



United Nations
Educational, Scientific and
Cultural Organization



50
years

International
Hydrological
Programme

WATER

PEOPLE AND COOPERATION

50 YEARS OF WATER
PROGRAMMES FOR SUSTAINABLE
DEVELOPMENT
AT UNESCO



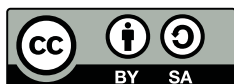
WATER **PEOPLE AND** **COOPERATION**

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“ Access to water is a common goal. It is central in the social, economic and political affairs of the country, African continent and the world. It should be a lead sector of cooperation for world development. No water, no future. ”

Nelson Mandela

2002 Earth Summit in Johannesburg



Foreword

UNESCO MEMBER STATES HAVE LONG RECOGNIZED THE IMPORTANCE OF WATER FOR HUMAN RIGHTS AND DIGNITY, FOR SUSTAINABLE DEVELOPMENT, FOR LASTING PEACE.

In the wake of the successful project on Arid Zones, the UNESCO Executive Board in 1961 requested the creation of a long-term programme for international cooperation in scientific hydrology, to protect the planet's water resources under increased pressure. In 1965, UNESCO and its partners established the *International Hydrological Decade*, to collect scientific data and lead internationally-concerted research and education for improved water use. The *International Hydrological Decade* broke new ground in highlighting the efforts needed to adapt water management and research. On this basis, since 1975, the *International Hydrological Programme* has taken this same vision forward, working through successive phases in consultation with Member States.

The situation has changed over the last fifty years – population growth, urbanization and higher consumption levels have increased dramatically the demand for water, tripling withdrawals globally, with pollution and climate change exacerbating the challenge. Without continued and coordinated action by the international community, by 2030, half of the world's population could live under high water stress.

The Millennium Development Goals brought much progress, but billions of people still do not have access to improved sanitation services – mainly in Southern Asia and Sub-Saharan Africa. This jeopardises chances for education, empowerment and development, especially for women, children, and those living in poverty.

The *International Hydrological Programme* is the only intergovernmental, science-based water cooperation programme of the United Nations system. Through its current eighth phase focussing on water security, in coordination with the agencies and partners of UN Water, UNESCO helped to shape the new Sustainable Development Goal for water and sanitation in the *2030 Agenda for Sustainable Development*, which the Organisation is now deeply committed to taking forward. For this, the interdisciplinary network and expertise of UNESCO's Water Family, as well as the innovative projects coordinated by the *International Hydrological Programme*, will be vital – embodying UNESCO's holistic approach to water, that includes also material, cultural and spiritual aspects. With the support of Member States, UNESCO will redouble all efforts to strengthen cooperation at all levels, to reinforce the science-policy interface and to develop institutional and human capacities.

This fiftieth anniversary of UNESCO's water programmes coincides with the seventieth anniversary of the Organisation's creation.

This book illustrates the twists and turns of this unique history, highlighting the will that has always driven all UNESCO's action. This story pays tribute to the water practitioners, scientists and policymakers committed to international cooperation. All this shows what can be done through solidarity and commitment to build a better future for all. This has never been so important.



Irina Bokova

Director-General of UNESCO



Preface

This juncture is a great opportunity to recognize the international community's commitment to water, which has been consolidated every year, and of the efforts of thousands of people around the world who have contributed toward building a more prosperous water future for humanity.

As a result, our water governance capacities are greater today than fifty years ago. However, so are the challenges that we must overcome in the twenty-first century. Globally, we must consider the ongoing growth and accelerated demand in all water uses, new hydrometeorological conditions due to climate change, the human right of access to drinking water and sanitation and ensuring sufficiency for food security.

THERE IS NO ROAD AHEAD OTHER THAN WATER; it is the most important resource humanity has. It is not only a prerequisite for life, but an essential component for social, environmental and economic development and a fundamental factor in peace, social cohesion and poverty reduction.

This is why water has been a centrepiece of UNESCO's initiatives for fifty years – a period that has borne witness to significant outcomes which are a source of pride and celebration. This volume has been published as part of the celebrations marking the fortieth anniversary of the creation of the IHP and the fiftieth of the launch of UNESCO's studies in water resources.

This date therefore represents a great opportunity to reflect on the outstanding solutions, as the future of generations to come depend upon them. Our analysis must take into account two basic elements: water is the core of sustainable development and each region is faced with different circumstances related to its own geographical and social conditions. For example:

Europe and North America have solved many issues due to their economic and social development but urgently need to increase their efficiency in agricultural water use and reduce pressure on groundwater sources.

Asia and the Pacific region face three key challenges: to generate resilience capacities in

the face of extreme weather events; to increase drinking water and sanitation coverage in rural areas; and ensure demand for their growing industrial and energy sector.

The Arab states are confronted with the need to ensure water supply in areas of increasing scarcity, mainly for drinking water supply to population centres, establishing regulatory frameworks for surface and groundwater basins of transboundary waters, and strengthening drought prevention and mitigation schemes.

Latin America and the Caribbean represent the region with the most unequal water distribution, which is why they must prioritise the reorientation of urban development toward areas with water availability. Meanwhile, they need to strengthen their water governance capacities, increase social participation, infrastructure financing and implementing regulatory practices, including efficient tariff models.

Africa is perhaps one of the regions with the most challenges, related to the construction of a water infrastructure that provides adequate drinking water, also to drainage and to sanitation required to promote their social development. Africa also requires an efficient water supply for irrigation and power generation in order to foster economic development and ensure food security.

Water conditions worldwide are far more complex today than they were fifty years ago.

Yet while each of our nations faces many challenges, we must realize that there is a common denominator for all: the efficient and integrated management of water resources as the new paradigm which, with co-responsibility on the part of society and governments, will enable us to consolidate a new development model for humanity.

This is why, the efforts of UNESCO and IHP on water are more necessary and important than ever: because they are the opportunity to continue driving this cause in the international agenda and within the new Sustainable Development Goals. More especially, they generate new opportunities through education, science and culture to strengthen the link between scientific knowledge and public policy, and to consolidate integrated basin planning with long-term vision, thus ensuring sustainable and efficient use of the resource that gives us life.

A handwritten signature in black ink, consisting of several fluid, overlapping loops and a long, sweeping tail that extends to the right.

David Korenfeld Federman

Chairperson of the Intergovernmental Council of the International Hydrological Programme (IHP) of UNESCO for the period 2014-2016

LIST OF ACRONYMS

AAAS	American Association for the Advancement of Science
ACC	Administrative Committee on Coordination of the UN
AFUS	Association of Former UNESCO Staff
AGWC	Africa Groundwater Commission
ALECSO	Arab League for Education Culture and Science Organization
AMCOW	African Ministerial Council on Water
ANU	Australian National University
AOC	West and Central Africa
APCE	Asia Pacific Centre for Ecohydrology
APWF	Asia Pacific Water Forum
BRGM	Bureau de Recherches Géologiques et Minières
CADWES	Capacity Development of Water and Environmental Services
CAZALAC	Water Center for Arid and Semi-Arid Zones of Latin America and the Caribbean
CEDEX	Centre for Studies and Experimentation on Public Works, Spain
CEHICA	Center for the Sustainable Management of Water Resources in the Caribbean Island States
CHM	Commission on Hydrological Meteorology
CIEH	Comite Interfricain d'Etudes Hydrauliques
CIRES	Ivorian Center of Economy and Social Research
CIS	Commonwealth of Independent States
CNCH	Czech National Committee for Hydrology
CNRS	National Council for Scientific Research
CNRST	Centre National de la Recherche Scientifique et Technologique
CSIR	Council for Scientific and Industrial Research, South Africa
CONAGUA	Comisión Nacional Del Agua
CONAMEXPHI	IHP National Committee of Mexico
COVIDSET	Conference of Vice-Chancellors and Deans of Science, Engineering and Technology
COWAR	Committee on Water Research
CUA	Czech University of Agriculture
DESD UN	Decade of Education for Sustainable Development
DEWARPID	Design of Water Resources Projects with Inadequate Data
DIKTAS	Dinaric Karst Transboundary Aquifer System
DMWRP	Directorate of Management and Water Resources Protection
DRR	Disaster Risk Reduction
DWAF	Department of Water Affairs and Forestry
DWS	Division of Water Sciences
DWS	Department of Water and Sanitation
ECAFE	Economic Commission for Asia & the Far East
ECOSOC	Economic and Social Council
ECOWAS	Economic Community Of West African States
EH	Ecohydrology
ERASMUS	European Region Action Scheme for the Mobility of University Students
ERB	Euromediterranean Network of Experimental and Representative Basins
ERCE	European Research Centre for Excellence

ESSP	Earth System Science Partnership
FAO	Food and Agriculture Organization of the United Nations
FFG	Flash Flood Guidance
FRIEND	Programme Flow Regimes from International Experimental and Network Data
GEF	Global Environmental Facility
GEMI	Global Expanded Water Monitoring Initiative
GGIS	Global Groundwater Information System
GGMN	Global Groundwater Monitoring Network
GIS	Geographic Information Systems
GIZ	German Agency for International Collaboration
GRAPHIC	Groundwater Resources Assessment under the Pressures of Humanity and Climate Change
G-WADI	Programme Global Network on Water and Development Information in Arid Lands
GWF	Global Water Forum
GW-MATE	Groundwater-Management Advisory Team
GWSP	Global Water Systems Project
HELP	Hydrology for the Environment, Life and Policy
HORIZON	2020 the Framework Programme for Research and Innovation
HTCKL	Humid Tropic Centre Kuala Lumpur
Hydromet	Hydrometeorological Centre
IAEA	International Atomic Energy Agency
IAHS	International Association of Hydrological Sciences
IAH	International Association of Hydrogeologists
IAHR	International Association of Hydraulic Engineering and Research
IASH	International Association of Scientific Hydrology
ICHARM	International Centre for Water Hazard and Risk Management
ICL	International Consortium on Landslides
ICSI	International Commission on Snow and Ice
ICSU	International Council of Scientific Unions
IFAS	Integrated Flood Analysis System
IGBP	International Geosphere-Biosphere Programme
IGC	International Geological Congress
IGLOBAL	Instituto Global de Altos Estudios en Ciencias Sociales
IGRAC	International Groundwater Resources Assessment Centre
IHD	International Hydrological Decade
IHP	International Hydrological Programme
IHP-NCs	National Committees
IHP RSC	Regional Steering Committee
IHP-SEAP	IHP in Southeast Asia and the Pacific
IIWQ	International Initiative on Water Quality
IMTA	Instituto Mexicano de Tecnología del Agua
INWEB	International Network of Water-Environment Centres for the Balkans
IOS UNESCO	Internal Oversight Service
IRCK	International Research Centre on Karst
IRTCUD	International Research and Training Center on Urban Drainage
ISARM	Internationally Shared Aquifer Resource Management
IUBS	International Union of Biological Sciences
IUGG	International Union of Geodesy and Geophysics
IUGS	International Union of Geological Sciences

IUTAM	International Union of Theoretical and Applied Mechanics
IW-LEARN	International Waters Learning Exchange and Resource Network
IWRM	Integrated Water Resources Management
JICA	Japan International Cooperation Agency
KIT	Transfer of knowledge, information and technology
LAC	Latin American and the Caribbean
LIFE	L'Instrument financier pour l'environnement
MAB	Man and the Biosphere programme
MDC	Mid-Decade Conference
MDGs	Millennium Development Goals
MFIT	Malaysia Fund in Trust
MOA	Ministry of Agriculture
MRP	Major Regional Programmes
MSMA	Urban Storm Water Management
MWI	Minister of Water and Irrigation
NC IHP	National Committee
NEPAD	New Partnership for Africa's Development
NGOs	Non-governmental Organizations
NICHE	Netherlands organization for international cooperation in higher education
NIWA	National Institute of Water & Atmospheric Research Limited
NN	Nomen Nominandum
NWRI	National Water Resources Institute
NWRS2	National Water Resource Strategy 2
NZ	New Zealand
OPS	Operational Projects Service
ORSTOM	Office de la Recherche Scientifique et Technique Outre-Mer
OSS	Observatory of Sahel and Sahara
PCCP	From Potential Conflict to Cooperation Potential
PHWR	Programme on Hydrology and Water Resources
PME	Presidency of Meteorology and Environment (Saudi Arabia)
PNC-IHP	Pakistan National Committee
PRoACC	Project on Climate Change Adaptation in the Mekong River Basin
PWP	Pakistan Water Partnership
PWRI	National Research and Development Agency Public Works Research Institute
RC-IRBM	Regional Centre for Integrated River Basin Management
RCTWS	Regional Center for Training and Water Studies of Semi/Arid Zones
RRI	Rainfall-Runoff-Inundation
RSA	Republic of South Africa
RSC-ASPAC	Regional Steering Committee for Southeast Asia and the Pacific
SANC	South African National Committee
SAPHYDATA	Systems for Acquisition, Transmission and Processing of Hydrological Data
SCOWAR	Scientific Committee on Water Research
SDGs	Sustainable Development Goals
SEAP	Southeast Asia and the Pacific
TARM	Transboundary Aquifer Resources Management
TC	Training Course
TUHK	National Hydrology Commission of Turkey
TUT	Tampere University of Technology

TWAP	Transboundary Waters Assessment Programme
UAE	United Arab Emirates
UDM	Urban Drainage Modeling
UK	United Kingdom
UNAM	Institute of Engineering of the National Autonomous University of Mexico
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNECWAS	UNESCO Chair in Sustainable Water Services
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNESCO-IHE	Institute for Water Education
UNESCO-SWITCH	Sustainable Water Management Improves Tomorrow's Cities' Health
UNGA UN	General Assembly
UNILC UN	International Law Commission
UNISDR	United Nations International Strategy for Disaster Reduction
UNU	United Nations Universities
USGS	UK Institute of Wallingford and the US Geological Surveys
USSR	Union of Soviet Socialist Republics
UWC	UNESCO Chair in Hydrogeology University of the Western Cape
UWC	University of the Western Cape
WBSR	Water, Biodiversity, Services and Resilience
WHO	World Health Organization
WMD	Water Demand Management
WMO	World Meteorological Organization
WMZs	Water Management Zones
WRC	Water Research Commission
WWAP	World Water Assessment Programme
WWDR	World Water Development Report

A scenic landscape of a rice field. In the foreground, there are lush green rice plants. A small, shallow pond is visible in the middle ground, reflecting the sky. The background features a line of palm trees and distant mountains under a cloudy sky. The text "Chapter 1." is overlaid in the center of the image.

Chapter 1.



**AN INTRODUCTION
BY FORMER
CHAIRPERSONS OF
THE IHP COUNCIL
AND IHP SECRETARIES**

CHAPTER 1

AN INTRODUCTION BY FORMER CHAIRPERSONS OF THE IHP COUNCIL AND IHP SECRETARIES

50 Years of UNESCO Water Programmes: a Canadian Perspective

by **Gordon J. Young**,
Chairperson of the IHP Intergovernmental
Council 1988-1990
Director, UN World Water Assessment
Programme 2000-2006

The initiation of IHD had a profound effect on the conduct of hydrological research in Canada. The setting up of a series of small representative and experimental basins in which instrumentation and measurement techniques were standardized and which were thus comparable with similar basins set up in many other countries facilitated the development and inter-comparison of hydrological models. Canada was one of the countries that particularly benefitted from this initiative, stimulating the research community that was somewhat lagging behind in research capabilities in comparison to several other countries. Many young scientists started their research in these small research basins, many of which are still active today, providing long-term data banks of meteorological and hydrological information.

IHD not only stimulated basic research into hydrological processes but created networks through which knowledge could be transferred,

and in many ways encouraged scientific cooperation between East and West in the time of the Cold War. Almost immediately links were fostered and established between industrialized and less developed countries, allowing scientists to become 'ambassadors of goodwill'. Thus IHD and, subsequently the IHP, had influence beyond strictly scientific research. Canadians were very much involved in this important networking.

The success of the IHD allowed the continuation of cooperation between countries throughout the continuing decades. The number of countries involved has increased dramatically; the concept of IHD was initially embraced by a relatively small group of primarily industrialized countries but quite quickly less developed countries from all continents became involved, broadening not only types of hydro-climatic environments but also, and significantly, broadening political and socio-economic diversity of situation. Following the breakup of the USSR and Yugoslavia there was a sudden increase of the number of countries seeking admission to the Intergovernmental Council of IHP.

While the building of research networks, the creation of working groups and education and training have always been an integral part

of IHD/IHP, the focus of the research itself has evolved over the fifty-year period. There were great challenges in getting countries and UN entities to agree on the setting up of the IHD and it was prudent, in those formative years, to decide to concentrate on understanding of basic hydrological processes. Once the Programme was established and seen to be successful, the more politically sensitive issues of water management could be incorporated into the Programme. Thus, over the past decades there has been an ever-increasing

emphasis on economic and social aspects of water research. Today IHP views water security for societies as the basis of the Programme – while still acknowledging the fundamental importance of the understanding of hydrological processes.

Canada has been involved from the very start of this fifty-year process and, hopefully, will continue its active involvement, both sharing its knowledge and, equally, learning from the wisdom of others.

A Croatian Perspective: The Importance of IHP for Global Water Management

by **Prof. emeritus Ognjen Bonacci**,
Chairperson of the IHP Intergovernmental
Council 2004-2006
IHP Bureau Member 2006-2008

Split University
Faculty of Civil Engineering, Architecture and
Geodesy
21000 Split
Matice hrvatske 15

My work at the Intergovernmental Council of the IHP of UNESCO, particularly in the capacity of its chairperson, has been an invaluable experience. I am one of the veterans who started working on this unique programme at its very early stages, prior even to IHD. Water and consequently hydrology as its basic scientific discipline have for centuries been crucial for the development of civilizations and, nowadays, they are essential in solving the ever-changing and ever more complex issues faced by mankind.

As a young engineer, I believed that hydrology as a discipline has a single task – to define

changing quantities of water across time and space. However, collaborating in many IHD-IHP actions with extraordinary colleagues from all over the world, I realized it happens to be just one and certainly not the most important role of this discipline. *Today the world of water is at the centre of the international environmental and development debate, and there is no doubt that IHD and IHP have made major contributions to achieving this.* IHP has connected hydrology with disciplines such as ecology, social sciences, history, economy and ultimately, politics, without overlooking its primary geoscientific and engineering aspects in the process. The hydrology that was taught and studied at universities only thirty or so years ago differs considerably from that which is currently being taught. The progress is evident.

The process of enabling scientists and experts working in different scientific fields to exchange their thoughts and ideas is highly complex and requires time. IHP is aware of that fact and through its actions has co-ordinated scientists, experts, politicians, stakeholders etc in the best possible manner throughout

the entire process. The process included, and still does, all the relevant scientific disciplines related to water and water resource management, giving equal importance to each member of the programme in discussions or decision-making. This has been carried out very diplomatically to avoid disagreements wherever possible. At the same time the freedom of expressing one's opinion and the possibility to defend one's position was fully encouraged. Assuming this approach, some complex issues were successfully solved.

IHP is to be given credit for the better part of the positive trends that have been established so far. Collaboration on the all-encompassing water-related problems is bound to be based on the same objective principles on which hydrology as a facet of geosciences and an engineering discipline is founded. Hydrology is also an unavoidable factor when it comes to dealing with current problems related to

the economy, biology and society. I firmly believe that, owing to the ever-increasing worldwide need for water, the role of IHP will continue to grow in its importance. This is precisely why IHP needs to continue with its numerous and complex activities, intensifying in particular efforts regarding the improvement of the global hydrological and climate-related measurements, gathering and free exchange of hydrological, hydrogeological, ecological and climatological information. These data represent an indispensable foundation for objective decision-making in the water resource management process and, consequently, the basis for addressing ever-increasing problems of mankind.

We must all work together to avoid the predicted water crisis. IHP needs to consider water management as a historical process that shapes humanity and vice versa.

Congratulations on the 50th anniversary of IHD/IHP!

by **Kuniyoshi Takeuchi**,
International Centre for Water Hazard and
Risk Management (ICHARM)

Chairperson of the IHP Intergovernmental
Council 1998-2000
Japanese National Commission for UNESCO –
Former Member
Japanese National Committee for the IHP –
Former Chair
IHP Bureau Member 2000-2002

My lifelong engagement in hydrology has always been associated with the IHD/IHP and I thank my great fortune to have been part of it for such a long time. My first visit to UNESCO was in 1974

together with Professor Hideo Kikkawa on the occasion of his service to IHD as a co-editor of the World Catalogue of Very Large Floods. I have been involved in IHP in one way or another ever since.

In 1992, when Professor Yutaka Takahasi was elected as a vice-president of the IHP Inter-Governmental Council, I participated in the establishment of the Regional Steering Committee for Southeast Asia and the Pacific (RSC) and served as its Secretary between 1993 and 1999. In this region there was virtually no communication lobby of hydrologists before then. Since its first meeting in Manila in 1993 the RSC has met every year with a research symposium rotating between different nations. Now the region is one of the most active in the world of IHP.

In 1998 I was elected as the Chairperson of the IHP Inter-Governmental Council, serving till 2000. It was a splendid memory to discuss about the establishment of various UNESCO Water Centres under the strong leadership of András Szöllösi-Nagy, Director of the Water Sciences Division supported by IHP member countries. There are now over thirty-one water centres.

From 2006 until 2014 I served as the founding director of International Centre for Water Hazard and Risk Management (ICHARM) under the auspices of UNESCO. It was truly a rewarding

experience to work closely with many IHP and other water and disaster management partners through research, capacity development and information networking.

I had the privilege of serving both for IHP and IAHS as the Chair and the President and promoted mutual collaboration, which has been a tradition since the birth of IHD. Water is now central in global sustainability issues. The role of IHP is increasing as a driver and an integrator of all water sciences. I trust in another successful half century for IHP.

A Moment to Take Stock and Draw Conclusions for the Future

by **Habib Zebidi**,
Chairperson of the IHP Intergovernmental
Council 1984-1986

The International Hydrological Decade was an important source of information and guidance in our work for young Tunisian hydrologists and hydrogeologists appointed by our newly independent country in a vast inventory project of national water resources, as a basis for the economic and social development of our country.

We were immediately confronted with the inherent problems linked to the implementation and management of surface water and groundwater measurement and observation networks, and to the interpretation of the results obtained, as well as the study of groundwater, the assessment of its resources and the programming of its exploitation. These were all issues we were not sufficiently prepared to address.

IHD offered not only the opportunity to address these issues, but also the advantage

of mobilizing international expertise in these areas and providing the appropriate literature. Following its success, IHP was set up as a broader, more ambitious and more durable successor which would take into consideration the different aspects of hydrology and water resources.

I had the privilege of being elected Chairperson of the Council in 1984, for a period of two years, and was consequently able to familiarize myself more closely with the functioning of IHP and measure the interest shown by most of the participating countries for this programme. I could however also notice the imbalance between regions; Africa, in particular, was poorly represented and did not draw enough profit from IHP.

From 1990 until 1998, I experienced IHP from the inside as a Programme Specialist in the Division of Water Sciences, and thus participated in the preparation and implementation of various phases established for successive periods of six years, based on a consultation process with Member States for topics related to the needs of a changing world.

I was able to appreciate the positive impact of projects related to applied hydrology such as FRIEND, which has spread through several parts of the world and which has had the advantage of bringing knowledge where it is most requested by directly mobilizing national hydrologists.

IHP has not only continued participating in the development of scientific hydrology, it has also offered the opportunity to take stock of problems relating to the world's water resources and usage thanks to the contribution of prominent specialists and prestigious national hydrology institutions. It also facilitated discussion of results at international conferences, drawing conclusions and recommendations for the future of world water resources.

IHP has also ensured that hydrologists from different countries could speak the same scientific language by preparing, in cooperation with WMO, the International Glossary of Hydrology in five languages (English, French, Spanish, Russian and Arabic).

IHP has for forty years been paying attention to water-related issues in a changing world and helping respond to them through its successive phases. After so many achievements and publications distributed across the world, now might be an appropriate time to take stock of progress, evaluate the work that has been carried out and draw conclusions for the future of hydrology and water resources and the role that UNESCO should continue to play.

A Major Contribution to Sustainable Water Management

by **Prof. Soontak Lee**,
Chairperson of the IHP Intergovernmental Council 2010-2012

Chair, IHP National Committee for Republic of Korea
Yeungnam University
Daegu
Republic of KOREA

I would like to express my sincere congratulations on the fiftieth anniversary of the UNESCO Water Programmes IHD and IHP.

To cope with global water challenges, since its establishment in 1975, IHP has been devoted to the scientific study of the hydrological cycle and to formulating strategies and policies for the sustainable management of water resources. The programme is implemented in

phases of six years, in order to be ahead of the curve in the identification of new, emerging problems, alerting decision makers, raising public awareness and defining the necessary resources to respond with appropriate action. This IHP is a multidisciplinary programme at the forefront of meeting all global water challenges and governed by its Intergovernmental Council with strong support and participation from IHP National Committees, UNESCO water-related Centres and Chairs.

Since I was elected as the Chairperson of the Intergovernmental Council and the IHP Bureau at the nineteenth Intergovernmental Council in 2010 and served four years as a IHP Bureau member – including two years as Chairperson and another two years as Ex-officio vice-chair for the Region-IV (Asia Pacific) – I initiated and finalized the formulation of the IHP-VIII (2014-2021) Strategic Plan: 'Water

Security: Responses to Local, Regional and Global Challenges'. I also contributed to the establishment of the IHP Regional Steering Committee (RSC) in South East Asia and the Pacific and served as its third Chairman from 1968–2000. *After Water Security was*

selected as the main theme of IHP-VIII, these words became central to the global water issue which will be a key factor for Sustainable Development Goals post 2015.

IHP: An Institution for Capacity Building and Integration

by **Victor Pochat**,

Chairperson of the IHP Intergovernmental Council 2002-2004

Among the many remarkable facets of IHP throughout its extended and dynamic history, there is one that has remained constant and deserves a special mention: its role as an institution for capacity building and integration. For many colleagues – from the academic world or the water resources management sector – the possibility of participating in the activities of a National Committee, Programme, Working Group, or UNESCO Centre or Chair is the first step towards expanding their horizon on water-related issues – a horizon which might be otherwise limited owing to a scope of work or academic background that is either very specific or focused only on solutions to local issues.

The establishment of contact at the national level between the respective National Committees allows them to reduce the usual distance between the researcher and the

manager, thus enriching them both through the exchange of mutual experiences and points of view. In addition, the opportunity to participate in some of the periodical meetings of the National Committees and Focal Points of their own region enhances the visions of individual colleagues. This is especially true when they are able to attend some of the biennial sessions of the Intergovernmental Council. Further important opportunities can arise if, according to their expertise and interests, they integrate a working group or contribute to the activities of a programme related to one of the themes contained within each phase of IHP. Contact with colleagues from other countries from their own regions and beyond enables them to compare similarities and differences, to identify coincidences and to favour cooperation over potential conflicts.

Consequently, those of us who have had the privilege of sharing those experiences with the help of teachers must take on the role of motivating younger colleagues. They, in their turn, can then contribute with renewed energy to help find solutions to the water-related issues that motivated UNESCO to create this programme and maintain it over four fruitful decades.

IHP's Contribution to Hydrology and Water Resources Management

by **Abdin M. A. Salih**,
 Professor, University Of Khartoum
 Former Chairperson of the IHP
 Intergovernmental Council and Former IHP
 Secretary

UNESCO's major contribution to hydrology and water resources management is implemented through IHP, which currently stands as one of the principal priorities of its Natural Sciences Sector. IHP was launched in 1975 as a continuation of IHD, which had been successfully completed between 1965 and 1974. IHD itself was born as a recommendation from a major UNESCO Initiative on arid zones, which took place between 1948 and 1964, but for many IHD represents the real beginning of UNESCO's active involvement in enhancing the knowledge base, research and capacity to sustainably manage water resources at local, regional and global levels. As the mandated UN organization on water sciences and management, UNESCO successfully managed to create a solid framework for local and global cooperation in this subject through a system of IHP National Committees and global intergovernmental bodies within the framework of a unique governance system established within IHD and IHP.

Arid Zone Initiatives (1948-64)

When UNESCO was launched in 1946 no specific reference was made to its direct involvement in water resources, yet its Member States soon started voicing the importance of creating an international institute for studying issues related to natural resources, including water, with a decision of its General Conference in 1948

ordering its establishment.¹ Considerable exchanges and many meetings were held to fulfil the decision, resulting in April 1951 in the first session of the Advisory Committee on Arid Zone Research in Algiers. Though the proposed Institute did not materialize, various specialized meetings were held resulting in the approval of the 'Major Project on Scientific Research on Arid Lands' by the ninth session of the General Conference, held in November 1956 in New Delhi. This project contributed significantly to the knowledge base and capacity development and laid the ground for the establishment of two major intergovernmental UNESCO programmes, namely IHP and the Man and the Biosphere programme (MAB).

Two important testimonies for the achievement of the major project have been documented in the key publications 'The UNESCO Water Adventure: From Desert to Water' by Michel Batisse²; 'The Future of Arid Lands: Papers and Recommendations from the International Arid Lands Meetings' by Gilbert F. White³ and 'The Future of Arid Lands – Revisited' by Charles F. Hutchinson and Stefanie M. Herrmann⁴. Both Michel Batisse and Gilbert White had themselves been closely involved in the project and their testimonies should be given great consideration. I quote, from the

1. Salih, Abdin, 2009, "UNESCO's contribution, to Water and Land Management in Arid and Semi-Arid Zones", proceedings of ERSES International Conference 2009: Sustainable Land Use and Ecosystem Conservation, Beijing, China, 4-7 May 2009.
2. Batisse, Michel, 2005, "The UNESCO Water Adventure – From Desert to Water", AFUS History Papers 4 and IHP Essay on Water History 1.
3. White, G.F. (editor), 1956, "The Future of Arid Lands: Papers and Recommendations from the International Arid Lands Meetings", Washington, DC: American Association for the Advancement of Science (Publication No. 43 of the AAAS).
4. Hutchinson, C.F. and S.M. Herrmann, 2008, "The Future of Arid Lands – Revisited: A Review of 50 years of Drylands Research", Springer – UNESCO publication.

introduction of Mr Nino Chiappano to the first publication, a conclusion drawn by Mr Batisse on the Major programme⁵:

In the end, and after approximately a fifteen-year period, the UNESCO programme had neither shrunk the deserts nor stopped erosion, which then more than ever before threatened the world. But it had contributed to clarifying the interlinked series of problems in arid lands and their economic, ecological and social repercussions. It had stimulated interest in questions previously neglected such as groundwater and salinity. It had opened the way towards an interdisciplinary approach to developing lands. It had served as the loom for weaving a lasting worldwide network of human contacts and dependable interchanges. It had acted as a catalyzer for a multitude of national and local initiatives whose list would undoubtedly be impressive. It had led to fruitful cooperation not duplicated by other organizations. It left a precious heritage of achieving success in finely tuning and synthesizing a number of topics on which the scientific community had worked very hard.

The International Hydrological Decade (1965-74)

Water issues had always been a key part of UNESCO's major project. However, it was only in 1961 that the idea for a world hydrology programme was proposed during an IAHS symposium held in Athens. The proposal was adopted by the Executive Board of UNESCO in its November 1961 meeting, which decided to include intergovernmental activities on scientific hydrology in its 1963-64 programme. Following this the Advisory Committee on Arid Zone Research in its 1962 meetings in Tashkent and Moscow reached an agreement on the creation of IHD.

5. White, G.F. (editor). 1956, "The Future of Arid Lands: Papers and Recommendations from the International Arid Lands Meetings", Washington, DC: American Association for the Advancement of Science (Publication No. 43 of the AAAS).

The twelfth session of UNESCO's General Conference in its meeting in Paris (November, 1962) approved the procedure for the implementation of IHD and officially closed the Major Project on Arid Lands. The Decade was then officially launched in November 1964 in Paris, making significant progress in regional hydrological investigations, capacity building and training, and wealth of publications.

Quoting from Batisse⁶:

"With Decade activities continuing to increase on all fronts, there was an impressive proliferation of meetings, consultants, missions, courses, seminars and publications – all extremely technical and thus making any detailed account of them impossible. In the field, the work of National Committees multiplied the numbers of IHD stations, experimental and representative basins, water balance investigations on watercourses and contributions to cooperative research projects. The Secretariat's report at the fourth session of the Coordinating Council was especially eloquent in this respect."

The year 1974 witnessed the ninth and final session of the Decade Coordination Council as well as the convening of its last major activity: the International Conference on Decade Results. The same year witnessed the launch of the first phase of the IHP as a legitimate child of the IHD⁷.

The International Hydrological Programme (since 1975)

The UNESCO initiatives in water resources were established because both the international scientific community and governments realized that water resources are often one of the primary limiting factors for harmonious

6. Hutchinson, C.F. and S.M. Herrmann, 2008, "The Future of Arid Lands – Revisited: A Review of 50 years of Drylands Research", Springer – UNESCO publication.

7. Records of the International Conference on the Results of the International Hydrological Decade and on Future Programmes in Hydrology, SC/MD/46, Paris, 1974.

socio-economic developments in many regions of the world, and therefore require internationally coordinated cooperation mechanisms to enhance the knowledge base, capacity and rational management. Thus, the general objectives of IHD, and later IHP, were set to improve the scientific and technological basis for the development of principal methods and techniques as well as providing the base of human resources necessary for the sustainable management of water. The pursuit of this objective has been fundamental to the search for solutions to the basic problems related to (among others) lack of reliable water supplies and sanitation, shortage of food and fibre, inadequate supplies of electrical energy, surface and ground water pollution, erosion and sedimentation, floods, drought, navigation, and negative effects related to global and climate change.

Since the inception of IHD in 1965 great progress has been achieved. Notwithstanding the attained achievements, the general objectives unfortunately remain valid to this day, but perhaps with some changes in emphasis. The main components of these changes include the role given to water resource management for sustainable development and the adaptation of hydrological sciences to cope with anticipated climate change and the preservation of the environment.

IHP Structure and Implementation

IHP is planned, executed, coordinated and monitored at global, regional, sub-regional and national levels with significant input from Member States. This is accomplished through the National Committees, the Intergovernmental Council and its Bureau, Technical Committees, Working Groups, Regional and International Centres, Networks, UNESCO Chairs, Regional Hydrologists and a Secretariat based at UNESCO headquarters in Paris. Close cooperation and harmony is maintained with related UNESCO environmental programmes, other

water-related United Nation Organizations under UN Water, regional organizations and non-governmental scientific organizations. IHP's projects are financed through a combination of a modest, regular UNESCO budget, countries' own resources and external funding sources.

Themes of the IHP Phases (1975-2021)

IHP is planned and implemented in six-year phases, covering themes reflecting the current priorities decided by Member States. The core themes of the first three phases of IHP (1971-89) followed the same directions of the Decade, focusing on research and capacity building in hydrological science in its strict sense. However, it was in IHP-IV (1990-95) that the programme crossed the boundaries to sustainability, water resource development and management, adopting 'Hydrology and Water Resources for Sustainable Development' as a core theme. In response to demands from the Member States, this was followed by the formulation of IHP-V (1996-2001), which chose 'Hydrology and Water Resources Development in a Vulnerable Environment' as a core theme.

As in the previous phases, IHP-V constituted a framework for applied research and education in the field of hydrology and water management. It was a dynamic concept whose aim was to improve the links between research, application and education, and to promote scientific and educational activities. This was successfully achieved through the following eight sub-themes: Global Hydrological and Biochemical Processes; Ecohydrological Processes in the Surficial Zone; Groundwater Resources at Risk; Strategies for Water Resource Management in Emergency and Conflicting Situations; Integrated Water Resource Management in Arid and Semi-Arid Zones; Humid Tropics Hydrology and Water Management; Integrated Urban Water Management; and Transfer of Knowledge, Information and Technology (KIT). Over thirty projects and hundreds of activities

were successfully carried out under these themes all over the world.

In recognition of the shift in thinking on water from fragmented compartments of scientific inquiry to a more holistic, integrated approach, the core theme for IHP-VI (2002-07) was defined as 'Water Interactions: Systems at Risk and Social Challenges'. In defining the critical research components for this phase, it became clear that what had hitherto been missing was a close investigation of water science and policy 'at the margins'. Five sub-themes were adopted, with many branching projects and activities, namely: Global Changes and Water Resources; Integrated Watershed and Aquifer Dynamics; Land Habitat Hydrology; Water and Society; and Water Education and Training.

The same trend of responding to arising needs of Member States was continued in the formulation of the IHP-VII (2008-13), which adopted 'Water Dependencies: Systems under Stress and Societal Responses' as a core theme, further emphasizing the interacting dependencies of the system components and the important role of society. The seventh phase consisted of the following five sub-themes: Adapting to the Impacts of Global Change, River Basins and Aquifer System; Strengthening Water Governance for Sustainability; Ecohydrology for Sustainability; Water and Life Support Systems; and Water Education for Sustainable Development. Twenty-three focal areas and hundreds of projects and activities were developed within these five themes and the crosscutting programmes and initiatives of IHP-VI.

Response to newly arising priorities and needs of the Member States has also influenced the formulation of the current phase. IHP-VIII (2014-21) has adopted 'Water Security: Responses to Local, Regional and Global Challenges' as its overarching idea. The six specific themes of the phase are: Water Related Disasters; Groundwater; Water Scarcity and Quality; Water for Human Settlement;

Ecohydrology; and Water Education. Thirty focal areas addressing five different topics under each of the six themes have been adopted. The challenges of water security, whichever definition is used, will benefit from the current movement towards 'The Sustainable Development Goals' in 2016.

Supporting Initiatives

In addition to the approved themes and sub-themes of IHP in its various phases since 1975, many supporting initiatives have been established in the form of crosscutting programmes, associated programmes, sister programmes, regional Centres and UNESCO Chairs.

Two crosscutting programme components – FRIEND (Flow Regime for International Experimental and Network Data) and HELP (Hydrology for Environment, Life and Policy) – have been initiated to interact with all IHP adopted themes through their operational concept. These components continue as major parts of IHP in all its related phases to date, expanding its coverage to almost all regions of the world.

The associated programmes include the Global Network on Water and Development Information in Arid Zones (G-WADI); The International Flood Initiative (IFI); the International Sediment Initiative (ISI); the project from Potential Conflict to Potential Cooperation (PCCP); the Joint International Isotope Hydrology (JIHP); the Internationally Shared Aquifer Resources Management (ISARM); the Urban Water Management Programme (UWMP); the World Hydrological Map (WHYMAP) and GRAPHIC.

The implementation of IHP themes and supporting initiatives is enhanced considerably by the rapidly expanding water related UNESCO Category 2 Centres, now numbering thirty-one worldwide. These are in addition to

thirty-three UNESCO Chairs, which address topics within the IHP themes and focal areas and are distributed widely across the regions.

Sister programmes within the Water Family should not be forgotten. The UNESCO-IHE Institute in Water Education (IHE) and the World Water Assessment Programme (WWAP) both contribute additional strength to IHP. The IHE is a Category 1 UNESCO Centre based in Delft (Netherlands) producing high quality post-graduate education and research and collaborating with IHP in the implementation of many of its themes and initiatives in spite of its different governance structure. WWAP, on the other hand, is coordinated by UNESCO with involvement from some thirty-one UN Water Members, producing the World Water Development Report as an important document on the status of water in the globe.

More information on these supporting initiatives and IHP can be found at the UNESCO Water Portal (<http://en.unesco.org/themes/water-security>). Through these initiatives and the various phases of IHP, UNESCO has made

significant contributions to the knowledge base, capacity development, rational development and sustainable management of freshwater at the national, regional and global levels.

Major Contributions from IHP (1975 to Date)

The major contributions of IHP to global water resources management have included a huge wealth of publications and knowledge base in hydrology and water resource management. A second major contribution has been in the wide range of capacity development, thanks to the establishment of research and training programmes and international Centres all over the world. IHP has also brought about regional and global networks of institutions and renowned experts, and launched pilot schemes in all regions linked to its themes and supporting initiatives. Last but not least, it has initiated and helped to establish a huge number of outstanding programmes, such as WWAP, UNESCO-IHE, and the thirty-one UNESCO Category 2 Regional Centres.

The Essence of Life: UNESCO Initiatives in the Water Sciences

Excerpts from: [2006. Sixty Years of Science at UNESCO 1945–2005](#). Paris, UNESCO

by **Sorin Dumitrescu**,

First Secretary of IHP

(November 1969-June 1988)

Vice-Chairman of the IHD Coordinating Council (1967-1969)

Before

Before 1961, the governing bodies of UNESCO did not recognize water as a specific field of interest to the Organization and its Member States.

Yet, by their very nature, water resources constitute a subject requiring crucial international cooperation. This cooperation fully corresponds with the purposes and functions of UNESCO as outlined in its Constitution. Over the years, the planning and management of water resources have formed a critical problem of economic and social development, a sine qua non condition for combating poverty and sustaining decent living standards for people throughout the world. Thus it was inevitable that water-related activities began to appear in UNESCO's programme in the early 1950s; and, from

about 1965 onward, these grew steadily to constitute in recent years a top priority area.

Main Achievements of the IHD

The major achievement of IHD was to create awareness at the national and international levels about water resources, and to mobilize efforts for the implementation of a worldwide research and educational programme in this field. Hydrology, which was relatively unknown in many countries – either as a science or as a profession – received universal recognition. One hundred and eight Member States officially participated in the programme and established IHD National Committees or focal points. The efficiency of National Committees greatly varied from one country to another, but their mere existence was an event in itself, confirming that hydrology had begun to be considered an activity of national significance. During the Decade, in many countries the development of measurement networks was markedly enhanced and the quantity and reliability of hydrological data substantially increased.

The International Hydrological Programme (1975 to the present) From scientific hydrology to water resources assessment and management

Some people believed that the new long-term programme was a mere continuation of the Hydrological Decade. To a certain extent this was true. The IHP inherited from the IHD a number of research and educational themes. It also inherited the mechanism that proved so successful during the Decade: the Intergovernmental Council, the fruitful partnership with various international organizations and the National Committees ensuring the participation of a great number of countries in the Programme. But over the thirty years of its existence, the IHP has had its own

dynamics: some earlier themes were becoming less interesting for international cooperation, and new themes emerged as vitally important problems at national and international levels. While the qualifier ‘hydrological’ remained in the title of the Programme, a shift was gradually made from the traditional subjects of scientific hydrology to the practical aspects of water resources assessment and management.

Already in 1974, in his opening address at the End-of-Decade Conference, Deputy Director-General John Fobes pointed out that the new Programme:

“should respond to the needs of tomorrow and should contain therefore some major innovations ...

taking into account the major water-related problems facing the world’. He added: I believe strongly that your plan should reflect, even more than the plan which is before you, what may be called a UNESCO approach to the problems of the contemporary world. I mean by this an approach which tries to integrate the contributions from the environmental sciences, the social sciences, culture, education and the communication media in the service of human progress – which today means survival, social justice and quality of life.”

These words were prophetic, but it took twenty-five years to fully achieve that objective.

Prospects for the future

In 2005⁸, the programme on water is firmly anchored in the overall programme of the Organization. It has become a top priority and is a good example of intersectoral cooperation around a vital environmental and socioeconomic problem. *By reinforcing the resources allocated to this programme, UNESCO was able to assume a leading*

8. Year at the time when Sorin Dumitrescu has written these lines in “60 Years of Science at UNESCO”, published in 2006 by UNESCO, in Part III P. 233 to P. 259.

role within the UN system in the field of water. The growing importance and urgency of water issues throughout the world is a guarantee for the pursuit of this trend. While contributing to a broad international cooperation involving many partners, UNESCO should consolidate its own water-related

niche, so as to reflect the complexity of the Organization's mandate on natural and social sciences, culture and communication, and the field of human rights. Following the pattern of Education for All, the water-related programme should also promote Water for All.

IHP and the Science of Hydrology

by **András Szöllösi-Nagy**,
Former Secretary of the International Hydrological Programme and Director of UNESCO's Division of Water Sciences in the period of 1989-2009
Former Deputy Assistant Director General, former Rector of the UNESCO-IHE Institute for Water Education (2009-2014)

Up until the early 1960s hydrology was an empirical field growing out from civil engineering and up to a certain extent from physical geography. It basically was a descriptive approach in understanding the workings of the hydrological cycle. This was largely due to both the complexity of the processes involved and to the lack of data that would enable a systematic approach to build up hydrology as a science.

The great change came partially after the 1958 International Geophysical Year and partially after UNESCO's fundamental Arid Zone Programme led by Michel Batisse in the fifties. These two major programmes provided ample evidence of how little was known about the distribution of water on Earth. Not only that water plays a determining role in all the global processes, although those days this was not yet the headline of the day, but the lack of understanding of the basic process involved as well as that of basic data at all scales provided an enormous obstacle in designing and operating water resources projects and systems.

The desire to know more about water was so to say hanging in the air.

Legend has it that at the margin of an IASH⁹ symposium in Greece, sometime in the summer of 1963, three persons were testing ouzo at a corner bar with a view to discussing what sort of action ought to be made to know more about the spatial and temporal distribution of water across different scales although scale transition was not yet one of the scientific issues of the day all over the world. *These three persons of vision, the American Ray Nace, USGS, the Belgian Claude Tison, Secretary General of IAHS and Michel Batisse of UNESCO, were chatting about the outline of a long-term programme devoted to hydrology. The notion of what became known later as the International Hydrological Decade (IHD) was born in that corner bar.* Although the epoch was certainly in the heyday of the Cold War, the idea was to have every nation, along with the scientific community in hydrology, involved. Due to Batisse's background work the idea was introduced to the intergovernmental arena, notably to UNESCO and to the World Meteorological Organization (WMO). With the formal adoption of the idea of IHD by the 1964 November session of UNESCO's General Conference UNESCO took the lead and the Decade commenced in January 1965.

9. International Association of Scientific Hydrology, later renamed to IAHS, International Association of Hydrological Sciences.

From early on a Romanian hydrologist, Sorin Dumitrescu, was involved in designing the activities of the Decade, first as Vice-Chair of the IHD Coordinating Council and later in 1969 as the first Secretary of IHD, a position that he held for twenty years with commendable technical leadership and diplomatic skills. It was Dumitrescu's wonderful work that turned the Decade into the truly innovative open-ended international scientific programme that IHP has become today. The Decade made fundamental contributions in establishing the first authoritative water balance of the world, a catalogue of discharges of the major rivers of the world and most importantly, through a world-wide set of experimental and representative catchments, contributed to some major breakthroughs in understanding the hydrological cycle. It may sound an overstatement but IHD indeed pushed hydrology into becoming a science. After the Decade was over the hydrological community came to know how much we don't know... Again, by a stroke of visionary leadership the Member States turned IHD in 1975 into the open ended IHP.

IHP operated through phases that were aligned to UNESCO's planning cycles. Worthwhile to note that IHP was perhaps the only programme for quite a long while within UNESCO that had its own C4, i.e. the medium-term plan in UNESCO, that was designed jointly by all the Member States. No wonder that this bottom-up approach, along with the planning of the bi-annual implementation was very strongly supported by the Member States through the IHP National Committee system under the lead of the IHP Intergovernmental Council.

A quarter of a century ago hardly anybody spoke about sustainability, climate change adaptation, hydrological non-stationarity or the cultural context of water when IHP already had those concepts at the core of its working

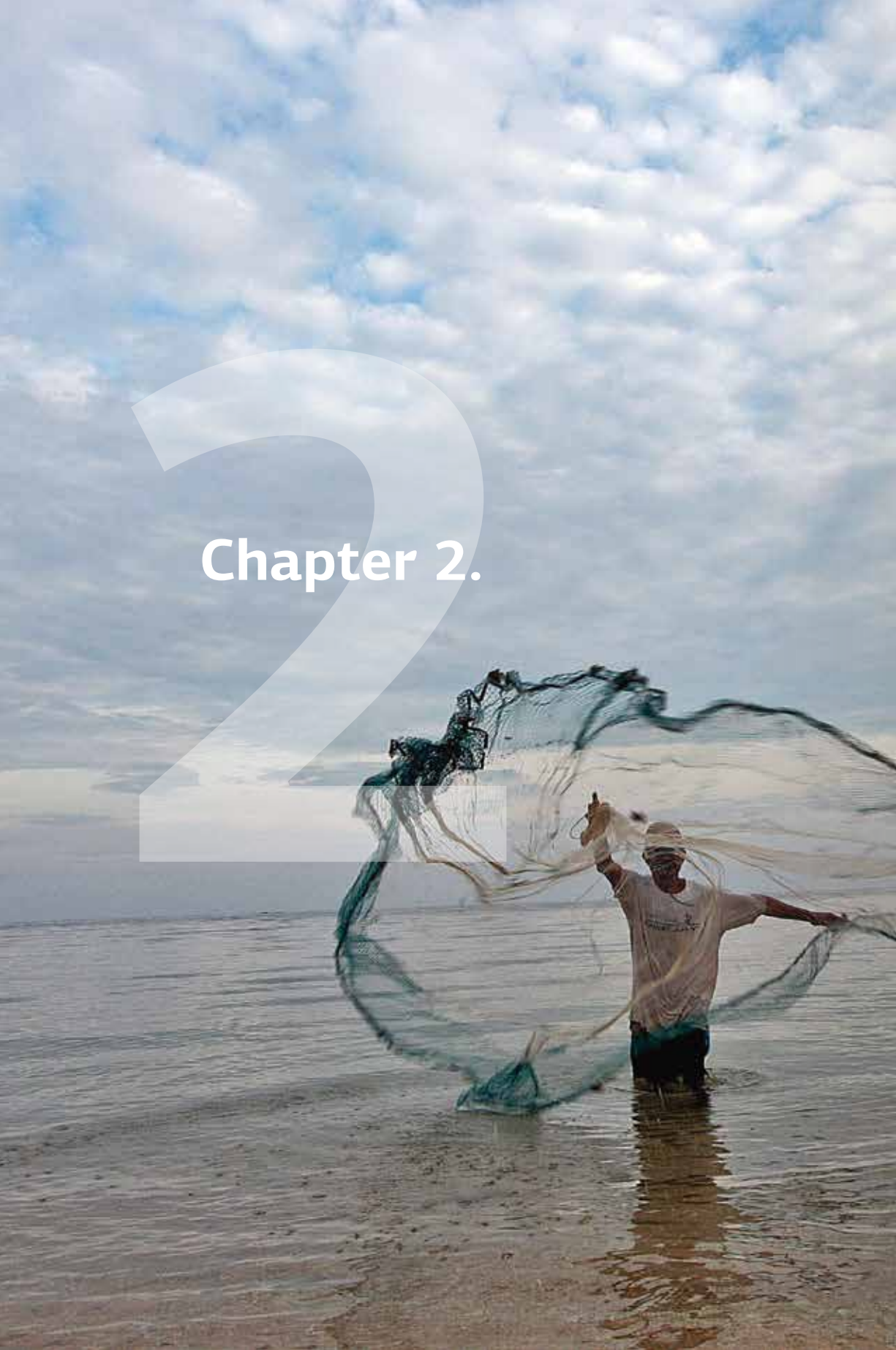
programme. It certainly is no overstatement to say that IHP set the broad lines of the research agenda of hydrological sciences. It is enough to have a glance at the various IHP Phase documents to prove this. Eco-hydrology, water conflict resolution, climate adaptation, groundwater management, humid zone hydrology, urban water systems, hydrogeochemical cycles, hydrological extremes, history of water and civilization are just a few examples. The interest in the programme has grown exponentially over the past few decades. The network of water-related Category 2 Centres, the launching by UNESCO of the UN World Water Assessment Programme, the establishment of the UNESCO-IHE Institute for Water Education as a major capacity development graduate school for the benefit of developing countries are fine examples. True, there still are challenges to effectively connect these institutions to make them work as one system but those challenges also offer huge opportunities that UNESCO should certainly grab.

Finally, if the author, who served the Programme for some fascinating years, may make a subjective comment, I would like to stress that if there were no IHP it should be established right now. Over the past few years the political recognition of the importance of water in a sustainable world finally emerged. Leaders recognized that some eighty per cent of climate change will be manifested through, with and by water, for instance. There is simply no way to advance social justice and diminish poverty without proper, science based water management. As work towards achieving the Sustainable Development Goals in fifteen years will start in earnest literally in a few weeks, there is no time to waste.

I am confident that IHP is ready and will continue to meet the enormous challenges ahead.

Time to act.

Chapter 2.





**THE INTERNATIONAL
HYDROLOGICAL
DECADE AND THE
BEGINNING OF IHP**

CHAPTER 2

FROM PROJECTS TO DECADE TO PROGRAMME: An Overview

Running up to IHD

Soon after the establishment of UNESCO, Member States realized that science should be incorporated into the organization's mandate. Subsequently, a Science Sector was added to the existing infrastructure and it became evident that the term 'science' should be understood as 'natural sciences' in a broader sense.

Earth sciences formed an important part of the Sector's activities, and water entered almost automatically, despite the fact that the term 'water' did not show up in

the UNESCO Constitution or in any of the approved programmes. Nevertheless, water soon became an important component, more and more visible in the Organization's agenda.

Upon its establishment UNESCO explored ways of working that could lead to tangible results. One such approach was seen in the creation of regional institutions and advisory bodies such as expert groups, setting up specialized institutes and providing scientific expertise.

Preceding Activities

In 1946 France proposed the creation of international research laboratories, one of which was devoted to arid zones. UNESCO submitted the proposal to the Economic and Social Council (ECOSOC) of the UN, focusing on the provision of fresh water in arid zones, and the Arid Zones Project was born. Water thus suddenly became a focal issue.¹

UNESCO neither had the funds nor the expertise and personnel to run the project and

it had to rely on external partners. The first group consisted of the participating Member States, in the case of the arid zones all from Western Europe and North America (although the project was largely carried out in Africa), an indication of the difficulties of the times to follow, during the Cold War.

The second group was formed of cooperating institutions, here in first line the French *Office de la Recherche Scientifique et Technique Outre-Mer* (ORSTOM) and *Bureau de Recherches Géologiques et Minières* (BRGM), the German Federal Institute for Geosciences and Natural

1. More information on the Arid Zones Project can be found in the book *The UNESCO Water Adventure* by M. Batisse (published in English in 2005).



Resources (BGR), the UK Institute of Wallingford and the US Geological Surveys (USGS). These were later joined by other institutions.

The third group consisted of Non-Governmental Organizations (NGOs). Many of them had been established between the two World Wars. They are too numerous to be listed here, most of them belonging to the International Council for Science (ICSU) family. With regard to arid zones, the International Association of Hydrological Sciences (IAHS) and the International Association of Hydrogeologists (IAH) have to be mentioned in first line. They provided top scientists on the basis of their scientific capabilities alone, not regarding geographical distribution.

The experiences drawn from the Arid Zone Project later enabled UNESCO to launch its water programmes.

Any project, whether local, national or regional, requires communication between multiple levels, from meetings on project coordination involving locally engaged staff to a general exchange of knowledge. This need gave rise



FROM LEFT TO RIGHT:

M. Batisse, the author of "The UNESCO Water Adventure".

Luna Leopold before his nomination as Chief Hydrologist of the US geological Survey.

to a range of seminars, symposia, conferences and decision-making governmental bodies. The advantage of these meetings was the free exchange of opinions, enabling the emergence of a high level project satisfying the scientific community. The meetings set the ground for evaluating achievements and generating ideas for the future. While often not being aware of the consequences of their deliberations, such meetings can be considered the origin of the ensuing UNESCO water programmes.

An arid zone project is not interested per se in aridity but in water for the population and for agriculture. Industry did not play a major role in the concerned countries at that time. It is often said that the focus at this point was often only directed towards quantitative aspects. Biological parameters played only a minor role, although salinity and hardness were well reflected in the project. By contrast, the later UNESCO programmes, while giving priority to quantitative aspects, included more and more qualitative parameters.

UNESCO's Arid Zone Project prompted a number of scientific meetings. However, the one held in Athens in October 1961 can be considered as the real birthday of the UNESCO water programme. The Symposium on Groundwater Resources in Arid Zones had been convened by the IAHS under the leadership of Prof L. Tison from the University of Gent (Belgium). A major water programme did not belong to the topics of the Symposium, but the idea evolved during

a talk in the lobby with Raymond Nace from the USGS in the presence of Dr Michel Batisse from UNESCO. Nace referred to his recent publication on the global nature of hydrology and the hydrological cycle and on the universality of water-related problems. Nace had no clear conception of a large international programme but he was thinking in terms of a ten-year programme on a truly international level.

The Birth of the International Hydrological Decade

The idea of an international scientific programme was not entirely new, since a similar idea had been raised during a symposium at Helsinki in 1960. Moreover, one international project had been successfully conducted against the complicated backdrop of the Cold War, namely the International Geophysical Year of 1957-58. It had been organized not by the UN but by the ICSU and this had the advantage of possessing an entirely scientific character, independent of a more political body like the UN. Having been a great success, the Year was extended to the end of 1959. East and West cooperated, and Nace had a similar event in mind, only on a longer time span.

The topic entered the UNESCO agenda when the US Delegate G. Shuster during the Session

of the UNESCO Executive Board raised his concern about the growing demand for water for drinking, agriculture and industry in the context of a rapidly growing world population. He asked for a two-year programme during which an international conference would come up with more detailed proposals. The proposal was adopted and the year 1962 saw a number of meetings, largely under the leadership of the USA, to elaborate proposals on the content of such a project, as well as how it would function. However, its responsibilities remained unclear. Moreover, there were serious doubts whether UNESCO was the appropriate body to conduct it, since the World Meteorological Organization (WMO) dominated the field of hydrometeorology and even briefly considered including groundwater in its remit.

The Decade Becomes Operational

The next months witnessed negotiations involving the WMO and ICSU. The US Delegations were largely composed of

members from the USGS, hence groundwater-oriented, while the Soviets came from the Hydrometeorological Centre (Hydromet), and

“ [...] it is a reasonable conjecture that the CHM may assume a major responsibility at the international level for problems such as the standardization of the apparatus and measurement methods to be used in the decade stations, for the reinforcement of hydrological networks and services, or for certain activities relating to precipitation, evaporation or water balances. There will therefore have to be very efficient liaison between the CHM and the Decade co-ordinating machinery. ”

*Preparatory Meeting of experts,
Paris, 1963; P34*

they never left a doubt that the WMO was their preferred organization. The USA prepared the bulk of working papers for the UNESCO Executive Board and the General Conference, not only because of its enthusiasm for the project but also because UNESCO lacked staff. A team was established consisting of R. Nace (as the driving force), V. Korzun (USSR) and J. Rodier (ORSTOM, France). Over three months in early 1963 this team set out a list of topics considered apt for an international programme.

The new programme had to take into account an enormous political change in the world. With former colonies gaining independence, particularly in Africa, the number of countries had grown in just a few years from around fifty to well over a hundred. These new countries had to be fully integrated, despite their mostly little developed hydrological services. The programme had to provide them with the necessary tools for cooperation without neglecting the high-level demands of industrialized countries. The list of main topics therefore included hydrological



FROM TOP TO BOTTOM:

Opening 6th Session of the Coordinating Council for the Decade held at WHO Headquarters Geneva.

Experiment on the demineralization of saline water using solar energy with the support of UNESCO, at the Negev Desert Institute at Beersheba, Israel.

networks, river discharge, changes in riverbeds and sedimentation, precipitation, evaporation, groundwater, the water balance of basins, hydrological forecasting and man's influence on continental waters.

'Scientific Hydrology', a Committee of Experts from twenty-five countries, was convened in 1963 and largely adopted the proposals of the experts. The meeting was opened by the new Director General Mr R. Maheu, who made a clear distinction between the tasks which UNESCO (and the WMO) would carry out and those falling under the umbrella of

the Member States. Training and education were designated as a major responsibility of UNESCO, while the collaboration of the Food and Agriculture Organization of the United Nations (FAO), the International Atomic Energy Agency (IAEA) and WHO and relevant NGOs was confirmed. The Soviet Union requested a high level partnership with WMO, resulting in jointly convening conferences. However, the way was paved for the General Conference to adopt the plan for a Decade as a UNESCO programme, setting out a plan for the first two years in some detail.

It was not easy to determine how to carry out the new programme, since numerous levels were involved. On the country level National Committees (NCs) were established, including representatives of surface and atmospheric waters, groundwater, higher education and governments. Some NCs became powerful institutions, while others consisted of just a single person. It should not be forgotten that, in words of Mr Maheu, although the Decade was a UNESCO programme, it was a programme

for the Member States, not for UNESCO itself, and that its success depended on the Member States' contributions. An international programme must remain general while the local requirements can only be defined and fulfilled at a national level.

At international level, the Administrative Committee on Coordinating of the UN, the ACC, settled problems between the UN Agencies and it appears that UNESCO's position was successfully defended during the annual meetings. Meanwhile, at UNESCO the General Conference met each second year to decide on long-term developments and, in detail, the programme and budget for the following two years. In discussions concerning the water programme the Member States always sent top people who not only defended the case but also paved the way for innovations and for appropriate budgeting. The General Conference always passed resolutions as a basis for the organs of the Decade's governing bodies.

Governing the Decade and the Programme

It was not evident from the very beginning how the new water programme (very soon called the International Hydrological Decade, or IHD) could be steered. There were proposals to convene annual meetings of all cooperating countries, at governmental level. This turned out to be unworkable, for both financial and operational reasons.

Instead, it was considered more appropriate to establish an Intergovernmental Council to meet annually and to report to the UNESCO General Conference. This institution proved highly efficient and, with only a few modifications, has been maintained over the past five decades, for IHD and IHP. In the beginning the Council

consisted of eighteen members, soon enlarged to twenty-one, with members representing all regions of the world. They were elected by a special Nomination Committee of the General Conference for a duration of two years with possible re-election. With the creation of the International Hydrological Programme, a new order was established. The Council was enlarged to thirty members, always five out of the six geographical regions of UNESCO. Re-election was possible in principle but remained the exception. The Chair would be elected on a rotation principle, always for a period of two years.

It should be noted that the Council Members represented their country of origin and that



their participation had to be paid for by their countries. In the long run this had some repercussions since some countries were not able to send their top hydrologist but instead sent representatives from the Permanent Delegation to UNESCO or Embassy in Paris. In the beginning, the Council met annually for periods of ten days. Subsequent meetings were shortened to a week, and eventually they were held every second year, with the duration cut to three days.

The language question limited UNESCO's capability to convene the Council. Initially sessions were held in all of the official

FROM LEFT TO RIGHT AND FROM TOP TO BOTTOM:

Prof. Boyko, founder of Negev Institute for Arid Zone Research.

Vittorino Veronese, Director -General from 1959 to 1961, during the Major Project on arid Lands. To his right, his successor René Maheu.

Egyptian Fellah drawing water from the Nile.

The Arid Zone Research Institute, Baghdad, Iraq, 1966.

languages of the Organization: English, French, Russian, Spanish, Chinese and Arabic. The last two were soon eliminated, despite which the costs for interpretation remained high and doubtlessly reduced the frequency



FROM LEFT TO RIGHT AND FROM BOTTOM TO TOP:

Logo of the Decade.

Three UNESCO Experts at CREUSI's research station at the oasis of Tozeur in Tunisia.

Hydrological Studies of the Upper Paraguay, 1972.

UNESCO's presence in the vast southern Sahara, in a project studying its water resources.

and duration of the sessions. Several failed attempts were made to limit the discussions to English and French, and it was insisted that all Council documents had to be available in all conference languages. This soon led to the

solution to declare only some basic texts as 'Documents', while others were designated as 'Information' – in English and French only.

The Council was obliged to consider the whole programme on the basis of reports by the Secretariat, Working Groups, Expert Groups, Panels, individual rapporteurs and also reports by participating UN Agencies and NGOs. It would then adopt a resolution acknowledging the results achieved and defining forthcoming activities. These resolutions, in the beginning long texts, were later replaced by shorter work instructions. A report by the Finance Committee would define the possible

frame. Throughout its time the Council has guided the Secretariat with a high degree of responsibility and efficiency, ensuring and that the Member States have received what they needed, in conformity with the capacity of the Secretariat and the funds at its disposal. No major disharmony can be reported over the past fifty years.

While the Council was responsible for the overall programme there were always special questions and problems demanding immediate solutions and a deeper discussion than the Council could offer. For this purpose, a Bureau was established, consisting of six individuals, representing each of the six UNESCO geographical regions. Its Chairperson was the Chair of the Council, the outgoing Chair (thus ensuring a transfer of knowledge) and four others from the remaining regions. The original idea was that they met on demand; later they met twice a year, and in the end annually. Their participation was financed by UNESCO and this explains the decrease in frequency. The Bureau can be considered a highly efficient and necessary instrument without which the programme could not operate.

Since the programmes, both IHD and IHP, relied on the decisions of the General Conference, there was a risk of delays and a lack of fresh ideas. UNESCO therefore convened international conferences with free participation. These featured invited papers but also encouraged a wider public to introduce new ideas to be considered for the formulation of future programmes. In this way, IHD and IHP were able to follow the political and scientific streams and adapt their work to the changing requirements of a world with often rapidly evolving themes. During the Decade two major conferences were held: the Mid-Decade Conference (MDC) in 1969 and the End-Decade Conference in 1974. Both conferences evaluated the results obtained and served to inspire new activities.

The Decade was of course intended to last exactly ten years. Towards its end the world community realized that more time was needed to achieve the expected results. There was some resistance among the Member States, and also within UNESCO, toward the idea of extending the project. However, there were also important voices calling for a longer-term, open-ended prolongation. A new designation needed to be found. There was much debate over the appropriate title, and the new name 'International Hydrological Programme' did not satisfy everybody, yet it survived. In the beginning a period of six years was considered to suffice, but further six-year phases followed (this duration corresponds to UNESCO's Medium Term Planning Periods). Today, as UNESCO's water programmes celebrate their fiftieth anniversary, much work still needs to be carried out as water problems in the world are on the rise and UNESCO's guidance is in high demand.

CHAPTER 2

THE INTERNATIONAL HYDROLOGICAL DECADE (1965-74)

The Expert Group in 1963

As UNESCO's programmes within the Science Sector evolved, the very successful Arid Zones Project persuaded UNESCO to work on water-related issues. East and West cooperated to set up a major project of worldwide scope with a view to enabling the newly independent countries to implement their own hydrological services. A number of priority areas were chosen, including, among others, data collection and use, research and education. The programme would not only involve UNESCO but, as many other UN agencies as possible (starting with the WMO and FAO), related NGOs (IASH, IAH) and experienced national institutions and institutes.

The First Expert Meeting preparing what was to become the International Hydrological Decade (IHD), was held at UNESCO House on 20-29 May 1963. It consisted of leading hydrologists who were aware of the need for an international programme, as well as of the global nature of hydrological problems which could only be solved through international cooperation. Another major priority was that the programme should meet with UNESCO's mandate and operate in line with its capabilities. As a first step the Group defined seven basic components (which were later enlarged), as follows:

- appraisal of UNESCO's existing knowledge of world hydrology and identification of the principal gaps within it;

“*The need for an international programme arises from the fundamental physical nature of the hydrological cycle, from the fact that the problems of water resource development occur throughout the world, and finally from the scarcity of highly specialized researchers who will often have to work outside their own countries.*”

Preparatory Meeting of Experts, Paris, 1963: P4

- standardization of techniques for collection, compilation and reporting of data;
- establishment of basic networks to provide fundamental data on hydrological systems, varying in size from small watersheds to systems on a global scale;
- research on unique or critical hydrological systems in selected geological, topographical and climatic environments, constituting 'representative basins';
- research on specific hydrological problems whose urgency and special nature called for considerable effort at international level;

- education and training in hydrology and related domains; and lastly,
- the systematic exchange of information.

From the beginning the Group was aware that these components could only be implemented through a long-term programme. It was also recognized that the newly developing countries needed enough time to build up capable national services, facilities and trained staff. From a scientific perspective, a longer period of time was also necessary in order to observe and correctly analyze the more variable hydrological parameters: hence the Group's suggestion of a decade-long duration.

The Group was aware that there was no adequate collection of data at the time to cover even the principal hydrological regions of the world. Nor was there any collection of data on global precipitation, evapotranspiration, soil moisture, groundwater, stream flow, lacustrine hydrology, erosion, sediment movement or water quality. To obtain this knowledge, the Group realized it would be necessary to establish a summarized collection of data, possibly supported by maps, with an indication of the observation period needed. It therefore suggested the following: the establishment of basic networks; research on representative basins; specific research (see below); education and training; systematic exchange of information; and, finally, interdisciplinary cooperation.

The Group then embarked on detailed proposals for the envisaged programme, which later became the terms of reference for the IHD Working Groups, Panels and Expert Groups. Some of the major proposals for designing the Decade's programme included: a) regimen of streams, streamflow, runoff distribution, overland and channel flow, including global changes with their fluctuations; b) evolution of river beds, sedimentation and erosion, and the establishment of measurement networks; c) precipitation (liquid and solid), including distribution in space and time, chemical



FROM TOP TO BOTTOM:

Meeting of the International Hydrological Decade at UNESCO in 1966.

Desiccation cracks in the sediment of an arid zone, picture from UNESCO Archives.

composition, rainstorms, snow and ice studies, snow storage, ice formation on rivers and glaciers; d) soil moisture, including variations according to climate and type of soil, movement of water and saturation; e) groundwater, including varieties of groundwater reservoirs, groundwater movement, fossil resources, f) water balance, interactions with rivers, water quality and preparation of maps; water balance of river basins; g) hydrological forecasts, covering the establishment of basin-wide networks, seasonal variations, rainfall floods, floods resulting from melting snow, and ice formation on rivers, lakes and reservoirs; h) quality of water, including geochemical cycles, flora and microbial fauna, influence of human activities; and i) the influence of man on continental waters, including industrial and agricultural inflow and the growth of towns.

To meet the above proposals, the Group suggested that the programme should establish basic network operations to fix standards, train staff and prepare textbooks, as well as Decade Stations to increase the number of rain-gauging and hydrometric stations, and the selection of particularly important stations to become Decade benchmarks. In addition, the programme should identify representative and experimental basins, undertake data collection and dissemination, train specialists, and foster international cooperation.

The Group developed a timetable for submission of its report to the UNESCO Executive Board and General Conference in

order for the Decade to become operational in 1965. At the same time the Member States were able to study the report, set up National Committees and prepare themselves for the execution of the proposed activities. UNESCO was invited to negotiate with the UN and the specialized agencies (particularly WMO, FAO and IAEA) to ensure their cooperation. It was also asked to ensure the participation of the competent NGOs from the ICSU and IUGG families, in addition to the IAHS, IAH and IAHR. The Group made a number of proposals concerning governance and recommended the establishment of a Coordinating Council of the IHD, possibly at governmental level.

The Expert Group in 1964

In order to launch the Decade, another expert meeting, called the Intergovernmental Meeting of Experts (also known as ‘Council Zero’) was held at UNESCO Headquarters in Paris from 7-17 April 1964. It was chaired by Prof A. Volker (Netherlands) and attended by fifty-seven countries and a great number of UN agencies and NGOs. The Secretariat consisted of Dr Michel Batisse, assisted by Mr J.A. da Costa and a number of staff members from the Division of Natural Resources. Its considerations were based on the report compiled by the expert meeting of 1963 and on the comments and suggestions received in the meantime from the various Member States and international organizations.

The Group immediately created three separate Working Groups concerned with: the collection of basic data; inventories and balances; and research. It appointed the Chairs, Vice-Chairs and Rapporteurs of these groups, it being understood that the other members would be appointed later. The Group then discussed the major objectives of

“*The idea of a long-term programme of international cooperation in scientific hydrology was considered by the Executive Board of UNESCO at its 60th session in October 1961. The scientific content of this programme and the proposed methods of execution were sketched out by an expert committee of the 12th session of the General Conference in November 1962. On the basis of this committee’s work, a document entitled ‘Proposals for an International Hydrological Decade’ (UNESCO/NS/NR/22) was compiled by the Secretariat as a working paper for a preparatory meeting of experts convened in Paris from 20-29 May 1963 in accordance with resolution 2.2122 (b) adopted by the General Conference at its 12th session.*”

*Intergovernmental Meeting of Experts,
Paris, 1964, P.3*

the IHD (which included essential changes to the 1963 list).

These were:

- appraisal of UNESCO's knowledge of world hydrology and identification of the principal gaps within it;
- standardization of instruments, observations, techniques and terminologies used for the collection, compilation and reporting of data;
- establishment of basic networks and improvement of existing networks, in order to provide fundamental data on hydrological systems varying in size from small watersheds to the world as a whole;
- research on hydrological systems in selected geological, geographical, topographical and climatic environments (representative basins);
- research on specific hydrological problems whose urgency and special nature called for a considerable effort at international level;
- theoretical and practical training in hydrology and related subjects; and finally
- the systematic exchange of information.

The Group then considered the content of the programme in detail, and this draft programme was sent to the Member States so that in the course of the year 1964 a consolidated version could be prepared for the first session of the IHD Council in 1965. The Group also suggested a special programme for education and training that, with some modifications, has been maintained over many years, spanning several IHP Phases.

The Group was able to make use of the experience gained from other international UNESCO programmes when formulating

“*The overall objective of an international programme in the field of hydrology is to accelerate the study of water resources and the regimen of waters with a view to their rational management in the interest of mankind, to publicize the need for hydrological research and education in all countries, and to improve our ability to evaluate resources and use them to the best advantage. That is, the programme will focus on science but will give strong consideration to utilitarian factors.*”

*Intergovernmental Meeting of Experts,
Paris, 1964; P.5*

the procedures for implementing the new programme. However, when IHD was founded very few such model existed. Thankfully, owing to the very close cooperation between the leading figures in each country, the Secretariat and the IHD Bureau, an extremely well-functioning hierarchy of the IHD Council and its sub-organs could be established over a relatively short time. It should be remembered that at the time communication was rather difficult and slow. Telephone connections did not always work well and in some cases did not even exist. Electronic communication did not exist. The most frequent means of communication were telegrams, with members of the Secretariat able to condense even a complicated message into the allotted ten words. Fortunately, the number of cables was not restricted during the first years of IHD, but later savings also had to be made in this area.

The meeting report (UNESCO Document NS/188) contains in its annexes the scientific projects, the reports of the preparatory Working Groups and the draft statutes of the Coordinating Council of the Decade.

The First Half of the Decade (1965-69)

First Session of the IHD Council, December 1965

The first Session of the newly established IHD Council was held in the middle of the year 1965, chaired by Mr P. R. Ahuja from India. At this time the IHD Council received reports on the Working Groups which had already been established, settled the memberships of the Groups still to be created and, finally, prepared for the next session.

It is perhaps worth noting that the Working Groups currently in existence at this time consisted of: a) Network Planning; b) Representative and Experimental Basins; c) Hydrology of Limestone Terrains (which was soon closed); d) and Hydrological Education. The new groups established by the IHD Council included: a) World Water Balance; b) Standardization; c) Hydrological Maps (at that time primarily involving surface waters); d) Influence of Man; and e) Floods and their Computation.

At that time the UNESCO Administration was only a small unit that existed primarily to help each division carry out its work. Rules and regulations were on a small scale, with no quota or budget codes, and the divisions had a relatively free hand in their work. The IHD Council considered its Session to be a scientific forum, discussing in-depth scientific problems and involving some of the world's leading hydro-geologists. The IHD Council felt the resulting papers were so important that it asked the Secretariat to publish all of them, with calculations, graphs, tables and maps, as annexes to its report. The character of the IHD Council sessions, however, changed over the years. Throughout the Decade scientific considerations were increasingly sidelined in favour of administrative and organizational aspects. Both Council and Secretariat were concerned by this

development. During the succeeding programme, IHP, the Council Sessions' lack of scientific content has been partially compensated for by a symposium (the Kovacs Symposium), which precedes the Council, except in 2012 when it had to be canceled for financial reasons.

The long list of papers included here demonstrates the Decade's original intention to create a global programme to cover all aspects of hydrology. During the Session a great number of proposals were made orally but not recorded. The proposals reflected the understanding of 'hydrology' at the time, mainly oriented towards water quantity because the 'ecological age' had not yet arrived. It is evident now that neither the Member States nor the Secretariat with its limited staff could implement a programme on the scale proposed.

Second Session, April 1966

The Second Session was held at UNESCO Headquarters in Paris from 19-25 April 1966, again under the chairpersonship of Mr Ahuja from India with Mr da Costa leading the Secretariat. From the twenty-one Council Members, twenty participated in the meeting and a further eighteen countries attended as observers. Numerous UN agencies and NGOs assisted in the meeting. It should be stressed that besides Mr da Costa the Secretariat consisted of only two staff members: Mr N. A. Bochin (USSR) and Mr J. Aimé (France).

The Secretariat presented an impressive list of circular letters addressed to the Member States asking for information on their intended input. It then reported on the main results, particularly on the Decade Stations, on network planning and design, on the Hydrogeological Map of Europe, the world water balance, representative and

▲ THE PAPERS PRESENTED AT THE FIRST SESSION OF THE IHD COUNCIL BY ORGANIZATIONS WORKING IN COORDINATION WITH UNESCO AND UNESCO MEMBER STATES (BY ALPHABETICAL ORDER OF PRESENTING ENTITY), DECEMBER 1965:

- Effect of land use on water quality: forested, agricultural and urban drainage basins (Canada, USA and Federal Republic of Germany)
- Mathematical analysis of streamflow and precipitation sequences (Canada and others)
- Global water balance (Expert Group of 1964)
- Hydrology of the Karst formations in the Mediterranean Basin (FAO)
- Influence of reclamation, irrigation and drainage schemes on the hydrological cycle (FAO)
- Watershed management and hydrology (FAO)
- Groundwater salinity in coastal waters (Federal Republic of Germany)
- World programme for geophysical investigations in groundwater exploration (France, Germany, Netherlands, USA)
- Application of stable isotopes in hydrology (IAEA)
- Applications of isotope techniques to glaciology and snow hydrology (IAEA)
- Direction and velocity measurements in groundwater by means of radioisotope techniques (IAEA)
- Radionuclide tracer studies in chronological hydrology (IAEA and USA)
- The discharge of tritium to the oceans by major rivers (IAEA)
- The use of nuclear techniques to determine moisture content in the unsaturated zone (IAEA)
- Hydrogeological Map of Europe (IAH)
- Hydrogeological Map of the Arid Zones (IAH)
- Hydrological maps (IASH and IAH)
- Representative and experimental basins (IASH)
- Relations between soil moisture and the behaviour and yield of various plant species (ICID, FAO)
- Combined water-ice-and heat balance measurements at selected representative glacier systems (ICSI)
- Measurements of glacier variations on a worldwide basis (ICSI)
- World inventory of perennial and annual ice and snow masses (International Commission on Snow and Ice, ICSI)
- Effects of variations in piezometric head on land subsidence (International Society on Soil Mechanics)
- Hydrology and hydrodynamics in the zone of vadose waters (Netherlands et al)
- Archaeohydrology (NN), never executed
- Hydraulic investigations in the area of artificial recharge of groundwater (NN)
- Gross sediment transport into the oceans (summary by the Secretariat on the basis of country and IAHS submissions)
- Hydrological benchmarks (summary by the Secretariat on the basis of country submissions)
- Dynamics of lakes and reservoirs (several countries)
- Effects of physiographic features on precipitation (several countries)
- Relations between sediment transport, streamflow and channel morphology (several countries)
- International glossary of hydrology (UN Inter-Agency Meeting on Water Resources, 1958)
- Application of mathematical models for runoff prediction in diverse climatic and physiographic regimes (USA and others)
- Chemical and physical changes in water in coastal areas (USA)
- Dispersion in moving groundwater (USA)
- Ecology and water-loving vegetation (USA and other countries)
- Genesis and physical chemistry in natural waters (USA)
- Hydrology of coastal wetlands, estuaries and coastal marine waters (USA)
- Incidence and spread of continental drought (USA)
- Measurement of snowfall and snowpack (USA)
- Vigil network, establishment of measurement stations to identify changes in the hydrological regimes in the world (USA, USGS)
- Basic scientific hydrological problems demanding international cooperation and establishment of a working committee on scientific research (both USSR); also exchange of information and publications in connection with IHD
- Determination of computing characteristics of the maximum precipitation for different periods of time in various natural zones (USSR)
- Evaporation reduction from open surfaces (USSR, Australia and others)
- Investigation of the maximum runoff of water from melting snow and ice (USSR)
- Mechanization and automation for processing the results of hydrological observations for hydrological operative information (USSR)
- The evaluation of methods of calculation for the regime of subterranean waters with the use of mathematical statistics and computing devices (USSR)
- The study of water balance in connection with the evaluation of the water-regulating and water-conserving role of forests (USSR)
- Water balance of the Earth and its variations in time (USSR)
- Decade Stations (WMO)
- Hydrological data for the design of water resources projects (WMO and ECAFE)
- Network design (WMO)

experimental basins, gross sediment transport to the oceans, and the hydrology of the fractured limestone of the Mediterranean Basin. The IHD Council also received information from the ten Working Groups it had established, from which it transpired that the small number of staff members in the Secretariat was not in a position to cater for them all. Having received all relevant information from the Working Groups, UN Agencies and NGOs, the IHD Council decided on the reestablishment or reorganization of the groups, defining their terms of reference and which subsidiary bodies they were permitted to create. Finally, the Council determined the composition of ten Working Groups, which were: Representative and Experimental Basins; Hydrology of Carbonate Rocks in the Mediterranean Basin (executed by FAO); Nuclear Techniques (executed by IAEA); Floods and their Computation; Exchange of Information; Education; World Water Balance; Hydrological Maps; Influence of Man on the Hydrological Cycle; and Standardization Problems.

Apart from a few minor changes, this composition remained stable over a number of years. The Council report contained a number of smaller reports on Working Groups. These reports were as complete as imaginable with exhaustive texts, drawings, calculations, tables, graphs and maps. A very detailed report on the WMO provided information on the contribution of this UN Organization to the Decade.

Third Session, June 1967

The Third Session was held from 6-16 June 1967 at UNESCO Headquarters in Paris under the chairpersonship of Mr I. Chéret of France. Of the twenty-one Council members nineteen participated, together with a large number of observers and representatives from international organizations. The IHD Council reviewed the progress of work since its last session, particularly with regard to the Decade

Stations, network planning, the world water balance, the Hydrogeological Map of Europe (at that time still a Decade project, later seen as a UNESCO project alone), the representative and experimental basins, the hydrology of carbonate rocks in the Mediterranean Basin, the measurement of the variations of glaciers on a worldwide level and the design of water resources projects with inadequate data. For all these activities, the IHD Council adopted an individual resolution.

During this time the resolutions were quite lengthy but this policy was later abandoned in favour of short conclusions. One (relatively short) resolution, concerning the design of water resources with inadequate data, is reproduced here as an example of the working method and spirit of that time (Res. III.5):

The Council

- 1.** Recalling resolution n° I.18 of its first session
- 2.** Considering the problem of availability of hydrological data for design of water resources projects
- 3.** Considering the importance of using and devising procedures to alleviate the scarcity of climatological and hydrological data, particularly in developing countries
- 4.** Having considered the report of the Secretariat in this question
- 5.** Invites Member States to participate actively in this programme and to provide available data to the Secretariat
- 6.** Requests the Secretariat in a first phase of this activity, with the aid of a small group of experts, for those regions in which hydrological-hydraulic data are limited, to:
 - (a) Collect summaries of established techniques and procedures suited

to the solutions of major hydraulic engineering projects, and distribute them among the National Committees

(b) Develop appropriate summaries regarding the nature of hydrological engineering analyses needed for water resources projects, for example those dealing with such items as annual volume of runoff, design flood, maximum flow line in rivers and lakes, mean annual sediment production, evaporation and so on

(c) Study the possibility of developing regional guides and summaries from the information submitted – for example, a concise appendix of hydrometeorological principles and procedures involved in the development of generalized regional estimates of probable maximum precipitation, runoff, evaporation and so on

(d) Examine the possibility of developing proposals for special training of personnel in the phases of hydrometeorology and hydraulic engineering involved in cooperation with the Council's Working Group on Education and Training

(e) Coordinate and provide for the exchange of information with other appropriate working groups such as World Water Balance, Influence of Man on the Hydrological Cycle, Floods and their Computation, Representative and Experimental Basins and so on

7. Recommends that UNESCO and other interested international organizations study the means of technical and financial assistance to countries which are desirous of participating in general studies of basic data for engineering purposes, and whose resources for such research are limited

This resolution superseded Resolution I-18.

The above example shows that at the very beginning of IHD the prevailing idea was that the Secretariat would act as a kind of worldwide agency for the collection and dissemination of hydrological data and for computing methods in a very broad sense, with many people speaking of an 'Office of Hydrology'. In fact, at that time the Secretariat received very detailed data and national reports but it turned out that the available workforce was insufficient to process the information, bring it into systematic order and publish it. The creation of this 'office' did not in fact take place. In fact, there was much resistance to the idea of such a global data office, not only from many Member States and UN Agencies but also within the House, since it would have required a great deal of personnel and space. It should be remembered that at the time everything still had to be processed manually.

The IHD Council then proceeded to examine research projects such as the "influence of man" on the hydrological cycle, snow and ice, hydrological forecasting, and acquisition, transmission and processing of hydrological data, amongst others. It also included a number of new themes, such as the hydrological problems related to artificial and natural changes to the quality of water, the use of saline water, ecology and water-loving vegetation. The Council stressed the need for an exchange of information and suggested a number of symposia to be held. It also supported activities in the field of education and training as well as regional cooperation. It then reaffirmed the existing Working Groups and in some cases changed their composition.

The IHD Council felt that it was necessary to hold a critical review in the middle of the Decade and took the decision to hold a Mid-Decade Conference in 1969, for which it also determined the overall objectives. The

Secretariat then presented an exhaustive report on the results of the Decade's activities, reproduced in Annex IV of the Council Report.

The IHD Council devoted a great deal of time to matters related to education and training and defined a number of key themes to extend beyond the Decade, such as the Working Groups on the framework for activities, the establishment of UNESCO-sponsored postgraduate courses, training of technicians and observers, the need for professional hydrologists, analysis of available textbooks, curricula and syllabi for university courses, teaching aids, Decade scholarships and continuing education. A significant innovation was the establishment of summer schools for teachers and professors.

Fourth Session, May 1968

The Fourth IHD Council Session was held at UNESCO Headquarters in Paris from 6-15 May 1968, again chaired by Mr Chéret from France. The Secretariat, under the leadership of Mr da Costa, had by this time been enlarged with the addition of two new staff members. With the exception of one country, all Council members participated, with 15 observers and a great number of international organizations also attending. The Council felt it was necessary to discuss those items more thoroughly, paying particular attention to execution or scientific content and leaving the details of other activities or those of minor importance for the Secretariat's report.

Reports on the First Session in 1965 had already stressed that the IHD Council would act as a kind of high-level scientific forum. With the number of projects increasing rapidly, the Council had to make the choice between surface discussions on a wide range of topics or in-depth treatment of selected themes: it chose the latter. However, the increasing number of projects caused other issues since the Secretariat did not have the

resources to cope with the resulting reports. The Council therefore agreed that the huge amount of documentation and working papers could no longer be presented in all four official languages of the Council, with the exception of the final report.

The IHD Council heard the reports of the cooperating UN agencies and NGOs and then, as in 1967, it discussed the reports of the IHD Working Groups, particularly with regard to the outcome of publications and symposia. The Council noted with satisfaction that the first products of the Working Groups were on the market (at that time only as UNESCO publications) and that the number of symposia was increasing.

The IHD Council also confirmed the timeline for its last session and discussed the planned Mid-Decade Conference, for which it developed a very detailed timetable and work plan. The plan included a useful block of meetings: Bureau (one day), Mid-Decade Conference (six days) and at the end the Fifth Council Session (one week). Three major fields were agreed upon, which were: a review of the work accomplished during the first half of the Decade; preparation and proposals for the future work of the Decade and for possible changes to the direction of the programme; and an exchange of views on a long-term plan of action in the field of hydrology.

The last item reveals that key decision-makers were already convinced that a (or the) Decade could not meet all expectations and that something like IHP might become necessary.

One detail should be added although it was not mentioned in the Council Report: During the last days of the session the famous Paris riots broke out and hampered the movement of delegates, with the result that many left prior to the official closing. Indeed, towards the end of the day the meeting room was almost empty; nevertheless, the final report was considered officially approved.

Fifth Session, 1969

Prior to the Fifth Session the Hydrology branch of the Division of Earth Sciences had become independent, under the name 'Division of Water Sciences' (internal abbreviation SC/HYD). In conjunction with the establishment of the new division a Director was appointed, Mr S. Dumitrescu from Romania, who went on to hold this post for a period of almost twenty years. He was well acquainted with IHD since he had participated in all preparatory meetings and had also acted as one of the Vice-Chairmen of the Council.

The Fifth Session was due to be held in conjunction with the Mid-Decade Conference in September 1969, but for internal reasons it had to be postponed to December. The Mid-Decade Conference, official title 'International Conference on the Practical and Scientific Results of the International Hydrological Decade and on International Cooperation in Hydrology' (this long title has often since been used as an example of how a conference should not be named), was held at UNESCO Headquarters in Paris from 8-16 December, followed by the Sixth Council Session from 17-19 December.

While Mr da Costa continued to act as Secretary of the Council, Mr Dumitrescu assumed his duties as Director of the newly established Division of Water Sciences. The IHD Council re-elected Mr Chéret as Chairperson. All Council members participated, and a great number of observers as well as international organizations attended the meeting.

The IHD Council established an ad hoc working group to examine the twenty-six resolutions on the future IHD programme adopted by the Mid-Decade Conference. In view of the short time available the Council selected five resolutions that called for

immediate action and referred the other twenty-one resolutions to be considered by the Sixth Council Session (Resolution V-1).

The IHD Council discussed the reorganization of Working Groups and Panels. Of particular note were its decisions on the continuation of the groups on World Water Balance, on Groundwater, on the Hydrology of Carbonate Rocks of the Mediterranean Basin (executed by the FAO), on Floods and their Computation, on the Influence of Man on the Hydrological Cycle, on Representative and Experimental Basins, on Nuclear Techniques in Hydrology (executed by the IAEA), on Standardization (largely executed by the WMO), on the Exchange of Information, and on Education and Training in Hydrology. Together with WHO, it established two new Panels on the Quality of Water and on Systems for Acquisition, Transmission and Processing of Hydrological Data (SAPHYDATA). The Council welcomed the willingness of the WMO to continue its work on hydrological forecasting, particularly on the Design of Water Resources Projects with Inadequate Data (DEWARPID), and also to continue the Panel on Network Planning and Design.

The IHD Council declared its intention to devote the second half of the Decade to the careful preparation of UNESCO's long-term hydrology programme to immediately follow the Decade, reflected in Resolutions V-11 and V-12.

The Council briefly reviewed the results of the Decade to that point, particularly with regard to publications, to symposia and seminars and major training events. In order to streamline the programme the Council carefully checked the previous resolutions and decided which ones to maintain and which ones to liquidate. Its decisions are summarized in Resolution VI-1 reproduced in Annex III of the Council Report.

Second Half of the Decade (1970-74)

Sixth Session in Geneva, July 1970

The Sixth Session of the IHD Council was exceptional in that it was held at the WMO headquarters in Geneva from 6-11 July 1970, again under the chairpersonship of Mr Chéret from France. The session was attended by eighteen out of twenty-one Council members and by fourteen observers as well by representatives of the relevant international organizations.

One of the outcomes of the previous conferences was that the IHD Council enlarged its number of members from twenty-one to thirty so as to incorporate five members from each of the six UNESCO geographical regions. It also redefined the role and functioning of the IHD Bureau and enlarged it to six members: Council Chairperson, Outgoing Chairperson and four members representing the other four geographical regions.

As the Fifth Council Session lasted for only three days it could only deal with the most urgent cases and postponed all other decisions until the 1970 Session. Following the 1969 deliberations the Council established a number of new Working Groups, incorporated some of the former groups (now called 'Sub-Groups') and dissolved those which did not fully satisfy international needs. As an example, the Working Group on Maps changed its name several times, was sometimes an Independent Group, sometimes a Sub-Group, and in the end a 'Panel of Authors'.

An individual resolution was devoted to each of the new groups, which were: On Water Balance; On Groundwater Studies; On Floods and their Computation; On the Influence of Man on the Hydrological Cycle (executed with the FAO); On Representative and Experimental Basins; On Nuclear Techniques in Hydrology

(executed by IAEA); On Information and Publications (executed with the WMO for the International Glossary); On Education and Training in Hydrology; On Hydrology of Carbonate Rocks in the Mediterranean Basin; and On Hydrological Problems Related to Water Quality (executed with the WHO).

The IHD Council laid out its work plan (Annex IV to the report) and its composition (Annex V), as well as a timetable for its meetings (Annex VI). The timetable also contained the planned symposia. The Council then assigned four specific tasks to be undertaken by the WMO, which were: meteorological and hydrological network design and operation; standardization of instruments, methods of observation and processing of data; hydrological forecasting of surface waters; and methodologies for computing design data with inadequate basic observations, mainly on the basis of hydrometeorological elements.

It then discussed the envisaged long-term programme (later IHP) and established a special Working Group for the preparatory work (Resolution VI-11)

Seventh Session, November 1971

The Seventh Session was held at UNESCO Headquarters in Paris from 22-26 November 1971 under the chairpersonship of Mr Volker from the Netherlands. The IHD Council took into account the amendments of the Rules of Procedure concluded by the recent session of the UNESCO General Conference concerning the number of members of the Council and of its Bureau (Resolution VII-1, and Annex II and III to the Report). It began with reports on regional cooperation projects such as the River Rhine Basin, The North American Great Lakes, the Nordic countries, the Baltic

countries and the Danube Basin. The Council then examined the reports of the IHD Working Groups and adopted a resolution for each of them, agreeing on the results and determining plans for future work.

The IHD Council also agreed to a proposal to celebrate the Tercentenary of scientific hydrology to be held in 1974 at the end of the Decade, as well as an End-of-Decade Conference. However, when reviewing the recent results it was informed that the financial situation of UNESCO had become difficult and a number of planned activities would therefore suffer. The Council nevertheless expressed hope that a long-term hydrological programme (and here the future name 'International Hydrological Programme' first appears) could be launched after the Decade. It was in this spirit that it adopted Resolution VII-13 and added other resolutions with an organizational aspect. But whilst the majority of countries and organizations endorsed the new programme there was also resistance from some, as well as from within the higher echelons of UNESCO management. The report also contains a detailed study on a long-term programme in the field of hydrology as a successor to the Decade, including the first proposals for projects (Annex XVIII).

Finally, the IHD Council noted the large number of activities supplementing the IHD, including training courses (basically postgraduate) and regional hydrogeological maps with the accompanying publications on legends and mapping techniques. A number of other supporting activities were also mentioned, such as water-loving vegetation (with the International Biological Programme – IBP), use of saline waters, glaciers, snow and ice (with the International Commission of Snow and Ice – ICSI), tropical hydrology and arid zones, permafrost areas and so on.

Eighth Session, May 1973

The Eighth Session was held from 23-30 May 1973 with Mr M. Mozayeni (Iran) as Chairperson. The Council studied in depth the reports of the Working Groups on: a) Water Balances; b) Groundwater Studies; c) Influence of Man on the Hydrological Cycle; d) Effects of Urbanization on the Hydrological Environment; e) Application of Nuclear Techniques in Hydrology; f) Education; g) Hydrology of Carbonate Rocks of the Mediterranean Basin; h) Floods and Low Flow; i) Representative and Experimental Basins. The IHD Council was also informed of other IHD projects, such as those relating to snow and ice, erosion and sedimentation. It then prepared for the closure of the Decade to take place in just over a year and took the necessary steps for the closing ceremonies, particularly the End-of-Decade Conference in September 1974.

Ninth Session, August 1974

A very short session was held at UNESCO Headquarters in Paris from 29-30 August 1974 immediately prior to the End-of-Decade Conference, chaired by Mr Mozayeni from Iran. The IHD Council was informed of the results obtained in 1973-74 and then declared that the work of the Decade Working Groups should be terminated or finalized under the successor programme (Resolutions IX-1 and IX-2). The Council left a final evaluation of the Decade to the End-of-Decade Conference, held from 2-14 September, which included the Tercentenary (9-12 September). These conferences marked the closing of the Decade.

CHAPTER 2

BRIEF OUTLINE OF THE INTERNATIONAL HYDROLOGICAL PROGRAMME (IHP)

Towards the end of the International Hydrological Decade, two main conclusions were drawn. The first was that many projects could not be executed within the given time frame of ten years and required an extension of a few years: a kind of 'Decade plus' period. The second conclusion was that IHD had opened so many new hydrological domains and had initiated so many activities in the fields of research, education, data collection and evaluation – not to mention drawing attention to the need to promote international cooperation – that it required continuous follow-up. IHD National Committees had been established and they needed further support and guidance, particularly in the developing countries. Many organizations needed further impetus, so the desire for a long-term hydrological programme was widely expressed. By the UNESCO Mid-Term Conference in 1969, the IHD Council had already formulated the resolution for such a programme and the UNESCO General Conference had paved the way by providing the necessary staff and budget, as far as its means allowed.

The main purpose of the End-Decade Conference in 1974, aside from assessing the benefits of IHD and evaluating its procedures, was to prepare for the successor programme, IHP. It adopted a working plan for the First Phase (IHP-I, 1975-80). The main directives were expressed as follows:

"The International Hydrological Programme (IHP) is to be executed through medium-term successive phases of a six-year duration. The contents of each phase will be determined by the General Conference in accordance with the general objectives of IHP and following recommendations adopted by ad hoc intergovernmental conferences gathering all Member States. Such conferences will take place, as a rule, every six years, in order to review past activities and to define the main orientations of the next phase of the programme. In accordance with the working agreement between the Secretariats of UNESCO and WMO, they will be jointly convened by these two organizations."¹

First Phase (1975-80)

The First Session of the newly established IHP Intergovernmental Council was held at

UNESCO Headquarters in Paris from 9-17 April 1975 in agreement with Resolutions 2.231 and 2.232 adopted by the General Conference at its 18th Session. These resolutions contained the foundation of the

1. Intergovernmental Council of the IHP, First Session, Paris, 1975

new programme with the composition of the new Council and the new statutes defining functions and responsibilities, as well as the right to establish subsidiary bodies such as Committees, Regional Committees, Working Groups, Panels and particularly the IHP Bureau. They also defined the role and task of the Secretariat as well as UNESCO's budgetary obligations. The IHP Council was obliged to regularly report to the General Conference for approval of its activities and for those planned during the forthcoming Biennium.

The general guidelines adopted by the IHP Council were: a) to provide a scientific framework for the general development of hydrological activities; b) to improve the study of the hydrological cycle and the scientific methodology for the assessment of water resources throughout the world, thus contributing to their rational use; c) to evaluate the influence of man's activities on the water cycle, considered in relation to environmental conditions as a whole; d) to promote the exchange of information on new developments in hydrology; e) to promote education and training in hydrology; f) and to assist Member States in the organization and development of their national hydrological activities.

The IHP Council stressed the necessity for cooperating closely with other UN Agencies (particularly the WMO, FAO, WHO and IAEA) and with the relevant NGOs, particularly from the ICSU and IUGS families. The Council was aware that a number of Decade projects still had to be concluded. Other projects were incorporated into the list of new IHP projects and further innovations were included.

The IHP Council adopted the following main projects, which formed the core of IHP's work for many years: a) development and improvement of methodologies for the computation of water balances and their various elements, including groundwater; b) compilation of regional, continental and global water balances; c)

research into hydrological regimes and development of methods for computation of their elements for water planning, including in cases of inadequate data; d) development of investigations on representative and

▲ WORKING GROUPS CREATED BY THE FIRST IHP COUNCIL

- Assessment of Quantitative Changes in the Hydrological Regime of River Basins owing to Human Activities;
- Compilation of a Casebook on the Use of Results of Research in Representative and Experimental Basins;
- Computation of Water Balances of Lakes and Reservoirs;
- Development and Improvement of Methods and Instruments for Observation of the Regime of Natural Waters (IAEA/UNESCO);
- Dispersion and Self-Purification Processes of Pollutants in Rivers, Lakes, Reservoirs and Estuaries;
- Estimation of Changes in the Salt-Fresh Water Balance in Deltas and Coastal Zones due to Structural Works and Groundwater Exploitation;
- Investigation of the Water Regime of River Basins Affected by Irrigation;
- Long-term Predictions of Changes in Groundwater Resources owing to Human Activities;
- Methods of Computation of Hydrological Parameters for Water Projects;
- Methods of Estimation of Effects of Man's Activities on Sedimentation Processes in River Beds;
- Preparation of a Casebook on Methods of Computation of Low Stream Flow;
- Preparation of the World Catalogue of Low Stream Flow;
- Processes of Groundwater Pollution; Land Subsidence owing to Groundwater Exploitation;
- Teaching Aids in Hydrology and Related Water Science.
- Thermal Effects of Hot Water to Natural Water Bodies; and,
- Training of Technicians in Hydrology and Related Water Sciences.

▲ TOPICS OF IHP COUNCIL-APPOINTED RAPPORTEURS

- Application of Mathematical Models and Systems Analysis in the Investigation of Representative and Experimental Basins;
- Artificial Recharge of Aquifers;
- Crystalline Rock Aquifers;
- Development of Hydro-Ecological Indices for the Evaluation of Water Projects; Research on Hydrology;
- Development of Mathematical Models Applied to Urban Areas (considering both Water Quality and Quantity);
- Development of Physical and Mathematical Models for Unsteady Groundwater Flow and for Complex Aquifers;
- Hydrological Aspects of Droughts;
- Hydrological Problems Arising from the Development of Energy Resources;
- Prediction of the Sediment Transport Capacity of River Systems;
- Relationship Between Water Quality and Sediment Transport;
- Review of the Current Literature Pertinent to the World Water Balance; and,
- Use of Operations Research in Water Resources Systems Simulation and Optimization.

experimental basins; e) investigation of the hydrological and ecological effects of man's activities and their assessment; f) hydrological and ecological aspects of water pollution; g) effects of urbanization on hydrological regimes and water quality; and h) long-term prediction of groundwater regimes, taking human activities into account.

A special chapter was devoted to education and training, with main topics including: a) survey of educational needs; b) education and training in hydrology and related water sciences at all levels; c) and teaching aids.

All these projects were described in detail, including the expected outcome, the means of execution and the date of delivery. The

IHP Council established two committees for their execution: 'On the Influence of Man on the Hydrological Cycle' and 'On Technical Assistance for Developing Countries in Hydrology and Related Water Sciences'. However, neither of these committees quite fulfilled the expectations placed on them and were later dissolved.

The First IHP Council also established a great number of Working Groups, and all these Working Groups had several facets, meaning that Sub-Groups or Panels of Authors had to be established. The full list of Working Groups and topics gives an overall picture of the whole range of intended IHP activities. In addition, the Council appointed a number of Rapporteurs (one-man Working Groups).

It was evident that UNESCO alone did not have the necessary competencies, staff or finances to execute all these activities, so the IHP Council stressed the importance of encouraging participation from other UN Agencies and competent NGOs. Hence, IHP was intended not only as a programme to incorporate all relevant aspects of hydrology but also as a worldwide umbrella of organizations working in this field, at global and regional levels with a strong basis in Member States and their national specialized institutions and institutes.

The Council began by addressing the UN, in particular its Centre for Natural Resources, Energy and Transport, with a view to taking the opportunities afforded by the United Nations Water Conference planned for 1977 in Mar del Plata, Argentina.

The First Years

The involuntary absence of the Division Director and the transfer of one staff member to OPS hampered IHP's project execution. The Second Session of the IHP Council in June 1977 therefore had to slightly alter the plan

and also had to take into account the results of the United Nations Water Conference with its Mar del Plata Action Plan. Furthermore, the Nineteenth Session of the General Conference in Nairobi in 1976 provided new inspiration and the IHP Council had to establish a bridge between what the global community expected and what UNESCO could deliver. It emphasized the increase of activities in the field of education and training and revived an IHD mapping programme, but generally speaking it maintained its working plan whilst allowing for some delays.

The Third Session in 1979 again referred to the United Nations Water Conference and decided on the inclusion of a number of topics (Resolution III-1), as well as adopting a number of issues emerging from the UN Conference on Science and Technology, Vienna 1979 (Resolution III-2). Having discussed all the scientific IHP projects, the IHP Council devoted much of its time to projects related

to education and training. It encouraged the preparation of textbooks and guidance material, agreed on the holding of regional training courses and particularly welcomed the growing system of UNESCO-sponsored postgraduate courses in a number of countries. The IHP Council took note of the revision of the statutes adopted by the 20th Session of the General Conference. The preparation of the Second IHP Phase underwent significant changes. The six-year Phases of the IHP had to be adapted to the UNESCO Medium-Term Planning, also covering a period of six years. This meant that the Second IHP Phase had to be shortened to three years from 1981 to 1983 only. Hence it would contain only a limited number of innovations and largely focus on the completion of on-going activities. The Third Session effectively closed the First Phase and resulted in a general consensus for continuation. The very short Fourth Session in August 1981 confirmed this view and formally closed IHP-I.

Second and Third Phases (1981-83 and 1984-89)

The Fifth Session of IHP's Intergovernmental Council in November 1982 reviewed the last results of IHP-I and those of the Second Phase (IHP-II) already accomplished, after which it devoted much time to the preparation of the Third Phase (IHP-III). It became evident that the year 1984 would largely be spent launching IHP-III.

Besides the already established items on the agenda, the Committees introduced some new ones: "influence of man" and education, training and technical assistance to developing countries. In order to better satisfy but also to involve the Member States the Major Regional Programmes (MRP) were established. These turned out to be highly efficient and were well

accepted by the participating countries; they also increased the importance of the UNESCO Regional Science Offices with their Regional Hydrologists. The first MRPs were launched in the Arab States, the Sahara and in Latin America and the Caribbean region. Europe continued with its main activities from the Decade, particularly the Hydrogeological Map. River Basins gained more and more attention, especially the Rhine, Danube and Mekong. The family of UNESCO-sponsored (mostly postgraduate) courses had grown to twenty-five and as a result were feeling the effects of UNESCO's growing financial problems. The same report also contains a list of the publications and the great number of books speaks for the huge number of

authors involved. Again and again the Council expressed the wish that the books be issued in languages other than English, but funds were too limited for other versions – a problem that has still not been fully solved.

The Sixth Session in March 1984, under the Chairpersonship of Mr H. Zebidi from Tunisia, adopted the programme and timetable of IHP-III. The plan consisted of eighteen separate projects. These included the on-going regional projects but several new ones were also implemented in South and Central Asia, South East Asia and the Pacific region. In addition to this, some smaller projects focused on the Nordic countries in Europe and the Socialist countries. An increasing number of the projects were achieved through outside funding (Funds-in-Trust).

The following list of eighteen projects, if compared with IHP-I, demonstrates that a number of activities had been completed and their executing bodies (IHP Working Groups) could now be closed. A number of new ideas had been incorporated, particularly in the field of water resources management, man's influence, education and training, and technology transfer. The activities were now to be known as 'Themes' and each theme contains several sub-activities:

- **Theme 1:** Investigation of elements of the hydrological cycle and determination of water balance;
- **Theme 2:** Methods for the investigation of surface and groundwater regimes and for determination of hydrological parameters for water projects;
- **Theme 3:** Interconnection between climatic variability and change and hydrological processes;
- **Theme 4:** Hydrology of particular regions and land areas;
- **Theme 5:** Application of special technologies for the study of water resources;
- **Theme 6:** Methods for assessing the changes in the hydrological regime due to man's influence;
- **Theme 7:** Environmental impact studies of water projects;
- **Theme 8:** Specific influence of man on the hydrological regime (a special annex for the great number of sub-projects);
- **Theme 9:** Methodologies for water resources assessment;
- **Theme 10:** Methodologies for integrated planning and management of water resources;
- **Theme 11:** Systems management for reduction of negative side-effects of water resources development;
- **Theme 12:** Development and presentation of information for planners and decision-makers concerning the implications of modern water resources planning and management approaches;
- **Theme 13:** Promotion of education and training in the field of water resources;
- **Theme 14:** Preparation of guidance material to be used for the establishment of training courses in hydrology and water resources management addressed to various categories of personnel;
- **Theme 15:** Improvement of teaching methods in hydrology and water resources management;
- **Theme 16:** Comparative methodologies for public information and the promotion of public participation in the proper utilization, protection and conservation of water resources;
- **Theme 17:** Scientific information systems to facilitate the flow and utilization of scientific and technical information in the field of water resources; and,
- **Theme 18:** Methods for the effective transfer of knowledge and technology related to water resources and for the exchange of information.

In the meantime, UNESCO's situation had drastically changed: Through the exit of the USA, United Kingdom and Singapore the funding situation thus became critical since these countries had accounted for around one third of financial contributions.

The Seventh Session in June 1986 under the Chairpersonship of Mr A. Arbhahirama from Thailand focused on evaluating the results of IHP-III. It expressed overall satisfaction but noted that the execution of the projects suffered increasingly from insufficient funding and addressed a special resolution to the Director-General on this subject. The Council also asked the USA, United Kingdom and Singapore to continue their cooperation under IHP despite their recent withdrawal from UNESCO.

Following this, the Council began with the preparation of the Fourth IHP Phase (IHP-IV, 1990-95) and expressed the hope that shift of seminars and symposia into the various regions would continue since the process of decentralization had prompted many institutions to secure funding from other sources. Furthermore, a new category of project financing for small projects, the Participation Programme (PP) was increasingly in use.

Fourth Phase (1990-95)

While the list of projects under IHP-III reads like a long list, for the next phase the Council developed a new order for IHP-IV. The main areas are reproduced in the box further below, each of which consisted of several sub-categories.

The Ninth Session in March 1990 was held in the absence of the elected Chairperson, Mr A. C. Tatit-Holtz from Brazil, who was replaced by the five Vice-Chairmen on a rotational basis. In the meantime, Mr S. Dumitrescu had retired and the Division of Water Sciences was now headed by Mr A. Szöllösi-Nagy from Hungary. The Council was informed of IHP's role in the preparation for the forthcoming 1992 United Nations Conference on Environment and Development (UNCED) for which a UNESCO Coordinator had been appointed.

Mr G. Young from Canada chaired the Eighth Session in June 1988. Having discussed the outcome of UNESCO's recent governing sessions and having examined the results so far achieved under IHP-III, the Council then turned to the preparation of the Fourth Phase. At this time it also expressed its concern regarding the staffing situation at headquarters and in the field, as well as the steady decrease of funds. On the other hand, it noted with satisfaction that an increasing number of outside bodies had joined the programme and in some cases (such as in training, mapping projects and so on) even taken the lead. In this context, the Council felt it was advisable to shift the emphasis from pure scientific hydrology to water resources, including sustainable development and the protection and enhancement of the environment. It also suggested changing the terms of reference of the Committee on Education and Training to include Transfer of Technology.



The 15th session of the IHP Bureau in Paris, 1987.

The Tenth Session was held from 6-11 July 1992 and it reviewed the progress of work under IHP-IV, which increasingly reflected the efficiency of major programmes such as FRIEND, the Humid Tropics, regional training

SUB-PROGRAMME H – HYDROLOGY IN A CHANGING ENVIRONMENT

(1) H-1	Interface processes between atmosphere, land and water systems
(2) H-2	Relationship between climate variability (and its expected change) and hydrological systems (to be related to the UN International Decade for Natural Disaster Reduction)
(3) H-3	Change in water quality through the hydrological cycle
(4) H-4	The role of snow and ice in the global water cycle
(5) H-5	Hydrological problems of specific regions

SUB-PROGRAMME M – METHODOLOGIES FOR WATER RESOURCES ASSESSMENT AND HYDROLOGICAL DESIGN

(1) M-1	Methodologies for water resources assessment and hydrological design
(2) M-2	Scientific and technical water-related information and documentation systems
(3) M-3	Evaluation of the environmental status of fresh water systems and prediction of the impacts of man's activities
(4) M-4	Integrated water resources development and the incorporation of risk-based decision-making
(5) M-5	Hydrological and water management aspects of international water systems

SUB-PROGRAMME E – EDUCATION, TRAINING AND PUBLIC INFORMATION

(1) E-1	Training of higher technicians (a supporting item for the regional training courses organized by UNESCO in Africa with Norwegian funds)
(2) E-2	University education
(3) E-3	Continuing education
(4) E-4	Public information

courses, the establishment of specialized Centres under the auspices of UNESCO, continental groundwater mapping and the management of urban water problems.

Owing to further deep financial cuts in 1993, the Eleventh Session could only be held in February 1995 and was chaired by Mr I. Muzila from Botswana. The IHP Council was informed that the UNESCO Director-General had proposed to the Executive Board that the programmes on science and social sciences be brought closer together in order to create a convergence of approaches and concerns between various disciplines, with a view to achieving a better understanding of the way

in which natural and human environments function.

During an examination of the various IHP projects, the Council stated that the financial situation meant that many projects had to be delayed or even cancelled. This would have a particular effect on regional projects in developing areas since the UNESCO Regional Offices were under-staffed with an extremely limited budget. At this time the first postgraduate courses were also closed. For several reasons the education projects had also ended, prompting UNESCO to publish a report entitled 'Hydrological Education during the Fourth IHP Plan (1990-95)'.

Fifth Phase (1996-2001)

The Council also adopted the plan for the Fifth IHP Phase (IHP-IV, 1996-2001), outlined in the box below:

- **Theme 1:** Global hydrological and geochemical processes (mainly within FRIEND)
- **Theme 2:** Ecohydrological processes in the surficial environment
- **Theme 3:** Groundwater resources at risk
- **Theme 4:** Strategies for water resources management in emergency and conflict situations
- **Theme 5:** Integrated water resources management in arid and semi-arid zones
- **Theme 6:** Humid tropics hydrology and water management
- **Theme 7:** Integrated urban water management
- **Theme 8:** Transfer of knowledge, information and technology (KIT)

The Twelfth Session of the IHP Council was held in September 1996 under the Chairpersonship of Mr M. Abu Zeid from Egypt. In its opening session the Council added a new item, the establishment of a Finance Committee with the task of recommending priorities. The Council also considered several options for its future governance, including whether the programme could be decentralized with regional councils, but the costs were assumed too high, particularly in developing regions. It was concluded that to maintain an international Council would not limit regional projects and responsibilities and many delegates reported on successful sessions of regional IHP National Committees. The Council noted that not all projects could be carried out as foreseen and that after consultation with the IHP Bureau priorities had to be set. It learned that one of the previous resolutions on 'Women and Water' had been very successful, particularly in

Africa. This action was in line with the desire of the UNESCO Director-General to bring together the scientific and social aspects of the programme.

The Thirteenth Session was held in June 1998 under the Chairpersonship of Mr K. Takeuchi from Japan. The IHP Council terminated the IHP-IV activities and then reviewed the ongoing projects under IHP-V. It agreed on the general theme for the Sixth Phase (IHP-VI, 2002-07) 'Water Interactions: Systems at Risk and Social Challenges', and charged a task force to confirm the details, in conformity with the funds that could be expected. In his opening speech the Director-General had provided an estimate of the funds he wished to allocate and his plans to find additional funding, since he was convinced of the importance and relevance of the IHP.

The Fourteenth Session was held in June 2000, chaired by Mr R. Feddes from the Netherlands. The Council was informed of the success of the Fifth UNESCO/WMO International Conference on Hydrology (Geneva, 8-12 February 1999). Twenty-five years after the inception of IHP, safe water and sanitation, environmental protection and sustainable development were increasingly recognized as global priorities. The evolution of the Programme integrated this change of spirit and philosophy.

The Council received a growing number of reports from IHP members not under the UNESCO umbrella. These groups partially consisted of regional or sub-regional IHP National Committees, NGOs and special Task Forces for individual projects, particularly in Africa, Central and South Asia, South and Central America, largely financed by the UN, UNEP, European Union and donor countries. It became more and more apparent that the bulk of direct actions had moved away from

UNESCO but enriched IHP and underlined the increasing role of UNESCO-IHP as a catalyst.

A new partnership emerged, through which the International Institute for Infrastructure, Hydraulic and Environmental Engineering (IHE) in Delft would be supporting IHP activities regarding tertiary water education, following negotiations between UNESCO and the Government of the Netherlands. IHE Delft had hosted the oldest and largest of the UNESCO-sponsored postgraduate hydrology courses, established far back in 1957. It was

agreed that the Netherlands would principally fund the Institute, while it would become part of the Organization as the UNESCO-IHE Institute for Water Education. The Council endorsed this idea and adopted it under Resolution XIV-10.

The same session also launched an International Initiative on Transboundary Aquifer Resources Management (TARM), as well as the IHP Initiative Hydrology for Environment, Life and Policy (HELP).

Sixth Phase (2002-07)

The Fifteenth Session of the Council took place on 17-22 June 2002 with Mr V. Pochat from Argentina as Chairperson. The Council was informed of the guiding theme for the Medium-Term Planning 2002/07, 'UNESCO contributing to peace and human development in an era of globalization', with the strategic objectives of promoting ethical norms, ensuring human security, and enhancing scientific and human capacities. Water and supporting ecosystems were afforded the highest priority.

The Council then elected the members of the Governing Board of UNESCO-IHE, Delft, and invited donors since the Institute relies entirely on external funding complementing the Dutch support. IHP's involvement in the World Water Assessment Programme (WWAP) and the World Water Development Report (WWDR) was also agreed upon. The IHP Council then considered the UNESCO-related activities and contributions to the 'International Year of Freshwater IYF' in 2003. It agreed on the creation of a number of programmes and regional Centres, such as International Sedimentation Initiative (ISI), Regional Centre for the Management of Shared Groundwater

Resources (Libya), Regional Centre on Urban Water Management (Colombia), Ecohydrology (Poland) and the Centre on Drought (Africa). (For the complete list of the approved Category 2 centres under the auspices of UNESCO, see the annexes of this book).

The Sixteenth Session of the IHP Council was held in September 2004 and Mr O. Bonacci from Croatia was elected Chairperson. It heard reports on the UNESCO Water Centres, including the IHE, now part of UNESCO and hence a Category 1 Centre. It also considered how to strengthen the National Committees.

The Seventeenth Session in July 2006 was convened under the Chairpersonship of Mr B. Braga from Brazil. The Council reviewed the on-going projects under IHP-VI as well as the work undertaken by the UNESCO Centres. New Centres were also proposed: the Water Management in Arid Zones in Pakistan, the IHP-HELP on Water for Food Security in Australia, International Hydroinformatics for Integrated Water Resources Management in Brazil and Sustainable Water Engineering and Management in Thailand. In view of the increasing number of Centres, the Council

established standard procedures and, in some cases, appointed members of the Governing Boards. It also discussed again the establishment of Regional Councils, with all the associated legal and financial implications, and agreed to ask the Drafting Resolutions Committee for suitable proposals. It became clear that the Council was not authorized to alter its governance as this would fall under

the jurisdiction of the UNESCO General Conference.

The Council then proceeded to determine the main contents of the Seventh IHP Phase (IHP-VII, 2008-2013) and prepared a draft strategic plan entitled 'Water Dependencies: Systems Under Stress and Societal Responses', to be worked out in greater detail in late 2006.

Seventh Phase (2008-13)

The Eighteenth Session was held in June 2008 under the Chairpersonship of Mr A. Salih from Sudan. It discussed the reports of the numerous Centres and received proposals for the creation of new ones. It then reviewed the reports on the activities under IHP-VII that had already commenced. It devoted much time to reports on UNESCO's involvement in related international ventures such as: partnerships with GEF for extra-budgetary projects in developing regions; on water and cultural diversity; on IHP's role in the thematic programme on Education for Sustainable Water Development run by the UN Decade of Education for Sustainable Development (DESD, 2005-14); and on UNESCO's involvement in the UNESCO Strategy on Climate Change. The Council also was informed of IHP's involvement in the Fifth World Water Forum (Istanbul, Turkey, 2009) and in the International Decade for Action – Water for Life (2005-14). The Council noted with much regret that UNESCO's budgetary constraints meant it was unable to meet the increasing demands for financial assistance.

The Nineteenth Session was held in July 2010, with Mr S. Lee from the Republic of Korea as Chairperson. The Council appealed to UNESCO to fill the post of Division Director that had remained vacant after Mr Szöllösi-Nagy left the office. A new Section on Groundwater

Resources and Aquifer Systems was also established, which increased of the number of sections of the IHP Secretariat to four, including the Global Water Assessment Section.

The Council reviewed only the projects that had been fully implemented by IHP and it became evident that their number was reducing, largely because of budgetary restrictions but also because more and more activities were being carried out as joint ventures with other UN Agencies or NGOs. It then embarked on the preparation of the Eighth IHP Phase (IHP-VIII, 2014-2019).

The Twentieth Session was held in June 2012 under the Chairpersonship of Mr J. Cullmann from Germany. Mr Salih headed the Secretariat as Acting Director. The Council spent a short time evaluating the results of the Sixth Phase (2002-07), in the light of a report by the UNESCO Internal Oversight Service IOS and the IHP-VI Evaluation Team. It noted the restrictions in the publication programme, again because of budgetary constraints.

The Council also discussed the new Strategic Plan for the Eighth Phase, starting in 2014 and for the first time extended to eight years (until 2021). It proposed a number of additional items, such as the water-energy nexus, water

harvesting, droughts, sedimentation, water education in schools, the concept of living with floods, remote sensing, vulnerability assessments and adaptation strategies for climate change. Further suggestions concerned the need for greater awareness amongst the general public, sharing of data, transboundary waters, water and peace, interactions with social sciences, training of specialists and, finally, water quality and pollution. There was also an emphasis on the need for closer cooperation with the Man and Biosphere Programme (MAB).

The IHP Council devoted much of its time to reviewing the achievements of the Centres, and of UNESCO-IHE. It also supported the efforts of the Secretariat to strengthen the cooperation with other intergovernmental and non-governmental organizations. The Council was informed of IHP's contribution to preparing the Rio+20 UN Conference on Sustainable Development, as well as the UN 2013 International Year of Water Cooperation.

Eighth Phase (2014-21)

IHP-VIII was opened by the Twenty-First Session of the Council, with Mr D. Korenfeld Federman from Mexico elected as Chairperson. After a long interim period, UNESCO also appointed a new IHP Secretary, Ms B. Jiménez-Cisneros. While the Secretariat had already earlier integrated female experts in its team, this was the first time that the overall responsibility of IHP's implementation was given to a woman.

The IHP Council received reports from its Committees on Finances, Publication and Communication. The Council then studied the report by the Working Group for supporting the implementation of the IHP-VIII strategic plan, with a particular focus on the years 2014/15. It also reviewed reports from the UNESCO Centres and filled new posts on the boards of various Category 1 and 2 Centres. Further proposals for new Centres were made and the development of a strategy for their management within IHP was requested.

The Council noted the Results of IHP-VII on the basis of the report of the UNESCO Internal Oversight Service (IOS) and charged the Secretariat to engage with all questions that were still left open and unresolved. Overall, however, it expressed great satisfaction with the results achieved, particularly under such financial constraints and limited staff numbers. It notably emphasized accomplishments related and the accomplishments related to achievement of extrabudgetary funds in particular to address groundwater issues, and to the International Year of Water Cooperation that had been led by UNESCO in 2013 on behalf of UN Water, in cooperation with the United Nations Economic Commission for Europe (UNECE), and with the support of other partners such as the UN-Water Decade Programme on Advocacy and Communication in Zaragoza (UNW-DPAC).

Outlook

The numerous publications and symposia reports speak clearly of the work carried out by UNESCO's water programmes. Now, after fifty years of IHD/IHP, hydrological research and education can certainly be further strengthened, and Member States are thus calling for a continuation of the programme and have identified water as a top priority of the Organization. The world is changing rapidly

in terms of consumption patterns, population growth, new technologies, changing political, economic and social aspects, change and the need to preserve nature and its resources. All this points to a continued need for a programme such as IHP, but one which always adapts to the water challenges' changing patterns. *Tempora mutantur et mutamus in illis* ('Times change and we change with them').

List of Sessions of the IHP Council

SESSION	DATES	CHAIRPERSON
1	9–17 April 1975	M. Slivitzky (Canada)
2	20–27 June 1977	D. Kraemer Malinowsky (Mexico)
3	9–16 November 1979	N. B. Ayibotele (Ghana)
4	2–29 August 1981	G. Kovacs (Hungary)
5	8–15 November 1982	G. Kovacs (Hungary)
6	22–30 March 1984	H. Zebidi (Tunisia)
7	18–23 June 1986	A. Anrbhabhirama (Thailand)
8	21–25 June 1988	G. Young (Canada)
9	19–24 March 1990	A. C. Tatit-Holtz (Brazil)
10	6–11 July 1992	I. A. Shiklomanov (Russian Federation)
11	30 January – 4 February 1995	I. Muzila (Botswana)
12	23–28 September 1996	M. Abu-Zeid (Egypt)
13	8–13 June 1998	K. Takeuchi (Japan)
14	5–10 June 2000	R. Feddes (Netherlands)
15	17–22 June 2002	V. Pochat (Argentina)
16	20–24 September 2004	O. Bonacci (Croatia)
17	3–7 July 2006	S. Shagari (Nigeria)
18	9–13 June 2008	A. Salih (Sudan)
19	5–9 July 2010	S. Lee (Republic of Korea)
20	4–7 July 2012	J. Cullmann (Germany)
21	18–20 June 2014	D. Korenfeld Federman (Mexico)

CHAPTER 2

SISTER INITIATIVES

by **Abdin M.A. Salih**

Former Chair of the IHP Intergovernmental Council and Former IHP Secretary

The Uniqueness of IHP: A Personal Account of IHP and its Sister Initiatives

It is notable that the components of the various phases of IHP are not prepared by the members of the Secretariat of IHP, but rather through a unique and wide global consultation process. The process starts with the selection, by the Bureau of IHP, of six outstanding visionaries in this field, representing the six regions of UNESCO, to work with the Secretariat to come out with a conceptual framework of what would be of great priority to the Member States of UNESCO in the forthcoming phase. This concept goes to the IHP Bureau and the Intergovernmental Council for further harmonization with inputs from the results of the feedback from the National Committees all over the world. If the conceptual framework is endorsed, further elaborations of the components of the phase are worked on by the visionary team and brought again to the National Committees, the Bureau and the Council in a number of stages until a final version is approved. This process

takes more than five years with additional inputs from associated scientific organizations such as IAH and IAHS.

I went through this unique and efficient process myself as one of the six pioneers involved in the preparation of IHP-V, along with great colleagues such as Prof. Vander Baken of Belgium and Prof. Ben Braga of Brazil. We drew upon the experience of IHP-IV as well as input from all the relevant stakeholders. I was also lucky to witness the progress of preparations for IHP-VI, IHP-VII and IHP-VIII as a member of the Secretariat and a President of the Intergovernmental Council (2008-10). I was amazed at how quickly the experience from the selected visionaries and the feedback the National Committees, Bureau and Council converged into solid themes and focal areas for the various phases. This is a great asset of IHP, which should be kept and enhanced.

The World Water Assessment Programme (WWAP, 2003 to Date)

The IHP involvements and contributions to Water Resources Assessments (WRA) was not new and in many ways was there in one form or another within the Arid Zone

Project (1956-64) and all the phases of the IHP. However, it was in 1977 that a specific recommendation of the UN Water Conference at Mar Del Plata mandated UNESCO (IHP)

and the WMO (Operational Hydrological Programme, OHP) to assist UN Member States in developing scientific methodologies for undertaking assessments of their national water resources. IHP and OHP worked closely together and published many guiding documents in this direction, which provided solid frameworks towards that goal, including capacity building actions related to WRA.

Many considered the WRA approaches of IHP and OHP extremely useful. Nonetheless, it was later concluded that these approaches needed to be widened to include a global, comprehensive assessment of the status of freshwater resources. This need was explicitly voiced in a recommendation from the sixth session of the UN's Commission on Sustainable Development asking the then Administrative Committee on Coordination (ACC) Subcommittee on Water Resources to undertake a collective UN continuing assessment process. After that IHP pushed through its six-monthly coordination meeting with OHP to extend joint work on WRA to this wider scope. By that time I was transferred from the Cairo UNESCO Office to Paris as a Deputy Secretary of IHP and became a part of this initiative under the leadership of Dr Szollosi-Nagy, the then IHP Secretary. I can attest that there was no big difference between our two teams, but the problem was always the funding constraints for this innovative initiative.

The dream was realized with the election of Mr Matsuura as the Director General of UNESCO. At his first, rather challenging meeting with the staff of the Science Sector he expressed reservations about the limited levels of funding and impacts of the UNESCO Water Programme. He requested the submission of an initiative that would have a wider impact and he undertook to secure the corresponding funds. The IHP Secretariat jumped at this opportunity and submitted a blueprint for the WWAP dream whereby IHP would lead the ACC subcommittee on Water Resources. In spite of



FROM TOP TO BOTTOM:

International Conference on World Water Resources, 3 June 1998.

Experiment in Arid Zone, Picture from UNESCO Archive.

many objections from senior colleagues within the Directorate at the time, Mr Matsuura's great vision saw the importance of this initiative and agreed to the total proposed budget to be met from a Japanese Fund in Trust. Dr Gordon Young was immediately appointed as a coordinator of the project and a core staff was established prior to the formal approval of the members of the ACC subcommittee.

I was given the difficult task of selling this opportunity to the members of the subcommittee meeting in Bangkok in 2000, since Dr Szollosi-Nagy was not available at that time. Though UNESCO managed to secure the necessary funds and staff for an initiative that had been called for by the UN Commission for Sustainable Development, I initially encountered a lot of opposition from colleagues representing sister agencies. However, after three days of meetings, and with appreciable support from the Chair of the subcommittee at the time, Dr Arthur Askew from WMO, the human factor worked. The participants all finally agreed to the establishment of WWAP under the coordination of UNESCO and to the publication, every three years, of a World Water Development Report (WWDR).

Under IHP leadership and the coordination of WWAP, the first WWDR 'Water for People, Water for Life' was published in March 2003, presenting a comprehensive picture of freshwater resources in all regions and most countries of the world. This was followed in March 2006 by WWDR2 'Water a Shared Responsibility', WWDR3 'Water in Changing World' in March 2009, WWDR4 'Managing Water Under Uncertainty and Risk' in March 2012, WWDR 2014 'Water and Energy' in 2014, and WWDR 2015 'Water for Sustainable World' in 2015.

It should be noted that the WWDR has been published annually since 2014 as a result of a survey carried out by UN-Water which applauded the importance of the report, but asked for a shorter, annual report with a more topical approach. Though the majority of UN-Water members voted in favour of this change, I personally prefer a comprehensive, three-yearly report issued during the World Water Forum for wider publicity and impact. However, if the annual publication continues, I suggest that at least every five or six years there should be a comprehensive report.

Though WWAP is considered a UN report with ownership by some thirty-one UN organizations, UNESCO remains its lead agency and the coordinator of this flagship publication. It is rare to find an initiative that brings more than two agencies together, thus coordinating thirty-one agencies is a great achievement. In fact it was WWAP/WWDR that saved the ACC subcommittee for Water Resources from being dissolved at the time into other similar subcommittees and the acceptance that it should instead be replaced by the current UN-Water. I was representing UNESCO/IHP in a meeting at IHE in Delft, where UN-Water was established, and personally witnessed the circumstances around this development.

The Vision Ahead

One of the strengths of IHP is that its programme is largely prepared, monitored, implemented and frequently evaluated by its stakeholders in the UNESCO Member States. It is not the Secretariat at HQ and regional offices who fulfil these functions, as in similar UN agencies. A second strength is that its governance is built upwards from the grassroots through the National Committees

(which need to be reinforced), an informal regional presence (which is very active in many UNESCO regions) and an intergovernmental council representing the six regions of UNESCO. A third strength is that it has the facility to review progress thanks to its medium term strategy through the biennial meetings of the intergovernmental council. Fourthly, it contains an expanding number of regional Centres and

UNESCO Chairs that can enhance the impact of IHP considerably, if these resources are well coordinated within the framework of the approved themes of the respective phases. Finally and most importantly are IHP's wide networks of devoted experts, who are willing to contribute to IHP all over the world with only modest travel and accommodation support.

On the other hand, the combined IHD and IHP programmes are now fifty years old, which is a long time for a UN programme to exist and expand without halting to review its direction. I was concerned with this fact during my Presidency of the Council in 2008-10 and together with my colleagues in the IHP Bureau posed the following questions:

Do we need an eighth phase of IHP?

If the answer is yes, should it follow the same direction or do we need a change?

If we need a change, what sort of a change is needed now and in the future?

Together with the Secretariat I considered inviting specialized visionaries from the six

regions of UNESCO and other stakeholders to a closed meeting for a few days to discuss these questions before we proceeded to IHP-VIII. Unfortunately, we were unable to do it that way. However, we did have some useful brainstorming sessions among the members of the Bureau and the IHP Secretariat. These helped us reach a consensus that an eighth phase was needed but that it should have a greater focus on fewer selected themes and there should be considerable changes in the implementation strategy.

I hope these discussions were minuted by the Secretariat so they can assist in initiating a task force that will address these questions prior to IHP-IX. My personal modest vision is that we may need a ninth phase after 2021 but certainly with different contents and implementation strategies. The expanding number of Centres and Chairs can give rise to opportunities if managed and coordinated closely with the themes of the forthcoming phases, but they could also become a burden if their focus and implementation methods are left loose. I believe also that IHP needs an effective communication strategy with an efficient implementation approach making good use of these Centres, Chairs, National Committees and the network of regional hydrologists (which should be kept and strengthened).

Conclusion

The foresighted fathers of the Arid Zone Programme, IHD and IHP must be commended for their wisdom, vision and dedication. The embryonic research programme on arid zones, initiated in 1948, has in the ensuing decades grown into a significant global water programme significantly enhancing capacity development and the knowledge base. Though a greater understanding of hydrology and water resources has been attained, there are

still many areas that need more work from this generation and in the future. The more we learn about arid zones, the more we discover our ignorance in certain areas. As we celebrate their fiftieth anniversary, we should be proud of both IHD and IHP, and of their considerable contribution to humanity. However, much more work is still needed in the future and I believe that IHP will remain a global priority well beyond 2021.

An aerial photograph of a dense forest with a river on the right side. The trees show a mix of green and autumnal colors like orange and yellow. A large, semi-transparent number '3' is overlaid on the left side of the image. The text 'Chapter 3.' is centered within the number.

Chapter 3.

An aerial photograph of a river with clear, turquoise water. The river flows from the top left towards the bottom right. On the right side, there is a wide, light-colored sandy bank. The bank is bordered by a dense forest of green trees. The water's surface shows some ripples and small waves. The overall scene is bright and natural.

**MAIN
ACHIEVEMENTS OF
IHD AND IHP**

CHAPTER 3

SUMMARY OF EVALUATIONS

Main Achievements of IHD and IHP

by **Blanca Jiménez-Cisneros**

Secretary of the IHP and Director of the
Division of Water Sciences

The International Hydrological Decade: “an outstanding example of international scientific and technical cooperation”

On the completion of the IHD in 1974, the International Conference on the Results of the International Hydrological Decade and Future Programmes in Hydrology provided an opportunity to reflect on the Decade’s achievements and to outline an implementation plan to follow up and continue its initiatives. The Conference took place as a joint venture of UNESCO and the WMO from 2-13 September at the UNESCO Headquarters in Paris. It gathered two hundred and ninety-nine delegates from ninety Member States as well as forty-two representatives of organizations associated with the United Nations, and other contributing governmental and non-governmental organizations.

To most participants of the End-Decade Conference, the main achievements of IHD were only made possible because IHD had been ‘an outstanding example of scientific and technical international cooperation’, which was in itself not an easy task given the context of the Cold War in which the Decade was initiated. Though the term ‘science diplomacy’ was only formally coined in 2010, science had already

been interacting with diplomacy for several decades, and the international cooperation that resulted from IHD can be seen as an interesting example of early science diplomacy¹. At a time of high international tensions the Decade brought together scientists from different nations to build constructive solutions to common problems, thus contributing to improving international relations – a concrete form of ‘science for diplomacy’.

This collaboration between over 100 countries brought about important scientific and practical results by “contributing to the understanding of the processes and phenomena occurring in the hydrosphere, to assessing the surface and groundwater resources and their variability and to developing a rational attitude towards the utilization and management of the

1. “Science diplomacy” is an umbrella term which exists in three main forms according to the definitions of the Royal Society and the American Association for the Advancement of Science (AAAS): “Science in diplomacy”, “Diplomacy for science” and “Science for diplomacy”. To read more, consult: AAAS and the Royal Society, “New Frontiers in Science Diplomacy”, January 2010, www.aaas.org/sites/default/files/New_Frontiers.pdf

water resources of the earth². In particular, the Decade facilitated the international cooperation necessary to conduct research and to compile scientific and technical data necessary to provide guidelines and information for the advancement of hydrological sciences. Through the establishment of topic-specific working groups, the Decade contributed to the following:

- Synthesizing available information on water balances, identifying the most important shortcomings in data and methodology and preparing guidance material;
- Preparing publications, international guides, maps, and glossaries related to groundwater studies, hydrogeological mapping, representative and experimental, and transboundary basins as well as the prediction and estimation of groundwater resources;
- Developing an extensive and efficient international cooperation for floods and low flow, and preparing and publishing guides on the collection and processing of flood data and low flow, large floods, practical methods of flood computations for engineering purposes and a concrete plan of investigation on problems related to flood flow formations and computation;
- Studying the influence of human society on the hydrological cycle and influence of urbanization on the hydrological environment; representative and experimental basins; and nuclear techniques in hydrology;
- Reviewing the contents and existing forms of hydrological education, highlighting the need for a more integrated approach for water-related education, which should not be limited to hydrology alone;

2. UNESCO and WMO, Records of the International Conference on the Results of the International Hydrological Decade and on Future Programmes in Hydrology, P30.

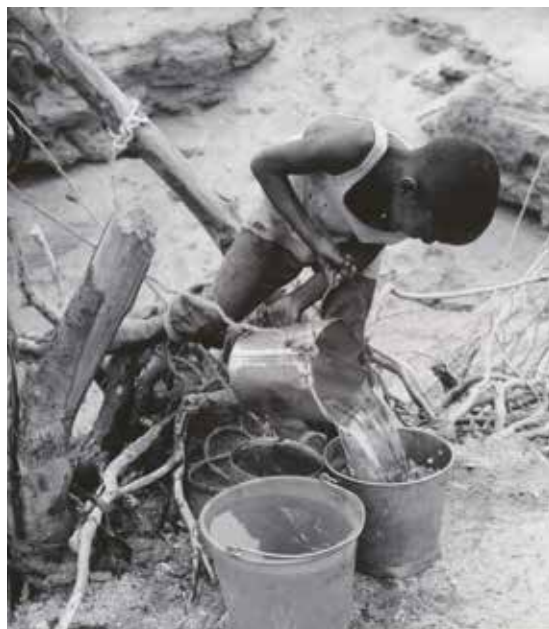


FROM TOP TO BOTTOM:

Sorin Dumitrescu at the symposium on hydrometry at Koblenz, September 1970.

Opening of UNESCO WMO End-of-Decade Conference Sept 1974.

Edith Carter and James H. Harrison at a meeting in 1979.



FROM LEFT TO RIGHT AND FROM TOP TO BOTTOM:

Grand Noria of Hama, Syria, on the Oronte river.

Daily life of the Touaregs of Hoggar, Algeria, in the 1950s.

Raymond Nace Hydrologist at the US Geological Survey.

- Preparing a glossary and multilingual equivalents of karst terms and a guide to hydrology of carbonate rocks;
- Preparing guidebooks and studies on water quality and pollutants, focusing on network design and forecasting;

- Summarizing best practice in hydrological data acquisition, transmission and processing systems;
- Developing hydrological forecasting projects;
- Providing studies on sediment transport by rivers, snow and ice.

Participants in the End-Decade conference agreed that IHD had generally played an important role in promoting research, education, training and technical assistance in hydrology, as well as facilitating the development of hydrology programmes, not only within UNESCO, but also in relation to other UN organizations and NGOs. Through the establishment of 108 National Committees, the Decade had also for the first time fostered genuine cooperation among hydrology-related national institutions, which in turn nurtured regional cooperation and greater understanding between disciplines and agencies. However, participants acknowledged that the gap between advances in scientific hydrology and their application had not been sufficient, particularly in developing countries,

despite the efforts made during the Decade. Therefore, they reiterated the need to maintain efforts in that area, through the establishment

of the International Hydrological Programme, which would build on the achievements of the Decade.

Sustaining the Efforts of IHD: the First Phases of IHP

The 1974 conference approved the outline plan for the implementation of IHP's First Phase (1975-1980). IHP-I maintained IHD's research orientation. Subsequent Phases, in response to the concerns of Member States, were reoriented in order to include practical aspects of hydrology and water resources. The IHP-II and IHP-III (respectively, 1981-1983 and 1984-1989) were conceived under the theme 'Hydrology and the Scientific Bases for Rational Water Resources Management'. Subsequently, IHP-IV (1990-1995) and IHP-V (1996-2001) of the Programme respectively focused on 'Hydrology and Water Resources Sustainable Development in a Changing Environment' and 'Hydrology and Water Resources Development in a Vulnerable Environment'. (See also Chapter 2 in this book.)

The first evaluation of the Programme took place in 1995, with the objective of revising its scope and improving its effectiveness³. This review focussed on the first four Phases of the Programme and their impact on hydrological sciences and education, as well as the impact of their publications and the effectiveness of the design, implementation and follow-up of the Programme. A detailed questionnaire was sent to the National Committees and Focal Points, which at that time already numbered 148, as well as to NGOs and UN agencies.

The responses demonstrated that IHP had played an important role in improving knowledge of hydrological processes, contributing to

the assessment of water resources and developing methodologies for water management nationally, regionally and globally. Regarding education activities, it was found that the training programmes had provided an effective transfer of technology, with significant contributions from postgraduate courses in training competent hydrologists and developing hydrological knowledge, including educational material. IHP's publications programme was also found to be effective in transmitting and exchanging knowledge. Finally, IHP's interaction with other UN agencies, particularly WMO, and with professional NGOs was deemed to have been very effective over the first four Phases.

Regarding IHP-V (1996-2001), an external evaluation carried out in December 2003 highlighted a number of important developments. First of all, it highlighted the scientific achievements of the Programme, which had published conference proceedings, books, databases, strategies and guidelines for dealing with water issues, as well as the importance of various Centres for water research and education, the institution of a prize and the launching of a UNESCO Chair. The importance of the FRIEND Programme (Flow Regimes from International Experimental and Network Data) was singled out for its success in establishing regional hydrological databases and information sharing between countries. The Fifth Phase had also been successful in generating and disseminating knowledge through training courses, promoting the application of Geographic Information Systems (GIS) and

3. Evaluation of the International Hydrological Programme (IHP) of UNESCO, Report of the External Evaluation Committee, Paris, January 1995.

developing public information and popular educational material, disseminated through television programmes, videos and CD-ROMs.

While recognizing that IHP-V had been instrumental in promoting the hydrological sciences, however, the evaluation also highlighted the need for the Programme to consider its longer-term vision for future directions and objectives. For the first time, the need to broaden the scope of IHP beyond purely scientific hydrological concerns was mentioned. It was suggested that the Programme should now focus on water resource management and related cultural,

societal and economic issues, to respond to Member States' needs and to the international community's growing interest in freshwater issues. The suggestion that IHP should focus on the production of policy-relevant science and expand the knowledge-base for water management influenced and modified the scope of the forthcoming Phases of the Programme. This transformed it from a single-discipline to a multi-disciplinary entity, with an increased emphasis on social science components. It represented a new recognition that solving the world's water issues was not just a technical problem.

IHP-VI Onwards: Shifting to a Holistic and Integrated Approach

The evaluation of the Sixth Phase of IHP (2002-2007, 'Water interactions: systems at risk and societal challenges') took place in 2011. This phase of the Programme represented an important turning point for IHP. Its focus shifted from studying the occurrence and distribution of water in the environment towards societal aspects of water resources, highlighting the need for better assessment and management, in particular at the transboundary level. During this period the Programme thus evolved from a 'pure science only' ethos to one of 'science within society'. In this context, the evaluation found that close collaboration among key players at global, regional and national levels was the basis of the Programme's success.

One of IHP's significant strengths and achievements was the network of water professionals it created at all levels. Mobilizing scientific opinion with only limited resources, great benefit arose from institutional links among organizations. The Programme thus influenced policymaking, research and capacity building, highlighting the fact

that institutional and economic issues are fundamental to the efficient use of water, conservation and depletion.

The Programme's success was said to be particularly tangible in the Latin American and Caribbean region, where IHP's importance had been evident in integrated water resources management, the existence of water balances, and environmental and social concerns, as well as in influencing the political agenda of regional governments. However, IHP's programmes were more broadly found to be comprehensive, relevant and useful to almost all countries, helping encourage national activities. The crosscutting programmes HELP (Hydrology for the Environment, Life and Policy) and FRIEND, in particular, were highlighted as significant driving forces within the Programme.

The most recent review, analyzing the Seventh Phase of the Programme (2008-2013, 'Water Dependencies: Systems under Stress and Societal Responses') took place in 2014. The aim of IHP-VII was to produce policy-oriented results for Member States, promoting

leading edge research, facilitating education and capacity development for sustainable development and enhancing governance in water resource management for ecosystem sustainability. The evaluation found out that IHP had been effective in targeting Member States as its main audience, through National Committees, and thanks in particular to the UNESCO Water Family, in collaboration with governmental bodies, NGOs, and academic and research institutions. In that sense, the Programme had managed to produce action-oriented and policy-relevant activities and outcomes – for example by providing support to the implementation of the ‘global agenda for sustainability’ and to training and capacity building in the field of water governance. In addition, it was highlighted that a major strength of the Programme was its ability to ‘enable and collate’ rather than conducting research itself.

Many international organizations regarded IHP as having a strong global cachet. This was thanks to its worldwide network (in particular the water-related Centres and Chairs, which played a key role in the implementation of the Programme), its ability to propose conventions and take an active role in the prevention of water conflicts, and its contributions to the World Water Development Reports. IHP’s reputation was further enhanced by its work with and inside developing nations, thus promoting South-South and North-South knowledge transfers.

Some examples of important achievements of IHP-VII are the Impact of Glacier Retreat in the Andes project; projects on transboundary resources, including mapping, through the From Potential Conflict to Cooperation Potential (PCCP) programme, which assembled important material for training in water-related conflict resolution; a series of books on flooding in a changing climate; developments in groundwater studies (such as the GRAPHIC – Groundwater Resources Assessment under the Pressures of Humanity and Climate



FROM TOP TO BOTTOM:

16th IHP Council at UNESCO in Paris, 2004.

Delegates follow the debates during the plenary of the 17th Intergovernmental Council of UNESCO-IHP, July 2006.

17th IHP Council at UNESCO in Paris, photo of the group.

Change – scientific review ‘Beneath the surface of global change: Impacts of climate change on groundwater’); and the publication of *Free Flow*, a UNESCO book that highlights the contributions to the International Year of Water Cooperation.

IHP Today: Challenges and the Way Forward

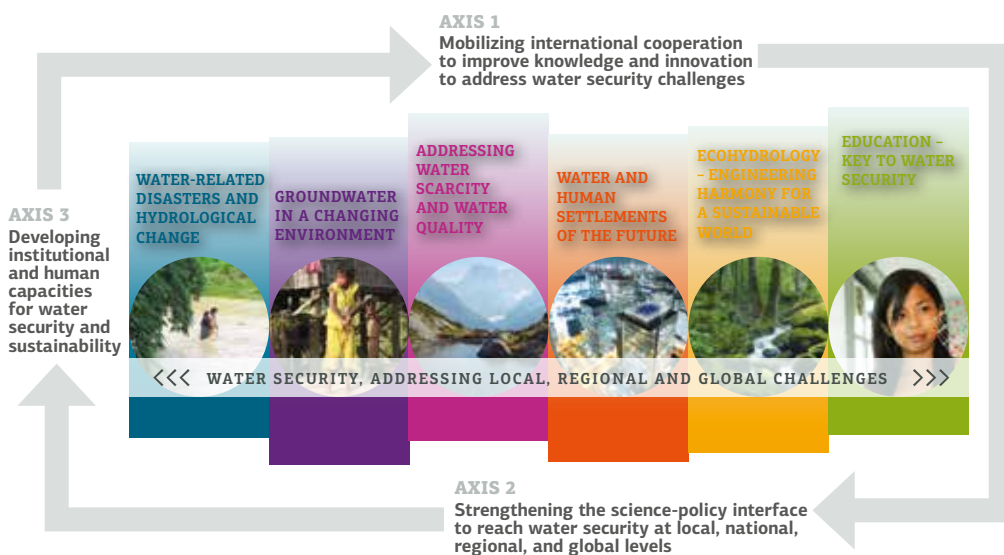
The evaluations of the Sixth and Seventh Phases of IHP have been instrumental in shaping the current Eighth Phase of the Programme (2014-2021), which focuses on 'Water Security: Responses to Local, Regional and Global Challenges'. In addition to highlighting many achievements, these evaluations have emphasised the challenges that IHP must meet today if it is to maintain its global position, facilitating an interdisciplinary and integrated approach water management, while incorporating a social and economic dimension, and promoting international research. The challenges include improving links within the UNESCO Water Family, since this extended worldwide network is one of the main strengths of the Programme and improving the effectiveness of the Secretariat in Paris in order to maintain its ability to successfully implement the Programme. In addition, it must continue to raise the profile of IHP so as to keep a competitive edge in the water sector, while dealing with reduced core funding and promoting further collaboration with other water-related institutions of the world. A final challenge is to optimize the

conception and execution of its future phases so as to identify and respond to arising issues.

Responding to the priorities and needs of the Member States, the current IHP-VIII is focusing on six thematic areas to assist them in their endeavour to optimize water management and security. These thematic areas are:

- [Theme 1](#): Water-related Disasters and Hydrological Changes;
- [Theme 2](#): Groundwater in a Changing Environment;
- [Theme 3](#): Addressing Water Scarcity and Quality;
- [Theme 4](#): Water and Human Settlements of the Future;
- [Theme 5](#): Ecohydrology, Engineering Harmony for a Sustainable World;
- [Theme 6](#): Water Education, Key for Water Security.

Through the current Phase and its relevant themes, IHP is addressing the identified challenges, seeking multidisciplinary and environmentally sound approaches to water





resources management and addressing the role of human behaviour, cultural beliefs and attitudes to water as well as the results of socio-economic research to adapt to changing water availability. IHP-VIII is striving to facilitate and use innovative methods, tools and approaches by capitalizing on advances in water sciences as well as building new competences to meet current global water challenges, notably through the valuable support of the UNESCO Water Family.



As IHP's fiftieth anniversary is taking place at the same year as the UN General Assembly adopted the 2030 Agenda for Sustainable Development, this presents yet another opportunity to revisit UNESCO's scope and programmes, responding to the ever increasing international attention on freshwater issues. As an active member of UN Water, IHP is involved, among other projects, in the Global Expanded Water Monitoring Initiative to develop indicators to measure progress towards the proposed targets under the future Sustainable Development Goal 6 on water, as well as a roadmap for their implementation with relevant monitoring mechanisms. In this context, and by constantly seeking to renew and strengthen itself to better assist Member States in their journeys towards water sustainability, IHP is today striving to capitalize on past achievements in order to score new ones in the future. In that sense, the UNESCO Water Family – which today counts more than sixty water-related Centres and Chairs, 169 National Committees, the



FROM TOP TO BOTTOM:

21st IHP Council at UNESCO in Paris, photo of the group. ©UNESCO/ R. Pareggiani.

Delegates follow the debates during the plenary of the 21st Intergovernmental Council of UNESCO-IHP, June 2014.

Plenary session, 21st IHP Council at UNESCO in Paris.

UNESCO-IHE Institute for Water Education and the World Water Assessment Programme, in addition to scientific experts at the Paris headquarters and in UNESCO field as well as associated NGOs – is a crucial element in that endeavour.

4

Chapter 4.





**GLANCE INTO THE
FUTURE
– OUTLOOK BY THE
UNESCO WATER
FAMILY**

CHAPTER 4

INTRODUCTION

by **Blanca Jiménez-Cisneros**

Secretary of the IHP and Director of the
Division of Water Sciences

Since the inception of the International Hydrological Decade, UNESCO has been developing a network of networks, often called the UNESCO Water Family, composed of different kinds of water institutions that have been joining forces with UNESCO in order to support the implementation of its water programmes and the organization's strategic goals. Today, as IHP is working on its eighth phase (IHP-VIII), the UNESCO Water Family operates globally as a network which includes: over thirty water-related Category 2 Centres under the auspices of UNESCO; thirty-three UNESCO Water Chairs and UNITWIN networks; the UNESCO-IHE Institute for Water Education in the Netherlands; the World Water Assessment Programme (WWAP), with its secretariat hosted and led by UNESCO in Italy and which produces the periodic World Water Development Report; and IHP National Committees representing the Programme in 169 Member States. All the above is in addition to the UNESCO staff located at the Paris headquarters of the IHP Secretariat and the Regional Hydrologists located in the UNESCO field offices. Together, they represent more than 1500 water experts worldwide.

The network of established water-related Centres under the auspices of UNESCO (Category 2 Institutes and Centres) contributes to the strategic goal of IHP and the relevant thematic and geographic priorities in their areas of expertise, at the international and regional level. These water-related Centres are associated with the organization through formal agreements approved by the General Conference (contributing to the water-related

objectives of UNESCO's strategic programme for the benefit of Member States), through capacity building, knowledge sharing and research. Today, as Member States have recognized the potential of these Centres, this network is growing rapidly.

With thirty-three members, the UNESCO Water Chairs and UNITWIN networks promote inter-university cooperation and networking among higher education and research institutions worldwide through the establishment of teaching and research positions and initiatives. Their main objective is to foster access to and share knowledge in water-related fields, actively contributing to research, training and the development of human and institutional capacity. They often serve as think tanks and bridge builders between academia, civil society, local communities, research and policy-making, informing policy decisions and generating innovation while contributing to the enrichment of existing university programmes and promoting cultural diversity.

The UNESCO-IHE Institute for Water Education, located in Delft, the Netherlands, is a Category 1 Centre and one of the main postgraduate institutions for water education in the world. UNESCO-IHE provides tertiary education degrees in collaboration with universities and a wide range of opportunities to a variety of target groups in developing countries and countries in transition, including education, training and scientific research, water sector capacity development, and partnership building and networking in its sector.

Hosted and led by UNESCO, the United Nations World Water Assessment Programme (WWAP) coordinates the efforts of thirty-one UN agencies, organizations, funds and programmes and 37 partners constituting UN-Water for the elaboration of the World Water Development Report (WWDR). This far-reaching UN-Water report provides a comprehensive picture of the state, use and management of the world's freshwater resources. Produced every three years from 2003 to 2012, the WWDR became an annual thematic publication in 2012. The first annual edition of the WWDR (focusing on 'Water and Energy') was presented on 21 March 2014 in Tokyo on the occasion of World Water Day. The most recent edition is the volume launched on 20 March 2015 in New Delhi, entitled 'Water for a Sustainable World'. The themes for the 2016, 2017 and 2018 editions of the report will respectively be 'Water and Jobs', 'Wastewater' and 'Nature-based solutions for water'.

The IHP National Committees, constituted and run under the authority of national governments, form the backbone of the Programme and are fundamental to ensuring the widest possible participation of Member States in the implementation of IHP. Their composition differs from one country to another, depending on national capabilities and existing institutional structure for hydrological studies and water resources management. These Committees include both scientists and water managers, as well as relevant government bodies, professional associations and civil society. At the regional level, they work closely with the UNESCO Regional Hydrologist and the Vice-Chair of the IHP Council from their respective regions, in order to ensure close and frequent communication and exchange of experience with other National Committees of the region and IHP. They also work closely with the UNESCO National Commission of their country, in order to contribute to international discussions and decision-making regarding

UNESCO affairs. Today, IHP is working to establish and implement an improved strategy for National Committees, to better support their work and cooperation with the Programme.

The IHP Secretariat in Paris gathers and provides studies, information and the necessary facilities to implement the Programme's activities. Its duties range from the daily responsibilities of maintaining a professional office, to promoting field-based decisions on water-related issues around the world. The Secretariat works in three different thematic sections to implement the different themes of each of IHP's phases: a section on Hydrological Systems and Water Scarcity; a section on Groundwater Systems and Settlements; and a section on Ecohydrology, Water Quality and Water Education. What is more, the Secretariat also coordinates the UNESCO Water Family and supports the Governing Bodies of IHP. Finally, at the regional level, the UNESCO Regional Offices are responsible for the implementation of IHP in their sphere of competence. Regional Hydrologists are posted in the field and serve as IHP focal points for all issues related to the Programme, as well as at national level. These Regional Hydrologists are located at the UNESCO Nairobi, Cairo, Jakarta, Venice and Montevideo offices.

The following chapter presents contributions from several of the UNESCO Water Family members. It provides a glance into the future, stating their hopes and aims for future cooperation with IHP based on both the past and current state of their relationship with the Programme.

The UNESCO Water Family

UNESCO-OFFICES

- ☀️ UNESCO-HQ/IHP
- ▲ WWAP
- ★ IHP Regional Hydrologist
- ◆ UNESCO-IHE

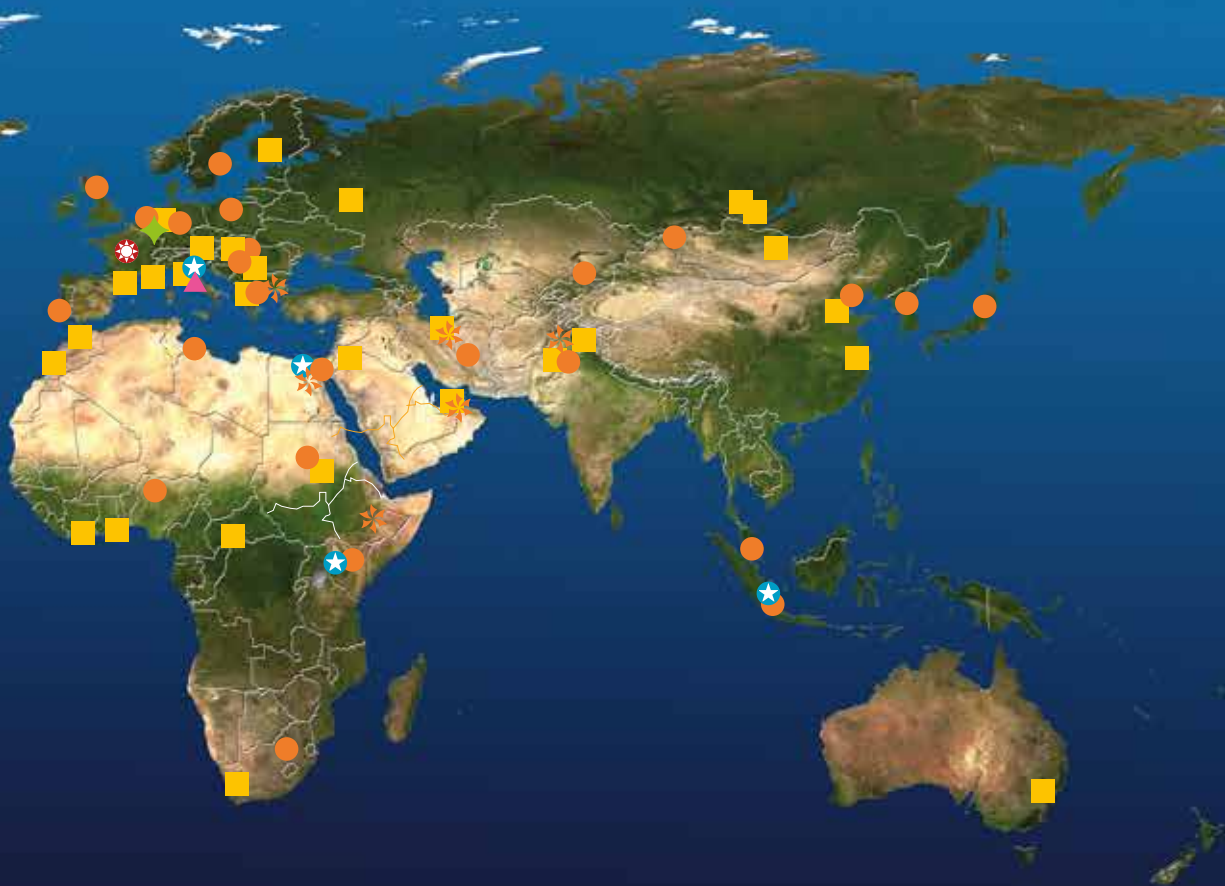
Water-related Category 2 Centres

- Established
- ✨ In Process

UNESCO Water-related Chairs

- UNESCO Chair









CHAPTER 4

IHP NATIONAL COMMITTEES

Belgium

Coordinating to Meet Complex Challenges

IHP National Committee
Belgium

Earth and Life Institute
Environmental Sciences
Université catholique de
Louvain

Croix du Sud, 2 - L7.05.02
1348 Louvain-la-Neuve
BELGIUM



Although Belgium has a moderate temperate climate with mean rainfall largely exceeding the national estimated water needs, freshwater resources in Belgium are subject to many pressures. Flooding regularly occurs in many catchments, while on other occasions droughts affect the hydraulic functioning of canals and constrain the functioning of river ecosystems. For some aquifers groundwater exploitation exceeds the recharge.

Another challenge relates to water quality. Due to the specific distributed land use patterns, surface and groundwater bodies remain subject to significant pollution pressures from all sectors, while wastewater treatment still does not cover the whole territory. As a result, a number of surface and groundwater bodies fail to comply with the target to reach a good ecological status by 2015, as set out by the European Water Framework Directive. A further point of concern is Belgium's large water footprint, partially explained by the virtual water import to support the Belgian economy, which questions global fairness, but also by the huge water consumption for cooling the nuclear power plants.

To face all these challenges Belgium needs efficient water resource management. This should be based on strong institutions, good science, high quality education in the water domain and strong participation on the part of various stakeholders in the development of a common water management vision. This capacity is constrained by the fact that Belgium is a federal state with a three-level governmental structure. Water resource stakeholders are found at all levels of this structure and a platform is needed to cross-link all actors.

In this context, IHP, through its National Committee, is an excellent vehicle to link scientific, academic and other Belgian professionals in the water domain. It also connects this Belgian expertise with the global Water Family.

PICTURE

November Sky, above a pond in Belgium.



Until 2002 the Belgian IHP Committee organized hydrological meetings for academics, public authorities and private entities, helping consolidate the scientific basis for water management at different levels. At this time, it was also a vehicle for designing different capacity building and training programmes. After a rather inactive decade the committee was reactivated in 2012. The new committee has recently organized high level scientific meetings on topics such as on the impact of climate change on Belgian water resource and Belgian university cooperation and development activities in the water sector. The committee also hopes to develop a common Belgian vision on urgent actions needed in the water domain. It hopes to thereby increase the visibility of Belgian expertise in the water resources domain and improve the

effectiveness of Belgian activities, projects and programmes that contribute to global water security.

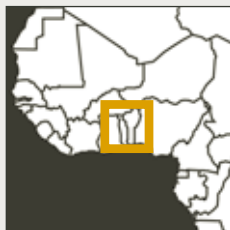
With significant backing from the Flemish Trust Fund, IHP concretely supports Belgian participation in specific IHP programmes such as the Nile FRIEND project, with tangible results. With a common shared vision, other specific activities are likely to be supported in the near future.

Benin

Applying Hydrological Tools to West African Water Needs

Comité national pour le PHI
Université d'Abomey-Calavi
Faculté des sciences et techniques
Département de Physique

BP 526
Cotonou
BENIN



The Republic of Benin joined IHP in 1975, since which time the country actively has participated in all sessions of the IHP Council where it served as a Vice-Chairperson for Africa from 1998 to 2000. The IHP National Committee for Benin has contributed to several IHP initiatives, including the FRIEND-AOC programme (Flow Regimes from International Experimental and Network Data – West and Central Africa) where it coordinated the section 'Variability of water resources'. In addition, Benin hosted the third meeting of IHP National Committees in February 2010.

The last fifty years of UNESCO's water programmes have offered Benin the opportunity, through active participation in the FRIEND-AOC and HELP (Hydrology for the

PICTURES

Left: Boats at anchor in the lagoon of Cotonou, Benin.

Right: Ganvie, fishing village on stilts in Benin.



Environment, Life and Policy) programmes to develop analytical and regionalization tools for hydro-meteorological parameters; significantly advance knowledge about the functioning of watersheds, both globally and at the level of small watersheds; develop tools for modelling the water balance; and model the variability of water resources, including surface water.

At the national level, there are several objectives and major issues for the development of the water sector, from the improvement of knowledge on groundwater resources regarding its quantitative assessment as well as its variability modelling to the evaluation and modelling of climate change impacts on water resources (surface and groundwater).

In addition, attention must be devoted to the forecasting of hydrological risks and early warning, training of senior executives in the field of water resources, and the continuation of Benin's contribution to various activities of IHP at the regional and international levels.

Burkina Faso

Long Live the International Water Community

IHP National Committee for Burkina Faso

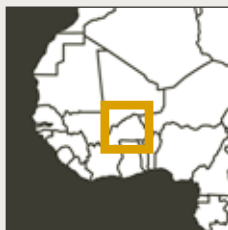
03 BP 7046

Avenue du Capitaine Thomas

Sankara

Ouagadougou

BURKINA FASO



The IHP National Committee for Burkina Faso would like, through this message, to share its pride in being part of the international water community under the auspices of IHP. Indeed, in its fifty years of existence, IHP has achieved many things and addressed many challenges, the most important of which have been improving global knowledge of the water cycle and working towards making water the best-managed and most equitably shared natural resource. It recognizes that water is a common priority for all humankind, the most precious natural resource and the source of most human settlements throughout history. In such a context, a change of approach in the search for solutions to water issues is needed.

Burkina Faso is a landlocked country located in the heart of the Sahel, whose economy is more affected by rain deficits than by large macroeconomic aggregates. It was in 1975 that the IHP National Committee was created in the former Upper Volta, now Burkina Faso, with its activities primarily directed towards participation in workshops, meetings and seminars organized by UNESCO. These included:

- In February 1989, in collaboration with MAB, CNRST, UNESCO and CIEH, IHP Burkina Faso organized an international symposium in Ouagadougou on the state of the art in hydrology and hydrogeology in the arid and semi-arid regions of Africa.
- IHP Burkina Faso participates in the FRIEND project. The first meeting of this project, held in Ouagadougou from 3-4 November 1992, was aimed at the creation and launch of the West and Central African arm of FRIEND.
- Two workshops organized in Accra by the IHP National Committee for Ghana and UNESCO regarding the management of the Volta River Basin in March 1988 and January 2002.
- Since 2006, IHP has initiated a series of biannual meetings of the programme's

PICTURE

24 years old, rides her bicycle with her baby to collect water for her family, Sorobouly village near Boromo, Burkina Faso.



National Committees in Sub-Saharan Africa including workshops or conferences on water-related themes.

IHP is extremely important for Africa, especially for the countries from the Sahel region. But as National Committees really do contribute to the development of the countries they represent, they could benefit from being better organized at national level. Burkina Faso has pledged to play its role within an international community clearly committed to implementing IHP's new vision on water resource management. To this end, and in order to put water at the heart of the national priorities and in line with the objectives of the 2030 Agenda for Sustainable Development, the country is revising its national policy on water. Moving forward, this policy will be implemented through the following five major programmes:

- Programme for integrated water resources management
- Programme for the supply of drinking water
- Programme for sanitation, wastewater excreta
- Programme for hydraulic infrastructure
- Programme for water sector governance

The implementation of these five programmes and the adoption by the Councils of Ministers of Burkina Faso, on May 7th, 2014, of a decree for the creation, attribution and composition of a National Committee for UNESCO-IHP, will revitalize IHP's activities in Burkina Faso.

Côte d'Ivoire

Facilitating Water Management Reform

Comité National PHI

22 BP 582 Abidjan 22
CÔTE D'IVOIRE



The reform of the Côte d'Ivoire water sector, beginning in 1996, culminated in the passing of a law in 1998 whose objective was Integrated Water Resources Management (IWRM). Since 1996 IHP-CI has been one of the main actors in water sector reform, whose conceptual phase is now completed.

In fact, IHP has helped make water resource problems a priority in Côte d'Ivoire, while also contributing to the formulation of a national vision of water for the year 2040. As defined in a national workshop chaired by the IHP, that vision recognizes the value of water according to six points of view: the cultural value of water; its spiritual value in Christianity; its spiritual value in Islam; its social value; its scientific value; and its economic value.

IHP-CI actively participated in the drafting of national water policies in 2010 and in 2011 conceived the institutional framework of the IWRM. From 2012 it has financially contributed

PICTURES

Left: Crossing the river, Côte d'Ivoire.

Right: Women on a market in Côte d'Ivoire.



to the implementation of the IWRM plan, with support set to total more than 20 billion F CFA up to the year 2030.

The most important challenges for water resources management in Côte d'Ivoire that can be addressed by IWRM are the institutional and regulatory framework for water resources management and the financial system in the water sector, which must be balanced and self-financing by the existence of a coherent and integrated framework for the water sector funding.

The concrete results of the first phase of the water sector reforms are being felt slowly, but we can already note the drafting and adoption of sixteen decrees of the Water Law, two of which concern the creation of the National Water Agency in Côte d'Ivoire and the Management Fund for Water Resources, Hydraulic Works and Facilities (Fonds de Gestion des Ressources en Eau, des

Aménagements et Ouvrages Hydrauliques). In addition to these, a National Observatory of Water Resource is in the process of establishment.

Looking to the future, as IWRM passes from theory to practice, the State of Côte d'Ivoire expects to make use of all the opportunities offered by IHP-VIII. In doing so, it can use the IWRM plan to address all the problems associated with water resources management, namely the operationalization of the framework, the funding of data collection activities, the assessment of water resource availability across the whole national territory and other emerging questions. The best way to improve project management and collaboration in the future is to strengthen the National Committee and connect the Directorate of Management and Water Resources Protection (DMWRP) with all IHP initiatives in the field.

Czech Republic

Building Cross-Border Awareness of Water Issues

Czech National Committee for Hydrology
Hydrology Division
Czech Hydrometeorological Institute

Na Šabatce 2050/17
143 06 Praha
CZECH REPUBLIC



There is a long tradition of hydrology and hydrological research in the Czech Republic. The first hydrological service was established as early as 1875. Its direct successor is today's Hydrological Service and Water Research Institute. The former Czechoslovakia fully supported the ideas and goals of IHD, and subsequently IHP, becoming an active contributor to both.

IHD and IHP have worked on many projects that have affected national research and applications. The IHD Working Group selected five countries that volunteered to create international postgraduate courses; one of these was Czechoslovakia, where the Czech University of Agriculture (CUA) developed a UNESCO hydrological data course. This offered a balanced series of lectures covered not only by the CUA staff but also by experts from the Czech Technical University, Charles University in Prague, the Czech Hydrometeorological Institute and several research institutes. The course was established in 1966 within the framework of IHD and was run on a biannual basis. Overall, there were nineteen courses with 225 participants from four continents.

When looking back, Czech National Committee for Hydrology (CNCH) believes the following IHP activities and outcomes deserve to be highlighted: The regional cooperation of Danube countries has produced not only valuable outputs that reflected and covered the whole basin and nineteen countries but has also established and promoted the framework of close cooperation and scientific exchange among nations; the FRIEND programme and experimental basins enhanced the understanding of basic hydrological processes; work on the terminology of hydrology has helped improve understanding between different languages; and activities in the field of groundwater assessment have been an important feature of international cooperation. The Czech Republic and Czech experts have participated in all these activities and benefited from them.

PICTURE

Autumn in Šumava, Roklanský potok Valley, Czech republic.



A specific role of the IHP and National Committees in the Czech Republic and Slovakia, given the separation of the former Czechoslovakia, has been to preserve close contacts between scientific communities in both countries by the continued organization of the joint conference 'Hydrological Days', which has run every five years since 1980.

In the future CNCH intends to highlight the role of IHP in the enhancement of scientific understanding of the water cycle from soil column through small 'slope', up to a global scale as a necessary prerequisite for applications in water management. Attention should be given to hydro-climate interaction with the aim of improving the understanding of climate and hydrological variability through the development and enhancement of seasonal forecasts. At the same time, CNCH recognizes and strongly supports the regional

cooperation within the IHP and its activities with regard to education, capacity building and raising general awareness of water issues in line with the basic spirit of UNESCO and IHP in particular.

Egypt

Supporting Regional Water Networks

Egyptian National Committee for IHP

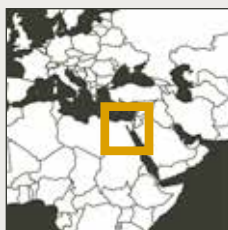
Arab Water Council

9 Al-Mokhayam Al-Da'em St.

6th District, Nasr City

Cairo

EGYPT



The Egyptian National Committee for IHP contributed to the formulation of IHP, proposing themes and selecting focal areas of interest for the Arab region, and the FRIEND/Nile and HELP programmes. It offers continuous support for regional networks (such as Wadi Hydrology and Groundwater Protection). Decision makers and experts from Egypt regularly attend meetings and workshops to discuss ideas, reports and the results of projects and studies at regional and national level in order to exchange knowledge relating to common issues such as water scarcity in arid and semi-arid regions, environmental assessments for dam construction and so on. It also works to improve cooperation between different Egyptian UNESCO committees.

During its existence, the Egyptian IHP Committee has made many significant achievements, such as the establishment of a hydrological library, containing IHP publications and textbooks on hydrology as well as other subjects relating to freshwater. Each year it also organizes an international course on Environmental Hydrology for arid and semi-arid regions, held in Egypt with participants from various African countries. Furthermore, it holds training programmes for Arab and African countries, which take place at the UNESCO training centre for arid and semi-arid regions.

The Egyptian IHP Committee is a regular participant in the governmental and intergovernmental council, the Arab IHP national committee bi-annual meeting as well as related internal or external conferences and workshops. It has organized a one-day workshop to discuss topics such as: climatic changes and their impact on the Nile flow; flood forecasting of the River Nile; sedimentation processes in rivers and storage lakes; the control of the evaporation rate at Lake Nasser; and the application of isotopes in hydrology. Each year the committee also contributes to the World Water Day celebration which is held in Egypt.

PICTURE

Going home, Egypt.



Furthermore, in cooperation with the National Committee for Water Resources, the Egyptian IHP Committee has prepared a series of reports entitled ‘The Use of Ground Water in the Nile Delta Region for Drinking Water Supply’. It was also responsible for the translation of the GIS book into Arabic as well as coordinating the translation of the irrigation and drainage dictionary. It provided support during the preparation and production of the Groundwater Operational Management toolkit and has overseen the preparation of the strategic resource plan for the Ministry of Water Resources and Irrigation up to 2050.

In the future the Egyptian National Committee for IHP will be overseeing the

preparation and production of a report entitled ‘Groundwater Importance for Egypt: Hydraulic and Hydrologic Studies for Projects at the Upper Nile with Emphasis on Eastern Nile’. It will be providing continued support for environmental monitoring hosted by UNESCO as well as preparing an atlas for Egypt’s water resources. Lastly, it will be hosting seminars on a variety of topics, including the treatment of drainage water, reuse of treated sewage water and desalination.

Greece

The Global Importance of Water

IHP National Committee
Greece- AC/HR/45
Aristotle University
54124 Thessaloniki
GREECE



Water is the essential factor for the survival and development of mankind, with a significance that goes way beyond local or national boundaries. It is, together with the weather, climate and seas, a vital element of global concern. The 'random' nature of its temporal and spatial appearance, behaviour and the effects it causes remains one of the major global scientific challenges. Water measurement, data analysis and hydrologic modeling have been and continue to be important issues for which scientific cooperation and knowledge exchange are the keys to progress and problem solving.

So far, the influence and activities of IHP in Greece have been relatively limited. Where the country has benefited has been in the areas of education, gaining new contacts in the international water community, the boosting of scientific and technical research, and programmes such as the FRIEND network.

PICTURES

Left: A small village in Greece.

Right: Fishermen in Greece.



To ensure the rational and sustainable management of water, IHP promotes efforts to secure the necessary quantities of water and to address extreme catastrophic events, such as floods and drought. However, the threat of climate change has triggered many additional questions about the availability of water of a satisfactory quality and in sufficient quantities. The identification of relevant phenomena and risks and the development of methods for anticipating and addressing them is therefore a major field of scientific research.

For over fifty years now, IHP has identified water-related problems, promoted cooperation, highlighted potential solutions and worked to enable the global diffusion of scientific and technical information and knowledge to meet the present and future needs of the human population, at all latitudes and longitudes.

IHP has achieved many things over the past fifty years, but there are still numerous unsolved problems to contend with, such as flooding, especially of coastal areas, and fears over the effects of climate change. The programme works to strengthen cooperation and identify common objectives and actions at national level through a number of specific programmes and cooperation networks. It is also creating opportunities for scientists in the area of hydrology and water resources, especially young scientists, in order to broaden their horizons and foster worldwide communication. IHP's activities in Greece could be further improved if younger scientists and engineers were attracted by information and voluntary mobilization efforts from UNESCO and local IHP teams. The Greek IHP Committee welcomes the jubilee and wishes and asks UNESCO to continue expanding its local initiatives and actions.

Italy

New Tools to Tackle Global Water Challenges

Italian IHP National Committee

CNR/IRPI

Via Amendola 122/I

70126 Bari

ITALY



Italy, through the Italian Committee, has been particularly active in IHP since its inception. Indeed, it had the privilege of serving as a Council member for twenty years (1994-2013), and for one year in 1975 (almost half of IHP's lifetime). The Italian Committee has been particularly sensitive to IHP's scientific mission of stimulating and consolidating its link with the International Association of Hydrological Sciences, organizing a significant number of workshops covering a diverse range of hydrology-related topics spanning water hazard and risk studies to basic and applied research. The Italian Committee has found the role of IHP as a 'bridge' between governmental Institutions and scientific and academic communities to be particularly useful from a strategic viewpoint. From this initial idea came the realization that it would be extremely beneficial to extend this role to the entire water science sector. Since water is a crucial issue for several UN

PICTURES

Left: Canals in Italy.

Right: Lake Como in Italy.



agencies, the development of the World Water Assessment Programme was encouraged, leading to the establishment of the new headquarters in Perugia.

Concerning the future, new efforts and interest are growing around the new UNESCO Chair recently launched in Perugia for Water Resources Management and Culture. The purpose of this is to study, disseminate and facilitate solutions regarding the potential risks of water for the UNESCO World Heritage sites, working, at the same time, to link the cultural and scientific knowledge that is strongly needed to preserve our world heritage. Coordinating contributions from several disciplines in order to manage such complex water issues in order to preserve the most beautiful and fascinating areas of the world is one of the biggest future challenges for IHP.

Japan

Promoting Collaboration in the Southeast Asia and Pacific Region

Japanese National Committee for the IHP

3-2-2 Kasumigaseki, Chiyoda-ku,
Tokyo 100-8959
JAPAN



Japan's contribution to hydrological sciences in the UNESCO framework dates back fifty years to the International Hydrological Decade (1965-1974). During that time urbanized areas have rapidly expanded, as a result of which reducing flood damage and solving water resource problems have become important national issues. IHD provided the momentum to promote various observational studies at experimental basins. The resulting, improved understanding of hydrological processes and progress of hydrological observation, modeling and prediction have contributed greatly to a reduction in water-related disasters and well managed water resources and environment.

Japan has been very active as a member of the Intergovernmental Council of the IHP, and significantly involved in regional and international water science issues. One of the

PICTURES

Left: Storm Mountain Fisherman, Arashiyama, Kyoto, Japan.

Right: Shinkyo bridge, Japan.



important Japanese contributions has been the foundation of the Regional Steering Committee (RSC) for IHP in Southeast Asia and the Pacific (SEAP). The RSC was originally established in July 1993 in Manila. Since then it has held an annual meeting to exchange experiences, discuss problems and solutions and promote scientific cooperation, exemplified by the publication of the [Catalogue of Rivers for Southeast Asia and the Pacific Volumes 1 to 6](#), as well as the Asian Pacific FRIEND programme.

In addition to active participation in the RSC for SEAP, the Japanese National Committee supports various national scientific and educational projects on hydrology and water resources in line with IHP-VIII. Since 1991 it has also organized the annual [IHP Training Course \(TC\)](#) in association with Nagoya

University, Kyoto University and other related universities and institutes.

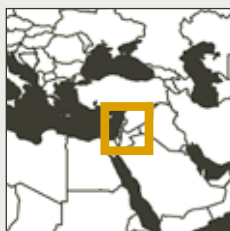
Climate change influences the hydrological cycle, causing serious impacts on ecosystems and water resources, as well as water-related disasters. To address these issues advanced hydrological knowledge and the ability to make accurate predictions become more important. The Japanese National Committee seeks, in cooperation with IHP RSC in SEAP, to promote scientific and technological activities with the aim of sustainable water resource development, preservation of ecosystems, and building disaster resilient societies in the context of a changing climate.

Jordan

Managing Water Across Arid Regions

IHP National Committee of Jordan
Secretary-General of the Ministry of Water and Irrigation

P.O.Box 2412-5012
Amman
JORDAN



Water scarcity in Jordan is a national problem that is accompanied by high population growth and immigration. This has created a significant gap between the available water resources and demand.

The Jordan National IHP Committee was created in 1992 and is headed by H E the Minister of Water and Irrigation (MWI), with the Vice-Chair acting as Secretary General. The committee comprises representatives from seven universities and other institutions in addition to the National Commission for Education, Culture and Science.

Since Jordan is one of the world's arid and semi-arid environments, the committee concentrates on areas such as: surface harvesting and groundwater artificial recharge; aquifer vulnerability risk water resources protection; integrated water resources management and adaptation to climate change; wadi hydrology and eco-hydrology; sanitation and reclaimed water reuse and management; shared water resources and transboundary water.

There has been significant support for the programme within the framework of IHP's mid-term plans, including the IHP-V plan (1996-2001), IHP-VI (2002-2007) and IHP-VII (2008-2013). This support came in the form of training, capacity building and water research projects and continues to be implemented through the ongoing strategic IHP-VIII plan (2014-2021). The aim is to develop a cooperative framework for the sustainable management of shared water resources and transboundary water.

The UNESCO regional offices in Cairo and Amman play a significant role in supporting the implementation of the programmes at both regional and national levels through, amongst other things, the Bi-Annual Arab national committees meeting organized through the Cairo office and supported by ALECSO. The

PICTURE

Irrigation of the fields, Jordan.



integration of the Wadi Hydrology Network and the Groundwater Protection Network has also been substantial.

In fact, several members of the Jordan National IHP Committee have been nominated to participate in various UNESCO Centres and initiatives, as well as Working Groups on a regional and international level such as ICHARM, UNESCO-IHE, ECO-HYDROLOGY and IRTCES. All this is in addition to Jordan's presence in the IHP intergovernmental council and IHP Bureau.

Jordan contributed to the fourth World Water Development Report (WWDR4) with a significant case study on dry environments. The UNESCO Amman Office supported the Ministry in developing this case study that was published in the WWDR4 launched in 2012 at the Sixth World Water Forum.

Finally, the contributions of the UNESCO-IHP secretariat over the past five decades to IHP's activities have been highly appreciated within the umbrella of the UNESCO organization. Such efforts have enabled the development of an overall strategy to ensure the active participation of Member States in the implementation of activities relevant to the main themes and focal areas of the IHP mid-term plans. The future activities of the Jordan National IHP Committee will be carried out in line with the ongoing strategic plan of IHP-VIII (2014-2021) and will depend on local, regional and international support.

Lebanon

IHP's Support for Lebanon's Water Management

Comité national hydrologique libanais

Lebanese National Council for Scientific Research

P.O. Box 11-8281

Beirut

LEBANON



Lebanon, a Middle Eastern country with a small area of 10452 km², is known for its diversified water resources and high precipitation rate, including snow. Like many regions worldwide, Lebanon has a serious problem with water supply/demand and water scarcity, which is exacerbated by increasing population growth, land use change as well as climate variability. Challenges relating to water supply have been pronounced in most regions of Lebanon in the past few decades. This is owing to an abrupt decrease in water volume in rivers and springs of up to sixty per cent. Also, the groundwater table and the discharge have regressed by around fifty per cent.

The hydrologic cycle and elements of the water budget are not well defined in Lebanon, and there is insufficient data and information on which strategies and policies could be based in order to produce better management

PICTURES

Left: Jordan river from aerial view, Lebanon.

Right: Fisherman, Jbail, Lebanon.



approaches. There have been several studies, projects and even donations to enhance the status of water resources in Lebanon and a substantial part of these studies and projects are managed by international entities.

Before the creation of IHP, however, Lebanon had no obvious entity for managing water resources, and it lacked links to the international water institutions. IHP therefore plays a major role and is contributing in many ways to the knowledge mapping of water resources in Lebanon. Perhaps most significantly, it established a National Hydrological Committee in Lebanon, similar to that in many other Arab countries, that meets on a regular basis. The IHP programme is run through the Paris and Cairo offices, organizing meetings and workshops on several water-related themes to improve the knowledge of the Lebanese experts, notably

in the field of water resources management. Moreover, the IHP programme has provided funds to support water research projects in Lebanon; this has been coordinated mainly by the National Council for Scientific Research and the Ministry of Environment. IHP's main contribution has been to the development of integrated management solutions for water resources in many developing countries, including Lebanon.

The National Council for Scientific Research (CNRS) in Lebanon has several future prospects for developing more cooperative activities with IHP, in particular relating to the establishment of water strategies and policies as well as measures for adapting to physical and anthropogenic challenges. IHP has a great deal of experience in this respect and it has been involved in similar programmes with highly successful results.

Mexico

Making a Positive International Impact

IHP National Committee- Mexico (CONAMEXPHI)

www.conamexphi.org

 [conamexphi](https://www.facebook.com/conamexphi)

 [@conamexphi_mx](https://twitter.com/conamexphi_mx)



Mexico has been a member of IHP since its creation in 1975. From 1986, the IHP National Committee for Mexico (Conamexphi) has been involved in many different activities, such as Mexico's participation in the development of the arid zones map of Mexico, Central and South America, following the norms of FAO and the methodology of the University of Chile. Conamexphi has also organized four seminars on potamology, with the objective of both evaluating and implementing studies and investigations into river engineering, surface and groundwater hydrology.

During the period 2008-2012, Mexico contributed to the HELP Programme with information regarding the Lerma-Chapala and Pátzcuaro Basins. It also initiated the UNESCO-IMTA Chair on 'Water in the Knowledge Society', with the goal of sharing knowledge and information with the wider society on

PICTURES

Left: Mexico strengthens cooperation with the UN and chairs the International Hydrological Programme.

Right: The Eastern Drainage Tunnel (TEO, acr. Sp.) is a worldwide unique piece of engineering, a 62km long underground wastewater treatment tunnel being built in Mexico City, Mexico. It will have a wastewater discharge capacity of 150m³/s. The project is being conducted by Conagua, which is also responsible for the management of the tunnel.



topics related to water resources, for which it has organized seminars, congresses and publications as well as creating a website.

Conamexphi has sponsored several publications, such as 'Water Cultures and the Indigenous Cosmovision', 'Guide for consensus building in integrated water resources management', 'Droughts and Climate Change' and 'Discover a Basin: Santiago River'. It also participated in creation of the book 'Transboundary Aquifer Systems in America'.

Today, the objective of Conamexphi is to position Mexico as an important player on the international water stage, with sufficient resources to strengthen that position through bilateral, regional, multilateral and global activities. It therefore believes in the importance of maximizing the positive impact of international cooperation schemes in the

creation and consolidation of capacity for sustainable water resources management in the Mexican water sector, as well as working to position Mexico as a global player in the field of water resources management.

In December 2013, with the support of the Government of Mexico through the National Water Commission (Conagua) and various leader institutions in the field of water, two major events were organized; first, the 'Xth Meeting of National Committees and Focal Points for the IHP Section for Latin America and the Caribbean' in the planning of the 2014-2015 biennium; and secondly, the 'Closing Ceremony of the International Year of Cooperation in the Field of Water', which was attended by over 400 participants from sixty countries and more than 200 institutions of various latitudes among ministries and governmental agencies, international



PICTURES

Left: IHP Bureau meets in 2014 for the first time in Merida, Yucatan, in Mexico, for a technical meeting of its members.

Right: The main arcade of the Aqueduct of Padre Tembleque, Tepeyahualco, has 68 arches, Hidalgo, 1971. CONAGUA-AHA, Fondo Colección Fotográfica, Caja 207, Expediente 5677, Inv. CF-05-5677.

organizations, development banks, civil organizations, etc.

In 2014, the ‘Technical Meeting of the members of the Bureau of IHP’ was hosted in Merida. Among the meetings outcomes was that the members of the IHP Bureau welcomed Mexico’s proposal to issue a postage stamp commemorating the Anniversary of UNESCO’s water programmes, which will be presented by Mexico in the second half of 2015.

In this the same year, Mexico submitted to UNESCO, the initiative for the creation of a Category II Centre named ‘Regional Center for Water Security’ headed by two emblematic institutions and leaders in the country in research and capacity building, the Mexican Institute of Water Technology (IMTA) and the Institute of Engineering of the National Autonomous University of Mexico (UNAM).



The Current Board of Conamexphi (2014-2016) has initiated a process to strengthen its Working Groups through the financing of various activities of national, regional and international impact, in order to build strong and lasting partnerships of cooperation on water issues.

In accordance with the objectives of IHP-VIII, and with the support of the International Working Groups, in 2015 various activities are being carried out, including: on the issues of groundwater, the translation of documents of Groundwater-Management Advisory Team (GW-MATE) of the World Bank to benefit the Spanish-speaking regions; regarding Gender and water, the 'Gender and Water Sovereignty in Latin America' initiative as a methodology for strengthening capacity building; the development of the 'Study for the implementation of the principles and practices

of Ecohydrology in the Water Development of Mexico and Latin America'; the production of the document called 'Risk Assessment of Hydroarsenicism and Hydrofluorosis' and the study 'Hazardous criteria, Vulnerability and Flood Risk in Urban Areas', the implementation of various analytical techniques for measuring emerging contaminants in water with reuse purposes for direct and indirect human consumption, the '1st Iberoamerican Congress on Sediments and Ecology'; and various reports led by Mexico for the World Water Assessment Programme, which will serve as inputs for the World Water Development Report.

Nepal

New Frameworks for Water Research in Nepal

**The Chairman
IHP National Committee
Nepal National Commission for
UNESCO**

Singh Durbar
Kathmandu
NEPAL



Although Nepal is endowed with tremendous water resources for various development activities such as hydropower, irrigation, drinking water and so on, the country suffers from various water-related disasters such as flooding, drought and landslides at the same times every year. The IHP National Committee was formed in order to carry out research on Nepal's contemporary hydrological and water issues; to contribute to the forming of rational opinions on such issues based on research findings; to conduct activities to develop and enhance human resources, mainly young researchers; and to exchange technology and information with both national and international institutions engaged in similar activities.

Since 2009, IHP Nepal has been celebrating National Water Week and commemorating World Water Day. This programme has built up momentum since that time, with various governmental and nongovernmental organizations and academic institutions working on the implementation of programmes such as seminars, workshops and knowledge exchange on contemporary water issues.

During 2008-2013 IHP Nepal successfully launched the UNESCO HELP programme in Upper Kaligandaki Basin, one of the HELP basins. It is currently involved, as one of the collaborating partners, in the research on 'Adaptive Governance of Mountain Ecosystem Services for Poverty Alleviation Enabled by Environmental Virtual Observatories' led by the Imperial College of London and focusing on the same basin.

It has taken part in various national and international forums, presenting papers and nurturing young researchers through IHP-organized training programmes. It has also supported and collaborated with the Society of Hydrology and Meteorology-Nepal and the Department of Hydrology and Meteorology in organizing the international conferences on 'Hydrology and Climate Change in the

PICTURE

Young girls in a field, Nepal.



Mountainous Areas’ in 2008 and on ‘Climate Change, Water Resources and Disasters in Mountainous Regions: Building Resilience to Changing Climate’ in 2013, both held in Kathmandu, Nepal. The Kathmandu Declaration, made during the Conference of 2013, recommended the establishment of a well-equipped Mountainous Climate and Water Research Centre in Nepal to carry out high quality scientific research with mechanisms for disseminating research findings right down to the community level.

Recognizing the need for such a centre, the General Assembly of the Nepal National Commission for UNESCO held on January 23, 2015 and chaired by the Honourable Minister of Education and Chairman of the National Commission for UNESCO endorsed a nine-member committee headed by the Chairperson of IHP Nepal to frame the structure of the centre. This new Regional Research Centre

will give continuity to IHP Nepal’s work in organizing and participating in workshops, seminars or conferences on both national and international level. It is planning to carry out a number of research projects on various water and climate issues both independently and in collaboration with other national and international institutes.

As water is one of Nepal’s main national resources its use has to be optimized in order to ensure sustainable development. This can be made possible through water resources management based on research findings and capacity building. Since the work of IHP is focused on promoting international scientific cooperation in water research, water resource management and education and capacity building, IHP Nepal has found the various programmes implemented to be highly useful in transforming the challenges the country is facing into opportunities for its development.

New Zealand

A Long and Fruitful Relationship

IHP National Committee of
New Zealand

National Institute of Water
& Atmospheric Research
Limited (NIWA)

10 Kyle Street
Riccarton
Christchurch
NEW ZEALAND



New Zealand (NZ) has been an active member of IHP since the 1960s. The early days of IHD and IHP coincided with an expansionary phase of NZ hydrology, when substantial investments in large infrastructure such as hydro-electric power schemes were made. In the 1970s, NZ pioneered its own hydrological data processing and archiving system to cope with the characteristics of its major rivers that are braided and unstable, needing frequent updates to stage-discharge relationships. A particularly pleasing aspect is the operational use of this system in many Pacific Island nations and South East Asian countries.

In the 1980s, owing to rapid economic and government changes, NZ's role in IHP was limited. Nevertheless, IHP documentation was helpful in benchmarking its hydrological activities with those of the rest of the world, and in particular introducing data telemetry.

PICTURES

Left: View from a dam, New Zealand.

Right: Milford Sound in New Zealand.



With the resurgence of IHP activity in South East Asia in the 1990s, NZ attendance at IHP's annual Regional Steering Committee (RSC) meetings for SE Asia and the Pacific has become a regular feature. NZ, with Australia, has taken a significant role in running the RSC meetings. From 1999 to 2001, NZ chaired the RSC and hosted the 2000 RSC meeting in Christchurch NZ.

Between 1997 and 2014, NZ contributed to the first five volumes of the 'Catalogue of Rivers', including leading the fourth volume. During this period, NZ, with support from Japan, played a key role in technical projects on extreme rainfall and flood design methods.

The content of the latest IHP Phase VIII (2014-2021) is relevant and consistent with NZ government's renewed engagement with water infrastructure development and management.

Approaches such as Integrated Water Resource Management and Ecohydrology are central to programmes such as the Canterbury Water Management Strategy. Ongoing engagement with UNESCO programmes such as FE2W will benefit from greater understanding of holistic approaches that combine social and biophysical sciences alongside a partnership with indigenous interests. In addition to education, these benefits include coordination of science and integration of cultural aspects to provide critical information for use in policy formulation, and to meet multiple economic and environmental targets.

Nigeria

Regional Responsibility for Africa's Water Resources

Nigeria National Committee for UNESCO-IHP
Nigeria Hydrological Services Agency
Federal Ministry of Water Resources

Plot 222, Shetimma Ali Monguno Crescent
 Utako District
 Abuja
 NIGERIA



In view of the importance of water resources to its national development, Nigeria, through the Ministry of Water Resources, is particularly pleased with its active involvement over the years in the implementation of various national and regional IHP activities. The establishment of the Nigeria National Committee for UNESCO-IHP is a reflection of IHP's strong dependence on national efforts, with the Nigeria Hydrological Services Agency acting as the Secretariat.

Through its IHP National Committee, Nigeria has been participating actively in the IHP Intergovernmental Council since 1987. Through this, its position in the IHP Bureau had enabled it to promote IHP's activities in the Sub-Saharan African group. Nigeria took the lead in hosting the 'First African Regional Consultative Meeting of the National Committees for UNESCO-IHP' in March 2006 in Abuja, so as to stimulate Africa's regional capabilities for cohesive implementation of IHP programmes and rekindle as well as strengthen the inactive National Committees.

Apart from this landmark achievement, two other Workshops – 'Improving Understanding of Parliamentarians on Water Management in the ECOWAS sub-region', and 'Improving the Knowledge of Nigerian Legislators and Managers of Water Resources on Sustainable Water Governance' in collaboration with the Nigeria UNESCO Office – were held in Abuja in 2007 and 2009 respectively with the National Water Resources Institute (NWRI) providing the resource personnel.

It is worth noting that implementing the relevant national programmes of IHP to a large extent facilitated the sustainable development and management of the nation's water resources. This had enabled IHP Nigeria to carry out projects including: The Transboundary Regional Aquifer Study for the Management of the Iullemeden Basin shared between Nigeria, Niger and Mali; Application of Isotope

PICTURE

Life on water in Makoko, Nigeria.



Hydrology Techniques in Contemporary Water Resources Assessment in Nigeria, as part of the JIIHP; and the Regional Project for the Joint Management of Shared West African Coastal Aquifer Resources, which involved the countries of Benin, Nigeria, Ghana, Cote d'Ivoire and Togo.

One particularly significant result of Nigeria's previous roles and active participation in UNESCO's water resources programmes has been the establishment of the Regional Centre for Integrated River Basin Management (RC-IRBM) in the National Water Resources Institute, Kaduna Nigeria in March 2012.

Apart from the fact that the National Committee has been involved in IHP's networking through the platform of the regional biennial meetings inter-alia, where

experiences and expertise are shared, the committee has also been rigorously implementing some specific areas of interest relating to IHP-VIII, which are strategically in line with national projects/programmes.

However, the prospects and visions for the future of the National Committee are to execute technical activities that will correspond with the various objectives of IHP, i.e. improving water supply and sanitation, study of transboundary waters including aquifers, hydrological disaster risk reduction and more.

Norway

A Strong History of Collaboration

Norwegian Hydrological Council

Middelthunsgate 29
PO Box, 5091 Majorstua
0301 Oslo
NORWAY



The year 1965, when IHD was established under UNESCO auspices, represented a milestone for hydrology as a scientific discipline. IHD and later IHP initiated international collaboration resulting in important hydrological knowledge and capacity building. For Norway, this meant developing hydrology from being national and hydropower oriented to becoming an international, broad scientific discipline.

The Norwegian Hydrological Committee was established in 1966, along with committees in the other Nordic countries. This provided a basis for extensive Nordic water-related cooperation, and the need to organise a broad water-related forum for exchange of research results and practices between Nordic hydrologists was also identified. As a result, the Nordic Hydrological Association was established in 1970.

In the Nordic countries, including Norway, the IHD led to the identification of representative catchments with extensive hydrological measurement programmes. The collection of data prompted research at the national hydrological institutions and at universities and university colleges, and after some years the first scientific positions in hydrology were established.

Since its initiation in 1985, the IHP FRIEND Water programme has provided Norwegian scientists and students with a unique international framework for collaboration. Norway has been one of its main contributors, overseeing the establishment and updating of the European Water Archive of near-natural daily streamflow records. Norwegian scientists have greatly contributed to, and benefitted from, the activities of the EURO-FRIEND project and are still active members. In particular, studies of long-term changes in hydrological variables have enabled a better understanding of climate control on hydrological variability and change across Europe, and have resulted in several well-cited international publications. National projects have complemented and interacted

PICTURE

Lofoten, Norway.



with the FRIEND Water programme. The informal character of FRIEND has provided a low threshold for students to engage in an international network. Furthermore, it has facilitated Norwegian participation in international proposals for research funding and engagement in training activities under the auspices of the FRIEND Water programme in other FRIEND regions of the world.

Norway is still active in the FRIEND Water Programme. This has been illustrated, to give just one example, by the Norwegian participation in many of the contributions to the FRIEND Water 2014 conference in France. Furthermore, the Norwegian IHP committee had the pleasure of hosting the last IHP Region I meeting in Oslo. The meeting discussed the future plans of Member States, and identified potential areas for collaboration and funding possibilities. The participants agreed to work

together on three concrete topics: design criteria, a water watch project for the region and an updated management practice handbook. It was recognized that as funding possibilities are limited, collaboration has to make use of related national activities that will be carried out without the support of IHP. The Norwegian IHP committee will continue to encourage the Norwegian hydrological community to actively contribute to IHP and through this gain further hydrological knowledge.

Oman

A Bridge Between Agencies

IHP National Committee Oman
Ministry of Regional
Municipalities and Water
Resources

P.O. Box 461
Postal Code 112
OMAN



The Oman National Committee for IHP (NC Oman) was initiated in 1997 to take the lead in improving the understanding of all water issues within the Sultanate of Oman. From its inception until the present day NC Oman has focused on transferring the global knowledge, experiences and technology related to water science and water engineering to all staff in the various agencies concerned with water inside the Sultanate. NC Oman acts as a bridge between IHP and all water related agencies in the Sultanate. It has played an active role in the implementation of the objectives of all IHP plans and programmes.

Consistently over the last fourteen years NC Oman has contributed to all regional and national events, activities and scientific conferences related to the development and management of water resources to enrich the dialogue and seek practical solutions to the problems of water scarcity, especially in arid and semi-arid countries. These activities include participating in and organizing workshops,

PICTURES

Left: Young girl carrying water, Oman.

Right: Mussandam Peninsula, Oman.



meetings, seminars and symposiums on topics such as water management and drought policy. NC Oman also actively participates in the cross cutting [Arab G-WADI Programme](#) (Global Network on Water and Development Information in Arid Lands), with Muscat, Oman, acting as host city to its Secretariat Office. In addition, NC Oman has contributed to the IHP survey for the Eighth implementation plan, 2014-2021. The National Committee proposed a list of several activities, events or projects which could be executed during IHP-VIII. These events will be held in Oman and other Arab countries in cooperation with the UNESCO Cairo Office.

In the past Oman has benefited directly from IHP collaborations and publications. Links have been established with international research institutions with joint projects submitted for funding. At present NC Oman is participating in a joint project with UNESCO entitled 'OMAN National Multi Hazard Early Warning System'. Integrating Disaster Risk Reduction (DRR) into

education, aimed at strengthening countries' preparedness for disaster risks and response capacity through education, is another Omani collaborative project with UNESCO. Such activities are examples of the benefits from the cooperation with the IHP's network. In the near future, another project in collaboration with the WMO and UNESCO, on development and implementation of Flash Flood Guidance (FFG) systems, will be developed to provide real-time informational guidance products pertaining to the threat of potential small-scale flash flooding throughout the Sultanate of Oman.

NC Oman's vision for the future is to continue cooperating with the IHP network, and to encourage all the institutions in Oman to strengthen their degree of collaboration with UNESCO through more projects in the water sector, encouraging Omani researchers to participate in IHP's publications and scientific journals and organizing joint workshops/conferences/courses that facilitate knowledge transfer to the benefit of Oman.

Pakistan

A Journey in Water Development and Continued Partnerships

PNC-IHP

Pakistan Water Partnership (PWP)

710, Street 22, I-8/2,
Islamabad
PAKISTAN



IHP and the Pakistan Water Partnership (PWP) have a long and productive relationship focusing on water development in Pakistan. This association, spanning the past sixteen years, has focused on a series of capacity building activities engaging policy makers and practitioners. We have benefited from UNESCO leadership in furthering our programmes in flood management, gender and water, hydropower and drought. We have jointly promoted integrated water resource management in Pakistan. Floods and droughts take a high priority in Pakistan's climate challenges, leading to measured disaster risk reduction. IHP was our lead partner in organizing the South Asia Water Forum in 2002. More recently we jointly organized an international conference and training workshop on the regulation of hydraulic structures.

Our common interest in a better understanding of ground water issues has culminated in

PICTURES

Left: Hindu Temple, Pakistan.

Right: Floods in Pakistan.



important conferences. Our joint focus on ensuring that grassroots voices reach policy makers and translate into dialogues is an important incentive for joint collaboration. We wish continued success of the UNESCO water program and its leadership in Pakistan and South Asia. We are proud to be a small part of this journey, which will go a long way in helping Pakistan address its water scarcity challenges.

Pakistan is at a crossroads, seeking the right direction in addressing its water-food-energy nexus. IHP can play a vital role in helping Pakistan formulate a science-based response. We envisage the water programme helping us eradicate poverty, with water standing out as a high priority agenda. The PWP firmly believes that IHP can join hands as we enhance our focus on water and energy. The IHP can take pride in helping Pakistan adopt

a multi-stakeholder approach to water in the country, recognizing the complexity and diversity of water resources and use. Future challenges require a paradigm shift that centres around pragmatism. We look forward to IHP filling this gap and sharing cutting edge science and international expertise.

Paraguay

Coordinating Activities for a Promising Future for Water

Comité Nacional Paraguayo del PHI

Coordinación Nacional PMARCO/PY

Secretaría del Ambiente

Avda. Madame Lynch 3500

Asunción

PARAGUAY



UNESCO's water programmes have contributed to an improvement in water knowledge and management in Paraguay. They have done so by facilitating tools and the sharing of knowledge and experiences among water-related stakeholders, as well as methodologies for decision-making.

The greatest achievements at the national level include the creation of the IHP National Committee for Paraguay; the creation of the Hydroinformatics Centre (UNESCO Category 2 Centre) in synergy with Brazil in order to promote hydroinformatics applied to water management; the collection of information on water and culture in relation to the native peoples of the Republic of Paraguay; and knowledge on the transboundary aquifers of the region.

PICTURES

Left: Farmers in Paraguay.

Right: Hydroelectric plant, between Brazil and Paraguay.



The coordination of inter-institutional activities achieved in the country, together with increasing civil participation, helps shape a promising future for water management at the national and regional levels. However, there is a pressing need to include water in the agendas of other sectors, because of its importance as a natural and socio-economic good and as an essential element for life. For these reasons, IHP will remain a crucial agent in promoting this process.

Republic of Korea

Republic of Korea's Contribution to IHP Activities

Prof. Soontak Lee
Chair, IHP National Committee
for Republic of Korea
Yeungnam University

280, Daehak-ro,
Gyeongsan, 712-749
REPUBLIC OF KOREA



The activities of UNESCO's IHD and IHP programmes in the Republic of Korea began with the IHD's representative experimental river basins operation. When the IHD programme was terminated in 1974 the IHP National Committee for the Republic of Korea was established and has continued to oversee the programmes from IHP-I in 1975 through to IHP-VIII.

Over this time the IHP National Committee for the Republic of Korea has undertaken pioneering hydrological surveys of selected representative river basins in three major river systems, in addition to extended surveys and studies of domestic river basins. Throughout the phases of IHP programmes research outputs have contributed significant, useful conclusions not only for domestic water resource management, but also solutions to global water problems and sustainable management.

PICTURES

Left: Forest in Korea.

Right: Waterway through rice fields, Korea.



The IHP National Committee for the Republic of Korea served and has been serving as a member state of the IHP Intergovernmental Council since 2004, and its Chairman Professor Soontak LEE was elected as the Chairperson of the Intergovernmental Council and the IHP Bureau at the 19th Intergovernmental Council and served four years as a IHP Bureau member, including two years of Chairperson and following another two years of Ex-Officio Vice-Chair for the Region-IV (Asia Pacific). In his function as Chairperson, he led the formulation of IHP-VIII (2014-2021) Strategic Plan as 'Water Security: Responses to Local, Regional and Global Challenges.' He also contributed to establish the IHP Regional Steering Committee (RSC) in Southeast Asia and the Pacific and served as its third Chairman from 1968 to 2000.

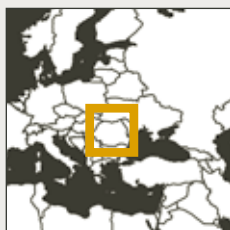
Editor's note: Thanks to Professor Soontak Lee, the Programme focuses on Water Security, a concept that has become popular worldwide since its inception to date.

Romania

Coordinating Stewardship of the Danube Basin

Romanian National
Committee for IHP-UNESCO
National Institute of
Hydrology and Water
Management

Sos. Bucuresti-Ploiesti 97, Sector 1
Bucharest
ROMANIA



In 1971 hydrologists from the then eight Danube Countries (Germany, Austria, Czechoslovakia, Hungary, Yugoslavia, Romania, Bulgaria and the Soviet Union) launched a voluntary, regional hydrological collaboration, aiming to produce consistent hydrological information about the whole Danube catchment with an area of 817,000 km². Since 1987 this collaboration has been carried out under the auspices of IHP, initially overseen by the National Committees of Germany, Austria, Slovakia, Hungary, Serbia and Croatia. However, in December 2012 at the 26th Working Meeting of Experts and Representatives of the Regional Hydrological Cooperation among the Danube Countries Romania officially took over the coordination of the Danube Cooperation through its Ministry of Environment, Water and Forests and the Secretariat of the Romanian National Committee for IHP being administered by the National Institute of Hydrology and Water Management.

Taking into account the challenges posed by the effects of the climate changes in our area, the Romanian National Committee considers that better information and data, as well as better, more accurate tools, are needed in order to find the right balance between economic development and the environment. This is possible, with political commitment, cooperation among countries, coordination of our actions and implementing adequate mechanisms and instruments.

In recent decades we have had four significant floods in the Danube basin, which affected almost all the countries located either upstream or downstream. The quantified losses run to billions of Euros, the lives of the affected people have been devastated, and governments have diverted large sums of money to deal, at least partially, with the situation.

Yet floods are only one of the risks which are affecting our region. After the floods, we have faced droughts in the middle and

PICTURE

Balea Lake in Fagaras Mountains, Romania.



lower parts of the basin, with a significant impact on agriculture, human settlements and environment. Moreover, the increasing demand for water for human developments in the Danube basin will heighten the pressure on this vital resource and lead to water scarcity in some parts of the basin. In order to deal with this challenge, we need a better water quantity assessment and forecasting.

Taking into account the transboundary nature of the rivers within the Danube basin, it is clear that we cannot find acceptable solutions to crucial problems without proper cooperation between our countries. In this respect, Romania considers that the appropriate framework to deal with the scientific aspects of quantitative water management is a regional hydrological cooperation between the Danube countries within the IHP framework.

We believe that now is time to enhance this cooperation, taking into account the increased needs for a new and better approach to the basin aspect, but also considering the possibilities for supporting the concrete projects provided by the European Union Strategy for the Danube river, the Europe 2020 Strategy and the research programmes within the new financing period 2014-2020.

Saudi Arabia

Supporting Sustainable Development of Water Resources at Regional and International Levels

IHP National Committee Ministry of Water and Electricity

PO Box 57616
Riyadh 11584
SAUDI ARABIA



The Saudi government has a long tradition of consultation and cooperation with government bodies, stakeholder organisations and citizens to support the long-term, sustainable development of freshwater resources against the challenges of increasing demand, limited availability and future impacts of climatic change. Within this framework, the Saudi Ministry of Water and Electricity has long been actively involved in the implementation IHP activities in water research, water resource management, education and capacity building.

The Saudi National Committee discusses national water issues related to IHP activities and reviews the progress of implementation of its objectives. The Committee is responsible for helping develop policy in the national context and translating guidelines into a regional context. It has the power and financial means to develop and implement local policy. It develops a comprehensive, multidimensional and rational approach for the sustainable development of water resources of the country in the twenty first century and beyond. It reviews the IHP-VIII plans and compiles the relevant major comprehensive on-going studies of various government organizations as recommended in the plan. It also participates in IHP steering committees and working groups.

The Saudi National IHP Committee participates in the implementation of IHP-VIII shares its experience and achievements with the other national committees. It has a number of initiatives. One is a comprehensive study to identify and evaluate potential future impacts (if any) as result of climate change on water resources in Saudi Arabia. Another is the formulation of a National Flood Management Programme to provide the framework for flood prediction, evaluation of flash flooding events, risk reduction and damage prevention and mitigation in close coordination with national and international agencies. A third initiative is the initiation of

PICTURE

Night view along the water, Saudi Arabia.



institutional and governance reforms in the water sector to adopt a robust, flexible and implementable operation model and redesign the organizational structure to streamline and standardize key work processes in line with strategic objectives and international best practices to enhance performance efficiencies. It has promoted a legislative framework for the sustainable development of water resources, and is reviewing the National Water Strategy, groundwater regulations, wastewater by-laws and the Integrated Water Resources Management Plan. The National Committee has also adopted an approach to land and water management encouraging bottom-up approaches, and implemented a nationwide water conservation programme focusing on Water Demand Management (WMD) and organizational restructuring towards privatization. Finally, it has launched campaigns to spread the message of water

conservation via commercials on various media.

The Saudi National IHP Committee collaborates with a number of public and private organizations, including the Presidency of Meteorology and Environment (PME), Ministry of Agriculture (MOA) and King Saud University, to develop joint strategies for research and capacity building in advanced hydrological modelling technologies. It encourages specialists to participate in scientific conferences, symposia, and training sessions in Saudi Arabia and abroad. It has conducted a number of regional workshops to promote the regional implementation of the international strategy for disaster reduction and management.

Serbia

International Cooperation and Improved Water Governance

Serbian National IHP Committee

Boulevard of the King Alexander
73/I-164
11000 Belgrade
SERBIA



As has been observed in ‘Free Flow’ (UNESCO, Tudor Rose, 2013), it has been difficult over the past fifty years to distinguish between most aspects of hydrology across different regions. During this time, a lot has been gained but there are two main improvements that could still be made:

- i. International cooperation, giving trans-boundary benefits through the exchange of culture, science and engineering for water resources;
- ii. Development of efficient water and environmental related regulations and modern governance solutions across wider areas, for the benefit of hundreds of millions of people on Earth.

The Serbian National Committee (before the Yugoslav Committee) was always open to cooperation with countries at the Danube watershed. Cooperation started in the year 1961, including a series of meetings, conferences, projects and publications, such as ‘Hydrology of the river Danube’ (UNESCO, 1988). There has been cooperation on major projects, including the design and construction of the Iron Gate dam (1974-1979), navigation on the Danube, and also small projects such as transboundary monitoring and workshops with national hydro and meteo services. During the 1990s this experience also helped foster the renewal of relationships between hostile countries at the Sava river, taking the form of protocols, construction projects and even employment for almost fifteen years.

The experience gained throughout this period among the IHP National Committees could now be applied to other regions. For example, the knowledge gained from the Danube projects could be implemented in the Black Sea and in Central Asia, particularly when it comes to water and environmental issues at the Kura-Aras–Caucasus. The international cooperation between countries from UNESCO Group II has begun to take concrete form through the

PICTURE

River in Serbia.



realization of contracts between universities (Republic of Serbia, Republic of Kazakhstan and Republic of Azerbaijan).

Furthermore, the International Research and Training Center (IRTCUD) established in 1988, organized a series of international conferences on Urban Drainage Modeling (UDM), running from Dubrovnik 1986 until Belgrade 2012. Numerous UNESCO publications written by IRTCUD professionals throughout the years have discussed subjects such as measurements and modeling, as well as proposing hundreds of urban drainage and water solutions, and suggesting solutions for integrated water management in future settlements.

Lastly, the establishment of simple and efficient water governance is important for poor countries and economies. This includes not only flows, water quality, floods and droughts, but also the education of people (UNESCO, Tudor Rose, 2013), based on Law by Hammurabi, 1700 BCE (Museum Louvre).

Promising areas for future hydrological development include networking between

both neighbouring and remote countries, and between universities and professionals. This would be aimed at improving education and collaborative research projects across boundaries, cultures, nations and basins, as opposed to demanding the use of procedures that never reach broad populations (Despotovic et al., 2014).

Literature

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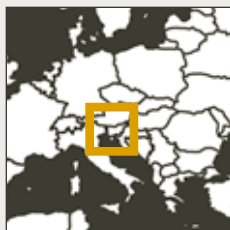
Slovenia

More Room for Water

**Slovenian National
Committee for UNESCO-IHP**

**Slovenian National
Commission for UNESCO**

Kotnikovaulica 38
1000 Ljubljana
SLOVENIA



It was in 1992, following its independence, that Slovenia acceded to IHP. Before that, Slovenian hydrologists participated in the IHP UNESCO Committee of the former Yugoslavia and engaged in research alongside IHD. The Slovenian National IHP Committee is composed of representatives of the ministries and agencies dealing with water, research organizations and water associations. Thus, the committee includes representatives of: the Ministry of Environment and Spatial Planning, Ministry of Agriculture, Ministry of Defense, Ministry of Economy, Biotechnical Faculty, Faculty of Civil Engineering and Geodesy, the Slovenian Environment Agency, the Institute for Water, the Water Society, the Hydrological Research Association and Hydrogeology Association.

The Committee participated in the organization of the 1997 International Conference FRIEND in Postojna and the 2008 XXIVth Conference

PICTURES

Left: River in Slovenia.

Right: Visit from Ban Ki-Moon, Secretary General of the UN, in Slovenia.



of the Danube River Basin Countries in Bled. In 2012, IHP organized the first Congress of Slovenian water.

IHP Slovenia also worked on the development of a hydrological glossary in the Slovenian language, and participated in the regional programme of the Danube River Basin, as well as working on the book 'Hydrological Processes of the Danube River Basin Perspectives from the Danubian Countries'. Furthermore, it has been an active participant in the FRIEND programme, ERB programme and other IHP programmes. The University of Ljubljana participates in the Erasmus Mundus Masters programme 'Flood Risk Management' coordinated by UNESCO-IHE. The committee also cooperates with the UNESCO CHAIR/INWEB team International Network of Water-Environment Centres for the Balkans and International Consortium on Landslides (ICL).

IHP Slovenia has also implemented its 'More Room For Water' action. The theory behind this is that the surfaces 'taken' from rivers have been intended primarily for agriculture and urban development, but very often too much has been taken. This situation will be further aggravated by the expected impact of climate change. Today, developments in water and land management should allow for increased room for water and, moreover, give back to the river at least some of the space that it once possessed.

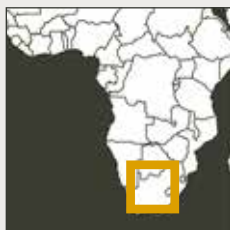
In the future, the Slovenian IHP Committee would like to support the development of the IHP Chair for Water-related Disaster Risk Reduction. The Chair will specialize in water-related disaster risk, hence covering in full the aforementioned themes that are the main priorities of the IHP-VIII Water Security programme.

South Africa

Building Water Research Capacity in South Africa

South African National
Committee for UNESCO-IHP
Department of Water and
Sanitation

Private Bag X313
Pretoria 0001
Republic of South Africa



In the Republic of South Africa (RSA), IHP activities are carried out by a multi-stakeholder South African National Committee (SANC) on behalf of UNESCO-IHP. The Department of Water and Sanitation (DWS) chairs the SANC to ensure alignment with UN water programmes and national priorities as reflected in the National Water Resource Strategy 2 (NWRS2). The Water Research Commission (WRC) is the secretariat of SANC.

The DWS ensured the implementation of IHP through its various phases including the current IHP Phase. The implementation of IHP-VIII in the country is supported mainly by the National Water Act (Act 36 of 1998). The six IHP thematic areas support the strategic priorities of the NWRS-2 with special emphasis on skills and capacity building.

The 37th UNESCO General Conference approved the establishment of a UNESCO Category 2

PICTURES

Left: Raw water canal, Rand Water, South Africa.

Right: Vaal Dam, South Africa.



Water Centre at the University of KwaZulu Natal. RSA also holds a Geohydrology UNESCO Chair at the University of the Western Cape. In addition, the government of South Africa and UNESCO implemented a FETWater Programme from Phase I through to the current Phase – FETWater Phase III. All these UNESCO Family activities contribute positively to the capacity pool of the region.

South Africa is currently participating in the Stampriet/Kalahari Karoo Aquifer case study funded by the Swiss Agency for Development and Cooperation and implemented by UNESCO as part of Transboundary Waters Assessment Programme.

The South African government has also hosted an IHP HELP Southern Symposium. In 2011, RSA hosted the first Sub-Saharan Africa HELP basins workshop, in parallel with COVISET (Conference of Vice-Chancellors and Deans of

Science, Engineering and Technology). Both sessions brought together researchers and intensified dialogue between scientists, policy makers and stakeholders. Furthermore, the South African government holds the Olifants and Tukela HELP Basins.

IHP has been central to maintaining good working relationships between various stakeholders and institutions.

Spain

An Integrated Approach to Hydrology

Centro de Estudios Hidrográficos of CEDEX

Paseo Bajo de la Virgen del Puerto, 3
28005 Madrid
SPAIN



Water is an economic, environmental and cultural resource. The study of processes and states of water gives rise to a wide range of scientific and technical specialties: the availability and uptake of water resources, the occurrence of droughts and floods, their impacts, the design of protective measures, and analysis of the chemistry and biology of water.

The International Course in General and Applied Hydrology, established in 1965 with the support of the Executive Board of UNESCO during IHD, is the oldest in Spain dedicated to scientific and applied hydrology. Its founding purpose was to develop hydrological science and education around tools for harnessing water wealth, knowledge of the environment and resources associated with the hydrological cycle through international collaboration. The steering committee comprised the General Directorate of Hydraulic Works, the Spanish National Research Council and the Centre for

PICTURES

Left: River in Spain.

Right: Canal in Spain.



Hydrographic Studies. In accordance with similar objectives, the International Course on Irrigation Engineering opened in 1972. Currently, both courses are organized by the Centre for Studies and Experimentation on Public Works (CEDEX), to which the Centre for Hydrographic Studies pertains.

Nearly 1,400 students from over forty countries, mainly from Europe and America, but also from Africa and Middle East have attended the forty-seven editions of the Course. The graduates embody an entire Hispanic scientific-technological hydrological network, which is a core value of the programme.

The Course addresses the theoretical basis and applied techniques in office, laboratory and field instrumentation, promoting the dissemination of experience derived from the complex water world, in which physical, chemical, engineering, environmental and

socioeconomic technical tools and expertise are needed. Its programme is continuously customized to incorporate the use of new technologies, methods and even regulations. Training in the implementation of both the EU Water Framework Directive (2000) and the Spanish National Water Act (1985) has been a noteworthy achievement.

Nowadays the Course is evolving and taking on new forms. Universities have expanded their educational programmes into fields pioneered by this Course. Therefore, the Course should focus on maintaining an educational programme for professionals who need to update their skills. It should also implement online learning practices, while nevertheless retaining an emphasis on immediate contact between participants in order to nurture not only institutional and technical relationships, but also a direct understanding of experiences discussed.

Switzerland

A Wide-Ranging Influence on Hydrological Research

Swiss National IHP Committee

Federal Office for the Environment
Papiermühlestr. 172
CH-3603
Ittigen
Bern
SWITZERLAND



As a country with no access to the seas but with the sources of many European rivers, Switzerland is well placed to understand the importance of international cooperation for the observation and understanding of the water cycle. IHP has provided a unique platform for these exchanges over the past fifty years.

In fact, IHD had a significant influence on the development of Swiss activities in hydrology even before its establishment. In 1957, as a preparation for IHD, the Swiss Hydrological Survey initiated a programme on hydrological test catchments. Over fifty catchments of different sizes and from different locations were selected according to the preservation of their natural characteristics; their water balance was researched on a long-term basis in order to identify hydrological changes. These hydrological research basins have not only provided excellent information about water processes in alpine basins but have also been the basis of the development of investigations into erosion, sediment transport and deposition. The know-how gathered by the operation and analysis of the hydrological basins has enabled Switzerland, together with the International Sediment Initiative of IHP and the International Commission for the Hydrology of the Rhine Basin, to develop and publish an expert system for the estimation of erosion and sediment transport in mountain regions.

With the acceleration of the climate change debate, such long-term research has gained in importance and significance. Without the seminal impact of IHD such a programme would not have been established on so wide a scale and over such a long duration.

Over the past fifty years IHP has contributed to the development of hydrology, illustrating the complexity of the water cycle by encouraging scientific research whilst also providing a sounder scientific basis for water management. Water management infrastructure and hydrological data have much improved but the challenges of

PICTURE

Reflections at Lake Retaud.



climate change are more complex and global, and therefore need more technology and tools from hydrological sciences.

Today Switzerland is still an active partner of IHP and takes part in its development through the Federal Office of the Environment. Switzerland is fully committed to the global goal of building a water-secure world for all. To achieve this end, the global hydrological community needs to:

- Achieve universal access to safe drinking water, sanitation and hygiene;
- Manage water resources sustainably with a basin approach and increase water productivity whilst protecting ecosystems;
- Manage all wastewater to protect water resources and ecosystems, increasing recycling and reuse;
- Increase resilience to water-related disasters.

Moreover, water requires a unified, robust monitoring mechanism based on improved data acquisition and analysis to track progress and provide a credible platform for advocacy and investment.

Considering the significant challenges for water management to be faced in the coming decades, Swiss hydrologists are in agreement that hydrology has to become more proactive. The challenge for future generations of hydrologists is to take the lead, to solve water management issues in unfamiliar territories which are likely to become more relevant in the near future.

IHP should therefore build an enabling environment for hydrology research groups, drawing on their particular strengths to develop research projects which serve the general interest.

Turkey

Building Global Platforms to Meet Hydrological Challenges

IHP National Committee of Turkey

General Directorate of State Hydraulic Works,
Investigation, Planning and Allocation Dept.

Yucetepe/Ankara
Turkey



In Turkey, the IHP Committee is represented by DSI (General Directorate of State Hydraulic Works) and has been active since 22 April 1963.

As identified by IHP, UNESCO's contribution to the hydrology community is based mainly on hydrological science policy, education and capacity building, as well as water resources assessment and management. The importance of global platforms, through which states, institutions and also civil society organizations engage with hydrological activities, lies in their ability to help us meet the challenges of global changes (including climate change, rapid urbanization, population growth and more besides).

The National Hydrology Commission of Turkey (TUHK) has contributed to IHP's activities in various ways. Several seminars (First, Second and Third National Isotope Symposiums) and Sediment Transport Courses have been organized by the DSI Technical Research and Quality Control Department. Furthermore, all

PICTURES

Left: Yedigöller ("seven lakes") National Park, Turkey.

Right: Farmer in Turkey.



hydrologic programmes implemented by IHP, IAHS and WMO are run in a highly coordinated fashion. It can be stated with some certainty that the harmonisation of hydrological activities directly related to each other can offer substantial benefits in the long run, especially in developing countries where the decision-making process is considered to be far more important when it comes to institutional and scientific development at national level. IHP made important contributions to the organization of the fifth World Water Forum in İstanbul in 2009.

Participation in UNESCO-IHE programmes is actively encouraged in Turkey and today many water professionals in the public and private sectors are graduates of these programmes. The importance of this cannot be overestimated as there are many barriers to overcoming Turkey's hydrological challenges, including political interest, conflicting views on priorities, inadequate institutional mechanisms and lack of knowledge, technical capacity and funding.

Today's global response to scientific and water-related challenges would not have been possible without the mission undertaken by IHP. Its efforts have contributed to bringing related parties together through coordinated initiatives throughout the world. IHP has achieved many things since its launch forty years ago. As times are changing, we are facing many challenges. Climate change and its consequences, pollution of water resources, water security, sustainability of water resources and urbanisation are the main issues to focus on. Therefore, our approaches must be adapted to the new challenges.

One of the water community's biggest achievements in recent years was the establishment of a water target defined by Millenium Developments Goals – something in which IHP played a major role. Secondly, UNESCO-IHE trains future water professionals and supports students all over the world. Thirdly, IHP launches new programmes to face the most important issues of the day, highlighting the need for action on a global scale.

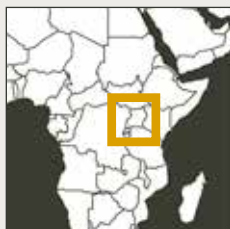
Uganda

Building Regional Networks for Effective Water Management

IHP National Committee of Uganda

Uganda National Commission for UNESCO

2nd Floor Embassy House
King George VI Way
P.O.Box 4962
Kampala
UGANDA



The Uganda National IHP Committee was first re-constituted in 2010 and re-vamped in 2012 with new membership. Nationally, there is good collaboration, involving the line ministry responsible for water resource management, government parastatal overseeing water supply in the country and its wide network of service providers, the academic institutions that conduct research and training on water resources management, the private sector/civil society organizations dealing with the water sector and the network of water professionals and regulatory bodies.

From 2012 to 2014, the Uganda National IHP committee members participated in the IHP Steering Committees/Working Groups of National IHP Committees in Africa and programmes of various national and international organizations. The members also participated in various projects including a UNESCO/GEF regional Groundwater Governance workshop held in Nairobi, Kenya in 2012, the UNESCO/IGRAC workshop on Global Groundwater Monitoring held in Nairobi, Kenya in 2012 and a workshop on 'Water for Peace in Africa' held in Dar es Salaam, Tanzania in December 2013.

Projects planned for 2015-2016 include, amongst others: the management of transboundary aquifers in the Karamoja and Turkana regions; scaling up adaptation to the impacts of climate change on water resources, eco-hydrology system solutions and ecological engineering for the enhancement of water safety and security; shaping of the catchment ecological structure for ecosystem service enhancement, biological productivity and sustainable biodiversity; and urban eco-hydrology in respect to storm water management in the city landscape. Long-term activities include: eco-hydrological regulation and ecological biotechnologies for sustaining and restoring connectivity and ecosystem functioning; identification, inventory and assessment of ground water-dependent ecosystems; strategies for adaptation to the impacts of climate change on surface- and

PICTURE

Hippos in the Kazinga Channel, Uganda.



groundwater resources; and promoting water education in educational institutions.

The main challenges faced by Uganda National IHP in the three years since its re-establishment have included lack of IHP-organized courses in-country and the UNESCO-IHE Institute for Water Education and/or international/regional water centres. Owing to lack of funding, there have also been a number of unimplemented activities originally planned for 2014/15, including: 'Promotion of adaptation to the impacts of climate change on aquifer systems' and 'Management of transboundary aquifers in the Karamoja & Turkana regions'. An opportunity has been created by the Ministry of Water and Environment, with support from development partners, with the establishment of four regionally-based Water Management Zones (WMZs) to carry out catchment level Integrated Water Resources Management

(IWRM). IHP can tap into this to support Uganda in the implementation of its strategic plans for water resources management and development.

The Uganda National IHP recommends that UNESCO-IHP shares annual plans with the national IHP Committees to ensure regular reporting and accountability for global activities. Building closer links between the global and national IHP committees through financed projects would demonstrate the relevance of IHP, attract national level support and improve the governance of IHP at national and regional levels. Regular meetings, joint activities and information sharing amongst the national IHP Committees coordinated by UNESCO headquarters or regional offices would ensure effective national and regional water management networks.

Ukraine

National Challenges, International Solutions

National Committee of Ukraine for IHP UNESCO & PHWR WMO

Secretariat: Ukrainian Hydrometeorological Institute

37 Nauki Prospect
252028 Kyiv
UKRAINE



Surface water is of vital importance to Ukraine's sustainable socio-economic development. With just 1.6 cubic km of water per year per capita, among the lowest in Europe, Ukraine faces the challenge of an insufficient water supply. On the other hand, river floods and associated catastrophes are a common feature of Ukrainian rivers, especially in mountain regions. Therefore, the objective of the IHP to facilitate an interdisciplinary and integrated approach in international hydrological and freshwater research, also incorporating the social dimension of water resources, is particularly relevant to Ukraine.

A number of Ukrainian scientific and educational organizations took part in IHD and have subsequently participated in all phases of IHP. It is worth noting the contribution of Ukrainian hydrologists to research into the surface waters of international river basins – above

PICTURES

Ukraine Waters.



all the Danube river basin. Ukraine's strategic priority as an IHP participant is to intensify cooperation between Ukrainian scientific and educational institutions and leading international counterparts, strengthening Ukraine's scientific potential and introducing breakthroughs in hydrological science into practical applications in the domestic water sector. In particular, scientific advances that have come about through IHD and IHP have been implemented in Ukraine to develop methods of water resource assessment and hydrological calculations; introduce principles of integrated water resources management; and develop education programmes for students in the areas of surface hydrology and water management.

However, we acknowledge that Ukraine's present participation level does not fully reflect the high potential of Ukrainian

hydrological science. The National Committee of Ukraine for IHP UNESCO and Programme on Hydrology and Water Resources of the World Meteorological Organization (PHWR WMO) therefore plans to involve the Ukrainian hydrological community more actively in IHP-VIII.

The PHWR WMO is another important water-related international collaboration. It seems to us these programmes should cooperate more closely in the future. The problems of water quality and water quantity in large international rivers should remain in the IHP's field of view and projects relating to these problems should have the highest priority. Without doubt, the development of methods to assess the impact of global and regional climate changes on the quantity and quality of water resources should be also one of the most important IHP's goals for the long term.

United Arab Emirates

Fifty Years of Water Programmes towards Sustainability of Natural Resources

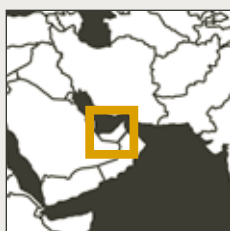
Dr. Ahmed Ali Murad
Vice Dean & Associate Professor of
Hydrogeology

UAE National Committee of IHP

[UAE University](#)

Geology Department,
College of Science

P.O. Box 17551, Al-Ain
UNITED ARAB EMIRATES



IHP was established by UNESCO to address water-related issues in different communities at different levels. This programme has succeeded over the last fifty years in gathering politicians and scientists to discuss water-related problems and find suitable and sustainable solutions. IHP has played a significant role in delivering the message of the importance of water as natural resource to the decision makers. National Committees of IHP in different countries across the world were established to link between international, regional and national activities that meet the objectives of the IHP.

UNESCO's water-related programmes have emphasized the importance of communication and increased the awareness of water-related problems. The efforts of IHP water programmes have helped scientists orientate their research projects to address national issues. Various types of activities have been carried out to

PICTURES

Left: Dubai Creek.

Right: Canals in Dubai.



achieve the main goals of those programmes. Activities such as meetings, conferences, workshops and networks at national, regional and international levels have contributed significantly to building capabilities. Such activities help scientists direct their research agendas in the field of water resources. Ultimately, IHP is a driving force towards sustainability and securing water resources for future generations.

IHP through the National Committee of UAE is playing a vital role in building capacity and enriching the water community with expertise and scientific publications. Various specialists from water-related entities have participated in the activities of IHP, which has helped to enhance the water education in the country and to develop the research agendas of the different scientists in UAE.

The major hydrological challenges facing the UAE are water scarcity, climate change impacts and changing the hydrological conditions of the watersheds. These challenges are addressed clearly in the IHP cycles. In order to maximize the effectiveness of this work, it is recommended that IHP allocated sufficient funds through different donors to address those challenges at different climatic conditions.

United Kingdom

A Gateway to International Collaboration

United Kingdom National Committee for the IHP of UNESCO

Centre for Ecology & Hydrology

Maclean Building, Crowmarsh
Gifford, Wallingford
Oxfordshire, OX10 8BB
UNITED KINGDOM



Participation in IHD and IHP programmes since 1965 has offered UK hydrologists the opportunity to expand their science internationally and enjoy the fruits of global collaboration. In turn, their projects have benefited from the endorsement of being contributions to UNESCO's scientific activities.

At the start of the Decade a National Committee for IHD was established by the Natural Environment Research Council to coordinate the UK's input to the Programme. With its secretariat at the Institute of Hydrology, now the Centre for Ecology & Hydrology, the Committee contains representatives of all areas of government and its agencies, as well as from the scientific community. Contributions from UK universities and research institutes have covered virtually all aspects of the hydrological cycle, including education and training. Postgraduate courses at Imperial College, London, the University of Newcastle, University of Birmingham and others catered for UK and foreign students and they have educated hydrologists working around the globe. More recently the Centre for Water Law, Policy and Science at the University of Dundee, the UK's only UNESCO Category 2 Centre, has provided much needed global teaching and research in the field of water governance.

The UK has been an active participant across IHD and IHP, helping formulate future phases of the IHP and review the past. However, its most notable contribution has been through the FRIEND Project which the UK, with the cooperation of Germany, the Netherlands and Norway, proposed to the IHP Council in 1984. Initially established for north-west Europe, its aim was to realise operational benefits from the data from representative and experimental basins set up under the IHD, coupled with national network data. The success of the Project attracted much attention and ensured that it evolved through successive Phases of IHP to become a worldwide, regionally-based study, recently encompassing 141 countries in eight

PICTURE

River Derwent, United Kingdom.



regions of the globe. Its many achievements include bringing together data from disparate transboundary sources, establishing a forum to encourage scientists to share methods for analysing these data, and providing very strong training and capacity building components for both research and operational hydrologists. Its results have influenced the water and land use policies of national governments.

Several other cross-cutting IHP projects have subsequently been promoted and supported by the UK, notably the HELP, G-WADI, Ecohydrology and the ISI projects, all of which have achieved considerable success with leading inputs from UK scientists.

For many UK hydrologists, both past and present, the IHP represents a route for making their water expertise available globally to the benefit of humankind. At a time when water

shortages are affecting an increasing number of nations, floods are taking a rising toll on life and climate change is altering hydrological regimes globally, participation in the coming phases of the IHP is a priority for them and the UK National Committee. In the face of such challenges, it is important that the IHP continues to provide scientific initiatives through which UNESCO has a direct impact on human wellbeing.

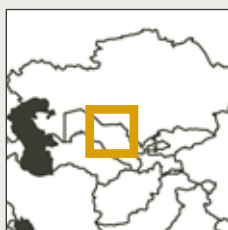
Uzbekistan

Hydrometeorological Services in Central Asia

IHP National Committee

Hydrometeorological Research Institute of Uzhydromet

72, 1st Bodomzor yuli street,
Tashkent, 100052
UZBEKISTAN



The National Commission of IHP in Uzbekistan, founded in 1999, consists of representatives of the State Committee, Ministry of Agriculture, the Academy of Sciences, the Ministry of Higher Education, Hydrogeology, Ministry of Foreign Affairs, and the Ministry of Economy. NC Uzbekistan works closely with the Interstate Council of the CIS countries and the World Meteorological Organization and other international organizations. One of its key functions is to monitor the complete water cycle in Uzbekistan, using modern methods of observation.

In accordance with WMO regulations, the national hydrometeorological services of Afghanistan, Kazakhstan, Kyrgyzstan, Tajikistan and Turkmenistan collaborate to provide timely and good-quality hydrometeorological information and forecasting, including remote sensing data. Hydrometeorological provision is undertaken in the fields of meteorology,

PICTURES

Left: Unnamed glacier in the Zeravshan River basin. View from helicopter.

Right: High level mountain of Zeravshan River Basin. View from helicopter. ©Sergey Karandaev.



agrometeorology, hydrology and climate science. The meteorological service deals with information about current and expected weather conditions and also about the possibility or occurrence of hazardous and disastrous weather phenomena associated with emergency situations. The agrometeorological service provides the operational agrometeorological information (five-day and ten-day agrometeorological bulletins), agrometeorological reviews and forecasts. Every ten days during vegetation periods special reporting notes about the conditions of the cotton crops are prepared, specifying information for different provinces of Uzbekistan. Meanwhile, the hydrological service presents operational hydrological information about the main water bodies irrigating the territory of Uzbekistan, published in daily and ten-day bulletins (current river regime, water levels, water volumes and release).

IHP contributes to joint programmes and scientific-practical seminars on hydrology and supports the training of hydrology specialists in international courses. For instance, in Paris in 2013 representatives of NC Uzbekistan participated in a workshop on the project 'Groundwater Resources Activities – improving knowledge and capacity for the management of a vital resource'.

Looking to the future, it is hoped that IHP may help facilitate collaboration to address regional challenges. For example, since the runoff of the Amudarya and Syrdarya rivers within the Aral Sea basin stretches over the territories of neighbouring countries, IHP could assist in the organization of international workshops on associated hydrology problems, involving each of the respective countries.

CHAPTER 4

UNESCO-IHE INSTITUTE FOR WATER EDUCATION

www.unesco-ihe.org/

IHP and IHE – Together We are Even Stronger

by **Stefan Uhlenbrook**

Officer in Charge and Vice-Rector of UNESCO-IHE, Delft, The Netherlands

It is a distinct pleasure to celebrate the fiftieth anniversary of the International Hydrological Programme of UNESCO. The programme has had an incredible impact over the last five decades, providing a strong basis to continue and even upscale in order to further support wise water management, which is key for sustainability and inclusive growth. Good partnerships are essential in that respect.

Located in Delft, The Netherlands, UNESCO-IHE (Institute for Water Education) is a Category 1 UNESCO institute and, consequently, a happy family member of the UNESCO Water Family. The Institute is a major pillar providing water education and research and thus plays a role in fulfilling UNESCO's general mission ('Building peace in the minds of men and women'). UNESCO-IHE envisions a world in which people manage their water resources sustainably and in which all sectors of society, particularly the poor, can enjoy the benefits of basic water services. The Institute implements various water education and research programmes, including four fully accredited Master of Science programmes (about 200 graduates per year), more than 100 short courses per year, an e-learning course and a PhD programme (with about 140 PhD students) which is implemented with partner universities. The

participants are future water professionals and water leaders; more than eighty-five per cent come from developing countries and countries in transition. The four MSc programmes have in total twenty-one specialisations – all related to water and environment – and fourteen of these specialisations are undertaken in partnership with partner universities worldwide, including other UNESCO Water Family members such as Category 2 institutes and UNESCO water chairs.

By implementing its research and innovation agenda, the Institute works towards the main goal of IHP to facilitate an interdisciplinary and integrated approach to watersheds, aquifer management and water resources, and to promote and develop international research in hydrological and freshwater sciences. Within IHP's current strategic plan entitled 'Water Security: Responses to Local Regional and Global Challenges' (IHP-VIII, 2014-2021) UNESCO-IHE is contributing to all themes. The thematic overlap between IHP-VIII and the research and innovation agenda of the Institute is as much as eighty per cent. In particular, the Institute plays a lead role in the theme on water education, promoting interdisciplinary and multidisciplinary curricula and research initiatives linked to water, joint courses and research with a focus on innovation, among universities and other research institutions. Furthermore, the Institute is spearheading research on topics central to IHP, including water-related disasters in a changing environment, ecohydrology, climate change/ climate change adaptation, urban water management, transboundary groundwater, water governance and pro-poor water supply and sanitation.

In addition, UNESCO-IHE implements various capacity development programmes in partnership with water sector organisations, mainly from the so-called Global South (often in public, civil society and private partnership). The Institute engages in institutional strengthening projects and provides advisory and consultancy services to knowledge institutes, water sector organizations, knowledge networks and UNESCO member states. Locally, the partners are often linked to the national IHP and, therefore, through these operations, IHE and IHP increase their global impact, helping to build sustainable organizations that are equipped to properly manage water resources and deliver water services sustainably.

Highlights of the IHP-IHE joint achievements include a successful collaboration with the World Water Assessment Programme (WWAP) to ensure the implementation of the ‘From Potential Conflict to Cooperation Potential (PCCP)’ programme, which has led to various (high-level) trainings that have been effective with respect to transboundary water management. In addition, several chapters of the annual World Water Development Report (coordinated by WWAP) were co-authored by IHE and IHP. A new joint Masters Programme has been launched recently in the field of water and conflict resolution, with the University of Peace (Costa Rica) and Oregon State University (USA). Furthermore, IHP and IHE are jointly engaged in different water conferences, among others the World Water Fora and Stockholm Water Week, helping prepare and implement several thematic sessions. Together with Category 2 centres they have shared a booth under the flag of the ‘UNESCO Water Network’.

Other examples of effective collaboration include cooperation with the Category 2 institutes such as long-term capacity development activities with the HidroEX centre in Brazil. The International Groundwater Assessment Centre (IGRAC; its in-house partner at the facility in Delft) and UNESCO-IHE have organised a tailor made training course



Diplomees from the Institute for Water Education in the Netherlands

on advanced groundwater monitoring and analysis. In collaboration with the UNESCO Namibia Office, UNESCO-IHE is involved in the upcoming OpenWater2015 symposium, which focuses on open source software and open access tools within the water domain. Effective collaboration is also supporting the Post-graduate Research Project on Climate Change Adaptation in the Mekong River Basin (PRoACC), with the UNESCO Bangkok Office supporting outreach and policy making impact.

IHP has played a pivotal role in supporting hydrological sciences and has therefore followed a very inclusive and broad definition of hydrology that includes more or less all aspects of freshwater. Over the years, it has increased its efforts at the science-policy interface and, consequently, has increased its societal impact, facilitating interdisciplinary and integrated approaches in water. As many partners with different types of expertise are essential to achieve these goals, I see a key role for the UNESCO Water Network also in the light of the upcoming implementation of the Sustainable Development Goals. IHP with its coordinating and agenda-setting mandate must continue to play an essential role. UNESCO-IHE looks forward supporting IHP to meet this challenge – at least for the next fifty years.

CHAPTER 4

WORLD WATER ASSESSMENT PROGRAMME (WWAP)

www.unesco.org/new/en/natural-sciences/environment/water/wwap/

Contribution by the United Nations World Water Assessment Programme

In its sixth session the Commission on Sustainable Development requested the United Nations agencies and programmes to carry out periodic global assessment and analysis of water resource availability and changes in water demand. In response to this critical call from the Member States, UNESCO in 2000 established the United Nations World Water Assessment Programme (WWAP) Secretariat within its Division of Water Sciences (DWS) to collaborate with IHP. The Secretariat is currently hosted by the Programme Office for Global Water Assessment in the DWS.

WWAP produces the World Water Development Report (WWDR) by coordinating the input of over sixty members and partners comprising UN-Water, which is an inter-agency coordination mechanism of the United Nations for all freshwater and sanitation related matters. The WWDR is considered the flagship report of UN-Water and the most authoritative UNESCO publication on freshwater resources. In this collective undertaking, which is unique in the UN system, the WWAP Secretariat collaborates with prominent institutions to ensure the report's content is up-to-date and scientifically sound.

In the last fifteen years (from 2000 until 2015), WWAP has published six editions of the

WWDR: in 2003, 2006, 2009, 2012, 2014 and 2015. IHP contributed to the series by leading development of parts of the publication, providing substantial input and offering review which helped shape the report's contents. Climate change, water education, promoting co-operation through water, groundwater as a critical resource for development, innovative technologies and approaches to improve water use efficiency are just some of the topics that reflect IHP's strengths and its broad areas of input into the WWDR.

Under its wide-encompassing themes, IHP develops and gathers the information needed to build the scientific basis to cope with the challenges related to fresh water. WWAP, through its WWDR, helps IHP to promote its valuable work while making progress towards the common goal of a fuller understanding of the role of water in ensuring socio-economic development around the world.

UNESCO, with its science mandate, plays a pivotal role in achieving the vision 'the future that we want' of the post-2015 development agenda. In this quest, WWAP takes pride in being an active member of UNESCO's water family comprising IHP, IHE and the growing number of water related Centres and Chairs around the world.

Thanks to its widely acclaimed WWDR series, WWAP has reached out to hundreds of thousands of people around the world (its 2014 and 2015 editions combined have been downloaded over 80,000 times) to advocate the message that 'water lies at the core of sustainable development'. This idea



LIST OF WORLD WATER DEVELOPMENT REPORTS COORDINATED BY THE WORLD WATER ASSESSMENT PROGRAMME (WWAP)

TITLE	YEAR
<u>WATER FOR A SUSTAINABLE WORLD</u>	2015
<u>WATER AND ENERGY</u>	2014
<u>MANAGING WATER UNDER UNCERTAINTY AND RISK</u>	2012
<u>WATER IN A CHANGING WORLD</u>	2009
<u>WATER. A SHARED RESPONSIBILITY</u>	2006
<u>WATER FOR PEOPLE. WATER FOR LIFE</u>	2003

Launch event for the World Water Development Report 2015 at WWAP.

summarizes the UNESCO Water Family's vision that water resources and the range of services they provide can contribute to poverty reduction, food and energy security, economic growth and environmental sustainability, thereby affecting the livelihoods of billions of people.





CHAPTER 4

WATER-RELATED UNESCO CATEGORY 2 CENTRES

Water Center for Arid and Semi-Aride Zones of Latin America and the Caribbean (CAZALAC)

A Virtuous Circle

CAZALAC

Benavente 980
La Serena
CHILE

All countries are faced with issues related to water resources. Droughts, floods, water quality, water education and so on all need to be addressed by each country's local services. However, some countries do not have the appropriate scientists or experts to face such difficulties.

IHP has the unique benefit of being able to gather all these issues under a common programme, enabling it to identify the best water resources management strategies for all conditions. This includes preparation for natural hazards, enhancing water sustainability and improving living conditions for water users. The way IHP works – spreading its advanced knowledge on techniques and new findings through local and international meetings, supporting training courses and academic programmes, and facilitating the exchange of technical and scientific knowledge – helps reduce costs as efforts are not duplicated and methodologies can be applied that are already known elsewhere.

CAZALAC, Water Centre for Arid and Semi-Arid Zones of Latin America and the Caribbean, was founded in the year 2002 in La Serena city in Chile, located 470km to the north of Santiago. The Centre was given the task of coordinating and engaging participants in water resources projects for dryland areas. Immediately, CAZALAC started to work on water management projects both in its host country and the rest of the Latin-American and Caribbean countries. The IHP network provided important support to enhance CAZALAC's standing throughout

PICTURE

Salar de Uyuni, Bolivia.



these countries. It also enabled CAZALAC to understand each country's water resource needs so it could develop new projects and ideas accordingly.

CAZALAC focuses on water issues in drylands. Nowadays, owing to heavy droughts, drylands in the LAC region seem to be expanding. IHP's role in the collaboration between CAZALAC and countries of the LAC region has been very important. Through the objectives of IHP, the collaboration has involved a multi-disciplinary point of view which is entirely necessary for LAC countries. Cooperation has allowed for the homogenization of knowledge regarding water resource issues throughout the LAC countries. Amongst other things, one result of IHP-driven cooperation has been the development of both a drought atlas and an arid zones atlas for LAC

countries, which are constantly being revised and updated.

In the near future it is important that LAC countries identify and define their common objectives and cooperation agendas so they can improve IHP involvement on a local level and therefore strengthen the programme in terms of the issues under consideration. Therefore, IHP can be seen as a 'virtuous circle': it can provide the benchmarks to better address water issues but also needs to be fed by all users, from water Centres, scientists to local services and so on – the great UNESCO Water Family.

The Centre for the Sustainable Management of Water resources in the Caribbean Island States (CEHICA)

Synergies in the Use of Water Resources in the Caribbean Region

The Center for the Sustainable Management of Water resources in the Caribbean Island States (CEHICA)

Instituto Nacional de Recursos Hídricos (INDRHI)

Av. Jiménez Moya, with Juan de Dios Ventura Simo, Centro de los Héroes, Santo Domingo
DOMINICAN REPUBLIC

The Centre for the Sustainable Management of Water resources in the Caribbean Island States (in Spanish *Centro para la Gestión Sostenible de los Recursos Hídricos en los Estados Insulares del Caribe* or CEHICA) is a UNESCO Category 2 Centre, representing the Caribbean island states of Antigua and Barbuda, Bahamas, Barbados, Cuba, Dominica, Granada, Haiti, Jamaica, Dominican Republic, Saint Kitts and Nevis, Saint Vincent and the Grenadines, Saint Lucia, and Trinidad and Tobago.

In 2007 the National Institute of Hydraulic Resources (*Instituto Nacional de Recursos Hídricos* or INDRHI) of the Dominican Republic started working with IHP Latin America and Caribbean (IHP-LAC) on the creation of CEHICA, whose official inauguration as a Category 2 Centre took place in 2010. During the last seven years before and after its creation, a process of integration around water resources took place in the Caribbean region, comprising both the Greater Antilles and the Lesser Antilles.

The unification of the Water Family in the Caribbean is definitely a consequence of UNESCO's initiative to create a centre in the region to look for synergies among solutions to common water-related problems. It is also thanks to the sustainable support and follow-up provided by the organization, as well as the logistical support of INDRHI and other institution in the region located in islands member of CEHICA.

With logistical, economic and technical support provided by IHP-LAC, several workshops have

PICTURE

Man and a truck transporting water, Dominican Republic.



taken place in the region that have made it possible to identify research priorities for the sustainable management of water resources in the Caribbean. The practical result of those workshops is that there is now a preliminary diagnostic for initiating actions to solve water-related problems. Moreover, capacity-building activities have been organized, as well as experience sharing, in order to strengthen theoretical and practical knowledge for the initiation of research and development projects.

It is also important to highlight that the status of CEHICA as a Category 2 Centre of UNESCO has facilitated the signing of technical cooperation agreements with international and national institutions. Those agreements, thanks to the exchanges they have generated,

have been beneficial for the management of water.

CEHICA hopes that IHP will improve its horizontal exchanges within the UNESCO Water Family at the global level by encouraging exchange between all entities (Centres, Chairs, programmes, etc.) to seek synergies and experience sharing to facilitate the development of initiatives, and by disseminating the work of other entities of the Family. This, we believe, will result in more efficiency at the human and economic levels.

Regional Centre for Training and Water Studies of Arid and Semi-Arid Zones (RCTWS)

A Beacon of Knowledge Dissemination

Regional Centre for Training and Water Studies of Semi/Arid Zone

6 October City, St no 1,
Fourth Industrial Zone,
P.O. Box 58
12566
EGYPT

Arid and semi-arid regions suffer from a scarcity in water resources. Creating an integrated framework of cooperation among regional countries in this field is one of the main challenges at national and regional levels. To meet this demand, the Egyptian Government has provided strong support to the Regional Centre for Training and Water Studies of Arid and Semi-arid Zones (RCTWS) ever since its establishment in 2001. RCTWS is a coordinating and consulting entity which deploys the capabilities of universities, research centres and the other governmental and non-governmental organizations in order to implement its activities and programmes.

RCTWS has been a Category 2 Centre of UNESCO since 2001 and contributes to the execution of UNESCO's programme through capacity building, the exchange of information in the field of water, theoretical and experimental research, and advanced training. Its critical contribution to building capacity in water management is reflected in its record of training more than 1670 regional staff since its establishment. A wide range of courses has been delivered, covering topics on geographical information systems; integrated water management; operations and maintenance of infrastructure; meteorological mathematical modelling; and climate change.

The Centre also participates in international collaborations such as the Global Network on Water and Development Information for Arid Lands (G-WADI), the Japan International Cooperation Agency (JICA), the German Agency for International Collaboration (GIZ) and

PICTURE

Desert and mountains in Egypt.



NICHE. It also always welcomes the chance to cooperate with donors to run courses for participants from the Nile basin countries and the entire Middle East-Arabic region.

Through the NICHE project RCTWS offers the possibility to take advantage of the efforts of IHP and the MSM to run courses on water and general management, such as Water quality and pollution abatement; Water policy making; Water and environmental law and institutions; River basin management; Water resource planning; and Hydro Informatics and Geographical Information Systems (GIS).

The training courses and events organized by RCTWS are tailored to serve the region's need to improve the technological and administrative support for sustainability. Courses relating to the objectives of the IHP-VIII address the topics of Water related diseases and hydrological changes; Groundwater in a changing

environment; Addressing water scarcity and quality; Water and human settlements of the future; Climate change; and Education – the key for water security.

In the near future the RCTWS will investigate the feasibility of making an application to be recognised as a Category 1 Centre. Its 2050 Strategy is to become a modern, state-of-the-art learning provider, applying advanced technologies and base learning processes to the latest research findings in brain and cognitive science. Its vision is to act as an effective regional Centre capable of facilitating learning and development in water management within and outside of Egypt. Meanwhile, its mission is to build capacities within the water sector for effective and efficient water management in the Ministry of Water Resources and Irrigation and other national and international stakeholders.

International Centre for Water Hazard and Risk Management (ICHARM)

Three Pillars of the Global Centre of Excellence for Water Hazard and Risk Management

[International Centre for Water
Hazard and Risk Management
\(ICHARM\)](#)

National Research and
Development Agency Public Works
Research Institute (PWRI)

1-6 Minamihara, Tsukuba
Ibaraki 305-8516
JAPAN

The world is struggling with water-related disasters, such as floods, droughts and windstorms, which together account for about eighty per cent of all natural disaster events and well over ninety per cent of the affected people, particularly after the 1980s. Based on a long history of fighting and overcoming water-related disasters, and the consequent wealth of knowledge, experience and sophisticated technology developed in Japan, the Public Works Research Institute proposed the hosting of an international centre for promoting research, capacity building and networking in the field of water-related disasters. The International Centre for Water Hazard and Risk Management (ICHARM) was established in 2006 under the auspices of UNESCO in order to serve as the Global Centre of Excellence for Water Hazard and Risk Management. ICHARM's main functions are to observe/analyze natural and social phenomena, develop methodologies and tools, build capacities, create knowledge networks, and disseminate lessons and information for governments and all stakeholders in managing the risks of water-related hazards at global, national and community levels, standing on the following three pillars:

- i.** Innovative research: Visible outcomes, such as the Integrated Flood Analysis System (IFAS) and the Rainfall-Runoff-Inundation (RRI) model, and a wide scope of knowledge have established ICHARM as a global leader and resourceful partner for promoting water-related risk management through field projects and training.

PICTURE

Flooded rice field in Japan.



- ii.** Effective capacity building: Through the provision of cutting-edge training, which emphasizes local capacity to develop and apply advanced knowledge and solutions, ICHARM supports a global network of exemplary practitioners of water-related hazard and risk management. ICHARM's network, including eighty-four M.Sc.s from twenty-four countries and two Ph.D.s from two countries (as of 2014), has been integrated seamlessly into its research activities.
- iii.** Efficient information networking: To support powerful and comprehensive opinions, which guide water-related hazard and risk management solutions, ICHARM emphasizes localism (i.e. project implementations tailored to local needs

and conditions) by creating an efficient worldwide information network through collaborations with the secretariat of the International Flood Initiative, a joint initiative with international organizations such as UNESCO, WMO, UNU and UNISDR.

ICHARM expects IHP to gain leadership immediately through IHP-VIII and far beyond through collaborative efforts in close harmony with national and local practices, especially in Theme 1 water-related disasters. Standing on the three pillars listed above, ICHARM is honoured to play an important role there as a knowledge hub and as an advisor for policy makers and practitioners.

Regional Humid Tropics Hydrology and Water Resources Centre for South-East Asia and the Pacific (HTC Kuala Lumpur)

Building Research Bonds in the Tropics

HTC Kuala Lumpur

Department of Irrigation and
Drainage Malaysia,

No. 2 Jalan Ledang off Jalan Duta
50480 Kuala Lumpur
MALAYSIA

The Fifth Phase of IHP (IHP-V, 1996-2001) was established as a response to global and regional water issues and the recommended actions of Chapter 18 of Agenda 21 (UNCED 1992). It set out to strengthen the bonds between scientific research, application and education. Based on these needs, the Regional Humid Tropics Hydrology and Water Resources Centre for South-East Asia and the Pacific (HTC Kuala Lumpur) was established in 1999 as a regional centre to manage and coordinate related activities in hydrology and water resources management in the humid tropics.

Since then, HTC Kuala Lumpur has organized and been involved in various activities and programmes in the areas of research and development, networking, disseminating activities and capacity building. Research carried out to date includes the Small Island Hydrological Study at Tioman Island and the Integrated and Multidisciplinary Research on Flood Hazard Assessment in Johor. These activities are consistent with the framework of IHP-V to -VIII, International Development Goals and national policy. The objectives of the programmes are to highlight the diverse issues and problems pertaining to hydrology and water resources and to find the best solutions to overcome them. Through these programmes, successful links and networks have been developed with various local universities and water-related institutes and centres such as APCE Indonesia, ICHARM Japan and RCUWM Iran.

Disseminating activities include participating in IHP cross-cutting programmes such as UNESCO SWITCH-in-ASIA, APFRIEND and

PICTURE

Cloud Forest.



UNESCO-HELP River Basin. Through UNESCO SWITCH-in-ASIA, HTC Kuala Lumpur has successfully conducted local scale research into MSMA-Integrated Stormwater Management Ecohydrology, which consists of a rainwater harvesting system, green roof system, bioretention system, porous pavement, grey water reuse system and constructed wetlands at its premises' compound. This research project has contributed to science, technology, education and regional and international cooperation in the field of water research and was officially launched by Irina Bokova, Director-General of UNESCO, in 2013. In addition, capacity building conducted through seminars, conferences, workshops and training courses has successfully addressed the needs of target groups to exchange scientific and technological information.

HTC Kuala Lumpur will continue to carry out and coordinate the implementation of hydrological and water resource research projects, through networking with similar

centres for the exchange of scientific information on research results and organizing training courses for knowledge and technology transfer. In 2015, through the Malaysia Fund in Trust (MFIT), HTC Kuala Lumpur together with partners from APCE, RC-IRBM, UNESCO Jakarta and local universities focuses on developing modular curricular water education and strategies in water management for sustainable development, which will be applicable within Asia-Pacific and Africa. HTC Kuala Lumpur has published six technical guidelines based on local scale research and the annual Journal of Water Resources Management.

HTC Kuala Lumpur hopes that there will be more collaborative programmes in the field of research and development for sustainable water solutions with other water centres, since local approaches and techniques can contribute to water protection and conservation. It is willing to share with other water-related centres its knowledge of ecohydrology design and the formulation of water education curricular.

International Groundwater Resources Assessment Centre (IGRAC)

Meeting the Challenges of Groundwater Monitoring

International Groundwater Resources Assessment Centre

Westvest 7
2611AX Delft
THE NETHERLANDS

The International Groundwater Resources Centre (IGRAC) was created at the Geological Survey of the Netherlands in 2003. In 2011, IGRAC became an independent foundation and a UNESCO Category 2 Centre. In 2012, IGRAC reaffirmed a partnership with the World Meteorological Organization (WMO), thereby becoming a United Nations Centre. IGRAC was born from the need to better understand groundwater at both a regional and global level. To this end, IGRAC gathers, processes and disseminates groundwater data and information and provides independent support for the assessment, monitoring and governance of internationally shared groundwater resources.

Owing to the need for coordinated management to prevent undesirable changes in groundwater flow, quality and quantity in transboundary aquifers, the assessment of these is one of IGRAC's main priorities. Its activities are carried out within the IHP Internationally Shared Aquifer Resource Management (ISARM) programme, UNECE transboundary waters assessments and Global Environment Facility projects such as IW LEARN, DIKTAS and the Transboundary Waters Assessment Programme (TWAP). Data gathered within these programmes and projects facilitates regular updates of the 'Transboundary Aquifers of the World Map,' which now identifies nearly 600 transboundary aquifers.

Lack of data from systematic groundwater monitoring is one of the main obstacles to sustainable groundwater management. The

PICTURE

River waters running.



Global Groundwater Monitoring Network (GGMN) and the Global Groundwater Information System (GGIS) are major IGRAC initiatives that address this challenge. Based on the principles of participatory monitoring, the GGMN gathers groundwater data from a global network of groundwater professionals and makes it accessible to a range of stakeholders to enable periodic assessment of groundwater resources on many levels. The GGIS is an interactive, web-based portal that contains approximately seventy world maps showing aggregated groundwater-related attributes for countries as well as raw and modeled data for the 199 transboundary aquifers assessed in TWAP.

Groundwater is expected to play a crucial role in water security in the future and will be essential in order to meet increased demand for food whose production is water

intensive, to boost economic development, and to buffer the effects of climate change. Consequently, IGRAC aims to grow further as the international water community's hub for groundwater information and knowledge sharing by continually engaging more national and regional specialists in its initiatives. IGRAC's programmes will expand in the coming years to enhance the availability of groundwater data and information available via its online portal and special thematic reports. It will also increase the reach of its project activities with new partners and begin serving as a facilitating intermediary between global groundwater knowledge and on-the-ground activities. In conjunction with IHP and WMO, it looks forward to making further significant contributions to enhance the international community's efforts to understand, manage and protect the world's groundwater in the future.

Regional Centre for Integrated River Basin Management (RC-IRBM)

Enhancing Water Education and Capacity Development in West African Sub-Region

National Water Resources Institute

Mando Road
Kaduna
NIGERIA

Over the past fifty years, IHP has supported innovative ideas that address water-related challenges in the West African sub-region through new knowledge and cutting-edge technologies for collaborative inter-disciplinary research, networking and capacity development in water resources management. The countries in the sub-region have had several decades of experience in river basin management with mixed results, leading to critical river basin management problems. To address the gaps, the Regional Centre for Integrated River Basin Management (RC-IRBM) was established in November 2011 and the agreement between the Government of Nigeria and UNESCO formally signed on 12 March, 2012.

Since its establishment, RC-IRBM has collaborated with the UNESCO Water Family to promote water education and human capacity development and has so far:

- i.** Developed modular curricula for Tertiary, Vocational and Technical Education in Integrated Water Resources Management for the promotion of Water Education and Human Resources Capacity Development;
- ii.** Built up the capacities of the IHP and MAB National Committees, government ministries, departments and agencies, academic institutions, non-governmental organizations and private individuals on issues relating to water, biodiversity and environmental management for institutional strengthening;

PICTURE

Woman near a water hole, Nigeria.



- iii.** Assessed current and future needs of water professionals and training priority areas; identified and adapted water-related courses in response to priority needs; and developed water resources capacity building strategies in training and research in response to national and regional needs;
- iv.** Created awareness of the importance of regional water security and cooperation through effective sensitization and capacity building of key stakeholders including Managers, policy makers and practitioners as well as National IHP Committees.

UNESCO has made giant strides in water education in the West African sub-region and African continent through the RC-IRBM and has the potential to do more. The

RC-IRBM is positioned in the sub-region as the fulcrum for promoting intergovernmental relationships via multi-disciplinary research and education/sensitization geared towards better management of river basins. This requires a dynamic contribution from the National Committees which regrettably are moribund in a number of African countries. The impacts of IHP would be greatly enhanced if the National IHP Committees were active and vibrant. Thus, there is urgent need for joint efforts by the UNESCO Water Family as well as National Governments and Regional Development Organizations in Africa to resuscitate and support the IHP National Committees through training the trainers themselves, sensitization workshops, and transnational and multi-disciplinary research activities.

European Regional Centre for Ecohydrology of the Polish Academy of Sciences (ERCE)

Towards an Understanding of Ecohydrology

European Regional Centre for
Ecohydrology of the Polish
Academy of Sciences

3, Tylna Str.,
90-364 Lodz
POLAND

Located in Lodz, Poland, ERCE is an international scientific research unit whose fundamental mission and goals are the implementation of the International Programmes of UNESCO and the Water Framework Directive towards national environmental policy. A theoretical and empirical background for the formulation of ecohydrological principles was developed in the 1980s and 1990s by Professor Maciej Zalewski with a team from the Department of Applied Ecology, University of Lodz. Ecohydrology (EH) as a scientific paradigm is based on the assumption that water is a common denominator and regulator in many types of ecological processes (e.g. nutrients circulation, energy flow) that influence biodiversity, bioproductivity, ecosystem services for society and the resilience of ecosystems to climate change. Conversely, biota modify the hydrological cycle to a large extent. Understanding these processes provides a basis to develop methods and systemic solutions for the enhancement of ecological potential, defined in water, biodiversity, ecosystem services and resilience, and additionally to mitigate the intermediate impacts at agricultural and urban catchments and to adapt to climate change.

ERCE's recent work has been based around the integration of hydrology with disciplines as diverse as ecology, hydroengineering, landscape processes, soil ecology, ecological biotechnology, phytotechnology, ecotoxicology, genetics, socioeconomic studies, and mathematical modelling in the framework of concept and principles of EH.

PICTURE

Wetlands in Poland.



The development of theoretical and empirical research on Ecohydrology in the broad collaborative framework of IHP with financial support by European Commission projects (LIFE +; HORIZON 2020) has been generating innovative methodology and systemic solutions for IWRM – such as an early warning for the identification of threats of toxic algal blooms using a molecular biology method, which also provides a background for the recent progress in the development of Ecohydrological biotechnology for the elimination of toxic algal blooms and also regulation of the dynamics of nutrients. All the above methods are transferred to other continents by organising advanced ecohydrology courses through UNESCO fellowships and ERASMUS MUNDUS Master theses for students from many countries. Through educating and training representatives of different continents, the staff of the new UNESCO Centres such as

the Ecohydrology Centre in Indonesia and the recently established African Centre for Ecohydrology in Ethiopia have also been developing the EH knowledge network for the exchange of knowledge and experience.

The strategy for the future focuses on the development of a methodology for the enhancement of the ecological potential of river basins and adaptation to climate change on different continents. This is to be achieved through cooperation with hydroengineering during the implementation of catchment scale projects, development of low cost/energy advanced solutions for IWRM applying biotechnology, and cooperation with sociologists and economists to adapt EH solutions to specific societies' cultural background. These efforts are intended to accelerate the development of an Integrative Transdisciplinary Sustainability Science.

Centre for Water Law, Policy and Science

Building Legal Frameworks for Water Management

Centre for Water Law, Policy and
Science

Peters Building

The University of Dundee

Dundee

DD1 4HN

Scotland

UNITED KINGDOM

The Centre for Water Law, Policy and Science is the UK's only UNESCO Category 2 Centre. It was established in 2006 by agreement between the UK Government and UNESCO, in partnership with the Scottish Government and the University of Dundee. The Centre was established to study the interface within water resource management between the underpinning science, its translation into policy and then, specifically, into law. When first set up it also had a role in relation to the IHP 'HELP' (Hydrology, Environment, Life and Policy) programme, a cross-cutting programme looking at river basin management and stakeholder engagement across vertical and horizontal boundaries. Stakeholder work remains one of the key research themes within the Centre, with all core staff working in that area from different perspectives. The science-policy interface is relevant across the work of the IHP and indeed across the water world, but the added dimension of legal analysis is unique in the IHP 'family'. Law is a key mechanism for implementing policy, but the timescales for making and amending law may not relate to the timescales for emerging scientific evidence.

Following renewal of the Centre's UNESCO status in 2014, its key objectives include: the development of an integrated approach to water management that incorporates water law, policy and science; interdisciplinary educational and training activities related to water resources management, with a particular focus on international development and the law, policy and science interface; and developing new approaches to global, regional and national water challenges that focus

PICTURE

Locharron waters, Scotland.



on the law, policy and science interface. The Centre works at international, trans-boundary and national levels, as well as in river basins and catchments at different scales, and seeks to engage in policy-relevant research for governments and other stakeholders. Staff are involved in the management of water resources and water services, and increasingly in cross-cutting areas such as ecosystem services. The Centre is closely involved in the Tweed river basin, which is a UNESCO HELP basin with a well-established governance model. Work on the Tweed includes river restoration for flood management and multiple benefits, as well as piloting the Scottish Government's land use strategy.

The current phase of the IHP, IHP-VIII, runs until 2021 and addresses water security.

Globally, much academic and practical work is being focused on this concept. The Centre can make a particular contribution in terms of advising on legal and policy frameworks to support this theme, whilst its work in the Tweed basin and in other project sites around the world allows engagement in the practical aspects of providing water security in its different dimensions. It looks forward to the future and continued collaboration with colleagues in other parts of UNESCO, including other Category 2 Centres and the UNESCO Chairs.





CHAPTER 4

WATER-RELATED CHAIRS

UNESCO Chair in Water Economics and Transboundary Water Governance

Building Capacity for Effective Water Governance

UNESCO Chair in Water Economics and Transboundary Water Governance

The Australian National University
Crawford School of Economics and Government

Crawford Building (Bldg 132)
Canberra ACT 0200
AUSTRALIA

IHP plays a key role in the production and dissemination of water research and education. The UNESCO Water Chair at the Australian National University (ANU) is proud to belong to the community of Water Chairs and Centres that are a force for better water management globally. We are also proud that an initiative of the UNESCO Water Chair at the ANU, the Global Water Forum (GWF), is assisting IHP in building the capacity of policy makers, the general public, researchers and practitioners to understand and address water challenges. As the leading online resource publishing concise, open-access articles on water governance, policy and science, the GWF is in a unique position to communicate research across disciplines and to stakeholders and decision-makers outside academia. The GWF's collation of freely available books, online courses and other educational materials on water reinforces the IHP's work to educate and inform a broad audience.

Established in 2010, the UNESCO Water Chair at the ANU has also successfully developed capacity building programs in southern Africa through partnerships with the University of Cape Town, University of Western Cape and University of Pretoria. Masters level courses have been conducted at both the ANU and the aforementioned partner institutions, and exchange agreements established. In 2011 a four-month intensive programme on 'Transboundary cooperation in the Mekong region' brought together twenty academic staff to the ANU from universities in China, Vietnam, Cambodia and Laos.

PICTURE

Young man working by the water.



The UNESCO Water Chair at the ANU looks forward to a continued and deepening engagement with the community of Water Chairs and Centres, the IHP Secretariat, UNESCO-IHE and the rest of the UNESCO Water Family. In particular, it hopes that the Global Water Forum becomes a portal for communicating and highlighting the research output from all units of UNESCO-IHP. It stands ready to assist the IHP Secretariat in achieving this objective and other initiatives that bring the network of UNESCO Water Chairs and Centres together.

UNESCO Chair in Sustainable Water Services (UNECWAS)

The World Needs Sustained Water Supply and Sanitation Services

UNESCO Chair in Sustainable Water Services

Tampere University of Technology
(TUT)

P.O. Box 541
FIN-33101 Tampere
FINLAND

The failure to provide sustained drinking water and sanitation services to all people was the greatest development failure of the twentieth century. Currently 800 million people lack safe drinking water and 2,500 million are without proper sanitation. More than five million people die each year as a result. The poor state of water services infrastructure reduces GDP growth, lowers productivity of industry, and pollutes the environment. The World Health Organization estimates that USD 260 billion is lost globally each year due to lack of adequate water supply and sanitation. Therefore, higher education and research programmes that are better at solving this global challenge are needed.

In 2000 the Capacity Development of Water and Environmental Services (CADWES) research team was established at Tampere University of Technology (TUT). Its mission is 'to produce usable knowledge and education, based on multi- and interdisciplinary research, on the evolution and development of sustainable use of water services and water resources in a wider institutional context: organisations, governance, management, economics, legislation, policy, rules and practices'.

In addition to experience from Finland, the CADWES team has 100 person-years of experience from international assignments in developing and transition economies in Europe and North America. Its research has shown that water services are closely linked to local needs and conditions – not only in terms of natural resources but also due to wider socio-institutional conditions. Instead

PICTURE

Lake Saimaa, Finland.



of promoting one-fits-all solutions, we should think of alternative ways of developing and managing water services. The solutions must be based on visionary and strategic thinking, institutional memory and lessons learnt.

The focus of the UNECWAS Chair established at TUT in 2012 is on Management, Development and Governance of Water Supply and Sanitation Services. The Chair promotes education and research on the principles of sustainable water governance and, especially, services based on co-creation principles and local needs by strengthening knowledge creation and sharing and enhancing the capacity of the partners through North-South-South collaboration. The Chair also promotes long-term collaboration between six universities in the South, two UNESCO centres in the North, three other European partners and the IHP programme.

CADWES has hosted three policy-oriented annual seminars, coordinated the Nordic-Baltic Research Network in 2011-14, initiated and implemented an NSS staff and student exchange project with African partners, and organized continuing education. Many joint papers and books have also been and will be published. Currently several doctoral students are conducting research on water services management, institutional development and governance in Finland and the developing economies on such themes as ecosanitation, capacity building for rural water supply, regional cooperation of utilities and cooperatives, competence development, water sector reform, strategic planning, and ageing and deteriorating water services infrastructure, which is considered one of the biggest future challenges worldwide.

UNESCO Chair in Hydrogeology

Sustainable Groundwater Resources Management in South Africa

Prof Yongxin Xu
UNESCO Chair in Hydrogeology
University of the Western Cape
P Bag X17
Bellville 7535
SOUTH AFRICA

The UNESCO Chair in Hydrogeology was established at the University of the Western Cape (UWC) in 2001, following the introduction of the National Water Act of 1998 by the then Department of Water Affairs and Forestry (DWAF) in Pretoria, South Africa. Since then, the Chair has been involved in groundwater research, education and outreach activities in developing countries from its base at UWC.

The research focus of the Chair is on sustainable groundwater resources management, with three books published in the niche areas of recharge, pollution and assessment. The scope of the research covers many facets of groundwater, including socio-economical, environmental, cultural, political and institutional issues. These diverse topics have provided multi-disciplinary research opportunities at UWC for many postgraduates at both PhD and MSc levels. As a result, many of the Chair's PhD graduates have become prominent at both national and international level in their areas of expertise.

In addition to its basic university teaching commitments, in the years since its establishment the Chair has organized more than twenty-five international short courses and workshops for capacity-building purposes. By teaming up with various stakeholders (including UNESCO, UNEP, UN-Habitat, CSIR, AGA and IRCK), the Chair has been instrumental in facilitating international collaboration between North-South and North-South-South, most notably in the establishment of the ChinAfrica Water Forum

PICTURE

Blyde River, South Africa.



– an initiative formed to enhance water- and environmental-related dialogue between Africa and China. In fact, the year 2015 will mark the third annual ChinAfrica Dialogue Forum on Water Resources.

The continued development of a UNESCO Chair Centre of Excellence (COE) on groundwater science and technology would have three core aims: (i) to assist with the implementation of national water policies through education and capacity building; (ii) to contribute to the implementation of the NEPAD Initiative and realize the vision of Africa Union in Africa through the AMCOW Africa Groundwater Commission; and (iii) to promote the utilization of sustainable groundwater in developing countries.

Further strengthening national and international initiatives and projects would enhance the UNESCO Chair's global research networking, consolidate a strong profile of research output through publications, and help to achieve the ultimate objectives set by UNESCO, South Africa National UNESCO Committee and the Chair's partners.

CHAPTER 4

WATER FOR WOMEN, WOMEN FOR WATER

A special contribution from
UNESCO Chairs on Water and Gender

“ *We need women in decision-making. They see problems from a different angle and bring a complementary set of solutions.* **”**

Blanca Jiménez-Cisneros

Secretary of the IHP and Director of the
Division of Water Sciences

The access to sufficient, safe and affordable water is a basic human right. It calls for governments, institutions, corporations, public and private organizations involved in the water sector to eliminate various forms of discrimination in access, management and decision-making regarding water resources. In most developing countries, women are the primary end-users and stakeholders in the water and sanitation sectors. They are directly both involved in water use and affected by it.

Within the framework of the UNITWIN/UNESCO Chairs programme, UNESCO has established five Chairs in Brazil, Côte d'Ivoire, Morocco, Togo and Dominican Republic, which seek to promote the engagement of women in sustainable development and management of water resources. All five Chairs are based in higher education and research institutions and work actively to develop human resources,

build solutions, and share scientific and practical knowledge. They work in partnership with different foundations, public and private organizations and play a significant role in the field of higher education. They also pave the way for higher education and research communities to join forces with UNESCO in the effort to achieve the Millennium Development Goals (MDGs) and other internationally agreed development goals. Having a high esteem for the Chairs' great potential for the impact, International Hydrological Programme has particularly encouraged the projects and initiatives of the Chairs in order to strengthen water security, to enhance tertiary and technical water education, to respond to the needs of communities, especially women's needs, and get involved in other focal areas of the IHP-VIII.

Established between 2006 and 2009, the UNESCO Chairs on water and gender have profound knowledge and experience in their discipline. Throughout their actions, the Chairs have successfully fostered cooperation and exchange of information among different institutions of higher education; conducted research and training activities on gender-related issues, water and natural sciences; established networks between professionals, governmental, non-governmental and private organizations; created new approaches to deal with water-related needs of local communities and to increase women's role, participation and leadership in the water sector and beyond.

As a general goal, the Chairs strive to build women's capacities by motivating, engaging and educating them. They have been very active in organizing learning courses, training sessions, workshops, conferences and various other projects.

UNESCO Chair on Water, Women and Development

Prof. Vera Lúcia de Miranda Guarda
The Federal University of Ouro Preto,
Minas Gerais

PO.Box. Rua Xavier da Veiga corner with Rua
 Pacico Ho-mem,
 Centre - 35.400-000 Ouro Preto,
 Minas Gerais
 BRAZIL

The mission of the UNESCO Chair on Water, Women and Development in Brazil is to encourage the construction of a sustainable society through environmental education and empowerment of women. The Chair actively works towards becoming a Centre of Excellence for preserving water resources, promoting sustainable development and encouraging women's participation in all activities. The Chair undertakes its projects through teamwork with people from multiple fields and disciplines, volunteer services and networking with different partners. The Chair primarily aims to create a synergy between local actors and various projects already undertaken in the area, in order to enhance their integration and sustainability. As a Chair on water and women, other major objectives are to promote the education of women in all areas related to water, bring out women's entrepreneurial spirit, and encourage women to invest in themselves and achieve decision-making power on equal terms with men. The Chair also seeks to train and qualify men and women as conscious peers who need to live in a balanced and sustainable environment.



FROM TOP TO BOTTOM:

Across the Sahel communities are challenged by erratic rainfall and climate change, Chad, 2009.

Women's Speak Out Event for UN Women in 2012.

UNESCO Chair on Water, Women and Decision-Making

Prof. Euphrasie Hortense Yao Kouassi
The Ivorian Center of Economy and Social Research (CIRES)
University of Félix Houphouët-Boigny, Abidjan

P.O.Box. Abidjan/ Plateau,
Avenue Lamblin, Immeuble Lamblin,
BP 641 cedex 3, Abidjan
COTE D'IVOIRE

The Chair aims to promote an integrated system of research, training, information and documentation in the field of women, water, natural and social sciences, which will enhance the implementation of the development goals. It strives to contribute to the struggle against

poverty by improving access to safe drinking water in a sustainable way, advancing women's status and involving local people in the management of resources and community issues. Through its various projects, the Chair facilitates the collaboration between internationally recognized researchers, the teaching staff of the CIRES and UNESCO Chairs' international network, specifically in Argentina, Sudan, Burkina Faso, Morocco and Brazil. As an international reference Centre for gender issues in the region, the Chair undertakes different activities relating to water and women and provides project development and consultation services.

UNESCO Chair on Water, Women and Decision-Making

Prof. Asma El Kasmi
The University Al Akhawayn, Ifrane

P.O.Box.
104, Avenue Hassan II, Ifrane
MOROCCO

The mission of the Chair is to strengthen women's capacity in integrated water resources management (IWRM) and promote sustainable development. The Chair designs and implements training, research and development programmes focused on strengthening women's capacity

in integrated water resources management. It provides technical and policy advice for environmental protection and sustainable management of water resources. The Chair uses science, technology and innovation for rural development, with a special emphasis on cross-sectoral planning and stakeholder engagement. It works to advance regional and international cooperation, building functional networks for capacity building in water sectors, and to contribute to the achievement of the Millennium Development Goals and to the Post-2015 Development Agenda.

UNESCO Chair on Women, Science and Reasoned Water Management in West Africa

Prof. Adolé Isabelle Glitho
The University of Lomé

P.O. Box.BP 1515 Lomé
 TOGO

The primary goal of the Chair is to contribute to the development and the achievement of the development goals, particularly, improving access to drinking water in Sub-Saharan Africa. For this reason, the Chair focuses first and foremost on creating a team of experts on water management in the region.

The Chair has activities in five countries – Benin, Burkina Faso, Côte d'Ivoire, Niger and Togo – which actively collaborate on a two-year international Master's programme Environment, Water and Health, and an elective course Women, Water and Health, hosted at the University of Lomé. Two other

countries, Senegal and Chad, also participate in this university programme. The two cohorts of the programme form a total of fifty-eight (thirty-nine women and nineteen men) water management professionals. The graduates of the programme are currently engaged in different projects related to the sustainable management of water resources in West and Central Africa, and the Chair closely follows their activities. Besides preparing high-level specialists for the region, the Chair aims to create a course for a Certificate of Aptitude in Techniques of Communication on gender and development. The Chair also promotes young girls' and women's education, their access to information and opportunities for training in water, health and environmental management. The Chair's activities target peri-urban and rural areas and the identification of problems and possible solutions in these two fragile zones.

UNESCO Chair on Water, Gender and Governance

Prof. Francisco T. Rodríguez.
The Instituto Global de Altos Estudios en Ciencias Sociales (IGLOBAL)

P.O.Box. César Nicolás Penson,
 127 La Esperilla, Santo Domingo
 DOMINICAN REPUBLIC

The overarching goal of the Chair is to promote the equal involvement of men and women in a better and more efficient governance and management of water resources. Thus, the Chair seeks to enhance the development of institutional frameworks, strategies, policies, research, capacity building and

communication which will serve this goal. The Chair particularly focuses on the role of women within the water sector at the national and regional levels. It fosters research and training activities in water and gender studies, and reinforces active and productive exchanges between professors, lecturers and researchers in different fields and disciplines. The Chair also develops tools and provides advice to enhance capacity development at institutions responsible for water resources management and services, water users' associations, as well as teaching, training and research establishments.





CHAPTER 4

PARTNER NGOs: SCIENTIFIC AND PROFESSIONAL ORGANIZATIONS

International Association of Hydrogeologists

Evolving and Growing in Parallel for Half a Century

Shaminder Puri
Secretary General

International Association of Hydrogeologists

PO Box 4130
Goring
Reading RG8 6BJ
UNITED KINGDOM



As UNESCO's Water Programme celebrates its fiftieth anniversary in 2015, so the International Association of Hydrogeologists (IAH) celebrates its sixtieth anniversary in 2016. Founded in 1956, the organization evolved from the meetings of the International Geological Congress (IGC), at which the science of hydrogeology had been a regular theme since 1948.

Since its birth the IAH has held regular congresses, where, apart from the scientific discussions, there has been an emphasis on promoting international collaboration. In the early years much effort was devoted to distinguishing between hydrogeology and hydrology through discussions with the International Union of Geophysics and Geodesy and their Hydrology Section. By 1961 UNESCO's involvement with the International Union of Geological Sciences (IUGS), and the IAH's association in the IUGS, led to recognition by UNESCO of the IAH as a non-governmental organisation, consisting of individuals and corporate members.

PICTURES

Left: Hills of Sapa, Vietnam.

Right: A young girl sits on a jerry can, as her mother fills up another with water, near the town of Jowhar, Somalia.



By the time that the IHD was established in 1965, the IAH had held a series of congresses with published proceedings dealing with hydrogeological concerns, such as the balance and reserves of aquifers, methods for applied studies of groundwater, applied hydrogeology and civil engineering, hydrogeological maps, karst hydrogeology, and the hydrogeology of chalk. A key issue that had evolved in the run up to the Decade was the consistency in international mapping, in particular the adoption of common legends, terminology and nomenclature. The Fifth Congress of the IAH (in Rome, 1961) was instrumental in promoting the idea of an International Hydrogeological Map (Europe) in collaboration between IUGS and IUGG, with UNESCO providing the coordination. At the launch of the IHD in 1965, and at the IAH Congress in Hannover, seven volumes of scientific deliberations were published, compiling much of the scientific basis for the future work of the IHD.

When in 1975 the IHD was superseded by IHP collaboration with IAH members, which started under the Decade, continued to flourish.

Congresses and publications supported by the IHP continue to this day, for example the Krakow Congress (2010) and the forthcoming Rome Congress (September 2015).

In IHP-VII and IHP-VIII the collaboration with IAH members was further consolidated with direct participation in the scientific design of both these Phases, leading to an increased appreciation of the role of groundwater in environmental sustainability. A number of IAH Commissions, such as Managed Aquifer Recharge, Urban Hydrogeology, Transboundary Aquifers, and Climate Change, are directly involved with the themes of IHP. The IAH publishes the *Hydrogeology Journal* and two book series, which highlight collaborative work with IHP.

The fifty years of the UNESCO Water Programme and sixty years of the IAH's evolution can be regarded as a history of close cooperation, providing significant benefits to the Member States of the UN. The Council of the IAH looks forward to another half century of similar collaboration.

International Association of Hydrological Sciences

Contributions to the Shaping of UNESCO's Hydrological Programmes

G. Young, C. Cudennec, H. Savenije
(on behalf of all present and former Presidents and Secretaries General)

International Association of Hydrological Sciences of the International Union of Geodesy and Geophysics

The concept of an international initiative in hydrology emerged in the frame of an IAHS conference in Athens in 1961, at a meeting between Léon Tison, Secretary-General of International Association of Hydrological Sciences (IAHS), Raymond Nace of the US Geological Survey (USGS) and Michel Batisse of UNESCO. Further discussion ensued with Jean Rodier of the French Office of Scientific and Technical Research overseas (ORSTOM), who was later to become IAHS President, and Valentin Korzun of the Soviet Academy of Sciences, along with extensive negotiations between UNESCO, WMO and other UN entities. These eventually resulted in the creation of the IHD in 1965.

IHD was slated to be a decade of concerted effort for advancing hydrology and integrating its sub-disciplines (such as surface and groundwater, water quality, snow and ice, and erosion) into a global science. It focused on understanding hydrological processes, with full recognition that such understanding underpins informed water management decisions. A particular approach adopted within the IHD was the study of hydrological processes within small representative basins, employing standardized measurement and analysis techniques, allowing inter-comparisons between basins and accumulating generic scientific knowledge. Many scientists affiliated with IAHS participated in these studies.

At the end of the decade UNESCO launched IHP, a continuous sequence of scientific programmes, each under a particular banner title with a selected set of priority topics. IAHS

PICTURE

Water fetched from a natural pond is carried by residents in plastic containers, Myanmar, 2008.



cooperated with UNESCO in setting up each IHP programme and contributed much of its science.

Thus, from the very start IAHS and its worldwide science network has had a strong connection with IHD and IHP and exerted a significant influence on their content and development. The evolution of hydrological sciences in the international arena has benefited from this two-way connection.

Beyond the prime focus within IAHS on understanding hydrological processes, water management issues have been growing in emphasis, as reflected in its current agenda-setting initiative 'Panta Rhei' (Greek for 'Everything Flows'). This has given a new prominence to a broad perspective of hydrology viewed within changing economic, political and social realities. This evolution in approach has been coherent with that of IHP, the current phase of the programme (2014-2021)

being focussed on 'Water Security: Responses to Local, Regional and Global Challenges'.

UNESCO and IAHS have been mutually supportive in a number of additional ways. The annual International Hydrology Prize presented jointly by IAHS, UNESCO and WMO was initiated in 1981. The biennial UNESCO-IAHS Kovacs Colloquium (George Kovacs held the offices of President of the IHP Intergovernmental Council, Secretary-General and President of IAHS), was initiated in 1992. IAHS officers have participated in IHP governance, meetings and working groups. UNESCO provides substantial support for IAHS events, and several co-publications have materialized. All this is a testament and promise to a very successful, continuing collaboration.

The International Association of Hydrological Sciences is grateful for the input of A. Askew, H. Colenbrander, P. Hubert, J. Rodda, U. Shamir, K. Takeuchi into the IAHS contribution.

The International Council for Science and UNESCO's Water Programmes

Vital Links: International Cooperation on Global Sustainability Goals

Gisbert Glaser

The International Council for Science (ICSU)

5 rue Auguste Vacquerie
F-75016, Paris
France

The International Council for Science (ICSU), whose mission is to strengthen science for the benefit of society, has had a long standing close involvement with UNESCO's water programmes. ICSU (up to 1996 the International Council of Scientific Unions) and three of its Union members – International Union of Biological Sciences (IUBS), International Union of Geodesy and Geophysics (IUGG) and International Union of Theoretical and Applied Mechanics (IUTAM) – were at the heart of UNESCO's proposal to develop scientific Arid Zone programmes (1950-1963). These programmes marked the start of a long story for UNESCO of enhancing international scientific cooperation and knowledge in two important areas: freshwater and terrestrial ecosystems.

The proposal for the establishment of IHD was again made in an ICSU context at the General Assembly of the International Union of Geodesy and Geophysics in 1960. The idea was expanded in 1961 at a meeting in Athens of the International Association of Scientific Hydrology (IASH), later renamed the International Association of Hydrological Sciences (IAHS), of IUGG. In fact, IHD was established as a joint initiative of UNESCO, WMO and ICSU. UNESCO provided the Secretariat throughout the Decade, with ICSU acting in an advisory capacity. To this end, ICSU in 1964 established a Committee on Water Research (COWAR) focused specifically on interdisciplinary scientific work. The committee acted as a facilitating mechanism for organizing advice and cooperation from ICSU and its affiliated bodies, among which IASH was always in the forefront.

PICTURE

A newly rehabilitated public water point in the Old town of Djenne', Mali, 2014.



Towards the end of the Decade, ICSU strongly supported UNESCO's plans to launch a long-term programme of intergovernmental scientific cooperation in hydrology, which became today's IHP. It was agreed that COWAR would continue its role, although ICSU would not be a formal sponsor of the new programme. By the end of the 1980s, COWAR had become more focused on water issues in relation to global environmental change research. While continuing its collaboration with IHP, it also developed close links with the International Geosphere-Biosphere Programme (IGBP) launched by ICSU in 1986, and later the DIVERSITAS programme. In 2002, the ICSU Scientific Committee on Water Research (SCOWAR) was dissolved by the ICSU General Assembly, recognizing that IHP had established itself as the proven global interdisciplinary scientific cooperation programme addressing freshwater issues.

Also in 2002, the ICSU-sponsored global environmental change research programmes established the Earth System Science Partnership (ESSP). One of the four ESSP joint projects developed in the following years was the Global Water Systems Project

(GWSP), aimed at understanding how humans are changing the global water cycle and the effects of these changes. Thus, the GWSP was complementary to IHP as regards its scientific focus. From the beginning, close collaborative linkages were established between the two scientific undertakings, despite their differences in organizational structure and size.

In 2012, ICSU and UNESCO launched, together with other partners, the new ten-year transdisciplinary initiative 'Future Earth-research for global sustainability'. This aims to provide the knowledge required to tackle challenges to global sustainability and to move towards a sustainable human development path. The accession of the GWSP into Future Earth is currently underway. At the same time, it will be important for IHP and Future Earth to explore possible synergies and potential areas of cooperation, such as providing the knowledge required for implementing the Sustainable Development Goals. ICSU and UNESCO also need to work together in the future to ensure that global interdisciplinary scientific cooperation on water issues will remain of the highest priority.

CHAPTER 4

PERSPECTIVES FROM THE REGIONS

Africa



The UNESCO water projects in Africa over the last half century have encompassed a wide range of activities and achievements, starting with the monitoring of sixty-five experimental basins during the IHD by ORSTOM (now IRD) for three to five years of field observations in hydrology. The hydrological data collected during the IHD was used as the basis for ten-year return period flow estimations for the design of small hydraulic infrastructures in the Francophone African countries (known locally as the 'méthode ORSTOM pour le calcul du débit de crue décennale').

The research conducted under the umbrella of FRIEND-AOC since the establishment of the FRIEND network of IHP for West and Central Africa and led by IRD has provided a comprehensive regional analysis of trends for hydrological variables in West Africa. This has for the first time identified on a regional level two distinct hydrological time periods in relation to annual rainfall: humid period before the 1970s, followed by a long period of long annual rainfall deficits. Scientific activity has continued to increase understanding of the drastic climatic and related ecological changes observed within the West African region. The various findings led to the organization of the first international scientific conference on Water Resources in Africa in 1998, in Abidjan, Côte d'Ivoire. FRIEND AOC also took a lead

in the Montpellier 2005 FRIEND conference in dealing with climatic and anthropogenic impacts on water resources, where the Sahelian Paradox – less rainfall-more runoff – was demonstrated.

IHP has been instrumental in raising the profile of groundwater in Africa with a series of workshops and conferences, cumulating in an inventory of transboundary aquifers within the framework of ISARM. This has improved knowledge on the number of transboundary aquifers in Africa, moving from around forty known to more than eighty identified. Scientific books have been published on groundwater in Africa covering areas such as sustainable groundwater resources management, groundwater pollution and groundwater recharge estimation in Southern Africa, and an international scientific conference on groundwater and climate in Africa was held in 2007 in Kampala.

Collaboration has been central to the development of UNESCO hydrological activities in Africa. Scientific and expert networks have been put in place by IHP to promote regional scientific cooperation. Among others, these include FRIEND in West and Central Africa, FRIEND in Southern Africa, ISARM in West, Central, Southern and Eastern Africa, and G-WADI Africa. At the institutional level, IHP was instrumental in the establishment of numerous institutions, including the Observatory of Sahel and Sahara (OSS) for addressing water and ecosystem challenges for Arid and Semi-Arid countries of West and Northern Africa and hosted by IHP before being moved to Tunisia; the Africa Groundwater Commission (AGWC), for which

IHP has provided continuing technical support for its operationalization; and the African Ministerial Council on Water (AMCOW), the highest body with a Pan-African Mandate to provide leadership on addressing water and sanitation challenges in Africa. As co-founder of AMCOW, DDG led the UNESCO's team for the celebration of the tenth Anniversary of AMCOW during the fourth Africa Water Week held in Cairo in 2012. In addition, there are seven water UNESCO Category 2 Centres – in Cairo for Arid and semi-arid lands, in Libya for transboundary groundwater management, in Kaduna for integrated river basin management, in Nairobi for groundwater research, training and education, in Khartoum for Rainwater harvesting and conservation, and in Kuazulu Natal for global changes and water resources.

Since 2006 IHP has initiated a series of biennial regional meetings of National Committees in Africa, combined with a scientific conference contributing to enhance exchanges and knowledge sharing among the Water Family in Africa. Five regional meetings have been held so far, starting in Abuja in 2006, followed by Cape Town in 2008, Cotonou in 2010, Dar Es Salaam in 2012 and Kinshasa in 2014. In parallel, strategic partnerships have been established with key regional stakeholders including AMCOW, the water entities of Regional Economic Communities such as ECOWAS, SADC, ECCAS and IGAD, AGRHYMET, ICPAC, ZIE, and IRD for better implementation and more impact of the IHP activities in Africa. In addition, through the UN Water Africa Group, of which IHP has been member and vice chair since 2010, IHP has contributed to every the series of Africa Water Week since its first edition held in Tunisia.

Looking to the future, a priority will be to strengthen existing partnerships with more emphasis on river basin organizations to promote water cooperation, improve the knowledge base on groundwater and integrate water resources management at basin level (both for surface and groundwater, quantity



FROM TOP TO BOTTOM:

Delivering water to storm victims in Haiti 2008.

Limnigraph on Lake Bam in Burkina Faso.

and quality). In addition, addressing global change impacts in Africa makes it essential to put in place adaptation measures backed by sound scientific knowledge. Three strategic regional programmes on climate resilient hydraulic infrastructures, enhancing resilience to floods and mitigating droughts in Africa should be put in place by mobilizing key stakeholders at national, sub-regional and regional levels. Finally, building capacity for a new generation of skilled water professionals to fill the huge gap at all levels is a paramount for African countries. The initiated Africa water capacity building programme will be promoted and countries and partners mobilized for its urgent implementation.

Asia-Pacific



The Asia-Pacific region is extremely dynamic, undergoing rapid urbanization, industrialization and economic development. These positive development trends are also sources of pressure on freshwater resources, thus jeopardizing future water availability in the region. While some

countries are making significant progress, many have failed to reach a stage of water security and millions of people are still living without safe water supplies and sanitation facilities.

Water availability in Asia-Pacific is very diverse. It is easy to go from highly arid temperate zones and small island states facing water pressure to water-abundant areas in the Himalayan snowfields and the tropics, which often alternate between drought and floods. Today relatively water-rich countries in the region, such as Malaysia, Indonesia, Bhutan and Papua New Guinea, now face water supply and quality constraints in their major cities because of population growth, growing water consumption, environmental degradation, damaging agricultural activities, poor management of water catchment areas, and groundwater overuse.

Water security may be defined as the capacity of a population to safeguard access to adequate quantities of water of acceptable quality to sustain the health of humans and the ecosystem on a watershed basis, and to ensure efficient protection of life and property against water related hazards such as floods, landslides, land subsidence and droughts. Measured against this gauge, it appears that the Asia-Pacific region still has many challenges to overcome.

With a network of fourteen UNESCO field offices, a regional coordination body – namely, the Regional Steering Committee for Southeast Asia and the Pacific (RSC-ASPAC) – seventeen National Committees, six Category 2 Water Centres and six Water Chairs, the International Hydrological Programme (IHP) of UNESCO is well established in the region. IHP in Asia-Pacific promotes integrated water resource management by providing support for technical projects, cooperative research networks, capacity-building, community-based initiatives, training and non-formal education at national and regional level.

Over past years and decades IHP in Asia and the Pacific has been very active in collecting, compiling and providing regional data on water related resources for the international scientific and management community, as well as providing advice to governments on policy and management issues.

Today it is fundamental to ensure the continuity of IHP programmes and projects, while also responding to new challenges arising in the Member States. To this end, the thematic areas identified under IHP-VIII will help develop innovative methods: models, technologies and approaches to optimize the use of resources and capitalize on the advances in water sciences and social and/or economic opportunities. Using a multidisciplinary approach and involving the UNESCO Water Family in Asia and the Pacific, IHP responds to the needs of various sectors of society.

At this critical moment in time when the international community is adopting the post-2015 development agenda on Sustainable Development Goals (SDGs), IHP actions in the region will take stock of the results of cross-cutting programmes such as AP-HELP, AP-Ecohydrology, AP-FRIEND. From a regional point of view this will involve building new actions, together with regional initiatives such as the RSC-ASPAC, the IHP Nagoya training course and the Asia Pacific



Water Forum (APWF), that work with Member States to maintain UNESCO's leadership role in providing solutions for securing the region's water future. Key actions include the following:

Integrated Water Resources Management (IWRM). The objective is to support a holistic approach that promotes coordination in the development and management of water, land and related resources and helps to maximise economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.

The second action is work with trans-disciplinary initiatives. Programmes, such as AP-HELP, AP-FRIEND and AP-Ecohydrology, designed to incorporate relevant policy and scientific issues through cross-cutting approaches on water management will be promoted.

Thirdly, dialogue will be promoted between the science and technology community and water policy makers for the integration of tools and techniques such as ecotechnologies and ecobiotechnologies for cost-effective, eco-friendly and people-centred water management.

A fourth priority is improving knowledge on water. It is important to develop capacities



FROM LEFT TO RIGHT AND FROM TOP TO BOTTOM:

View from a dam in Tateyama Kurobe, Japan.

View From Yulong Dragon Bridge, China.

A local fishing boat, Atauro Island waters, Timor-Leste, 2010.

and skills to give to stakeholders the tools necessary for a better understanding of water issues and to find solutions for positive change.

Finally, there will be an emphasis on strengthening the regional water network. In doing so, the IHP network in Asia and the Pacific, as well as other such as the APWF Regional Network of Water Knowledge Hubs, could play a more significant role in addressing the challenges related to water security in the region.

Latin America and the Caribbean



Over the last fifty years IHP in the Latin American and Caribbean region (LAC) has become a renowned player in the regional water field. IHP LAC has a sound network comprising National Committees, six Category 2 Centres, six water-related Chairs, and an outstanding group of scientists and experts that provide expertise to the network in key areas of knowledge.

IHP has brought about state-of-the-art science through its initiatives devoted to understanding the water cycle and its changes, extreme hydrometeorological events, and the impacts of global changes in present and foreseen changes. In collaboration with its Member States, data and information management systems, early warning systems, modelling tools, forecasting systems, and emergency preparedness and risk management models have been put in place.

In a region where transboundary waters are of major relevance to the IHP together with the Organization of American States has developed a hemispheric network of experts representing each of the Member States. This network has been able to study transboundary aquifers in order to identify and characterize such resources. Based on this information it has been able to contribute to a common strategy supported by sound knowledge for the management of these transboundary aquifers.

The importance of the aquatic ecosystem in managing water resources has been raised

by UNESCO as a theme in the scientific and political agenda. This relates to concepts such as environmental flows, green infrastructure and ecosystem services, which have strongly emerged in the IHP's agenda over the last years. Other emerging concepts in recent years, such as integrated water resources management, water governance, water ethics, have also come to prominence.

Key initiatives of the IHP have emerged from a region that has its own specific demands. The work on water and ancient cultures has been pioneered under the lead of IHP, aimed at recovering and revaluing the key role of water in the region's cultures. Moreover, UNESCO's work in assessing the impacts of the global changes in the Andean glaciers has for more than twelve years been a reference point for the scientific community within and beyond the region.

In the field of water education IHP has developed and adapted a series of methodologies and materials to educate teachers, schools students and kids in non-formal environments in the relevant water issues. One niche among IHP's work has been education around water cooperation, with adapted training materials and regional case studies designed to build on the concept of regional water diplomacy. Such initiatives have expanded over the years thanks to the interest and commitment of the Member States.

Emerging issues such as water quality and urban water challenges have been given special attention by IHP in LAC, which is developing regional studies and convening scientific and academic networks from the region to address the key concerns of the countries.

In a region that recognizes the value of UNESCO in this area continuous interaction with its Member States, and work devoted to the consolidation of the Water Family are



FROM LEFT TO RIGHT AND FROM TOP TO BOTTOM:
Iguaçu National Park, 2013.
Family whose home floods every year in Colombia.
General View of the Brazilian Amazonian landscape.

crucial to the success of the IHP. Thanks to this, UNESCO is present in several initiatives and projects where it provides its specialised expertise, even within the context of the UN system agencies and programmes.

It is expected that, utilising its strengths, IHP will support the implementation of the hydrological agenda post-2015 by providing advice to its Member States, while supporting

science development and knowledge transfer. The LAC region is urged to continue its work and to help shape the regional water agenda.

CHAPTER 4

THEMATIC PERSPECTIVES

Enhancing water security: mainstreaming adaptation and resilience through knowledge services

by **Anil Mishra**, Programme specialist, **Siegfried Demuth**, Chief of Section, and **Bárbara Ávila**, Consultant, International Hydrological Programme, Section on Hydrological Systems and Water Scarcity

Freshwater resources are under intensifying pressure to meet the social, economic and environmental needs of a growing world population. We are in a crucial moment, and the direction we take will determine the future of our generations. Facing climate change by increasing local resilience and adaptation strategies are key elements towards water security. Cooperation among stakeholders and collaboration between science and policy are crucial to meet human needs and to achieve sustainable development.

Many of the world's water resources are shared. Transboundary rivers originate in one country and flow through downstream countries before reaching the ocean. Furthermore, large-scale climate drivers that may cause hydrological extremes, like floods and droughts, have a spatial extent clearly beyond nations. Therefore, it is vital that nations collaborate on analysing and solving hydrological issues of transnational importance. The International Hydrology Programme (IHP) provides a platform and links different countries to address these issues.

Drawing on more than four decades of experience, IHP fosters and consolidates

cross-disciplinary networks that facilitate cooperation within research and capacity building, development of analytical tools and data sharing, primarily across national boundaries. IHP also raises the awareness of policy-makers at the national, regional and international level on the projections and risks related to the challenges of global change, including climate change and human impact.

As an example, IHP recently launched a project “Addressing Water Security: Climate Impacts and Adaptation Responses in Africa, the Americas, Asia and Europe” in 2015. This project focuses on vulnerability assessments to identify adaptation responses based on the case studies from different regions, particularly targeting vulnerable regions such as mountains, and arid and semi-arid regions. The project aims to improve adaptation strategies by developing policy recommendations based on scientific studies, to respond to local and regional needs by providing tools to adapt to global changes, and to meet global water challenges. Converging on developing adaptation strategies to climate change in order to contribute to achieve water security, the abovementioned project is being implemented within the Eighth Phase of IHP (IHP-VIII).

The project also aims to establish a “Global Knowledge Forum on Water Security”, which will establish stronger links between science and policymakers to improve water management in the context of climate uncertainty. This Forum will call

for cooperation and collaboration among institutions, scientists and stakeholders to address water security challenges impacted by climate change.

Another example of IHP's work is the implementation of a drought monitoring and forecasting system in Africa, Latin America and the Caribbean. This system is a key step forward in building capacity through technology and knowledge transfer, and has the potential to reduce the impact of droughts providing a tool for food security. This project also aims to alleviate poverty and to improve the quality of

life of local communities in arid and semi-arid environments by reducing the vulnerability of water resources systems to global changes based on sound scientific knowledge.

In the forthcoming years, IHP will continue strengthening its collaboration with Member States to help them reduce vulnerability to climate and global change impacts on water resources and to achieve sustainable water management, and will collaborate with the scientific community to enhance research to fill existent gaps on climate change impacts on water resources and livelihoods.

Fifty Years of Love for Groundwater Resources

by **Alice Aureli**, Programme Specialist, and **Matthew Lagod**, Project Officer International Hydrological Programme Section on Groundwater Systems and Settlements

Since 1965 the IHD / IHP has been leading the call for increased international and political attention to freshwater resources, including the recognition of the vital role of groundwater in many regions of the world. Thanks to the financial support of Member States, IHP has earned the distinction of being the UN System's most comprehensive, long-term scientific initiative on hydrogeology, the science that studies the aquifers and the groundwater resources they contain. Since the 1970s the IHP has worked to increase awareness of the immeasurable value of the world's groundwater resources. By making these unseen, underground water resources more visible, IHP has slowly but surely brought groundwater to the highest positions in the global scientific and political agenda.

To celebrate the IHP's fiftieth anniversary, the following recollections provide a glimpse into

the organization's commitment to aquifers and groundwater, recalling fifty years of love for groundwater resources.

It was during the International Hydrological Decade from 1965 to 1974 that UNESCO embarked upon its first important research programmes on aquifers and groundwater resources. In 1970 it joined forces with the International Association of Hydrogeologists (IAH) and the International Association of Hydrological Sciences (IAHS) to begin work on the preparation of the International Legend for Hydrogeological Maps. This landmark tool has since become one of the most widely used cartographic aids in hydrogeological mapping projects throughout the world.

The early work of IHP was mainly orientated towards research activities focused on purely scientific hydrogeological studies. Between 1970 and 1975 it focused its efforts on the long-term prediction of groundwater regimes. In 1974 at its eighteenth Session the UNESCO General Conference approved IHP's first formal six-year phase of work (1975-1980), during which it was mandated to develop and improve methodologies for the computation of water balances, including groundwater.

At this same time, pioneering studies were initiated on land subsidence, resulting from groundwater overexploitation as well as on groundwater recharge and crystalline rock aquifers. IHP meanwhile demonstrated its multidisciplinary approach by recognizing the potential synergies with the application of nuclear techniques to groundwater studies, and began a longstanding cooperation with the International Atomic Energy Agency.

These activities laid the cornerstone for the IHP's substantial contributions to a number of hydrogeological studies that in the early 1980s began capturing the attention of donor agencies and decision makers, who recognized IHP's unique intergovernmental nature.

With solid scientific knowledge in place, IHP then expanded its focus to take into account the impacts of human activities on groundwater resources, and increased efforts were devoted to advancing studies of groundwater vulnerability. Aquifer vulnerability studies provided the grounds on which to formulate methodologies for the use of aquifer vulnerability maps in case of emergency situations to plan and establish systems to provide good quality water supply and avoid groundwater contamination due to hydrological extremes and natural disasters. In parallel, inventories were established on groundwater contamination to provide a much needed baseline for IHP-V (Theme 3: Groundwater resources at risk, 1996-2001), which took on the challenge of groundwater quality protection, not only looking at agricultural practices and industrial activities but also including groundwater contamination due to urban development. IHP-V signaled a shift towards a cross-cutting approach to groundwater resources management, including consideration of the role of socio-economics, environmental concerns, institutional, legal and policy aspects, as well as governance.

In 1996 IHP initiated its assessment of the major deep aquifers in North Saharan Africa

in cooperation with the Sahara and Sahel Observatory (OSS). It began considering how to include non-renewable groundwater resources in the environmental sustainability approach, preparing recommendations on the strategic use of fossil groundwater, and proposing exit strategies. In this context, the international conference on 'Regional Aquifer Systems in Arid Zones – Managing Non-renewable Resources' organized by IHP in Tripoli, Libya, in November 1999 marked a milestone in the dialogue on the emerging concept of planned groundwater mining. The conference furthermore served as a basis for the evaluation of, and recommendations for, the management of non-renewable groundwater resources, and inspired the launch of the inventory of transboundary aquifers of the world. A major outcome of this activity was the establishment of an international expert group on non-renewable aquifers around the world and the book 'Non-renewable Groundwater Resources'. Published by IHP in 2006 and prepared in cooperation with the World Bank's Groundwater Management Advisory Team (GWMATE), the book provided guidance on the management of these aquifers, which are very often shared by several countries (UNESCO 2006, SC-2007/WS/4).

Recognizing the widespread lack of information on the number, distribution and relevance of transboundary aquifers as well as the absence of regulation and of applicable international law instruments, IHP launched the International Shared Aquifer Resources Management Initiative (ISARM) in 2000. The first inventory of transboundary aquifers was presented in a map prepared with Germany's Federal Institute for Geosciences and Natural Resources (BGR) and published in 2006. Three years later IHP was called to provide scientific support to the UN International Law Commission (UNILC) for the preparation of the Draft Articles on the Law of transboundary aquifers. The preparation of the Articles under the neutral leadership of Japan was guided by the UNILC rapporteur Ambassador Chusei

Yamada, a visionary and experienced diplomat who recognized that to tackle the subject of aquifers and groundwater resources it was essential to build a genuine dialogue between UNESCO's network of hydrogeologists and the legal community. Following eight years of intensive dialogue and meetings with experts of both disciplines from all regions of the world, a set of draft articles was completed and was ready for presentation to the UN General Assembly (UNGA) in New York. Consequently the UNGA adopted three resolutions in 2008, 2011 and 2013 commending countries to take inspiration from these articles to manage their shared aquifers, enter into bilateral negotiations and cooperation and (considering the amount of scientific work still needed) asked IHP to continue studies on these systems and provide technical support to the interested member states.

At the beginning of the IHP-VII (2008-2013), Member States asked for assistance with the development of best practices on groundwater resource management and governance, including shared groundwater resources

and conflict prevention. An important tool developed in response to this request is the map of transboundary aquifers published in 2015 by the UNESCO IGRAC Centre with the delineation of more than 600 transboundary aquifers, including more than 400 outside of Europe. The map is a valuable tool for those working in the multidisciplinary fields of study of water diplomacy and water-related conflict prevention.

The accomplishments of IHP over the past fifty years in the scientific knowledge base on aquifers and groundwater have done much to raise global awareness about the importance of groundwater resources to the wellbeing of human communities, the hydrological cycle and the earth's ecosystems and the services they provide to all living beings. IHP is committed in the coming years to stepping up its efforts on the evaluation and characterization of aquifers and to working with countries on science-based approaches to management of their groundwater resources, while meeting the challenges posed by the new realities of climate change.

Addressing Water Quality Challenges to Enhance Water Security for the Post-2015 Sustainable Development

by **Sarantuyaa Zandaryaa**,
Programme Specialist
International Hydrological Programme
Section on Ecohydrology, Water Quality and
Water Education

Water quality is vital to sustain human and ecosystem health and ensure water resource sustainability and water security for the world's rapidly growing population. The degradation of water quality across the world due to the impacts of human activities and

global changes presents a serious threat to water security. Water pollution is an acute problem in many parts of the world, causing serious human health risks and environmental degradation. Water-borne diseases due to unsafe drinking water, lack of sanitation and polluted water resources are the primary cause of child and maternal mortality in developing countries, affecting mainly poor and marginalized populations.

Environmental impacts caused by water pollution are not only limited to the extensive freshwater ecosystem degradation,

biodiversity loss and reduced ecosystem goods and services, but go far beyond. In some regions, the increasing pollution of water resources has become the main problem limiting the availability of water resources for different uses and resulting in water shortages. Eutrophication and toxic algal blooms are the most widespread water quality problem in lakes and reservoirs, posing a threat to fish and other aquatic organisms, as well as to surrounding wildlife and humans. Water quality deterioration also has significant economic costs. Water pollution causing a decrease in fish production and aquatic plants can lead to a loss of fisheries, aquaculture and tourism. In addition, the effect of climate change and other environmental changes such as saltwater intrusion on the quality of water resources remains to be addressed.

Although water quality problems differ due to different use and management priorities in different social and economic settings, water quality has been clearly recognized as the most critical water issue in both developing and developed countries for its far-reaching effects on the environmental sustainability, health, poverty and economic development. Major sources of water pollution include the discharge of insufficiently treated or untreated wastewater containing high loads of pollutants into water bodies, lack of sanitation, and inadequate solid waste management, intensive use of fertilizers and pesticides in agriculture, and industrial and land-based activities such as mining and deforestation. Meanwhile, emerging pollutants present a new water quality challenge. Consequently, concrete action to prevent, control and attenuate pollution is key to improving water quality.

The continuing degradation of water quality calls for urgent attention. In response, water quality issues have been brought at the forefront of IHP activities. The renewed focus on water quality in IHP-VII (2007-2013), through a dedicated Focal Area on “Protecting water

quality for sustainable livelihoods and poverty reduction”, has resulted in the development of a comprehensive programme to address water quality and wastewater issues in a holistic, integrated manner. In addition, the twentieth session of the IHP Intergovernmental Council has established the UNESCO-IHP International Initiative on Water Quality (IIWQ) which aims at strengthening knowledge, research and innovative technological and policy approaches to tackle the global water quality challenge. Furthermore, water quality has been recognized by Member States as the top priority for IHP-VIII (2014-2021), resulting in the theme of “Addressing Water Scarcity and Quality”.

Activities under IHP-VIII focus on current challenges and emerging issues with the aim of strengthening countries’ capacities to develop and implement comprehensive measures to improve water quality for sustainable development and livelihoods.

One such activity consists in promoting innovative scientific, technological and policy approaches to improve water quality and attenuate pollution. Water quality issues are becoming ever more complex due to diverse pollution sources and types. The existing sanitation, purification and wastewater technologies, along with existing policy solutions, are no longer effective in providing safe drinking water, reducing pollution, and removing a large part of these diverse pollutants from wastewater and drinking water in order to comply with more stringent water quality and environmental regulations. Hence, the development and promotion of approaches and tools for water quality improvement and pollution control through an integrated water quality and wastewater management framework is urgently needed. Strengthening scientific cooperation and the sharing and dissemination of existing knowledge and research on water quality is of critical importance.

A second activity is focusing on tackling new and emerging pollutants. In the face of growing use of a wide variety of pharmaceuticals, personal care products and other toxic chemicals, emerging pollutants represent a new challenge with potentially serious threats to human health and ecosystems. Therefore, scientific knowledge, technologies, and appropriate policy approaches and tools are needed to monitor these contaminants in water resources, assess associated human health and environmental risks and control their disposal in the natural environment.

The third priority is improving water quality monitoring to support the post-2015 SDGs and sustainable development. Water quality monitoring is fundamental for sustainable resource management, as identifying the nature and source of water quality problems in receiving waters is the first step in designing, planning and implementing water management strategies and programmes. Effective monitoring provides not only indispensable information on the status of water resources and trends over time, but also a means to identify emerging water quality issues. Improving monitoring is crucial in identifying policies and measures to enhance water quality and control pollution from specific sources, evaluating the efficacy of pollution control and regulation policies, and supporting decision-making and investment prioritization. Water quality monitoring and data will be important for the evaluation of progress towards the achievement of post-2015 SDG targets on water quality and

wastewater, health, ecosystems, poverty, chemicals, and food security.

Finally, there is a focus on promoting the science-policy interface for effective water quality management. Improving the understanding and knowledge of the quality of the world's water resources for human wellbeing is essential for effective policies on water quality and pollution control, as sustainable water management requires an enabling environment in the form of sound policy, legal and institutional frameworks. It is of crucial importance that the science-policy interface is enhanced in order to develop such frameworks for water quality management and to build institutional and human capacity on water quality and pollution control.

Improving water quality worldwide has been recognized as a prerequisite for water security in post-2015 sustainable development. Specifically, Target 6.3 aims to improve water quality by reducing pollution and improving wastewater management and safe reuse globally. To enhance water security globally and locally, water quality and pollution issues need to be addressed as an urgent priority through concerted action at all levels—global, regional, national and local. As access to water of good quality brings multiple environmental and socioeconomic benefits, improving water quality is necessary for the achievement of the post-2015 sustainable development and SDG targets including those on water, health, ecosystems, poverty, education, gender equality, and food security.

Ecohydrology: Engineering Harmony for a Sustainable World

by **Giuseppe Arduino**,
Programme Specialist
International Hydrological Programme
Section on Ecohydrology, Water Quality and
Water Education

In the face of increasing climate instability, demographic growth, human migration and the emergence of new geopolitical centres affecting the global economy (including growth in food prices and intensified environmental impact) there is an urgent need to reverse the degradation of water resources and stop further decline in biodiversity. Improving ecosystem services for society and enhancing the resilience of river basins to climatic and anthropogenic stress may greatly contribute to reach this goal.

Most of the global landscape, except deserts, high mountains and the boreal zone, has been converted into agricultural land with spots of highly modified urban areas. This over-engineering of urban and agricultural landscapes results in a reduction of biomass and organic matter, leading to a modification of the water cycle from the model situation where a biological component stabilizes the heat budget and water dynamics at the intermediate disturbance level, to a model where the water cycle accelerates, becoming more stochastic and unfavorable for biota and humanity (droughts and catastrophic floods). Additionally, these processes reduce carbon storage and nutrient transfer from mineral to organic forms, impacting on the material cycle.

Under this theme, IHP is filling existing knowledge gaps by addressing issues related to critical water systems, such as in arid and semi-arid zones, coastal areas, estuaries

and urbanized areas where ecohydrological processes have not yet been sufficiently addressed. IHP also works to show how better knowledge of the interrelationships between the hydrological cycle and biota can help make freshwater management more cost-effective, socially acceptable and environmental-friendly. Advancing the integration of social, ecological and hydrological research is key for a sound scientific basis in this domain. The Ecohydrology programme also aims at providing system solutions and facilitating technology exchange.

As an important component for an integrative approach, Integrated Water Resource Management (IWRM), Ecohydrology aims to harmonize society's needs with enhanced ecosystem potential by increasing the carrying capacity of ecosystems. Ecohydrology also supports the conservation of pristine ecosystems and expands efforts for the regulation of ecohydrological processes at novel ecosystems in order to increase their ecological potential in terms of water resources, biodiversity, ecosystem services and resilience to global change and anthropogenic stress (WBSR, for Water, Biodiversity, Services and Resilience). As such, Ecohydrology complies with the IWRM concept but also provides innovative tools to achieve sustainability.

UNESCO Ecohydrology centres across different countries are undertaking studies to pursue systems solutions for the integration of ecohydrological technologies on different scales. They are also integrating and further developing links with universities, institutes and other research centres with an interest in developing degree programmes in Ecohydrology. The wider UNESCO family (UNESCO Chairs and IHP National Committees) can help build a legal and policy analysis to implement biotechnologies and

systemic solutions by establishing related Ecohydrology demonstration projects in fresh water and estuarine systems. Along with other international partners it can also assess relations between the role of Ecohydrology and groundwater dependent ecosystems, flood resilience, water quality improvement for increased crop production, and the urban environment.

The Ecohydrology approach is being implemented in water catchments, particularly in demonstration sites, with the use of different ecohydrological biotechnologies in agricultural, coastal, estuarine and urban areas. Comparative studies of artificial and natural wetlands are also being undertaken, as well as legal and policy analyses. In addition, a scientific networking platform is being set up, establishing a web-based platform

to function as an information exchange network involving all demonstration sites. Ecohydrology also supports Member States in the task of including the ecohydrological best practice in natural resources master plans as an important component of the IWRM approach. This includes developing low-cost, advanced water quality and quantity solutions for sustainable ecosystem management. Lastly, Member States benefit from training courses on the principles and practices of Ecohydrology, in particular those countries most affected by massive land use changes, deforestation and water quality degradation.

UNESCO also disseminates information through the networking platform, which shares the various types of intervention at all levels and showcases their results and benefits.

An Overview of Water Education: Key for Water Security and Sustainable Development

by **Miguel de França Doria**,
Programme Specialist
International Hydrological Programme
Section on Ecohydrology, Water Quality and
Water Education

Water-related education remains a crucial element in ensuring universal access to water services and deterring a looming water crisis. In many countries water problems are largely due to inadequate human and institutional capacities at different levels, rather than to the scarcity of freshwater resources. Three key challenges remain evident in this area: namely, the insufficient number of adequately trained professionals, the need to extend water education to all stakeholders, and the need to

strengthen the quality of education systems at all levels.

Water education has been an area of work for UNESCO since its early days, due to its mandate in education and sciences. It was, however, with advent of the IHD that it became a priority area, the IHD Coordinating Council recognizing education as a critical element for the success of the Decade. Indeed, the Decade gave high priority to post-graduate and technical training of about 1300 hydrologists, most from developing countries. This had a tremendous impact, particularly in countries where hydrological services had not recovered from the tragic loss of human resources during the World War, and also in countries whose recent independence entailed the need for new specialised staff. Following

the recommendation of the International Conference on the Results of the IHD 'to accord the highest priority within the framework of the IHP to the training in water sciences', education and training remained a central tenet of IHP through its multiple phases.

Emphasis was initially given to the survey of the manpower needs of hydrological services, courses for professionals and the development of teaching aids. Since the United Nations Water Conference (1977), attention has also focused on public information and participation. The recognition that water is everybody's business and that many of the decisions affecting water resources are taken outside the water sector gradually prompted IHP to strengthen learning opportunities for multiple stakeholders, from local communities to high-level policy-makers. In parallel, education at IHP expanded from a strict emphasis on hydrology to a focus on a wider range of water sciences, engineering and management, also encompassing multidisciplinary and transdisciplinary perspectives, inspiring other institutions to adopt a similar approach. These efforts resulted from the commitment of hundreds of people, of whom two former education officers at the IHP Secretariat – Mr Wilfried Gilbrich and Mr Mike Bonnel – deserve special acknowledgement.

Over the last decade, IHP has developed a comprehensive UNESCO Water Family, now encompassing UNESCO-IHE Institute for Water Education, thirty three UNESCO Chairs, thirty one Centres and the World Water Assessment Programme. Overall, the Family aggregates over one thousand experts and researchers, devoted to water education at different levels, from short distance courses to doctorates, covering a vast range of themes. This network considerably reinforces IHP's contribution toward strengthening capacities worldwide and it is estimated that UNESCO has trained at least about thirty thousand professionals. Its contribution has been significant, despite the

fact that the estimates of the additional water workers needed globally to meet the SDGs vary enormously from around a few hundred thousand to over a million. In any case, such need is likely to be much higher in the future, due to the exponential increase in freshwater depletion associated with population growth and economic development.

In recent years IHP has also benefited from closer collaboration with UNESCO's education sector in several areas, notably with Education for Sustainable Development. This collaboration has implied a reorientation of the purpose, relevance, and content of water education – a process which was first reflected in the strategic plan for IHP-VII. From a holistic perspective, water education has been recognised as a means for sustainable development, with its social, economic and environmental dimensions. The linkages between water and other sustainable development issues have been highlighted, including its connections with poverty eradication, gender equality, cultural diversity and human rights. In addition, rather than the mere transmission of information, education is now emphasizing the values, knowledge and skills needed to enhance citizenship and to promote a lifelong commitment to sustainable development. Within the current IHP-VIII, greater emphasis is placed on providing learning opportunities to ensure the capacities needed at different levels to attain water security. Among other aspects, this entails greater attention to transboundary capacity-building and collaboration with IHP programmes.

Currently, IHP has about thirty projects on water education, in a diversified global portfolio that includes early childhood education, formal education at school level, empowering youth, promoting gender equality and women professionals in the water sector, post-graduate courses, distance learning, informal education and training of mass-media professionals. In spite of the progress achieved, water education

remains increasingly necessary to ensure that professionals in the water sector and elsewhere, as well as in local communities and among various stakeholders, have opportunities to acquire adequate capacities. Content wise, programmatic reorientations are still required to align with the SDGs and to ensure a smooth adaptation to global changes, particularly in terms of demographics, land use, urbanization and climate. Greater attention to the formal education of children and youth is also necessary, not only because they constitute a significant and vulnerable part of the demographics of many countries, but also since education remains the best tool available to cope with the changes mentioned above, whose impacts will be unprecedented in their lifetimes.

CONCLUSION

WORKING TOGETHER FOR THE FUTURE



Fifty years of cooperation, fifty years with a common goal: linking science, the expert community and decision-makers for the sustainable and integrated development of water resources.

Water is essential to life; it has no substitute. Access to water and sanitation plays a key role in addressing many of humanity's global challenges, including eradication of poverty, health, farming, energy, economic and urban development, education and gender equality. Today, water management is a major challenge

in all countries, industrialized and developing alike. Its importance for the international development agenda and, more generally, the fate of humanity, has been widely recognized and is now enshrined in the United Nations 2030 Agenda for Sustainable Development, with a dedicated goal.

The necessity for concerted action in the field of water was indeed stressed by scientists half a century ago: the International Hydrological Decade, as reflected in this anniversary publication, is an outstanding example of the results achieved through scientific and technical international cooperation, and represented the first attempt to better manage freshwater resources and water services under increasing pressure. The Decade fostered for the first time real cooperation among hydrology-related national services and institutions, and enabled the development of regional cooperation, bringing about greater understanding between disciplines and agencies. The establishment of the International Hydrological Programme was intended as a follow-up on the achievements of the Decade, with the aim of continuing its promising efforts. Now serving UNESCO's Member States for forty years, IHP has succeeded throughout its phases to anticipate the needs of the times and to adapt its strategies and implementations. IHP remains the only intergovernmental programme of the UN system devoted to the promotion of water research, integrated water resources management, education and capacity development, and strengthening the science-policy interface.

However, water-related challenges have continued to grow, rather than decline. With population growth, economic and development choices, increasing urbanization, excessive withdrawals, globalization and higher consumption levels of all resources, misuse and pollution of surface and groundwater, the difficulty of transboundary water management and other issues, water-related challenges are pervasive and have become increasingly complex. As a result, the objective of achieving global water security is at risk. As IHP-VIII underlines, we need to: mobilize international cooperation to improve knowledge and innovation; strengthen the science-policy interface at local, national, regional and global levels; and develop institutional and human capacities to reach water security and sustainability.

The messages in this book are clear: the UNESCO Water Family, composed of IHP, UNESCO-IHE, Centres under the auspices of UNESCO, Chairs, WWAP and the National Committees, will continue to address the need for additional and better information to be shared among stakeholders, as well as for improved and more accurate tools to be facilitated to decision-makers for their use in water management.

Another global challenge that IHP and the UNESCO Water Family are facing is gender equality, not just in terms of water and sanitation, but also with regard to water resource management and governance. One of IHP's goals is to eliminate various forms of discrimination in the access, management and decision-making processes involving

water resources. However, women were largely absent throughout IHD and have been strongly underrepresented on the IHP Council and Bureau, as well as in the domains of water-related research, engineering and governance. For over twenty years, IHP has been organizing courses, training sessions and conferences, amongst other things, in order to enhance women's decision-making capacities and their role in society. Although there has been progress, the challenges of gender equality remain. It is a domain with much room for improvement: for example, only around half of all countries produce gender statistics related to water.

Today, management of water resources must reinforce the approach by basin and take into account water's often transboundary nature. We need to have efficient water and environmental regulations, and ensure the protection of water resources today and tomorrow. Furthermore, there is the need to ensure the sufficient and adequate availability of water for all users, including ecosystem, the universal provision of water services and the governance and permanence of solutions at the local, regional and global levels. All this must happen through reinforced cooperation between a wider range of institutions and individuals at the national level all while making sure that water is integrated within the agendas of other sectors, including aspects related to cultural diversity and the use of traditional knowledge.

To this end, the IHP Secretariat is reinforcing the ties, synergies and support between the members of the UNESCO Water Family

and strengthening representation and participation in networks. IHP-VIII is the tool at hand for Member States to make water security a reality, in a coordinated way and with a global, regional and local impact. The Programme helps to develop flexible and adaptable solutions for various contexts to assist societies of all cultures to transform into societies that are resilient to global changes, while increasing their potential for sustainable development. This very broad challenge can only be addressed through international cooperation and the rapprochement of science and innovation with policy makers.

Today, as the international community begins implementing the 2030 Agenda for Sustainable Development, with a Sustainable Development Goal (SDG) entirely dedicated to freshwater, the UNESCO Water Family will play a key role to continue promoting international scientific cooperation in water research, integrated water resources management, education and capacity-building, the preservation of the planet's water resources and universal access to water services worldwide. The extended

outreach and comprehensiveness of the UNESCO Water Family constitutes one of the main strengths of IHP in this endeavor and is what sets the Programme apart from other water organizations.

This anniversary publication is an opportunity to renew our wishes for a better future together: let's face the new water challenges with the same spirit of international cooperation that led to the successful creation of UNESCO seventy years ago and of its water programmes twenty years later. Today, the rapid flow of change is effervescent with innovation, imagination and hope, to be employed to IHP's purpose: reaching a water secure future for all.



Blanca Jiménez-Cisneros

Secretary of the IHP and Director of the Division of Water Sciences







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by **Blanca Jiménez-Cisneros**

Secretary of the IHP and Director of the Division of Water Sciences

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ANNEX 1

Statutes and Rules of Procedure of the Co-ordinating Council of the International Hydrological Decade Annexes II and III of the Final report of the Seventh session of the Co-ordinating Council of the IHD, Paris, 22-26 November 1971

ANNEX II

STATUTES OF THE CO-ORDINATING COUNCIL OF THE INTERNATIONAL HYDROLOGICAL DECADE⁽¹⁾

ARTICLE 1

1. A Co-ordinating Council of the International Hydrological Decade (hereinafter called "Council") is hereby set up within the United Nations Educational, Scientific and Cultural Organization.

ARTICLE 2

1. The Council shall be composed of thirty Member States of Unesco, selected by the General Conference at each of its ordinary sessions, taking due account of equitable geographical distribution, of the need to ensure appropriate rotation, of the representativeness of these States from the hydrological viewpoint in the various continents and of the importance of their scientific contribution to the Decade programme.

2. Members of the Council shall be immediately eligible for re-election.

3. The Council may make recommendations concerning its own membership to the General Conference.

4. The experts appointed by Member States as their representatives on the Council shall preferably be chosen from among those persons who are playing a major part in the implementation of the Decade activities of the said Member States.

ARTICLE 3

1. The Council shall normally meet in plenary session once a year. It shall, however, be free to decide to meet at any other time.

2. Each Council member shall have one vote, but it may send as many experts or advisers as it deems necessary to sessions of the Council.

3. The Council shall adopt its own Rules of Procedure.

ARTICLE 4

1. The Council shall be responsible for supervising from the organizational and from the scientific points of view the implementation of the whole Decade programme, for studying proposals concerning developments and modifications of this programme, for recommending scientific projects of interest to all or to a large number of countries, for co-ordinating international co-operation in the framework of the Decade, for assisting in the development of national and regional projects related to the Decade and for taking any practical or scientific measures that may be required for the successful implementation of the programme.

2. In carrying out its activities, the Council may make full use of the facilities offered by the arrangements between Unesco and the other intergovernmental organizations mentioned under Article 7, paragraph 2.

3. The Council may consult on scientific questions all appropriate international non-governmental organizations with which Unesco maintains official relations. The International Council of Scientific Unions (ICSU) may give advice to the Council on matters of scientific character.

⁽¹⁾ Statutes adopted following resolution 2.222 of the General Conference at its thirteenth session and amended by resolution 2.333 of the General Conference at its sixteenth session.

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4. The Council shall, wherever possible, attempt to co-ordinate the programme for the Hydrological Decade with other international scientific programmes.

ARTICLE 5

1. The Council may set up ad hoc committees for the study of specific projects. Membership of such ad hoc committees shall also be open to Member States of Unesco which are not represented in the Council.

2. The Council may delegate to any such committee the powers that it may need in regard to the project for which it has been set up.

3. The Council may establish working groups of specialists to examine certain aspects of the Decade programme. These working groups, whose members shall serve in a personal capacity, may include nationals of Member States of Unesco which are not represented on the Council.

ARTICLE 6

1. At the beginning of its first session, the Council shall elect a chairman and four vice-chairmen; these shall form the Council's Bureau.

2. The Bureau shall discharge such duties as the Council may lay upon it.

3. Meetings of the Bureau may be convened in between meetings of the Council, at the request of the Director-General of Unesco or any one member of the said Bureau.

4. The Council shall elect a new Bureau whenever its own membership is changed by the General Conference in accordance with Article 2, above.

ARTICLE 7

1. Representatives of Member States and Associate Members of Unesco, which are not themselves members of the Council, may nevertheless take part, without the right to vote, in all meetings of the Council and of its committees.

2. Representatives of the United Nations, the United Nations Educational, Scientific and Cultural Organization, the Food and Agriculture Organization of the United Nations, the World Meteorological Organization, the World Health Organization and the International Atomic Energy Agency may take part in all meetings of the Council, of its committees and of its working groups without the right to vote.

3. The International Council of Scientific Unions may take part, without the right to vote, in all meetings of the Council, of its committees and of its working groups.

4. The Council shall determine the conditions under which other international governmental or non-governmental organizations may be invited to attend its meetings without the right to vote.

ARTICLE 8

1. The Secretariat of the Council shall be provided by the Director-General of Unesco, who shall place at the Council's disposal the staff and other means required for its operation. Staff members of the other organizations mentioned in Article 7, paragraph 2, above, may be assigned to the Secretariat by agreement with the said organizations.

2. The Secretariat shall provide the necessary services for all sessions of the Council and meetings of its bureau, committees and working groups.

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3. The Secretariat shall take any day-to-day measures required in order to co-ordinate the execution of the international programmes recommended by the Council; it shall fix the date of the Council's sessions in accordance with the Bureau's instructions, and shall take all steps required to convene such sessions.

4. The Secretariat shall assemble all proposals sent in by members of the Council, other Member States of Unesco and the various international organizations concerned, with regard to the formulation of the international programmes of the International Hydrological Decade, and shall prepare them for examination by the Council.

5. In addition to the services which it renders to the Council, the Secretariat shall co-operate closely with the respective secretariats of the international governmental and non-governmental organizations mentioned in Article 7, paragraphs 2 and 3, above.

ARTICLE 9

1. The international programmes of hydrological investigations, recommended by the Council to Member States for concerted action on their part, shall be financed by the participating Member States, according to the commitments which each State is willing to make. The Council may, however, make recommendations to the United Nations Educational, Scientific and Cultural Organization and to the other organizations mentioned in Article 7, paragraph 2, above, concerning assistance to Member States for the development of hydrological research or the implementation of some particular aspect of the Decade programme. If the said organizations approve such activities, they shall finance them in accordance with the provisions of their respective constitutions and regulations.

ARTICLE 10

1. The Council shall submit reports on its activities to the General Conference of Unesco at each of its ordinary sessions. The Director-General shall send a copy of these reports to the other international organizations mentioned in Article 7, paragraphs 2 and 3, above.

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ANNEX III

**RULES OF PROCEDURE OF THE CO-ORDINATING COUNCIL
OF THE INTERNATIONAL HYDROLOGICAL DECADE⁽¹⁾**

I. MEMBERSHIP

(1) The Co-ordinating Council of the International Hydrological Decade (hereinafter called the Council) is composed of 30 Member States of Unesco, selected by the General Conference at each of its ordinary sessions in accordance with Article 2 of the Statutes of the Council.

(2) Each State member of the Council shall notify the Secretariat of Unesco of the names of its designated representative as well as of advisers and experts.

II. SESSIONS

1. Date and place

(1) The first session of the Council shall be convened by the Director-General of Unesco. The place and date of that session shall be communicated in advance to all interested Member States and organizations.

(2) Other sessions shall be convened by the Secretariat of the Council in accordance with the instructions of the Bureau of the Council.

(3) The Council shall normally meet at the Headquarters of Unesco. It may meet elsewhere if so decided by a majority of the members.

III. AGENDA

2. Provisional Agenda

(1) The Provisional Agenda of the first session of the Council shall be prepared by the Director-General of Unesco.

(2) The Provisional Agenda of the following sessions of the Council shall be prepared by the Secretariat of the Council in consultation with the members of the Bureau.

(3) The Provisional Agenda shall be communicated to the members of the Council at least two months before the opening of each session.

(4) The Provisional Agenda shall be communicated at the same time to Member States and Associate Members of Unesco which are not members of the Council as well as to the United Nations, FAO, WHO, WMO, the IAEA and ICSU.

(5) The Provisional Agenda of a session of the Council shall include:

- all items whose inclusion has been decided by the Council;
- all items proposed by States members of the Council;
- all items proposed by the United Nations or by its agencies;
- all items proposed by the Director-General of Unesco.

⁽¹⁾ Rules of Procedure adopted at the Council's first session and amended by resolution VII-1, at its seventh session.

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3. Adoption of the Agenda

At the beginning of each session, the Council shall adopt the Agenda for that session.

4. Amendments, deletion and new items

The Council may, during a session, modify the order of items of the Agenda or add or delete items. A majority of two-thirds shall be required for the addition or deletion of items during a session.

IV. OFFICERS

5. Election of chairman and vice-chairmen

(1) In accordance with Article 6 of its Statutes, the Council shall elect a chairman and four vice-chairmen; these shall form the Council's Bureau.

(2) Members of the Bureau are eligible for re-election.

6. General powers of the chairman

(1) In addition to exercising the powers conferred upon him elsewhere by these rules, the chairman shall have the following powers: he shall declare the opening and closing of meetings, direct the discussions, ensure observance of these rules, accord the right to speak, put questions to the vote and announce decisions. He shall rule on points of order and subject to these rules shall control the proceedings and the maintenance of order.

(2) If the chairman ceases to represent a State member of the Council or is so incapacitated that he can no longer hold office, a vice-chairman shall become chairman for the unexpired portion of the term of office. If that vice-chairman also ceases to represent a State member of the Council or is so incapacitated that he can no longer hold office, another vice-chairman shall become chairman for the unexpired portion of the term of office.

7. Functions of vice-chairmen

In the absence of the chairman during a session, his functions shall be exercised in turn by the vice-chairmen.

V. COMMITTEES AND WORKING GROUPS

8. Ad hoc committees

(1) Ad hoc committees set up by the Council in accordance with Article 5 of the Statutes of the Council shall meet in accordance with the decisions of the Council or of the Bureau.

(2) These ad hoc committees shall elect their own chairman, vice-chairmen and, if necessary, their own rapporteur.

9. Working groups

(1) Working groups set up by the Council in accordance with Article 5 of the Statutes of the Council shall meet in accordance with the decisions of the Council or of the Bureau.

(2) These working groups shall elect their own chairman, vice-chairmen and, if necessary, their own rapporteur.

10. Rules of Procedure

These Rules of Procedure shall apply to the proceedings of committees and working groups unless the Council decides otherwise.

VI. SECRETARIAT

(1) The Director-General shall place at the disposal of the Council a member of the Secretariat of Unesco who shall act as Secretary of the Council and the staff and other means required for its operation.

(2) The Secretary of the Council shall attend all meetings of the Council and the Bureau.

(3) The Secretary or his representative may make oral as well as written statements to the Council, its ad hoc committees and working groups and to the Bureau concerning any question under consideration.

(4) Staff members of the other organizations mentioned in Article 7, paragraph 2, of the Statutes of the Council may be assigned to the Secretariat in accordance with Article 8, paragraph 1, of these Statutes.

VII. LANGUAGES

11. Working languages

English, French, Russian, and Spanish shall be the working languages of the Council.

12. Use of other languages

Any representative may make a speech in a language other than the working languages currently in use for a particular session of the Council of a committee or a working group on the condition that he provides for the interpretation of his speech into one or the other of the said working languages.

VIII. REPORTS AND DOCUMENTS

13. Reports

(1) The Secretariat shall submit a report to each session of the Council.

(2) The Council shall submit reports on its activities to each ordinary session of the General Conference of Unesco.

(3) Copies of these reports shall be circulated by the Director-General of Unesco in accordance with Article 10 of the Statutes of the Council.

14. Working documents

The working documents of each session of the Council shall, as a rule, be communicated to the members one month before the opening of each session.

IX. MEETINGS

15. Quorum

(1) A simple majority of the States members of the Council shall constitute a quorum.

(2) At meetings of subsidiary bodies of the Council a quorum shall be constituted by a simple majority of the States members of the Council which are members of the body in question.

16. Publicity of meetings

All meetings of the Council shall be open to the public unless the Council decides otherwise.

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X. CONDUCT OF BUSINESS

17. Right to speak

Experts and observers may, with the authorization of the chairman, make oral or written statements before the Council and its committees.

18. Order of speeches

The chairman shall call upon speakers in the order in which they have expressed the desire to speak.

19. Time-limit on speeches

The Council may limit the time to be allowed to each speaker.

20. Points of order

During the discussion on any matter, a representative may at any time raise a point of order and the point of order shall be forthwith decided by the chairman. Any representative may appeal against the ruling of the chairman which can only be overruled by a majority of the members present and voting. A representative may not in raising a point of order speak on the substance of the matter under discussion.

21. Suspension, adjournment, closure

Any representative may, at any time, propose the suspension, adjournment or closure of a meeting or of a debate. Such a motion shall be put to the vote immediately. The order of priority of such motions shall be as follows:

- (a) suspension of the meeting,
- (b) adjournment of the meeting,
- (c) adjournment of the debate on the item under discussion,
- (d) closure of the debate on the item under discussion.

XI. VOTING

22. Voting rights

Each State member of the Council shall have one vote.

23. Simple majority

(1) Unless otherwise provided in these rules, decisions shall be taken by a simple majority of the members present and voting.

(2) For the purpose of these rules, the phrase "members present and voting" means members casting an affirmative or negative vote. Members who abstain from voting are considered as not voting.

24. Show of hands and roll-call

Voting shall normally be by show of hands, except that any member may request a roll-call. The vote and abstention of each member participating in a roll-call shall be inserted in the report.

25. Voting on amendments

(1) When an amendment to a proposal is moved, the amendment shall be voted on first.

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(2) When two or more amendments to a proposal are moved, the Council shall first vote on the amendment deemed by the chairman furthest removed from the original proposal and then on the amendment next furthest therefrom, and so on, until all amendments have been put to a vote. If one or more amendments are adopted, the amendment proposal shall then be voted on. If no amendment is adopted, the proposal shall be put to the vote on its original form.

(3) A motion is considered an amendment to a proposal if it adds to, deletes from or revises part of that proposal.

26. Secret ballot

All elections shall be decided by secret ballot unless, in the absence of objections, the Council decides otherwise.

27. Equally divided votes

If a vote is equally divided on matters other than elections, the proposal shall be regarded as rejected.

XII. SPECIAL PROCEDURES

28. Special consultation by correspondence

Should the approval of the Council be required for measures of exceptional urgency and importance while the Council is not in session, the chairman may, by means of the Secretariat, consult the members by correspondence. The proposed measure shall be adopted if it is approved by two-thirds of the members.

XIII. AMENDMENT

29. Amendment

These Rules of Procedure, except when they reproduce provisions of the Council Statutes or decisions of the General Conference, may be amended by a decision of the Council taken by a simple majority of the members present and voting, provided that the proposal for amendment has been placed on the Agenda.

30. Suspension

Suspension of any of these rules shall require a two-thirds majority of the members present and voting.

ANNEX 2

IHP Intergovernmental Council Statutes¹

Article I

An Intergovernmental Council of the International Hydrological Programme is hereby established within the United Nations Educational, Scientific and Cultural Organization.

Article II

1. The Council shall be composed of 36 Member States of the United Nations Educational, Scientific and Cultural Organization elected by the General Conference at its ordinary sessions, taking due account of the need to ensure equitable geographical distribution and appropriate rotation of the representatives of these States from the hydrological viewpoint in the various continents and of the importance of their scientific contribution to the Programme.
2. The term of office of the members of the Council shall begin at the close of the ordinary session of the General Conference at which they are elected and shall expire at the close of the second ordinary session of the Conference following it.
3. Notwithstanding the provisions of paragraph 2 above, the term of office of one half of the members designated at the first election shall expire at the close of the first ordinary session of the General Conference following the session at which they were elected. The names of these members shall be drawn by lot after the first election by the President of the General Conference, it being understood that the outgoing members shall be replaced by members belonging to the same regional group.
4. Members of the Council shall be immediately eligible for re-election.
5. The Council may make recommendations concerning its own membership to the General Conference.
6. The persons appointed by the Member States as their representatives on the Council shall preferably be experts in the field covered by the Programme and chosen among those persons who are playing a major part in the implementation of the activities related to the Programme in the said Member States.

Article III

1. The Council shall be responsible, within UNESCO's field of competence, for planning the International Hydrological Programme, defining its priorities and supervising its execution and in particular for:
 - (a) guiding and supervising from the scientific and from the organizational point of view the implementation of the programme, including the relevant activities of the Regional Offices;
 - (b) studying proposals concerning developments and modifications of the Programme and also plans for its implementation;
 - (c) recommending scientific projects of interest to Member States and assessing priorities among such projects;
 - (d) co-ordinating international co-operation of the Member States in the framework of the programme;
 - (e) making any necessary proposals for co-ordinating the Programme with those conducted by all the international organizations concerned;
 - (f) assisting in the development of regional and national projects related to the Programme;

1. Approved by the General Conference of UNESCO at its eighteenth session and amended at its twentieth, twenty-first, twenty-third, twenty-seventh and twenty-eighth sessions.

- (g) taking any practical or scientific measures that may be required for the successful implementation of the programme.
- 2. In performing its functions the Council shall rely as much as possible on the activities of the National Committees established by Member States in accordance with the recommendation contained in paragraph 6 of resolution 18 C/2.232 and foster by all means their active participation on the Programme.
- 3. The Council shall make full use of facilities offered by the agreements or working arrangements between UNESCO and other inter-governmental organizations mentioned in Article VIII, paragraph 2 below.
- 4. The Council may consult on scientific questions all appropriate international non-governmental organizations with which UNESCO maintains official relations.

The International Council of Scientific Unions, its unions and associations, may give advice to the Council on questions of a scientific or technical nature.

- 5. The Council shall, whenever possible, attempt to co-ordinate the International Hydrological Programme with other international scientific programmes, in particular those of UNESCO.

Article IV

- 1. The Council shall normally meet in plenary session once every two years. Extraordinary sessions may be convened under the conditions specified in the Rules of Procedure.
- 2. Each Council member shall have one vote, but it may send as many experts or advisers as it deems necessary to sessions of the Council.
- 3. The Council shall adopt its own Rules of Procedure.

Article V

- 1. The Council may establish committees to examine the implementation of certain major orientations of the Programme and to prepare appropriate recommendations to the Council. Such committees may include Member States of UNESCO which are not represented in the Council.
- 2. The Council shall define the terms of reference and tenure of each committee thus established.
- 3. The Council may establish working groups of specialists to examine specific projects. These working groups, whose members shall serve in a personal capacity, may include nationals of Member States of UNESCO which are not represented on the Council.
- 4. In the composition of committees and working groups appropriate geographical distribution and adequate representation of regions where the problems occur might be sought.

Article VI

- 1. Regional committees may be established on the initiative of and by mutual agreement among Member States of the same region sharing a common hydrological interest.
- 2. The Council shall extend all possible assistance and help to regional committees thus established.

Article VII

- 1. At the beginning of its first session following a session of the General Conference at which elections to the Council have been held, the Council shall elect a chairperson and four vice-chairpersons. These, with the chairperson of the previous Bureau, who shall be an ex-officio member, shall constitute the Council's Bureau. The composition of the Bureau so formed shall reflect an equitable geographical distribution. The members of the Bureau who are representatives of Member States of UNESCO shall remain in office until a new Bureau has been elected.
- 2. The Bureau shall discharge the following duties:
 - (a) fix, in consultation with the Secretariat, the dates of the Sessions of the Council and of its

- committees and working groups, in accordance with the general guidelines of the Council;
- (b) prepare the sessions of the Council, in consultation with the Secretariat;
 - (c) supervise the implementation of the resolutions of the Council, and report at each session of the Council, on the status of implementation of the prescribed phases of project execution and, in particular, follow the activities of the Council's committees and working groups;
 - (d) prepare for the Council all reports requested by the General Conference of UNESCO;
 - (e) discharge all other duties which it may be assigned by the Council.
3. Meetings of the Bureau may be convened between meetings of the Council at the request of the Council itself, of the Director-General of UNESCO or of a Bureau member.

Article VIII

1. Representatives of Member States and Associate Members of UNESCO which are not members of the Council, may attend, as observers, without the right to vote, all meetings of the Council, of its committees and of its working groups.
2. Representatives of the United Nations, United Nations Educational, Scientific and Cultural Organization, the Food and Agricultural Organization of the United Nations, the World Health Organization, the World Meteorological Organization and the International Atomic Energy Agency may take part, without the right to vote, in all meetings of the Council, of its committees and of its working groups.
3. Representatives of the International Council of Scientific Unions, of its Committee on Water Research and of its affiliated International Association of the Hydrological Sciences and International Association of Hydrologists, of the International Association for Hydraulic Research, of the International Commission on Irrigation and Drainage, the International Commission of Large Dams and of the International Water Resources Association may take part, without the right to vote, in all meetings of the Council, of its committees and of its working groups.
4. The Council shall determine the conditions under which other international governmental or non-governmental organizations may be invited to attend its meetings, without the right to vote, whenever questions of common interest are discussed.

Article IX

1. The Secretariat of the Council shall be provided by the Director-General of United Nations Educational, Scientific and Cultural Organization, who shall place at the Council's disposal the staff and other means required for its operation.
2. The Secretariat shall provide the necessary services for all sessions of the Council and meetings of its Bureau, committees and working groups.
3. The Secretariat shall take any measures required in order to co-ordinate the execution of the international programmes recommended by the Council, it shall take all steps required to convene the sessions of the Council.
4. The Secretariat shall assemble all proposals sent in by members of the Council, other Member States of UNESCO and the international organizations concerned, with regard to the formulation of international projects under the Programme, and shall prepare them for examination by the Council. It shall maintain liaison with the National Committees referred to in Article III, paragraph 2 above, and inform them of the Council's recommendations.
5. In addition to the services which it renders to the Council, the Secretariat shall co-operate closely with the respective secretariats of the international governmental and non-governmental organizations mentioned in Article VIII, paragraphs 2 and 3, above; it shall for this purpose take part in inter-secretariat co-ordination meetings as necessary.

Article X

1. The international programmes of hydrological investigations recommended by the Council to Member States for concerted action on their part shall be financed by the participating Member States according to the commitments which each state is willing to make. The Council may, however make recommendations to the United Nations Educational, Scientific and Cultural Organization and to the other organizations mentioned in Article VIII, paragraph 2, above, concerning assistance to Member States for the development of hydrological research or the implementation of some particular aspects of the Programme. If UNESCO and the said organizations accept such activities and if the Member States concerned signify their agreement, these organizations shall undertake to finance the related activities in accordance with the provisions of their respective constitutions and regulations.
2. Member States shall bear the expense of participation of their representatives in sessions of the Council and its committees. The running expenses of the Council and its subsidiary organs shall be financed from funds appropriated for this purpose by the General Conference of UNESCO.
3. Voluntary contributions may be accepted and established as trust funds in accordance with the Financial Regulations of the United Nations Educational, Scientific and Cultural Organization and administered by the Director-General of that Organization. The Council shall make recommendations to the Director-General on the allocation of such contributions for international projects within the Programme.

Article XI

1. The Council shall submit reports on its activities to the General Conference of UNESCO at each of its ordinary sessions. These reports shall also be communicated to the other international organizations mentioned in Article VIII, paragraphs 2 and 3, above, and to all National Committees for the International Hydrological Programme.
2. The Council may receive from other international organizations reports concerning the Programme.

ANNEX 3

Rules of Procedure of the Intergovernmental Council of the International Hydrological Programme¹

Memberships

- (1) The Intergovernmental Council of the International Hydrological Programme (hereinafter called the "Council") is composed of 36 Member States of UNESCO, elected by the General Conference in accordance with Article II of the Statutes of the Council.
- (2) Each State member of the Council shall notify the Secretariat of UNESCO of the names of the designated representatives as well as of the advisers and experts.

II. Sessions

1. Date and Place

- (1) The first session of the Council shall be convened by the Director-General of UNESCO. The place and date of that session shall be communicated in advance to all interested Member States and organizations.
- (2) Other sessions shall be convened by the Secretariat of the Council in accordance with the instructions of the Bureau of the Council.
- (3) The Council shall normally meet at the Headquarters of UNESCO. It may meet elsewhere if so decided by a majority of the members.

III. Agenda

2. Provisional agenda

- (1) The provisional agenda of the first session of the Council shall be prepared by the Director-General of UNESCO.
- (2) The provisional agenda of the following sessions of the council shall be prepared by the Secretariat of the Council in consultation with the members of the Bureau.
- (3) The provisional agenda shall be communicated to the members of the Council at least two months before the opening of each session.
- (4) The provisional agenda shall be communicated at the same time to Member States and Associate Members of UNESCO which are not members of the Council as well as to the United Nations, FAO, WHO, WMO, the IAEA and ICSU.
- (5) The provisional agenda of a session of the Council shall include:
 - all items previously decided by the Council;
 - all items proposed by Member States of the Council;
 - all items proposed by the United Nations or by its agencies;
 - all items proposed by the Director-General of UNESCO.

3. Adoption of the agenda

At the beginning of each session, the Council shall adopt the agenda for that session.

4. Amendments, deletions and new items

1. Approved by the IHP Council at its first session and modified in accordance with the amendment of the Council's Statutes by the General Conference of UNESCO at its 21st, 23rd and 28th sessions. The IHP Council amended article 26 on 'secret ballot' at its 14th session.

The Council may, during a session, modify the order of items of the agenda or add or delete items. A majority of two-thirds shall be required for the addition or deletion of items during a session.

IV. Officers

5. Election of chairperson and vice-chairpersons

- (1) At the beginning of its first session, following a session of the General Conference at which elections to the Council have been held, the Council shall elect a chairperson and four vice-chairpersons. These, with the chairperson of the previous Bureau, who shall be an ex-officio member, shall constitute the Council's Bureau. The composition of the Bureau so formed shall reflect an equitable geographical distribution.

The members of the Bureau who are representatives of Member States of UNESCO shall remain in office until a new Bureau has been elected.

- (2) Members of the Bureau are eligible for re-election.

6. General powers of the chairperson

- (1) In addition to exercising the powers conferred upon him/her elsewhere by these rules, the chairperson shall have the following powers: He/she shall declare the opening and closing of meetings, direct the discussions, ensure the observance of these rules, accord the right to speak, put questions to the vote and announce decisions. He/she shall rule on points of order and subject to these rules shall control the proceedings and maintenance of order.
- (2) If the chairperson ceases to represent a State member of the Council or is so incapacitated that he/she can no longer hold office, a vice-chairperson shall become chairperson for the unexpired portion of the term of office. If such vice-chairperson also ceases to represent a State member of the Council or is so incapacitated that he/she can no longer hold office, another vice-chairperson shall become chairperson for the unexpired portion of the term of office.

7. Functions of the vice-chairpersons

In the absence of the chairperson during a session his functions shall be exercised in turn by the vice-chairpersons.

V. Committees and working groups

8. Committees

- (1) Committees set up by the Council in accordance with Article V, paragraphs 1 and 2, of the Statutes of the Council shall meet in accordance with the decisions of the Council or of the Bureau.
- (2) These committees shall elect their own chairperson, vice-chairpersons and, if necessary, their own rapporteur.
- (3) These rules of procedure shall also apply to meetings of committees unless the Council decides otherwise.

9. Working groups

- (1) Working groups set up by the Council in accordance with Article V, paragraphs 3 and 4, of the Statutes of the Council shall meet in accordance with the decisions of the Council or the Bureau.
- (2) These working groups shall elect their own chairperson, vice-chairpersons and if necessary their own rapporteur.

VI. Secretariat

10. Secretariat

- (1) The Director-General shall place at the disposal of the Council such members of the Secretariat of

UNESCO as may be necessary as well as other means required for its operation.

- (2) The Director-General or his/her representative may make oral as well as written statements to the Council, its committees and working groups and to the Bureau concerning any question under consideration.

VII. Languages

11. Working languages

English, French, Spanish and Russian shall be the working languages of the Council.

12. Use of other languages

Any representative may make a speech in a language other than the working languages currently in use for a particular session of the Council or of a Committee on the condition that he/she provides a text for the interpretation of his/her speech into one or other of the said working languages.

VIII. Reports and documents

13. Reports

- (1) The Secretariat shall submit a report to each session of the Council.
- (2) The Council shall submit reports on its activities to each ordinary session of the General Conference of UNESCO.
- (3) Copies of these reports shall be circulated by the Director-General of UNESCO in accordance with Article XI of the Statutes of the Council.

14. Working Documents

The working documents of each session of the Council shall, as a rule, be communicated to the members one month before the opening of each session.

IX. Meetings

15. Quorum

- (1) A simple majority of the States which are members of the Council shall constitute a quorum.
- (2) At meetings of subsidiary bodies of the Council a quorum shall be constituted by a simple majority of the States which are members of the Council and which are members of the body in question.

16. Publicity of meetings

All meetings of the Council shall be open to the public unless the Council decides otherwise.

X. Conduct of business

17. Right to speak

Experts and observers may, with the authorization of the chairperson, make oral or written statements before the Council and its committees.

18. Order of speeches

The chairperson shall call upon speakers in the order in which they have expressed the desire to speak.

19. Time limit on speeches

The Council may limit the time to be allowed to each speaker.

20. Points of order

During the discussion on any matter, a representative may at any time raise a point of order and the point of order shall be forthwith decided by the chairperson. Any representative may appeal against the ruling of the chairperson which can only be overruled by a majority of the members present and voting. A representative may not in raising a point of order speak on the substance of the matter under discussion.

21. Suspension, adjournment, closure

Any representative may, at any time, propose the suspension, adjournment or closure of a meeting or of a debate. Such a motion shall be put to the vote immediately. The order of priority of such motions shall be as follows:

- (a) suspension of the meeting;
- (b) adjournment of the meeting;
- (c) adjournment of the debate on the item under discussion;
- (d) closure of the debate on the item under discussion.

XI. Voting

22. Voting rights

Each Member State which is a member of the council shall have one vote.

23. Simple majority

- (1) Unless otherwise provided in these rules, decisions shall be taken by a simple majority of members present and voting.
- (2) For the purpose of these rules, the phrase "members present and voting" means members casting an affirmative or negative vote. Members who abstain from voting are considered as not voting.

24. Show of hands and roll call

Voting shall normally be by show of hands, except that any member may request a roll call. The vote and abstention of each member participating in the roll call shall be inserted in the report.

25. Voting on amendments

- (1) When an amendment to a proposal is moved the amendment shall be voted on first.
- (2) When two or more amendments to a proposal are moved, the Council shall first vote on the amendment deemed by the chairperson to be the furthest removed from the original proposal and then on the amendment next furthest therefrom, and so on, until all amendments have been put to a vote. If one or more amendments are adopted, the amended proposal shall then be voted on. If no amendment is adopted, the proposal shall be put to the vote in its original form.
- (3) A motion is considered an amendment to a proposal if it adds to, deletes from or revises part of that proposal.

26. Secret ballot

(As amended by the IHP Council at its 14th session in June 2000)

- (1) All elections shall be decided by secret ballot unless, in the absence of objections, the Council decides otherwise.
- (2) a. Before the voting begins, the Chairperson shall appoint two tellers to scrutinize the votes cast.
 - b. When the counting of the votes is completed and the tellers have reported to the Chairperson, he/she shall announce the results of the ballot bearing in mind that the voting will be recorded as follows:
 - i. From the total number of Members of the Council will be deducted:
 - the number of Members absent, if any;
 - the number of blank ballots, if any;
 - the number of invalid ballots, if any.

- ii. The remaining number will constitute the number of votes cast. The majority required will be more than half that number.
 - iii. Those receiving a number of votes in favor, equal or superior to the majority required shall be declared elected.
- (3) a. When a single elective place is to be filled, any candidate obtaining in the first ballot an absolute majority (i.e. more than half) of the votes cast shall be declared elected.
- b. If no candidate obtains absolute majority in the first ballot, a second ballot shall be taken, restricted to the two candidates who obtained the most votes in the first ballot. The candidate obtaining a majority of the votes cast shall be declared elected.
- (4) When two or more elective places are to be filled at one time under the same condition, those candidates obtaining in the first ballot an absolute majority of the votes cast shall be declared elected. If the number of candidates obtaining such a majority is less than the number of places to be filled, there shall be additional ballots to fill the remaining places, the voting being restricted to the candidates obtaining the greatest number of votes in the previous ballot, to a number not exceeding twice the number of places remaining to be filled.
- (5) If necessary, in order to determine the candidates to participate in a restricted ballot, an eliminating ballot may be taken restricted to the candidates having obtained the same number of votes in the previous ballot.
- (6) If, in the final ballot or an eliminating ballot, two or more candidates obtain the same number of votes, the Chairperson shall decide between them by drawing lots.
27. Equally divided votes
If a vote is equally divided on matters other than elections, the proposal shall be registered as rejected.

XII. Special procedures

28. Special consultation by correspondence
Should the approval of the Council be required for measures of exceptional urgency and importance while the Council is not in session, the chairperson may, by means of the Secretariat, consult the members by correspondence. The proposed measures shall be adopted if it is approved by two-thirds of the members.

XIII. Amendment

29. Amendment
These rules of procedure, except where they reproduce provisions of the Council Statutes or decisions of the General Conference, may be amended by a decision of the Council taken by a simple majority of the members present and voting, provided the proposal for amendment has been placed on the agenda.
30. Suspension
Suspension of any of these rules shall require a two-thirds majority of the members present and voting.

ANNEX 4

Water-related Centres under the auspices of UNESCO

CATEGORY 2 CENTRES	COUNTRY	ESTABLISHMENT
International Research and Training Centre on Erosion and Sedimentation (IRTCES)	CHINA	1984
International Research and Training Centre on Urban Drainage (IRTCUD)	SERBIA	1989
Regional Humid Tropics Hydrology and Water Resources Centre for South-East Asia and the Pacific (HTC)	MALAYSIA	1999
Regional Centre for Training and Water Studies of Arid and Semi-arid Zones (RCTWS)	EGYPT	2001
Regional Centre on Urban Water Management (RCUWM)	IRAN	2002
International Centre on Qanats and Historic Hydraulic Structures (ICQHS)	IRAN	2005
IHP-HELP Centre for Water Law, Policy and Science (IHP-HELP)	UK	2005
Water Centre for Arid and Semi-arid Zones of Latin America and the Caribbean (CAZALAC)	CHILE	2006
International Centre for Water Hazard and Risk Management (ICHARM)	JAPAN	2006
European Regional Centre for Ecohydrology (ERCE)	POLAND	2006
Regional Centre on Urban Water Management for Latin America and the Caribbean (RCUWM-LAC)	COLOMBIA	2007
Regional Centre for Shared Aquifer Resources Management (RCSARM)	LIBYA	2007
International Centre of Water for Food Security	AUSTRALIA	Approval by the 34 th session of the UNESCO General Conference, 2007
International Centre on Hydroinformatics for Integrated Water Resources Management (ICHIWRM)	BRAZIL & PARAGUAY	Approval by the 34 th session of the UNESCO General Conference, 2007
Regional Centre for Water Management Research in Arid Zones (RCWMRIAZ)	PAKISTAN	Approval by the 34 th session of the UNESCO General Conference, 2007
International Centre for Education, Capacity Building and Applied Research in Water (HIDROEX)	BRAZIL	2009
International Centre for Integrated Water Resources Management (ICIWaRM)	USA	2009
Centre for the Sustainable Management of Water Resources in the Caribbean Island States (CEHICA)	DOMINICAN REPUBLIC	2010

CATEGORY 2 CENTRES	COUNTRY	ESTABLISHMENT
International Centre on Coastal Ecohydrology (ICCE)	PORTUGAL	2010
Asia-Pacific Centre for Ecohydrology (APCE)	INDONESIA	2011
International Groundwater Resources Assessment Centre (IGRAC)	NETHERLANDS	2011
Central Asian Regional Glaciological Centre (CARGC)	KAZAKHSTAN	2012
Regional Centre for Integrated River Basin Management (RC-IRBM)	NIGERIA	2012
Regional Centre on Groundwater Resources Education, Training and Research in East Africa (RCGRE)	KENYA	2013
Centre for Water for Sustainable Development and Adaptation to Climate Change (WSDAC)	SERBIA	2013
Regional Centre on Capacity Development and Research in Water Harvesting (RCWH)	SUDAN	2013
International Centre for Water Security and Sustainable Management at the K-Water Institute (IWSSM)	REPUBLIC OF KOREA	Approval by the 37 th session of the UNESCO General Conference, 2013
African Centre for Global Change and Water Research (ACGCWR)	SOUTH AFRICA	Approval by the 37 th session of the UNESCO General Conference, 2013
International Centre on Water Resources and Global Change (ICWRGC)	GERMANY	2014
International Centre for Water Cooperation (ICWC)	SWEDEN	2014
Regional Centre for Groundwater Management for Latin America and the Caribbean (GW-LAC)	URUGUAY	2014

ANNEX 4

List of UNESCO Water Chairs

UNESCO CHAIR	UNIVERSITY OR INSTITUTE	COUNTRY	ESTABLISHMENT
UNESCO Chair in Global Environmental Changes	University of Quebec, Montreal	CANADA	1992
UNESCO Chair in Water Resources	Omdurman Islamic University	SUDAN	1994
UNESCO Chair in Sustainable Water Resources Management	Hassania School of Public Works	MOROCCO	1998
UNESCO Chair in Geohydrology	University of the Western Cape	SOUTH AFRICA	1999
UNESCO Chair in Wadi Hydrology	University of Jordan	JORDAN	1999
UNESCO Chair in Water in Desert and Arid Zones	Al-Fateh University, Tripoli	LYBIA	2001
UNESCO Chair in Water Resources	Irkutsk State University	RUSSIAN FEDERATION	2001
UNESCO Chair in International Network of Water-Environment Centres for the Balkans on 'Sustainable Management on Water and Conflict Resolution'	Aristotle University of Thessaloniki	GREECE	2003
UNESCO Chair in Applied membrane sciences for environment	Ecole Nationale Supérieure de Chimie de Montpellier, Institut Européen des Membranes, Montpellier	FRANCE	2004
UNESCO Chair in Water Resources Sustainability	University of San Carlos	GUATEMALA	2005
UNESCO Chair in Water, Women and Development	Federal University of Ouro Preto	BRAZIL	2006
UNESCO Chair in Water, Women and Decision-making	Ivorian Center of Economy and Social Research (CIRES), Abidjan	CÔTE D'IVOIRE	2006
UNESCO Chair in Water, Women and Decision-making	University Al Akhawayn, Ifrane	MOROCCO	2006
UNESCO Chair in Sustainable Groundwater Management	University of Tsukuba, Ibaraki and Institute of Geo-ecology, Mongolian Academy of Sciences, Ulaanbaatar	JAPAN & MONGOLIA	2007
UNESCO Chair in Water Management	University of Bangui	CENTRAL AFRICAN REPUBLIC	2008
UNESCO Chair in Water in the Knowledge Society	Instituto Mexicano de Tecnología del Agua	MEXICO	2008
UNESCO Chair in Women, Science and Reasoned Water Management in West Africa	University of Lomé	TOGO	2009
UNESCO Chair in Hydrological Change and Water Resources Management	RWTH Aachen University	GERMANY	2010

UNESCO CHAIR	UNIVERSITY OR INSTITUTE	COUNTRY	ESTABLISHMENT
UNESCO Chair in Water Resources Management and Ecohydrology	Water Problem Institute of the Russian Academy of Sciences	RUSSIAN FEDERATION	2010
UNESCO Chair in Water Economics and Transboundary Water Governance	Australian National University. The Global Water Forum initiative	AUSTRALIA	2010
UNESCO Chair in Hydroinformatics for Ecohydrology	Capital Normal University	CHINA	2011
UNESCO Chair in Sustainable Water Services	Tampere University of Technology	FINLAND	2012
UNESCO Chair in Water and Environment Management for Sustainable Cities	Sharif University of Technology	IRAN	2012
UNESCO Chair in Ecologically Sustainable Development	University of Belgrade	SERBIA	2012
UNESCO Chair in Water Access and Sustainability	University of Cincinnati	USA	2013
UNESCO Chair in Water and Education for Sustainable Development	Universidad Nacional del Litoral	ARGENTINA	2013
UNESCO Chair in Water Resources Management and Culture	University for Foreigners in Perugia	ITALY	2013
UNESCO Chair in Water and Culture	Faculty of Humanities and Education, University of the Republic (UDELAR)	URUGUAY	2013
UNESCO Chair in Integrated River Research and Management	University of Natural Resources and Life Sciences	AUSTRIA	2014
UNESCO Chair in Water Reuse	University of Tehran	IRAN	2014
UNESCO Chair in Knowledge Systems for Integrated Water Resources Management	COMSATS Institute of Information Technology	PAKISTAN	2014
UNESCO Chair in Water, Women and Governance	Instituto Global de Altos Estudios en Ciencias Sociales (IGLOBAL), Santo Domingo	DOMINICAN REPUBLIC	2014
UNESCO Chair in Environmental History: Water and Indigenous Peoples	University of Arizona	USA	2015

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THE INTERNATIONAL HYDROLOGICAL DECADE, THE BEGINNING OF IHP AND SISTER INITIATIVES

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“Water is the driving force of all nature.”

Leonardo da Vinci

UNESCO is proudly celebrating its 70th anniversary as well as the 50th anniversary of its water programmes.

The International Hydrological Programme (IHP) is the only intergovernmental programme of the UN system devoted to water research, water resources management, and education and capacity development.

Since the inception of the International Hydrological Decade in 1965, the cooperation has evolved from an internationally coordinated hydrological research programme into an encompassing, holistic programme to: mobilize international cooperation to improve knowledge and innovation to address water security challenges; strengthen the science-policy interface to reach water security at local, national, regional, and global levels; and facilitate education and capacity development in order to enhance water resources management and governance.

Today, IHP facilitates an interdisciplinary and integrated approach to sustainable watershed and aquifer management, which incorporates the social dimension of water resources, and promotes and develops international research in hydrological and freshwater sciences.

This volume constitutes the reference document on this historical jubilee of UNESCO and the IHP. It will tell the story and past achievements of the cooperation, and will present options for the desired future of IHP.

