribution before publication. It is expected that an English version of this document will be prepared at a later stage.

The proceedings of the International Seminar on the Hydrology of Flatlands (Buenos Aires, November 1989) were published in UNESCO's "Technical Documents in Hydrology" series and distributed to the IHP NC's.

The preparation of a technical document on the hydrology of flatlands by a Working Group, under the supervision of Mr. Fuschini-Mejia (Argentina) is still underway by correspondence. Because of the absence of a meeting, this component of the project is experiencing much delay.

**Activities foreseen until the end of 1995**

- Publication of the popularized document on the hydrology of flatlands in Spanish and, if possible, preparation of an English version.
- Complete the technical document under preparation by the Working Group.

**PROJECT H-5-4:  
Applications of methods of hydrological analysis in different regions of  
the world (comparative hydrology)**

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

The IHP National Committee of Spain has published a translation of "Comparative hydrology" into Spanish.

**Activities foreseen until the end of 1995**

Preliminary arrangements for compiling a revised issue of "Comparative hydrology" during IHP-V.

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

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

The FRIENDS project is being developed widely around the world, extending to Africa and possibly soon to the Himalayan region and South America during IHP-IV.

**1. FRIENDS Northern and Western Europe**

- 4th meeting of the Advisory Group was held in Prague (4-7 May 1992) with the objective of reviewing the implementation of the project. The meeting decided to include in this group 3 Eastern European countries (Poland, Russia and the Czech Republic), awaiting the establishment of a new FRIENDS Group in Eastern Europe. The organization of the 2nd FRIENDS Conference in Braunschweig (Germany) was also discussed, together with the publication of information in the newsletter "IHP Information". A new Steering Committee for the project was elected and the future of the FRIENDS project considered in relation with the 5th Phase of IHP.
- 3rd meeting of the Steering Committee was held in Wallingford (2-3 October 1992) for the review of the implementation of its 6 projects, the performance of the Coordination Centre (Institute of Hydrology, Wallingford, UK) hosting the data base, and the preparation of the Braunschweig conference.
- 5th meeting of the Advisory Group was organized by the Department of Water Resources, Wageningen Agricultural University (12-14 May 1993). It reviewed the implementation of the 6 projects and the preparation of the scientific report on its main findings, to be presented during the FRIENDS Conference in Braunschweig. This conference will mark the end of the second phase of FRIENDS Northern and Western Europe. The organization of the FRIENDS Conference was reviewed, together with the activities of the AMHY Group. Following a request of the various FRIENDS groups, UNESCO accepted to continue the FRIENDS project within IHP. It was also recommended to encourage the launching of new FRIENDS projects in other regions of the world.
- 2nd International Conference on FRIENDS held in Braunschweig, Germany (11-15 October 1993) illustrated the success of the FRIENDS project in Europe. The main results obtained in the framework of the different groups and in particular the European ones were presented and discussed, together with contributions from all around the world. A document in three volumes, gathering the main results obtained during the second phase of the FRIENDS project, was distributed to the participants; it will be forwarded by UNESCO to all the IHP/NC's. The proceedings of the Braunschweig Conference will be published within the IAHS series of documents.
- The 1st Steering Committee of the third phase of FRIENDS/N.W. Europe met during the Braunschweig Conference and launched a new phase of activities to be based on 5 selected projects. The participants to these projects met together to organize their activities.

Professor Takeuchi, Secretary General of the Regional Steering Committee of project H-5-1 in S.E. Asia, spoke on activities of his group and their intention to establish a hydrological data base which will constitute the basis of a new FRIENDS project in the region during the 5th phase of IHP.

The cooperation with ERB (European Representative Basins in Europe) was also discussed.

## 2. **FRIENDS/AMHY**

The second annual seminar was held in Perugia, Italy on 17-20 November 1992. The objective was to review the implementation of the project and discuss the results of the launched topics. The seminar was combined with the Steering committee meeting. It was decided that a seminar would be held every year, together with the Steering Committee meeting and that AMHY projects should be presented during the 2nd International FRIEND Conference in October 1993 in Braunschweig.

The third annual seminar and Steering Committee meeting took place in Madrid, Spain on 22-24 November 1993. The objective was to discuss the main topics and results of the project. The progress of the project was considered a big success.

## 3. **FRIENDS Southern Africa**

After a long period of inactivity due to a mis-understanding on the role of SADC, the project was reviewed with the help and significant contribution of the Institute of Hydrology (Wallingford, UK) and it was made clear that this should be a UNESCO project. Following this decision, a meeting was held with the Coordination Centre (University of Dar-es-Salaam) in Dar-es-Salaam (December 1992) to review the implementation of the project and plan for future activities with the financial contribution of ODA; accordingly, several activities were implemented in 1993 including a training course, the provision of software, the visit of a representative from the Coordination Centre to 4 participating countries seeking their contributions.

The 1st Steering Committee Meeting of FRIENDS/Southern Africa was held in Dar-es-Salaam, Sudan, on 18-20 February 1994.

The foregoing led to the organization of the first Steering Committee meeting with the participation of the countries of the region, and SADC. The programme of activities was reviewed and finalized, with distribution of tasks; the University of Dar-es-Salaam confirmed its willingness to act as Coordination Centre, host the data base, and contribute to the organization of 3 workshops for the upgrading of the state of knowledge of hydrologists from the related African countries.

The Institute of Hydrology (Wallingford, UK) will provide scientific support to the project and fund some activities. Bidding from ECE and other organizations is also foreseen to cover the participation costs of African representatives.

The project will last 3 years (1994-1996) and will be concluded by a regional conference to present the results.

## 4. **FRIENDS Western and Central Africa**

The launching meeting of this project was held in Ouagadougou, Burkina Faso (3-5 November 1992). The African Committee of Hydraulic Studies (CIEH) was established as Coordination Centre to host the regional data base. A programme of activities was agreed upon by the 9 African countries of the region; this programme will receive contributions from ORSTOM, CIEH, the School of Engineers (EIER) and other regional organizations. A Steering Committee was designated and a schedule of activities prepared.

### **Activities foreseen until the end of 1995**

#### 1. **FRIENDS Northern and Western Europe**

- Development of the research activities of the third phase of FRIENDS.

- 2nd meeting of the Steering Committee during the High Tatras Conference on the Hydrology of Mountainous Areas (September 1994).

## 2. FRIENDS/AMHY

- Publication of 2nd and 3rd annual meetings within the Technical Documents in Hydrology series.
- Joint annual and Steering Committee meeting during the Conference on Hydrology and Mountainous Areas, High Tatras, Slovakia, 12-16 September 1994 (H-5-6).
- Organization of the 3rd International FRIENDS Conference at end 1995/beginning 1996.

## 3. FRIENDS Southern Africa

- 2nd Steering Committee Meeting to be held in Rhodes, South Africa (6-9 September 1995).

## 4. FRIENDS Western and Central Africa

- 1st Steering Committee meeting to be held in Abidjan, Côte d'Ivoire (24-28 October 1994).

## 5. FRIENDS South America

- Launching meeting of a FRIENDS South America project (Argentina, 1995).

**PROJECT H-5-6:  
Hydrology of mountainous regions**

### Activities performed since the 10th session of the IHP Council (as of 1st March 1994)

During the 5th meeting of the FRIENDS Advisory Group, the representative of Slovakia reported on the preparation of the Conference on "Hydrology of Mountainous Areas" to be held in High Tatras, Slovakia (12-16 September 1994), in the framework of project H-5-5 and in cooperation with FRIENDS/AMHY.

The first circular was issued in March 1993 and distributed.

The organizing committee of the above conference met during the FRIENDS Conference in Braunschweig, Germany, on 10-16 October 1993, with the participation of a representative from FRIENDS/AMHY. The programme of the High Tatras conference was reviewed and modified to improve the focus. UNESCO will support the conference within the framework of project H-5-6 and the FRIENDS project, and offered to publish the proceedings within the IHP "Technical Documents in Hydrology" series; an abstracts volume will be made available for the conference by the Slovak IHP/NC.

The second circular was issued in July 1993.

### Activities foreseen until the end of 1995

- International Conference on "Developments in Hydrology of Mountainous Areas" to be held in High Tatras (Slovakia), 12-16 September 1994.
- Development of research activities in the hydrology of mountainous areas in the Hindu-Kush and Himalayan region, with support from the German IHP/NC.

**PROJECT M-1-1:**  
**Preparation of a methodological guide for the execution of water resources assessment studies for use in the preparation of water master plans and environmental evaluations and guidance material on integration and coordination of water-soil monitoring programmes and systems to support groundwater resources assessment**

**SUB-PROJECT M-1-1a:** *Preparation of a methodological guide for the execution of water resources assessment studies for use in the preparation of water master plans and environmental evaluations*

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

The draft of the guidebook for the execution of water resources assessment studies for use in the preparation of water master plans and environmental evaluation was sent for comments to different NGO's and related UN Agencies. No comments have been received to date.

It was also foreseen to hold a seminar in Germany to finalize the guidebook. Due to reductions in the budget this seminar has been frozen.

Accordingly, UNESCO will publish the document as the main contribution to the above project.

**Activities foreseen until the end of 1995**

Publication of the guidebook.

**SUB-PROJECT M-1-1b:** *Preparation of guidance material on integration and coordination of soil water monitoring systems to support groundwater resources assessment*

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

The activities of this project are now linked with project H-5-2 "Groundwater Recharge" and a joint meeting of the two Coordinators was held in UNESCO/Paris (16-17 September 1992). A draft outline for the M-1-1/b technical report was prepared with identification of possible contributors.

The Coordinator contacted all the contributors and confirmed their participation in the project.

During the International Workshop of Hyderabad, India (18-20 January 1994), the contributions prepared by members of the Working Group were presented and discussed, and additional contributions presented by the Indian participants. A meeting of the Working Group was also held in Hyderabad during which proposals suggested by the Workshop for inclusion in the technical report were considered. An implementation schedule for the completion of the technical report was agreed upon.

**Activities foreseen until the end of 1995**

The technical report to be compiled by the Rapporteur before printing by UNESCO and distribution by the end of 1994.



**PROJECT M-1-2:**  
**Preparation of methodological guides for mapping water resources and  
 their vulnerability**

**SUB-PROJECT M-1-2a:** *Preparation of a guidebook for mapping groundwater resources and their vulnerability*

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

Under the leadership of IAH the joint IAH/IHP panel held its second session in Torino, Italy, from 14-16 September 1992, and a special panel on legends for vulnerability maps met in Oegstgeest, Netherlands, from 13-15 January 1993.

**Activities foreseen until the end of 1995**

Preparation of the manuscript, with model legend and a sample map, for ultimate publication by IAH, with the support of UNESCO.

**SUB-PROJECT M-1-2b:** *Preparation of a methodological guide for mapping surface water resources and their vulnerability*

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

The activity has been suspended due to the lack of funds.

**PROJECT M-1-3:**  
**Updating of IHP publications related to water resources assessment**

The objective of this project was the updating of several UNESCO publications, outlined as follows:

**SUB-PROJECT: Groundwater studies**

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

After the failure to nominate a single Rapporteur, UNESCO proposed the establishment of a Panel of 3 Rapporteurs who met in UNESCO/Paris on 7-9 December 1992. The Panel reviewed the former document on "Groundwater Studies" together with comments and proposals received since the Tenerife meeting (April 1991), and established a new detailed outline to facilitate the contributions of the different authors.

During the IAH Congress of Oslo (June-July (1993) a meeting of the Advisory Committee of the project was organized with the participation of one member of the Panel of Rapporteurs. The participants reviewed, commented and proposed modifications to the draft outline prepared by the Panel of Rapporteurs; they also suggested authors for the preparation of contributions. An implementation schedule was also established. UNESCO contacted all the proposed authors and confirmed their contribution to the project.

During the Workshop of Hyderabad (January 1994), a meeting of two members of the Panel of Rapporteurs was organized. The project outline, as revised by the Advisory Committee in Oslo, was finalized. New authors were proposed to fulfill the tasks not yet allocated, and the distribution of responsibilities for the expected contributions among the three members of the Panel of Rapporteurs.

#### **Activities foreseen until the end of 1995**

Meeting of the Panel of Rapporteurs in UNESCO/Paris (November 1994) to review the contributions and decide on the preparation of a preliminary document. The Panel of Rapporteurs will meet with the Advisory Board of the project during the IAH Congress of Edmonton, Canada (June 1995) to review and finalize the preliminary document on Groundwater Studies.

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#### **SUB-PROJECT: Monograph "World water resources at the beginning of the XXI century"**

##### **Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

The Rapporteur, Professor Shiklomanov undertook a mission to ESCAP, Bangkok to get their involvement in the project, and collect hydrological information on the region; many other contacts were made for the collection of data. A detailed outline of the monograph was prepared by the Rapporteur, taking account of the comments received.

A workshop on the project was organized in the State Hydrological Institute, St. Petersburg (Russia) on 9-12 March 1994 to review the progress made in the preparation of the monograph, and plan for its completion. The detailed outline was thoroughly discussed and amendments proposed - a new chapter on groundwater will, in particular, be included and this will be extracted from another monograph which is being prepared.

##### **Activities foreseen until the end of 1995**

UNESCO to provide the State Hydrological Institute with water resources related documents published by the UN system. UNESCO's regional offices will also be requested to collect data on the discharge of rivers and on groundwater, particularly in South America, Africa and S.E. Asia to be used in the monograph.

The completed monograph will appear in the Cambridge University Press-UNESCO International Hydrology Series.

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#### **SUB-PROJECT: Monograph "Groundwater resources of the Earth and their use"**

##### **Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

This monograph was kept pending for a long time in the shadow of the one described above, despite several suggestions received with regard to its contents.

Finally, during the Workshop of St. Petersburg (9-12 March 1994), it was decided to have a second monograph on groundwater, to be prepared in parallel with the Monograph on "World Water Resources at the Beginning of the XXI Century". The contents of this monograph was discussed and several proposals made for its improvement. A Working Group composed of representatives from each continent was proposed, to act as an Editorial Board and prepare contributions.

This monograph will be implemented by a team from the Institute of Water Problems (Moscow) with contributions from the Working Group, using the main publications from the UN and other international

and regional agencies.

A schedule of implementation was established.

**Activities foreseen until the end of 1995**

A meeting of the Working Group to be organized at the beginning of 1995 to review the progress of the monograph.

**SUB-PROJECT: Guidebook on hydrogeological maps with model sheets and legend**

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

IAH has revived the project of publication of a guidebook on the preparation of the hydrogeological maps. Preparatory work had been interrupted due to a new professional assignment of the chairman of the IAH Commission on Hydrogeological Maps.

**Activities foreseen until the end of 1995**

- Editorial meeting in June 1995
- Completion of the manuscript and printing of the guidebook.

**SUB-PROJECT: International Glossary of Hydrology**

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

The Glossary was published jointly by UNESCO and WMO and distributed to all IHP/NC's.

**PROJECT M-1-4:  
Hydrological computations for project design**

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

The activities planned under this project are the organization of a symposium and publication of the proceedings.

The first meeting of the International Organizing Committee was held in Valdai, Russia (21-23 September 1992); it considered the preparatory process to the symposium and the scientific programme to be addressed. This was followed by a meeting of the local organizing committee (December 1993) which agreed on the text of the first circular distributed under the title of "International Symposium: Runoff Computation for Water Projects" to be held in St. Petersburg, 18-22 October 1994.

Because of the belated distribution of the circulars, the Russian IHP/NC suggested postponing the symposium to April 1995.

**Activities foreseen until the end of 1995**

- The International Symposium on Runoff Computation for Water Projects, St. Petersburg, April 1995.

- Publication of the Proceedings.

**PROJECT M-2-1:  
Development of national water-related information and documentation  
systems with emphasis on non numerical information**

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

A prototype of a bibliographic data base based on UNESCO's CDS/ISIS software has been developed in the framework of the Environmental Programme for the Danube River Basin. The prototype was presented at a regional seminar organized by UNESCO with GEF assistance under a UNDP Interagency Co-operation Agreement.

The structure of a bibliographic data base based on UNESCO's CDS/ISIS software has been developed to collect information related to the "Role of the Hydrological Cycle in the Transfer of Radionuclides". The package will be distributed free of charge.

A second training course on the "Management of Information in Science and Technology (MIST2) with emphasis on Information related to Water and the Environment" will be held from 4 March to 30 June 1994 in Brussels, for participants from developing countries. It is being sponsored by UNESCO and the Belgian General Administration of Co-operation for Development (ABOS)".

A publication entitled "Information related to Water and the Environment Data Bases Available Online and on CD-ROM" has been released in the series Technical Documents in Hydrology.

A joint UNESCO/FAO programme has been set up to collect information on water resources assessment on a global basis. The FAO agro-climatic databases will be used as well as the FAO study of irrigation potentials in Africa which is GIS based and the digitized FAO/UNESCO geological maps. The programme aims at promoting sustainable agriculture and rural development through the sustainable use of natural resources. A meeting was held at FAO in February 1994.

This programme will be carried out in close co-operation with the IHP project M-1-3b "Preparation of a Monograph on World Water Resources at the Beginning of the XXI Century".

**Activities foreseen until the end of 1995**

- A Third Training Course (MIST3) will be held in Brussels in 1996.
- A Regional Training Seminar using the CDS/ISIS database on the "Role of the Hydrological Cycle in the Transfer of Radionuclides" will be held in Moscow in 1994.

**PROJECT M-2-2:  
The use of internationally available water-related information systems**

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

An IAH/IHP Workshop on the "Development of Water-related Information Systems" was held in Washington, D.C., USA from 19-20 May 1993.

**Activities foreseen until the end of 1995**

The Proceedings of the 1993 Workshop will be published by UNESCO.

<p style="text-align: center;"><b>PROJECT M-2-3:</b> <b>The use of geographic information systems in hydrological and water resources studies</b></p>
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**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

The overall goal of the UNESCO/ITC programme is to demonstrate the usefulness of the application of GIS in the environmentally sound management of natural resources. A Steering Committee Meeting was held in June 1993.

An International Conference on "Application of Geographic Information Systems in Hydrology and Water Resources Management" was organized by UNESCO/IAHS in Vienna from 19-22 April 1993. IAHS has published the Proceedings.

A workshop on "GIS for Sustainable Development" was organized in Cagliari, Italy, from 6 to 9 April 1994, as a follow-up to the international conference in Vienna.

**Activities foreseen until the end of 1995**

Demonstration packages on "The Application of GIS to Water Management using a case study in Samburu, Kenya" have been prepared by ITC and will be published by IHP in 1994.

A regional seminar on the "Use of Geographic Information Systems in Hydrology and Water Resources Management" will be organized in Kenya in April 1994 within the framework of the UNESCO/ITC programme.

Within the framework of the UNESCO/ITC programme a sourcebook on "GIS in Hydrology" has been compiled and will be published by IHP.

Training packages on coastal zone systems will be developed in collaboration with IOC/MRI.

The First UNESCO/IAHR International Conference on "Hydroinformatics" will be held in Delft, the Netherlands, from 19-23 September 1994.

A Seminar on "Spatial Information Systems" will be held in the framework of the IUGG Conference in Colorado, USA, in 1995.

**PROJECT M-3-1:  
Hydro-ecological models and bio-monitoring for environmental evaluation  
and prediction of impacts of natural and man-made changes and  
hydro-ecological classification of fresh water bodies**

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

A meeting of the Working Group on "Surface Water Typologies at Global Scale" was held in October 1994 in order to prepare the guidebook on: "Hydro-ecological models and bio-monitoring for prediction of impacts of natural and man-made changes and hydro-ecological classification of fresh water bodies".

**Activities foreseen until the end of 1995**

The Working Group will meet in September 1994 to finalize the guidebook. It is foreseen that the book will be published in the International Hydrology Series.

**PROJECT M-3-2:  
Study of the role of inland-water/land ecotones in landscape management**

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

The project is being executed jointly by MAB and IHP.

The ecotones project tackled the question of biodiversity in the land/inland-water ecotones. A special session on this subject was held in August 1992 by UNESCO/SIL Barcelona (Spain) in the framework of the World Congress of the International Limnological Society. The result of this session will be published in the MAB book series in 1994.

The sub-network on "Fish and Land/Inland-Water Ecotones" held its mid-term meeting at Lunz, Australia, from 31 August to 4 September 1992.

An international workshop on "Ecotones at the river basin scale: global land/water interactions" was held in Bermera, South Australia, from 12 to 16 October 1992.

An international conference on "Ground/Surface Water Ecotones: biological and hydrological interactions and management options" was organized in Lyon, France (5-9 July 1993) in the framework of the sub-network "Groundwater/Surface Water Interfaces".

An international workshop on "Ecology and Management of Aquatic-Terrestrial Ecotones", to allow an analysis of results at the two-thirds mark in the Ecotones project was held in Seattle, USA, from 14 to 19 February 1994.

Publications that have emerged from this project since the 10th session of the Council are as follows:

- Nutrient Dynamics and Retention in Land/Water Ecotones of Lowland Temperate Lakes and Rivers. Kluwer Academic Publishers, Dordrecht, The Netherlands, 1993
- Wetlands and Ecotones: studies of land-water interactions. National Institute of Ecology, New Delhi, India, 1993
- Lowland Stream Restoration: theory and practice. Freshwater Biology, Vol. 29, no. 2, April 1993. Blackwell Scientific Publications.

- Ecotones at the River Basin Scale, Global Land/Water Interactions. Proceedings of Ecotones Regional Workshop, published by the South Australian Department of Environment and Natural Resources, Adelaide, South Australia, 1994.

**Activities foreseen until the end of 1995**

The final meeting of the sub-network "Fish and Land/Inland Water Ecotones" will be held in Zakopane, Poland, in the middle of 1995.

**PROJECT M-3-3:  
Integrated water management in urban areas**

**SUB-PROJECT M-3-3a:**     *The use, planning and treatment of water and wastewater in urban areas*

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

The project is being executed and financed jointly by the IHP National Committees of Germany and the Netherlands.

**Activities foreseen until the end of 1995**

Workshop on integrated water resources management in urban and surrounding areas, Gelsenkirchen, Germany, 30 May - 3 June 1994.

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**SUB-PROJECT M-3-3b:**     *Urban runoff and drainage in different climates: tropical, arid or semi-arid and cold*

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

The project was executed by IRTCUD, Belgrade and it has been suspended because of the events in ex-Yugoslavia.

**Activities foreseen until the end of 1995**

Activities will be resumed if IRTCUD Centre re-opens.

**PROJECT M-3-4:  
Flood plain pollution control management of the rivers Vistula (Poland)  
and Main (Germany)**

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

The activities are being executed jointly by the IHP National Committees of Germany and Poland.

**Activities foreseen until the end of 1995**

Joint activities by the IHP National Committees of Germany and Poland.

**PROJECT M-3-5:  
Promotion of environmentally-sound water resources management**

**SUB-PROJECT M-3-5a:** *Development of manual and guide related to promotion of environmentally-sound river management*

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

- Publication and distribution of the document: "Use of models for river problems", by M. de Vries.
- Preparation and editing of a popularized document on "Water, Development, Environment: The whole truth", by E. Razvan.
- Meeting of the Working Group during the Karlsruhe Symposium (6-10 August 1992). The discussions were focused on the difficulties in implementing this project, whose subject is relatively new, and the search for a new Rapporteur, upon the resignation of Professor Larsen. Two new candidates were foreseen, but after several months of correspondence, they both turned down the offer and the project was consequently frozen.

**Activities foreseen until the end of 1995**

Publication of the popularized document entitled, "Water, Development, Environment: The Whole Truth".

**SUB-PROJECT M-3-5b:** *Development of guidance on methods for analyzing cumulative impacts of water resources projects and plans*

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

This project has not commenced activity. Nor will it during the next year.

**SUB-PROJECT M-3-5c:** *Groundwater assessment and environmental impact due to over-development*



**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

Preparation for the Fifth International IAHS/UNESCO symposium on Land Subsidence.

**Activities foreseen until the end of 1995**

The Fifth International IAHS/UNESCO Symposium on Land Subsidence will be held in the Netherlands in 1996. The Proceedings will be published in 1996 with a contribution from IHP.

**PROJECTS M-4-1/M-4-2:  
Environmental and socio-economic consequences of the development of  
water projects**

**The inclusion of socio-cultural aspects in the integrated evaluation  
of water resources**

At its 19th session (Paris, 13-15 June 1990) the IHP Bureau decided that project M-4-1 and M-4-2 will be developed together, because of their complementarities, whereas project M-4-3 will be implemented separately.

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

The International Organizing Committee of the symposium on "Environmental and socio-economic consequences of water projects" held its meeting, organized by the Russian IHP/NC in Moscow (September 1992). The meeting reviewed and corrected the subject and structure of the symposium and the composition of the International Organizing Committee.

The first circular of the symposium took into account the different comments received, and was issued and distributed in September 1993.

**Activities foreseen until the end of 1995**

- The International Symposium on "Environmental and socio-economic consequences of water resources development and management", Moscow, 15-20 May 1995.
- Publication of the proceedings.

**PROJECT M-4-3:  
Study experiences with modern resources planning and management methods  
taking into account risk factors**

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

Two meetings of the key members of the Working Group were held, one in Paris in July 1992 and the other in Koblenz (Germany) in 1993, to co-ordinate the preparation of a book on "Water Resources Management in a Changing World: Sustainability, Uncertainty and Decision-Support", to be published in the International Hydrology Series.

**Activities foreseen until the end of 1995**

A document on "Water Resources Management: Focusing on Sustainability" by D.P. Loucks will be published by IHP in the Technical Documents in Hydrology Series.

An International Symposium on "Water Resources in a Changing World" will be held in Karlsruhe, Germany, from 28-30 June 1994. The Symposium is being convened by UNESCO and will be organized by the German IHP National Committee in co-operation with the Institute of Hydrology and the University of Karlsruhe.

**PROJECT M-5-1:**  
**Comprehensive and comparative study of great lakes**

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

A contract was drawn up with SIL (African Great Lakes Group) for the preparation of three monographs on Lake Victoria, Tanganyika and Malawi, to be followed by a comparative study on these three lakes; a workplan was established. The three monographs were prepared and sent to different scientists for comments; the draft document was also discussed during a symposium held in Jinja, Uganda (February 1993). The three monographs were finalized and the one related to Lake Victoria is now ready for printing; the two others will follow.

**Activities foreseen until the end of 1995**

- Publication of the monographs on the hydrology and limnology of Lakes Victoria, Tanganyika and Malawi.
- Preparation and publication of a comprehensive report on the similarities and differences between the three lakes.
- Organization of an international workshop on the water balance of Africa.

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

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

UNESCO sponsored the symposium on "Transboundary River Basin Management and Sustainable Development" held in Delft, The Netherlands in May 1992 and published the proceedings in two volumes within its Technical Documents in Hydrology series. (Also see project M-2-1 with respect to the Danube Basin.)

**Activities foreseen until the end of 1995**

Due of shortage of funds, this project was given low priority and is frozen for the moment.

**PROJECT E-1-1:  
Education systems for higher hydrology technicians**

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

Publication of "Education systems for hydrology technicians" by M. Bruen in the Technical Documents in Hydrology series.

**Activities foreseen until the end of 1995**

Publication of "Curriculum for long-term training of hydrology technicians" by Theresa Winkler in the Technical Documents in Hydrology series.

**PROJECT E-1-2:  
Improvement of training programmes for both technicians and their supervisors through teaching material and courses**

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

- Meeting of a working group in Zelezna Ruda, Czech Republic, 7-10 June 1993
- Editing of the revised lecture notes.

**Activities foreseen until the end of 1995**

Printing of the lecture notes by UNESCO in the Technical Documents in Hydrology series.

**PROJECT E-1-3:  
Regional networks of technician training centres concerned with water resources**

Terminated.

**PROJECT E-1-4:  
Comparison of textbooks for hydrology technicians**

Closed by the 10th session of the Council.

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

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

- Fifth meeting of the working group (cost-sharing between UNESCO and the IHP/OPH National Committee of Germany), Berlin, 31 August - 4 September 1992.
- Publication of the report "Curricula and syllabi for hydrology in university education" by U. Maniak in the Technical Documents in Hydrology series.

**Activities foreseen until the end of 1995**

Terminated.

**PROJECT E-2-2:  
Cooperative arrangements on water programmes among educational institutions**

Terminated.

**PROJECT E-2-3:  
Comparison of water resources textbooks for undergraduate students**

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

The rapporteur appointed by the IHP Bureau, Mr. U. S. Vuglinsky, is preparing the comparison and analysis.

**Activities foreseen until the end of 1995**

Completion of Mr. Vuglinsky's report.

**PROJECT E-3-1:  
Improvement of the system of postgraduate courses in hydrology and water resources through better topical, geographical and language distribution**

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

Preparations for the workshop planned to be held in Prague, Czech Republic, in 1994, have continued. These include the preparation of a state-of-the-art report by the rapporteur, Mr. P. Kovar.

The system of UNESCO-sponsored post-graduate courses has been maintained.

**Activities foreseen until the end of 1995**

- Publication of the state-of-the-art report
- Workshop, Prague, 29-31 August 1994

- Continuation of the support to the system of UNESCO-sponsored courses.

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

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

Publication of the report "Continuing education in hydrology" in the Technical Documents in Hydrology series.

**Activities foreseen until the end of 1995**

Terminated.

**PROJECT E-5-1:  
Introduction of water-related subjects in primary and secondary education**

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

None due to lack of funds.

**Activities foreseen until the end of 1995**

None due to lack of funds.

**PROJECT E-5-2:  
Use of mass media for disseminating information on the rational use of water**

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

No progress reported since the 10th session of the IHP Council.

**Activities foreseen until the end of 1995**

No activities envisaged.

**PROJECT E-5-3:  
Development of reports for decision-makers and legislative bodies on water  
resources for sustainable development in a changing environment**

**Activities performed since the 10th session of the IHP Council (as of 1st March 1994)**

Publication of the COWAR Report, "Water in our common future" by J. Jordaan, E.J. Plate, E. Prins and J. Veltrop.

**Activities foreseen until the end of 1995**

Support to publications for the general public.



