

# **IAHR, IHP AND THE WATER WORLD: PARTNERSHIP AND CHALLENGES.**

## **KEYNOTE ADDRESS**

### **XII<sup>TH</sup> CONGRESS OF IAHR/APD**

*Bangkok, Thailand, 13-16 November 2000*

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Mr. Chairman, Ladies and Gentlemen, Dear Colleagues and Friends,

Let me start my presentation with a few personal remarks. First of all, I would like to thank the organizers of this Congress who invited me to deliver this address. It is very rewarding to be back, among former colleagues and students in Southeast Asia. My friends and colleagues like Prof. Ashim Das Gupta know that I consider Thailand as my second home country. But being here at an IAHR/APD Congress is also a ‘homecoming’ of a different type. While at AIT in the second half of the eighties I attended the Seoul and Kyoto Congresses of IAHR/APD. I am also a member of IAHR since 1977. Recently I was invited to serve on its Section of Education and Professional Development. IAHR is for me not only a scientific, but also a family association as my father was vice-president in the seventies and then, till his recent death honorary member of IAHR. Thus talking to you is both a privilege, and at the same time also an obligation. A duty of a ‘family member’ to do what he can for the welfare of his family. Therefore I decided to use the opportunity

of this keynote address for an appeal, rather than to present a scientific talk. I want to appeal to your hearts and minds, but I also want to touch the ‘institutional conscience’ of the association.

At present I am working at UNESCO, the United Nations Educational, Scientific and Cultural Organization. Thus after having been an active researcher I belong now to the group of international research organizers and facilitators, implying to manage and to justify research. A task almost more demanding than doing it. This double background is needed to carry a credible message to you on:

What is the role of water science at the turn of the millennium?

What are the issues we are facing today?

What is relevant water research?

How can IAHR as an association and its members as individuals contribute?

What can an international world science organization like UNESCO do?

Many justified questions and I shall attempt to give some answers.

UNESCO provides the Secretariat for the International Hydrological Programme (IHP), which is the only freshwater-related science and scientific educational programme of the UN System. It represents the water related services and science community of the Member States. Therefore it is a fair statement that IHP’s medium range science programme of the respective 6-year-long phase aptly reflects the research needs and issues concerning freshwater as seen by these services. IHP, which grew out of the IHD 1965-1974, has a long history. A history of partnership, also with IAHR, but also a history of adaptation. At present we are implementing the Vth Phase ‘Hydrology and Water Resources Development in a Vulnerable Environment’(1996-2001). Preceded by the IV<sup>th</sup> Phase: ‘Hydrology and Water Resources for Sustainable Development in a Changing Environment’. In 13 months time, the sixth phase will be launched: ‘Water Interactions: Systems at Risk and Social Challenges’. The evolution of the programme from pure scientific hydrology towards hydrology and its symbiosis with what is called Water Resources

Management (WRM) is obvious. IHP is not alone to face and to shoulder challenges in water science. Most of you are members of IAHR, thus I do not need to introduce the association to you. But the River List Internet discussion platform on the great issues of river engineering for the XXIst Century initiated by Profs. Bettes and Knight might not be known to everybody. Let me display this evolving list of river engineering problems which should be solved in this century.

Table 1. "Top Twelve" Problems in River Engineering in the XXIst Century.

1. Flow resistance and resistance coefficients for channels of arbitrary shape
2. Representation of turbulence
3. Determination of the discharge coefficient for a structure of arbitrary shape
4. Prediction of the movement of solid particles in turbulent flow. Note that this includes both steady and unsteady sediment transport, bed load, suspended load and wash load
5. Prediction of local and general scour
6. Theory or theories for fluvio-morphology. This includes both plan form and geometry of stable alluvial channels
7. Analytical solutions to the Navier-Stokes equations
8. Suitable strategies for modelling overbank flow in natural rivers with floodplains
9. Development of methods for integrated river basin management. Note that this includes but is not limited to floods, water resources, quality and ecology
10. Development of an approach that quantifies the link between the hydraulics and channel morphology of a river as well as the ecology of the river
11. Development of measurement techniques at all spatial and temporal scales, particularly during floods
12. Strategies for raising the awareness of society to the value of river engineers

This is an astonishing list. A part of it reads like the table of content of a standard textbook on river engineering, since virtually all and every aspect should be revisited as we still miss ultimate scientific answers. But the list contains a few challenges

well beyond the realm of river engineering. We face issues we are unable to solve within IAHR or even within the scientific community alone. Water science is doomed to leave its cocoon.

When I analyzed the development of the scope and mandate of IHP and IAHR, I discovered parallel tracks. I see our common roots, “the unity of purpose” of IHP and IAHR to cultivate science and disseminate scientific results. I sense the “unity of challenge”, the looming water crisis we both face and our common task to ensure the appropriate role of water science in responding to this crisis. These similarities gave me the idea to talk today about:

IAHR, IHP and the Water World:

Partnership and Challenges.

After these remarks I hope it is obvious that I consider IHP and IAHR as traditional partners. We always had our common challenge: to do science and to do it always better. We feel that both of us are “well established” citizens of the “Water World”, this miraculous sphere composed of the hydrological cycle - defined in its broadest sense – and the intellectual cycle of those who know, manage but also share and care for it.

The "Water World"



Figure 1

This "Water World" is not a playfield of IHP and IAHR alone. It is full of professional and "lay" stakeholders having not only diverging views and convictions, advocating different approaches but also having entirely different perception of water and water problems. Most of them do not see a river as a sequence of intriguing hydraulic phenomena, but rather as a source of life, part of their own life. For them a river is not subject of scientific scrutiny but something with utility and even with a "soul".

Let me recall the closest example. The Chao Phraya River – just a few kilometers away - is affectionately called by the Thai people "Mae Nam", Mother Water.

Those who have abundant water may also appreciate water for its scenic value. The USGS Website for children features the question: which form of water do you find most beautiful? The overwhelming response is "waterfalls". Well, needless to say that this young stakeholders did not mean that the overfall is exciting because of the

extreme curvature of the water surface, that the critical water depth is reached, flow is turning hypercritical and then you observe the free fall and energy dissipation in the plunge-pool. It is simply beautiful for them.

Can we change this view?

Should we change this perception?

Certainly not. The challenge however is for us to help them relate this beauty and utility of water to physics. We have to let people feel that they need to know more than simply adoring, admiring, using or even wasting water. Water science and water professionals should become interactive with other members of the stakeholder community of the Water World. We have to convince the broad public and the political decision-makers alike that the water professionals are good custodians of the science, development, utilization, protection and sharing of water.

It is generally claimed that there is no sustainable solution without stakeholder participation. We have to observe social, cultural, economic values. Gender, age and politics are all relevant as far as water management is concerned. However there is no sustainable solution without water science either. Being at the conference of IAHR; the venerable association for hydraulic research and engineering I mean first of all hydraulic research, the physics of water movement, but it also implies interdisciplinarity of the scientific approach. We have to realize that those stakeholders who claim to represent the public are more aware of and critical towards the shortcomings of the previous “technocratic” approaches in Water Resources Management than being aware that their own involvement should be an addition to form a holistic approach rather than a replacement of science and engineering.

There is no doubt that the broad interpretation of “stakeholders of the Water World” carries a number of challenges to the scientific/professional community. What should IAHR do to make itself ready to face the “new” challenges? Internal debates on the

raison d'être, mandate and a Work Programme are essential elements in this process.

The decision of the XXVIII<sup>th</sup> Congress of IAHR in Graz, Austria, to change the name of IAHR by adding "Engineering" to it can be interpreted as a step towards the right direction. Basic research and applied research must go hand in hand. Applied research is often the "visible" part of science. It has the task to convince the public, donors and decision-makers. Applied research is challenged more directly by the actual problems formulated by society. The search for the appropriate solution of a "real world problem" is often triggering basic research. We may visualize this process within IAHR as "closing the gap" between theory and practice.

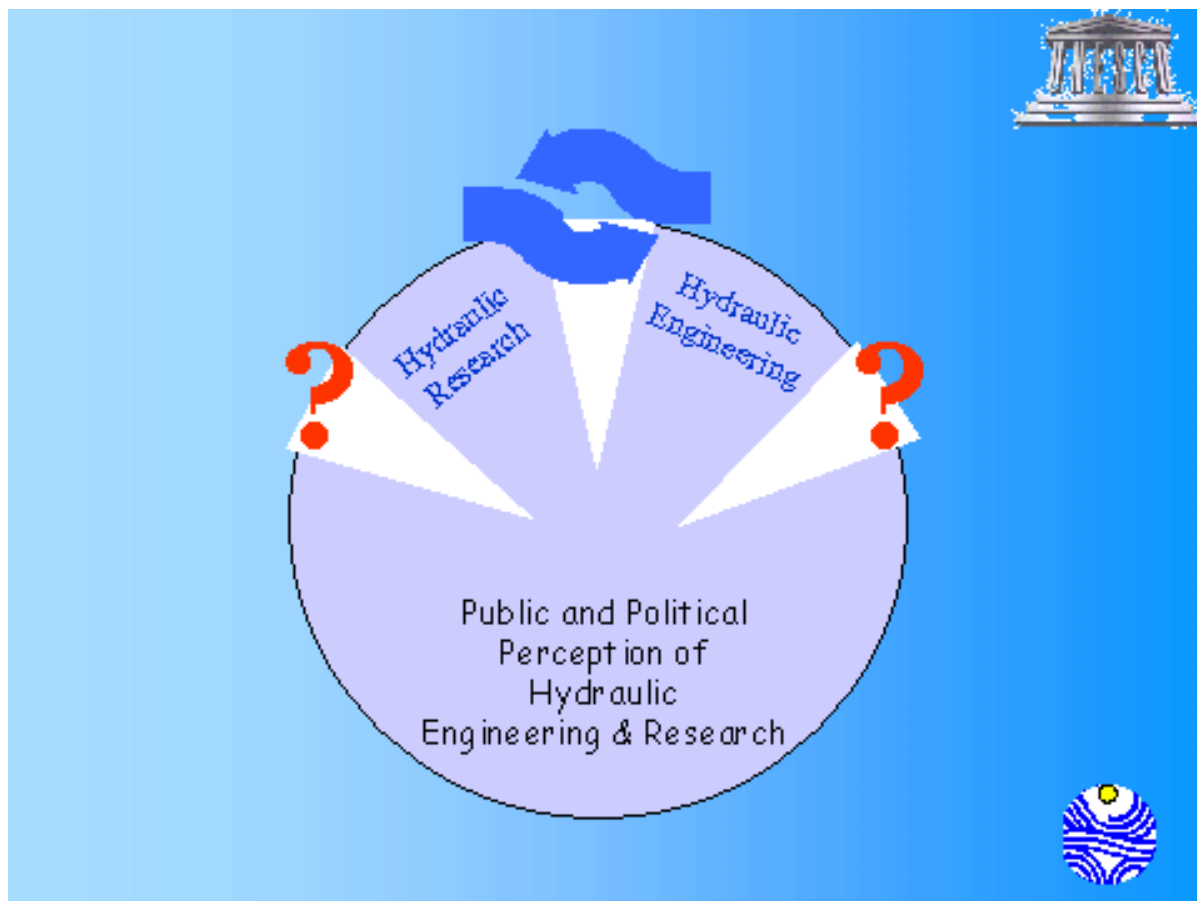


Figure 2

Yet question marks still remain, how far the public and political perception of hydraulic research and engineering changed? As a parallel I may also refer to long conceptual debates in our governing organ, the IHP Intergovernmental Council on how far should IHP "venture" beyond the limits of the "classical scientific" hydrology.

Some colleagues, even among those who are in the forefront of the paradigm change in water resources management to incorporate the principle of sustainability and to implement the concept of integrated water resources management would like to have IHP as the “last refuge” of pure scientific hydrology. I am sure that the number of IAHR faithful is not negligible, who would favor a purely hydraulic research focussed association. But there are no “last refuges”, no “reserves” and certainly no academic ivory towers any longer. Thus besides our efforts to rectify the public perception and image of water science, there is also need for an “internal” conviction to change scope and to address the actual issues.

Sustainability issues, environmental awareness, ecological concern precipitate in scientific challenges. A generation ago, no one imagined that a term like “ecohydraulics” would be coined. Today there is already a Section of IAHR that addresses these issues. Like IAHR with its Section Ecohydraulics, UNESCO IHP has addressed in its present phase the growing ecological concern of the “Water World”. The respective project “Ecohydrology in surficial (water) environment” does not only address the inherent scientific problems but it contributes to the gradual amalgamation of the disciplines hydrology and ecology to become a new scientific (inter)discipline.

But let me move beyond this example. We have to acknowledge that there is more than the need for ecology and hydrology to come together. There are more artificial disciplinary divides to be abolished. I refer in this regard to the very core divide of the traditional water sciences, the “split” between hydrology and hydraulics. Let me interpret from now on hydrology in the broadest possible sense as the “science of water”.

In “this” hydrology, the major scientific issue is to address scale problems. Observed and experimental data from point measurements and from plot size water balances should be extrapolated to basin scales and further to match results from global circulation models. What intrigues me in this regard is the often forgotten scale

transition problem, which is inherent between the so-called hydraulic and hydrological approaches. Hydrometry, the measurement of water, the basis to collect information for water resources assessment and management cannot be imagined without hydraulics. Nowhere else is more evident this artificial split than in the case of flood routing. Numerical solutions of the de Saint-Venant equations, or hydrological flood routing techniques like Muskingum or Kalinin-Milyukov methods are differing because they give answer to different questions, at different time and spatial scales and with different accuracy requirements although they both could be derived from the de Saint-Venant equation through a series of simplifications.. There is no different physics behind hydraulics and hydrology. Besides the great interdisciplinarity and social changes, emanating from society's needs and perception we have also our own "internal" scientific challenges.

Thus, how can we insist on holistic, interdisciplinary scientific approaches to solve water and water-related problems when we seemingly do not even have the "integrated water scientists"? Both IAHR and IHP are caught here in a dilemma.

How can we endorse and enter into interdisciplinary studies formed around water, linking not only water with ecology but law, administration, sociology, economy, gender issues or even politics, diplomacy, finance, history and ethics, when we need first of all the expert being well aware of and comfortable simultaneously with all aspects of the classical disciplines of water science: hydrology and hydraulics in the atmosphere, on the surface and underground.

Irrespective of all other important aspects, the integrated approach to water problems should imply first of all the comprehensive consideration of the hydrological cycle. True interaction with other sectoral concerns and their respective scientific disciplines could only be pursued on the basis of solid knowledge of the occurrence and movement of water in all natural and artificial compartments it passes through. We need a modern mixture of the traditional hydraulician and hydrologist the "HYDRAULOGIST".



Figure 3

While calling for it we have to answer the question: Can we afford to have this ‘Hydraulologist’? No doubt, to nurture it within reasonable time is an education challenge. Do we have a market for it? But with the same rigor the question whether “can we afford not to have it?” has to be answered as well.

Our traditional partnership, the unity of purpose and challenge of IAHR and IHP is not an empty slogan in this regard. There has always been place for hydraulics and IAHR in the International Hydrological Programme, and vice versa. IAHR is growing in its scope for addressing hydrological and water resources management problems. Nowhere else can it be demonstrated better than in the area of Water-Education and Training. I may refer to our support of the very successful IAHR/IHP Lecturer Scheme, which enabled leading scholars from the hydraulic research community of IAHR to teach in academic institutions in developing countries. This scheme could be developed even further. We may pursue the idea to create a

UNESCO Chair together with IAHR, a visiting professorship to assist universities all over the world to substantiate the scientific challenge, to develop the study programme of the ‘hydraulist’. The already functional IAHR Graduate School for Hydraulics can be seen as a possible framework for this chair”.

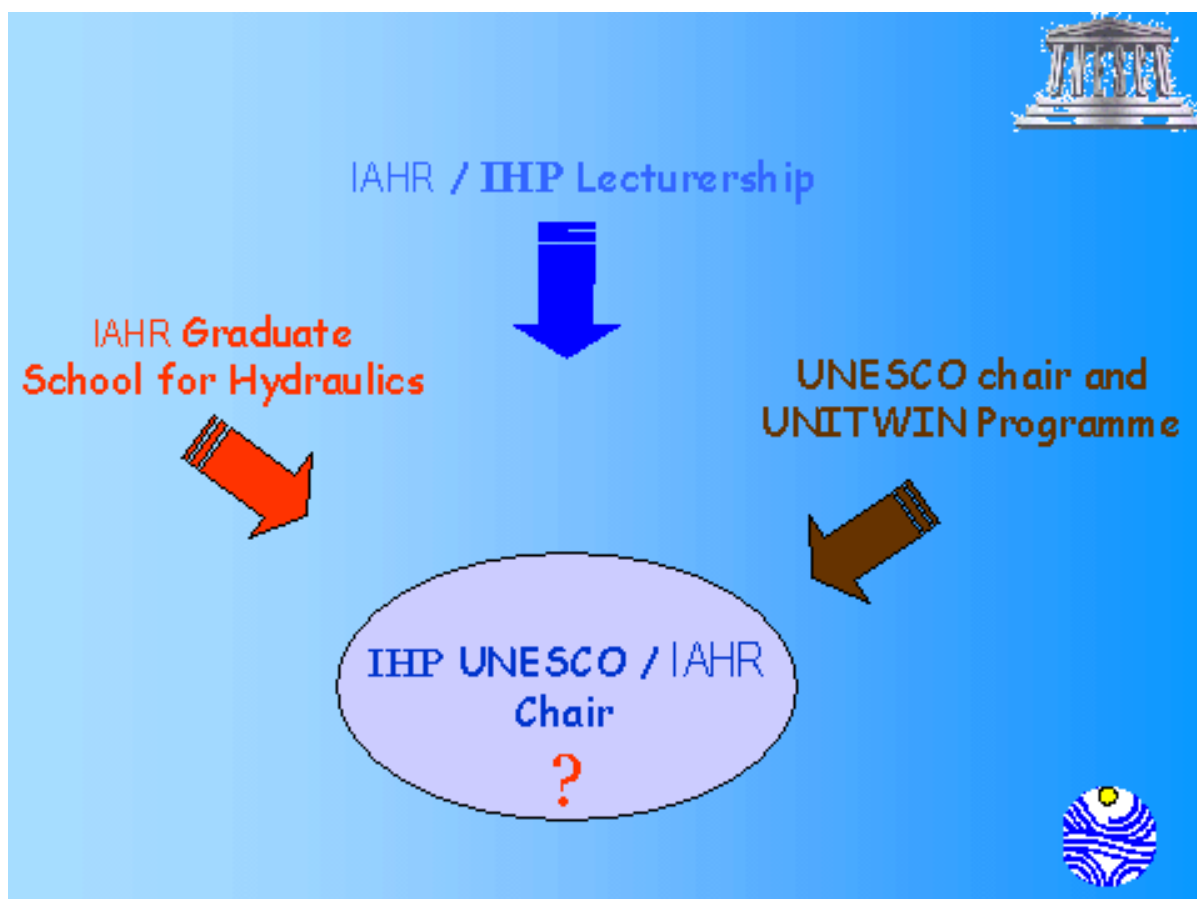


Figure 4

But beyond the direct IHP-IAHR link IAHR may also consider to form “permanent partnerships” if not outright merger with fellow scientific/technical NGOs. The recent unification of IWSA (International Water Supply Association) and IAWQ (International Association for Water Quality) to form the powerful IWA (International Water Association) sends a clear strategic message in this regard. Both IHP and IAHR need a clear strategy, a clear message but also the critical mass to carry this message to those whom it may concern.

Ladies and Gentlemen,

I referred in my presentation to the “Water World”, the environment within which both IAHR and IHP act and interact. Let me attempt to characterize this “Water World” at the turn of the Millennium. The most comprehensive picture emerges from the Long Term Vision for Water, Life and the Environment (short the World Water Vision), which was compiled in the last two years and presented to the 2<sup>nd</sup> World Water Forum in March 2000 in The Hague. This event, with more than 5500 registered participants and 80 parallel sessions was a real landmark. The Forum was the culmination of a, so far unprecedented, massive public awareness campaign, with its climax, the associated Ministerial Conference and its Statement. Let me analyze these in a few words. All scientific, technical NGO’s like IAHR, but also science programmes like IHP should scrutinize their scope, practices, results and impacts, to check their relevance, to identify their “niche” and map their strategies and collaborative alliances by reflecting on the Vision and Forum documents.

Water is now high on the international political agenda. Finally, it may be as high that it slipped away from the usual horizon of the hydraulic and hydrological research community and their research projects. The urgency to face and to counter act on the perceived water crisis, not to tolerate any longer that 3 billion people has no adequate sanitation, that more than 1 billion people has no safe water supply, that well over 3 million people, mainly children die annually in water-related diseases was underlined by statements like: we know enough, we have enough data, stop talking, act NOW!

Undeniably no scientific meeting has ever opened directly new sources of water. Scientists and delegates never went out to dig canals or lay pipes as a technical excursion of a conference, but it is us, the hydraulic engineers, scientists and water experts, know best how to do it. There is no water management without the aggregate wisdom of water professionals. I claim it for all of us with pride and determination. But with the honesty of a scientist we have to admit that we also know best how little we really know.

Maybe this scientific modesty, the lack of assertiveness and lobbying of professionals, which lead to a certain discreditation of water science and engineering in particular. The prevailing intellectual environment of the “Water World” entails deep contradictions. On the one hand it is advocated that innovative approaches are needed, that the solutions of the world’s water problems are not quick technical fixes, while there are loud voices claim that there is sufficient knowledge and data available to rely on. While water is on the political agenda and humanity’s water awareness is on the rise, funding for water related research and education is on the decline. It is also not an exaggeration to claim that hydrological observation networks in crucial parts of the world are generally in a worse shape now than 20 or 30 years ago. This is our “biased Water World”.

The Ministerial Conference in The Hague in March 2000 meant to explore new avenues to seek the dialogue of political decision-makers with the stakeholders of the Water World. With reference to the above contradictions it might not be astonishing that water professionals were not considered originally as stakeholders. Finally a single representative of the water professionals and science got the chance to address in five minutes the assembly of ministers next to stakeholder representatives of gender, the youth, grassroot NGOs, trade unions, and the business community. The dialogue in caucusses with the ministers remained limited to these “new stakeholder” groups.

The World Water Vision consultation and the subsequent Forum stood under the motto: “Water is everybody’s business”. Yes! But first of all it is your business! It is our business! What did we do wrong that even the notion, to seek solutions, while excluding the water professionals and science community could be germinated? One is for sure! Water is indeed everybody’s business. Even more: everybody’s life. Those, whom I just called “new stakeholders”, are really stakeholders. We have an obligation to involve them.

Ladies and Gentlemen,

I always admired IAHR conferences, where world-class scientists exchanged views on turbulence models, sediment transport theories or stratified flow phenomena. Laboratory research and complicated mathematical models were worshipped. But did we make enough effort to explain to the outside world to political decision makers, to the new stakeholders, to young people why turbulence modeling should be developed, why do we need sediment transport theories, what is the importance and consequence of stratification, to mention but a few hot topics of hydroscience! Why should research be funded, why should observations be carried out in nature on large scale? Why should we continue to gather knowledge while simultaneously embarking on actions as well?

We have to acknowledge that the Vision and the Forum revealed a credibility gap. We are all challenged to close it. Thus my analysis of the Vision and the Forum (both of which I was part of) is not that of critics. It is rather my impression that the professional and scientific community of the Water World has to develop strategies how to recapture the leadership in the debate. Water professionals always implement societal mandate. Now that many previous water development projects are regarded as “unsustainable”, professionals, who built and managed them, are considered responsible. No one questions the wisdom of former social aspirations instead. Water professionals do need to polish up their image. We may have to forget a bit about “water details” in order to be able to talk about “water issues”. To strike this balance right is certainly one of the strongest challenges faced by this association.

What are the prevailing water issues at the turn of the millennium? The Ministerial Declaration of The Hague summarizes the main water related challenges. It is a fair assumption that this negotiated international document, accepted by 120 ministers and delegations from all over the world reflects the current “public perception” of water problems and thus defines the “political environment” within which, both IAHR and IHP have to act. The key statement is “Water Security” for the 21<sup>st</sup> Century. An appealing slogan, since no one is against security. This term is

interpreted in its multiple dimensions:

Table 2. Key Elements of Water Security for the 21st Century (Issues Defined by the Ministerial Conference March 2000)

- Meeting basic needs (water supply, sanitation, health)
- Securing the food supply (equitable allocation of water for food)
- Protecting the ecosystems ( integrity and sustainability)
- Sharing water resource (between different users and between different states)
- Managing risks (floods, droughts, pollution..)
- Valuing water (economic, social, environmental, cultural, including “careful” (socially cushioned), pricing)
- Governing water wisely (good governance and stakeholders involvement)

We may subdivide these seven attributes of “Water Security” into two categories, that of the first three ones describing and “politically” prioritizing the legitimate water demands and the remaining four highlighting the “how’s of water resources management. It is not to oversee that the three underlined ones, out of these four categories: Sharing, Managing, Valuing, Governing are almost entirely beyond the classical domain of hydraulic research and engineering.

The Ministerial Declaration is rich in defining priority issues and steps to meet the above outlined challenges. I will only mention those, which seem to be relevant with respect to IAHR. It is worth to analyze these as no progress can be achieved without substantial and well co-ordinated research efforts to derive solutions for these priority problems.

Integrated Water Resources Management (IWRM) was adopted as the framework for actions to be taken. IWRM is defined as the approach taking into accounts social, economic and environmental factors and integrating surface water, groundwater and the ecosystems through which they flow. Quantity and quality aspects are to be

considered. I recall at this point agenda item 9 from the list of the 12 top priority research areas of IAHR's "River List" Forum (See Table 1.).

"Water Security" and the sustainable management of water resources are treated as synonymous. Collaborative partnerships across the whole society and coherent institutional policies to counteract fragmentation of the sector are called for.

The Ministerial Declaration reiterates the decision of the Commission of Sustainable Development of the UN to call on the UN System, its specialized agencies and programmes to develop appropriate indicators and periodically reassess the state of the freshwater resources as well as to document it in biennial World Water Development Reports.

I am happy and proud to report that a generous funds-in-trust contribution of the government of Japan enabled UNESCO to take the lead, to provide the Secretariat for this interagency programme, which is developing into the World Water Assessment Programme. Needless to say that IAHR is more than welcome to contribute.

The Ministerial Declaration realizes the need for a new strong "water culture" to be developed through the co-operation of all stakeholders.

"Best practices" are to be identified through enhanced research and knowledge generation, knowledge dissemination and sharing among individuals, institutions and societies. This includes not only technology transfer and capacity building in developing countries but also strengthening humanity's capability to cope with the water related disasters.

Ladies and Gentlemen,

There is a clear, albeit implicit, invitation to the scientific, technical NGOs,

research institutes and universities. Every and each of us within IAHR and IHP are called upon to give appropriate substance to, what is called “best practices”.

I am very pleased to tell you that IAHR is already on the right track and moves towards broader visibility, to contribute with expertise and resolve to the ongoing global water debate and to shape the new “water culture”. Last month in Maputo, Mozambique IAHR and the Preparatory Secretariat for the 3<sup>rd</sup> World Water Forum (to be held in Japan in 2003) co-organized, together with the National Water Directorate of the host country an international conference on floods. The devastating inundation earlier in this year in Mozambique and in Southern Africa gave particular actuality to this conference. This event which incorporated a regional meeting between ministers of water affairs and experts is an excellent example of the dialogues needed between political decision makers and water professionals. IAHR invited UNESCO’s IHP to be represented and to contribute to the Mozambique Conference. It was one more example of our fruitful partnership.

Both IHP and IAHR have to face the political and social realities of the Water World and have to find proper interfaces to shape and be part of the mainstream development to address the actual water issues through research but also education and awareness raising. Let me relate the Plan of UNESCO IHP’s emerging VIth Phase with the seven attributes of “Water Security for the 21<sup>st</sup> Century” as stipulated by the Ministerial Declaration.

The title of the VIth Phase:

“Water Interactions:

Systems at Risk and Social Challenges”

hits the same “cords”, even though the idea of IHP-VI lead theme was conceived more than 2 years ago. But a science programme should not be satisfied, even if its “predicts” or “reflects” tendencies prevailing in the Water World. We have to identify and address “white spots” in the map of our knowledge.

IHP-VI's thrust is structured into 5 core themes, strengthened by two cross-cutting-programme components FRIEND (Flow Regimes from International Experimental Network Data) and HELP (Hydrology for Life Environment and Policy) and an interagency Joint International Isotopes in Hydrology Programme, (JIHP). Furthermore several initiatives, like SARM (Shared Aquifer Resources Management), IGRAC (International Groundwater Resources Assessment Center), the envisaged transfer of the well known International Institute for Infrastructural, Hydraulic and Environmental Engineering (IHE) in Delft to become the UNESCO Institute for Water Education and the WWAP (World Water Assessment Programme) will support and contribute to IHP-VI.

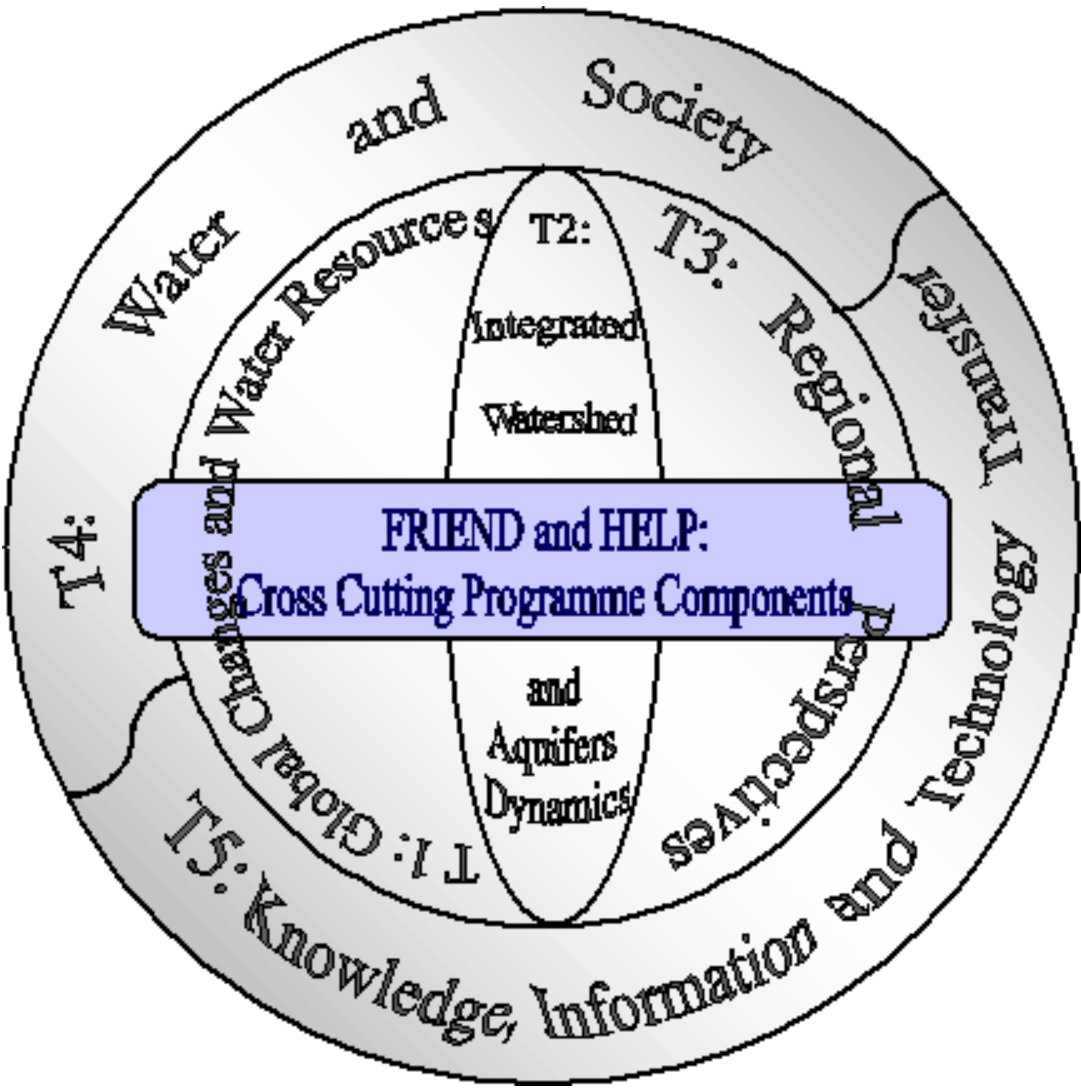


Figure 5.

The 'Hydroglobe' shows the relationship and structure of the five themes.

- § Global Changes and Water Resources
- § Integrated Watershed and Aquifer Dynamics
- § Land Habitat Hydrology
- § Water and Society
- § Water Education and Training

It reveals the hierarchical sequence from global through basin/aquifer to landform/land use scales as well as the embedding relevance of Water and Society and Water Education and Training for all other Themes. There are 21 Focal Areas identified to structure research efforts towards achievable scientific objectives.

Table 3. Overview of the Core Programme Themes of the Sixth Phase of IHP.

| <b>Global Changes and Water Resources</b>        |  |
|--|--|
| <b>Theme 1</b>                                   |  |
| Focal Area 1.1                                   | Global estimation of resources: water supply and water quality   |
| Focal Area 1.2                                   | Global estimation of water withdrawals and consumption   |
| Focal Area 1.3                                   | Integrated assessment of water resources in the context of global land-based activities and climate change |
| <b>Theme 2</b>                                   |  |
| <b>Integrated Watershed and Aquifer Dynamics</b> |  |
| Focal Area 2.1                                   | Extreme events in land and water resources management  |
| Focal Area 2.2                                   | International River Basins and Aquifers  |
| Focal Area 2.3                                   | Endorheic Basins   |
| Focal Area 2.4                                   | Methodologies for integrated river basin management  |
| <b>Theme 3</b>                                   |  |
| <b>Land Habitat Hydrology</b>                    |  |
| Focal Area 3.1                                   | Drylands   |
| Focal Area 3.2                                   | Wetlands   |
| Focal Area 3.3                                   | Mountains  |
| Focal Area 3.4                                   | Small islands and coastal zones  |
| Focal Area 3.5                                   | Urban areas and rural settlements  |
| <b>Theme 4</b>                                   |  |
| <b>Water and Society</b>                         |  |
| Focal Area 4.1                                   | Water, civilization and ethics   |
| Focal Area 4.2                                   | Value of water   |
| Focal Area 4.3                                   | Water conflicts – prevention and resolution  |
| Focal Area 4.4                                   | Human security in water-related disasters and degrading environments                                       |

|                |  |
|----------------|--|
| Focal Area 4.5 | Public awareness raising on water interactions               |
| <b>Theme 5</b> | <b>Water Education and Training</b>                          |
| Focal Area 5.1 | Teaching techniques and material development                 |
| Focal Area 5.2 | Continuing education and training for selected target groups |
| Focal Area 5.3 | Crossing the digital divide                                  |
| Focal Area 5.4 | Institutional development and networking for WET             |

I will not want to go into a detailed description of this programme to be launched in 2002. But I want to refer back to this table as we review how water science should contribute to the solution of problems identified in the Ministerial Declaration. The following table plots the seven key “water issues” of this declaration against the five core themes and 21 focal areas of the IHP-VI Work Plan

Table 4. How Could Science Contribute to the Solution of Problems Identified in the Ministerial Conference

| <b>IHP-VI</b>                        | <i>Theme 1</i>                            | <i>Theme 2</i>                                   | <i>Theme 3</i>                | <i>Theme 4</i>           | <i>Theme 5</i>                      |
|--------------------------------------|---|--|-------------------------------|--------------------------|-------------------------------------|
| <b>Ministerial Declaration</b>       | <i>Global Changes and Water Resources</i> | <i>Integrated Watershed and Aquifer Dynamics</i> | <i>Land Habitat Hydrology</i> | <i>Water and Society</i> | <i>Water Education and Training</i> |
| <b>2<sup>nd</sup> WWF Key Issues</b> | (Focal Areas 1..)                         | (Focal Areas 2..)                                | (Focal Areas 3..)             | (Focal Areas 4..)        | (Focal Areas 5..)                   |
| <i>Meeting Basic Needs</i>           | R 1. 2. 3.                                | R 3. 4.  | 1 5<br>R 1. 3.                | R 1. 2. 3.<br>4.         | R 1. 2. 3.<br>4.                    |
| <i>Securing Food Supply</i>          | R2.                                       | R1. 3. 4.  | R 1. 3.                       | R 1. 2. 3.<br>4.         | R 1. 2. 3.<br>4.                    |
| <i>Protecting Ecosystems</i>         | R 3.                                      | 1 1. 4.  | 1 2. 3.<br>R 1. 4. 5.         | R 4. 5.                  | R 1. 2. 3.<br>4.                    |

|                                |        |                    |                    |                          |                  |
|--------------------------------|--------|--------------------|--------------------|--------------------------|------------------|
| <i>Sharing Water Resources</i> | R 3.   | 1 4.               |                    | 1 1. 2. 3.<br>R 5.       | R 1. 2. 3.<br>4. |
| <i>Managing Risks</i>          | R 3.   | 1 1. 2. 3. R<br>4. | 1 3. 5.<br>R 2. 4. | 1 4.<br>R 5.             | R 1. 2. 3.<br>4. |
| <i>Valuing Water</i>           |        | R 2. 4.            |                    | 1 2.<br>R 1. 3. 4.<br>5. | R 1. 2. 3.<br>4. |
| <i>Governing Water Wisely</i>  | R1. 3. | 1 2.<br>R 4.       | R 2. 3. 4.<br>5.   | 1 1. 3.<br>R 2. 4. 5.    | R 1. 2. 3.<br>4. |

1 Explicit relevance; issues addressed by IHP-VI head on.

R Implicit relevance; IHP-VI provides scientific/educational background information and input.

**Symbol** followed by number of relevant Focal Area(s).

**11** Focal Areas address 6 Key Issues of the Ministerial Declaration explicitly (altogether 17 matches identified).

**All** Focal Areas provide background information and scientific input addressing all 7 Key Issues (altogether 80 identified matches).

(Altogether 97 matches out of 147 possible ones).

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The previous overview clearly demonstrates the Work Plan provides the framework and identifies most of the research areas to search for the appropriate answers.

Theme 4 “Water and Society” responds most comprehensively to all key elements of the Ministerial Declaration. Theme 2 is also thoroughly represented as it harmonizes the proper scale of management concern and scientific hydrological approach.

Except the very society oriented key issues: “Sharing Water resources” and “Valuing Water” all others are addressed by all Themes of IHP-VI. Water Education and Training plays as expected a thoroughly important, yet indirect role.

The combination of the seven key issues of the Water World and the 21 Focal Areas (subdivided into the five Themes) would yield 147 potential matches describing either explicit or implicit relevance of the respective research efforts. The analysis of the Work Plan of IHP-VI revealed 97 identified coincidences (both direct and indirect ones) proving that the IHP Phase VI will address the scientific aspects of the actual agenda of the Water World.

The present Work Plan incorporates the suggested contributions of IAHR. However the implementation of IHP-VI is still ahead of us. I am confident that both IAHR and IHP will further strengthen synergies and the coming years of the VIth Phase will see an increase of exciting joint activities reflecting our unity of purpose and challenge.

Thank you!