

**COMPREHENSIVE EVALUATION
REPORT
FOR THE FIFTH PHASE OF THE
INTERNATIONAL HYDROLOGICAL
PROGRAMME: "HYDROLOGY AND
WATER RESOURCES DEVELOPMENT IN
A VULNERABLE ENVIRONMENT"
(December 2003)**

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i. Preamble

Many parts of the world are facing a water crisis. This is despite the fact that there are numerous national and international initiatives underway, such as the International Hydrological Programme (IHP)—initiatives which are attempting to overcome this predicament. Nations in the Middle East and in parts of Africa and Asia currently experience considerable stress, because demand for water is outstripping the available resource. As the 21st Century unfolds, this situation will worsen, particularly but not exclusively in the developing world. Fuelled by population increase, coupled with mounting pollution and exacerbated by climate-altered hydrological regimes, the stresses will intensify and resources will become more strained over wider areas of the globe. At the same time flood risk is rising and the toll of death and destruction caused by floods and other water-related disasters is mounting. In these circumstances there can be no doubt that poverty is directly related to these stresses and strains on water. But water and humanity also face problems as serious in other areas of endeavour, such as those concerned with: the governance of water, its place in international politics, water and health and water and agriculture. And the world is facing a dilemma that, in general, the more water is used to meet human needs, the less there is for sustaining the environment—a dilemma addressed through the Fifth Phase of the IHP: “Hydrology and water resources development in a vulnerable environment”.

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1 EXECUTIVE SUMMARY

This Comprehensive Evaluation Report (CER) describes the process, the findings and the recommendations of the evaluation of the Fifth Phase of the International Hydrological Programme (IHP V) (1996 to 2001). The Report attempts to give a frank appraisal of the problems faced in the implementation of IHP V and an objective assessment of the results. It examines the parts played by UNESCO and its Division of Water Science and its Field Offices, the Intergovernmental Council of the IHP and its Bureau and the roles of national committees for the IHP, together with the aims and products of the eight Themes of the Programme. It is focused mainly at the global and Theme levels, but it also takes account of matters at the regional and project levels. The views of partner organisations and the conclusions and recommendations on the scientific aspects of IHP V reported at the Sixth Kovacs Colloquium are also reflected in the CER. The Evaluation Team was established in October 2002 and reported initially in May 2003, working to a plan contained in its Terms of Reference (TOR). The June 2003 session of the IHP Bureau considered the initial CER and asked for certain additions. This version incorporates these additions and certain other changes.

Since its launch in 1975, the IHP has been a collaborative programme, with 90% or more of the effort and resources being committed by Members, in a number of instances to international and regional activities, as well those meeting national needs. These are reinforced by inputs from other UN agencies, IGOs and NGOs. The Team did not attempt to measure the extent of these inputs. Indeed IHP V can be likened to an iceberg, with the major part of the activities taking place below the waterline nationally and not always visible from the international perspective. The UNESCO and IHP Secretariat roles are essentially catalytic, with a budget of over \$1million a year available over the 6 years to support IHP V. Of course much of hydrology and hydrological research is long term—the lag time of many of the results and benefits can be considerable—and the difficulties of making an evaluation become apparent. Furthermore IHP V did not incorporate a methodology to reveal its benefits directly: it was, of course, implemented before results-based management was instituted by UNESCO. Under these conditions this and future evaluations cannot be exhaustive.

Set against a background of purpose and methodology, this Report initially presents the analysis of responses to the Questionnaire on IHP V circulated to the IHP national committees of 163 Members and to ten UN bodies and agencies, IGOs and NGOs. The number of country responses (43) received by March 2003 was disappointing, particularly the number from developing countries and was taken as an indication that

many national committees are not effective. In addition there were five responses from the other bodies, sent Questionnaires. As the IHP Bureau requested, the Questionnaire was circulated several times more to Members in July and August 2003 and this increased the total number of responses to 86—a rate of 52%.

IHP V consisted of eight themes and the Questionnaire attempted to discover their impacts. While the aims and objectives of the eight themes were considered to be relevant to national water activities, these aims were only clearly achieved in the fields of groundwater (Theme 3) and capacity building (Theme 8). It was also apparent that only through these two themes was there a clear impact of IHP V on water activities and on the hydrological sciences. The impact of the other themes was less clear. Of the other respondents, WMO, IAH and IAHS considered the aims and objectives of all or certain of the eight themes highly relevant to their own activities. The responses from national committees showed that publications and training material were highly rated, except in Africa, probably because of difficulties of accessing them. IHP V had had some success in promoting international partnerships and of its organs, national committees were ranked as less efficient and effective, while the Bureau and the Council were considered to be reasonably efficient. African responses gave a lower mark to the effectiveness of the field office than other regions, probably because of communication difficulties. While the organisational structure and managerial support provided by UNESCO were thought to be effective, the budgetary provision was considered to have held back the progress of IHP V. The recommendations of the Kovacs Colloquium on the scientific results of IHP V are incorporated into this part of the Report.

Through a series of missions to national committees chosen to be representative of differing levels of development and involvement in the IHP and a range of hydrological conditions, the Team examined progress in the eight themes. As the June 2003 IHP Bureau requested, the missions to Australia and Indonesia aborted in February because of SARS, were undertaken in July 2003 and the results of these missions are included in the CER. In Theme 1, which dealt with global processes, the FRIEND Project was identified as a success for its decentralised structure, its contribution to data-sharing through the establishment of regional data bases and for its capabilities in transferring knowledge and skills. Certain of the other projects had also been fruitful, such as those concerned with climate/atmosphere/water relations. A number of notable publications had been released: the World Atlas of Snow and Ice and the Proceedings of the International Symposium “Water: a looming crisis?”, for example.

Theme 2 focused on Ecohydrology, an area of growing importance, one new to the IHP, but with strong links to MAB. Land/ water relations, soil erosion, wetlands and sediment were the more important topics involved leading to better knowledge of the vulnerability of land-water systems to the impact of human activities. The outputs included several significant conference proceedings, but it was not clear whether the transfer of knowledge across the gap between hydrologists and ecologists had been successful.

Groundwater resources at risk (Theme 3) dealt with the very serious problem of degradation of groundwater—a priority theme for IHP V. It developed guidance material on setting up an inventory of sources of contamination; it produced sets of conference proceedings, such as those from the Third International Conference on Groundwater Quality and contributions to the hydrogeological maps of Europe and the World. It developed strategies for detecting groundwater quality problems, but because of lack of

funds, work on the Role of Unsaturated Zone Processes had to be postponed. Urban and agricultural threats to groundwater were also studied and links made to activities in the arid and semi arid zone. The work of the IHP Network on Groundwater Protection in the Arab Region was stimulated through its many research, awareness raising and capacity building activities. Most of the actions planned for Theme 3 were implemented successfully.

Theme 4 considered strategies for water resources management in emergencies and conflicts, a new area for the Programme. Through this Theme, UNESCO's Aral Sea Basin Initiative took an important role in developing the water related vision for the region. Several innovative seminars were held which centred on turning water-sharing from a matter of contention to one of concerted action. Three global water scenarios were devised and the future explored from the three points of view. While considerable progress was made in this Theme, it proved to be a difficult one to address.

Water resources management in arid and semi arid zones was the substance of Theme 5, the second with priority status. With two main aims, the first on gaining better knowledge of hydrological processes and improving methods of water resources assessment, and the second on integrated management and conservation of scarce water resources, work on this Theme suffered from budgetary problems and delays in working group contributions. Nevertheless progress within this Theme was remarkable with many professionals trained, technical meetings successfully organized and a number of publications produced. There were several important conferences and workshops, a network on wadi hydrology was established, the "Hydrology of Wadi Systems" was published by UNESCO and a Chair of Wadi Hydrology was established. The opening of two centres for the study of the arid zone, one in Chile and the other in Egypt and the launch of the International Prize for Water Resources in Arid and Semi Arid Areas were further important contributions to the Theme. Problems in the Arid Zone are huge and will continue to require priority consideration in the future IHP. The impact of this Theme in the Arab countries has been considerable, especially because of the guidance given by UNESCO officers.

Theme 6 was devoted to humid tropics and water management. It had quite detailed aims and four projects addressing them. However during the course of IHP V, the projects seemed to merge, new objectives were developed and fresh products appeared. Two regional humid tropics centres were established, the first in Panama and the second in Malaysia. Plans for a third located in Ghana were proposed. A number of seminars and training courses were held at these centres on a diverse range of topics. A number of successful field projects were mounted, a noteworthy list of publications produced and several key symposia were held. There was concern at the limited inputs by local scientists as opposed to the large numbers from Europe and North America. Stress was placed on building partnerships and translating research findings into management practice.

Integrated urban water management was Theme 7 in IHP V, with urban drainage, non structural urban flood control measures, dissemination of knowledge on integrated urban water management and the establishment of regional centres in different climatic zones as the principal thrusts. The Regional Centre on Urban Water Management was set up in Tehran under the auspices of UNESCO, while the collaborating centres on research and training on urban drainage were activated in Sao Paulo and Oslo. Progress in this Theme

was substantial with conferences organized, proceedings issued and a three volume series on urban drainage in different climates published. Amongst the other activities, guidelines were published for professionals and planners on public participation for formulation of flood control policies. The publication of “Frontiers in Urban Water Management: Deadlock or Hope?”, a comprehensive book on the subject, was a major step forward, along with the adoption of the “Marseilles Statement” from the Marseilles Symposium in June 2001.

Theme 8, which was entitled Transfer of Knowledge, Information and Technology (KIT), was the most highly regarded theme of IHP V. Some 30 projects were carried out within this Theme including the dissemination of knowledge through courses, awareness raising and through water knowledge clearing house activities. The application of GIS was promoted and public information and non formal educational material developed and disseminated through television programmes, videos and CD-ROMs. A special project on women and water was implemented. Capacity building, education and training in the water sector were promoted amongst the other successes.

RECOMMENDATIONS

Ten recommendations are made in the main body of the Report in section 2.7, along with a number of ways and means for instituting them. They are addressed to the four main organs of the IHP.

The most important component of the IHP is the National Committee. An effective National Committee is more likely to lead to a successful national input to the Programme and to the bottom-up approach to the IHP that is frequently advocated.

To National Committees

1) Strengthen National Committees for the IHP, especially those in Africa.

Secure governmental funding to support the work of the Committee.

Meet at least once a year.

Draw the membership from bodies involved with a wide range of the nation’s water activities especially national water policy.

Establish partnerships between national committees in the developed and developing world and between neighbouring national committees.

Establish partnerships with NGOs.

Seek to lead or be involved in national research projects and tailor them to contribute to the IHP.

Combine the committee for the IHP with the committee for WMO’s equivalent Programme and share responsibilities.

That improvements are needed to the organs of the IHP and to the performance of their activities are revealed in this Report.

To The Intergovernmental Council and the Bureau

2) Make sessions of the Intergovernmental Council and the Bureau more efficient and effective

Work with shortened agendas,

Give priority to discussion of matters that need decisions

Place time limits on presentations.

3) Improve the Process of Planning the IHP

Seek to institute a more bottom-up approach to the planning of IHP VII and future phases

Engage in discussions of the long term future of the IHP culminating in a gathering of all stakeholders to mark the 30th anniversary of the launch of the Programme. These discussions must also consider the IHP input to the UN International Decade for Action, “Water for Life”. 2005-2015

Achieve a better balance between the ambitions of the Programme and the resources available.

Continue to encourage the participation of partner organisations.

4) Give more guidance to national committees.

Draw up guidance material for publication in the IHP series on the role and responsibilities of national committees and on additional means of improving their effectiveness. Disseminate this guidance material through a series of workshops held in Africa and selected parts of the rest of world.

Organise more visits to national committees by members of the IHP Secretariat and Regional Hydrologists, especially those that need encouragement

5) Monitor projects more effectively.

Introduce a system of regular reporting by Working Groups.

Set targets for projects and measure whether they have been achieved

The Division of Water Sciences and the Regional Offices are the main driving forces for the IHP. For example, most IHP projects are implemented through working groups activated by the Secretariat. There is concern expressed in this Report that the Division is understaffed and that it has been underfunded

[UNESCO, the Division of Water Sciences and the Regional Offices](#)

6). Balance the human and financial resources against the needs of the Programme in a better fashion.

Maintain conditions where the resources available match the requirements of the Programme or vice versa.

Ensure support to the regional hydrologists.

Encourage regional hydrologists to make more frequent visits to national committees.

7) Increase the speed of publishing.

Introduce tighter schedules for the production of UNESCO/IHP publications and encourage authors to keep to them.

Give preference to outside publishers with short turn-around times.

8). Make publications more readily available.

Investigate the destinations of IHP publications and whether the numbers of publications are adequate.

Give preferences to outlets which ensure distribution to the largest number of stakeholders.

Increase the advertising of publications.

Encourage more national committees to translate the whole or parts of IHP publications into their own languages.

Survey user opinion.

Favour joint publications, such as with WMO and IAHS.

Increase the use of electronic means of publishing

9) Maintain the level of advocacy for the IHP

Continue to give a high level of visibility to the IHP and UNESCO in the water affairs of the UN system and in the forums where world water issues are debated.

Raise the amount of effort devoted to public relations.

Contribute to the work of partner organisations.

Institute a prize for young persons

The IHP would derive more benefit from greater involvement of partner organizations

[To Partner Organisations](#)

10) Share in the activities of the IHP to a greater extent and encourage links between programmes.

Take part in the planning process for the IHP

Send an observer to meetings of the Council

Take on the responsibility for certain projects.

Participate in working groups.

Produce publications, or joint publications, contributing to the IHP.

The conclusions state that, on the whole, IHP V achieved its objectives to a considerable degree, but that these achievements were not spread evenly across the themes and regions. There is concern that IHP V had a lower impact on national water activities than it did on the furtherance of the hydrological sciences. There is also concern for a vision of the future Programme and about the part the IHP will play in the UN International Decade for Action “Water for Life” (2005-2015).

2. THE COMPREHENSIVE EVALUATION REPORT

2.1. BACKGROUND

The International Hydrological Programme (IHP) is UNESCO's major intergovernmental machinery in the science sector for advancing cooperation and collaboration between Member States in the field of research and practice in water resources and in their assessment, development and management. This cooperation is aimed at improving and upgrading these activities, particularly in developing countries. Starting with the International Hydrological Decade (IHD 1965-74), which involved a number of UN bodies and agencies together with several international non-governmental organisations, UNESCO has promoted the long term programme of the IHP through its successive phases. The fifth phase (1996-2001) addressed the theme "Hydrology and Water Resources in a Vulnerable Environment". The current sixth phase (2002-2007) is entitled "Water Interactions: Systems at Risk and Social Changes"

Like previous phases of the IHP, IHP V was a collaborative programme with 90% or more of the effort and resources being committed nationally—UNESCO and the IHP Secretariat playing an essentially catalytic role. Much of the effort expended by Members was on national activities, but some also contributed substantial amounts to regional efforts and to the international projects within the IHP. Indeed the IHP V expenditure of financial and human resources can be compared to an iceberg, with the major part taking place below the waterline nationally and not always visible from the international perspective. Because it would have proved extremely difficult, if not impossible, to determine the extent of what was going on below the water-line of the IHP V iceberg, the Team made no attempt to collect this information. The only data readily available are for the Secretariat (Annex 12). These show that over the six years the total approved funding for IHP V, excluding staff costs, was \$8.4million, the allocated funding \$6.8million and the networking funds some \$6.3 million.

Of course, much of hydrology and hydrological research is long term; many of the benefits being delayed a considerable time. Furthermore IHP V was not designed to reveal its benefits directly and it was implemented before results-based management was instituted by UNESCO. Under these conditions this and future evaluations cannot be claimed to be exhaustive.

2.2. PURPOSE

The 31st Session of the General Conference of UNESCO, in endorsing document 31C/5 Programme and Budget, accepted the evaluation of IHP V proposed therein; a decision reiterated in Resolution XV-9 of the 15th Session of the IHP Intergovernmental Council.

Resolution XV 9 acknowledged that: "the Fifth Phase will be subject to a comprehensive external evaluation". This evaluation is designed to measure the performance of the Programme and its value to Member States and to the other bodies involved, such as the World Meteorological Organization and NGOs. It is anticipated that the results will provide guidance for the execution and management of IHP VI and future phases of the Programme.

2.3. METHODOLOGY

The 31st and 32nd sessions of the Bureau of the Council agreed the principles to be followed in the Evaluation, the procedure, the draft Terms of Reference (TOR) (Annex 1) and how the Evaluation Team would be composed. Following these directions the Team (Annex 2) was established with Dr John Rodda (UK) as the Team Leader and Professor Miguel Medina (USA), Professor Walid Abderrahman (Saudi Arabia), Professor Kate Rowntree (South Africa) and Professor Xia Jun (China) as members. It was foreseen that the Team would work with the Division of Water Sciences, the Field Offices and the Internal Oversight Service (IOS) to perform the evaluation, in consultation with Members, IGOs and NGOs, as appropriate.

The Team met at UNESCO from 18 to 20 November 2002, to become familiar with the evaluation process through instruction from IOS, to discuss IHP V and its eight themes with members of the Division, and to learn of allied programmes from members of other divisions. The Team was furnished with a large number of reports stemming from activities in IHP V, together with those of the Council, the Bureau and the Finance Committee and with other relevant material. The Team approved its TOR, its method of work and agreed upon the timetable leading to the submission of the CER to UNESCO in May 2003. It was recognised that most of this work was to be by email and that a second meeting of the Team was not planned.

Following the meeting, the Team decided on the substance of a Questionnaire (Annex 3) to be sent to National Committees and to other participants. The twelve questions it contains were designed to capture the tenor of the main aspects of IHP V listed under the terms of Article VI Activities of Evaluation of the TOR (Annex 1). Some of the aspects not captured in the Questionnaire were covered in discussions, those about the clarity of the design of IHP V and its attainability, for example. It was agreed that the evaluation would be conducted mainly at the theme and global levels. Members of the Team also selected the missions that each would undertake to particular parts of the globe and they agreed to take responsibility for certain of the Themes within IHP V. Because of the limited funds available and the shortage of time, Team members would also contact their own National Committees, namely those in South Africa, Saudi Arabia, China, UK and the USA.

Early in December the Team despatched copies of the Questionnaire by email, with a 1 February deadline for responses. The Questionnaire was sent to the email addresses of all IHP national committees listed on the IHP web site (<http://ww.unesco.org/general/eng/about/members.shtml>) and to selected intergovernmental and international nongovernmental organizations. Web-based versions of the Questionnaire were developed in English <http://ceeweb.egr.duke.edu/~medina/ihpv/> as well as in Spanish http://ceeweb.egr.duke.edu/~medina/ihpv_es/, and widely publicized through emails and

the Internet. Because of the slow response by the deadline, later in February reminders were emailed to Members who had not responded.

Missions by most of the members of the Team took place between January and March to Members chosen to be representative of different hydrological regimes and levels of development and activity in the IHP. Because of the limited funds for missions and the short time available, the Team only made visits to a small number of Members, ones the Team members were able to contact readily and who were able to receive them. These missions were to Brazil, Chile, the Netherlands, Germany, Ireland, Kenya, Mauritius, Japan, Jordan, United Arab Emirates and Egypt. Because of the outbreak of SARS and other difficulties, the planned missions to Australia and Indonesia were postponed. Annex 10 contains descriptions of the conditions in the countries visited.

During the missions discussions were held in some cases with national committees and in others with chairpersons and secretaries. Both groups and individual scientists and engineers were also consulted, as were certain UNESCO Regional Offices, UN bodies and agencies and international non-governmental organizations.. The analysis of the Questionnaires, the thematic reports, the results of the missions and the deliberations that took place form the body of this Report, which was summarised and accommodated within the 40 pages stipulated by the TOR and submitted to UNESCO by 15 May 2003. The Team's complete reports are located on the IHP Evaluation web site at: http://ceeweb.egr.duke.edu/~medina/unesco_ihp.

The May version of the CER was put before the June 2003 Session of the IHP Bureau. The Bureau asked for the postponed missions to be undertaken and, because of the low number of responses, for the Questionnaire to be recirculated to capture the opinions of the many Members who had not responded. Accordingly in July and August the IHP Secretariat sent out the Questionnaire several times more and members of the Team encouraged unresponsive national committees to return the Questionnaire. This revised CER was drafted to take these responses into account, with the results of the July 2003 missions to Australia and Indonesia. It also accommodated observations from the IHP Secretariat and the comments of IOS made in May, July and October 2003.

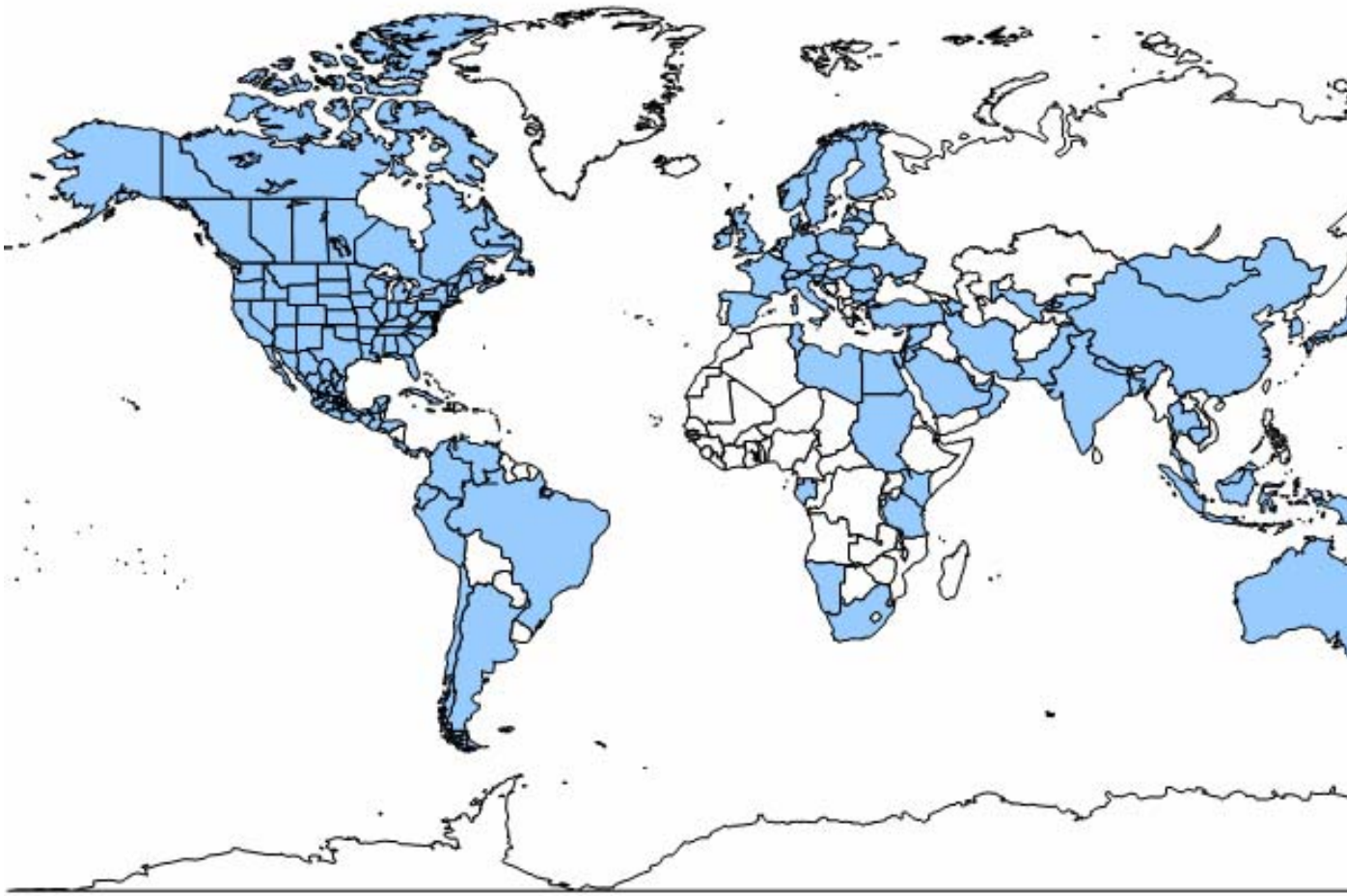
2.4. MAJOR FINDINGS

2.4.1. Analysis of Responses to the Questionnaire

2.4.1.1. Overview

A total of 48 responses to the questionnaire were received by March 2003 and their contents were analyzed and presented in the first draft of the CER (May 2003). Further trawls of Members were conducted with a deadline of 5 September 2003 bringing in additional responses. This gave a total of 86 countries responding (Figure 1), some 52% of Members. Multiple responses were received from several countries; that is, from official water agencies other than IHP national committees. It has to be assumed that the body making the response, normally the national committee, was competent to answer all the questions. However there is the possibility that without expertise in certain areas, such as in urban drainage, the responses to questions about the impact of IHP V in those areas could be distorted.

Figure 1. The Members responding to the Questionnaire by 5 September 2003



The Evaluation Team considers the final number of responses quite impressive, the rate of response 52% being above the success rate achieved by most surveys. The responses analyzed below represent all replies received up to the extended deadline of September 5, 2003, or shortly thereafter. The list of countries responding is presented in Annex 4. The questionnaire was mailed through the postal system, as well as by electronic means to all IHP national committees and several other key governmental and nongovernmental organizations. Automated web-based versions of the questionnaire were developed in both English and Spanish and replies could be submitted online [<http://ceeweb.egr.duke.edu/~medina/ihpv/>]. This effort proved itself to be very effective. In an extraordinary effort to solicit additional responses, and in close cooperation with the evaluation team, many email reminders were sent from the IHP Secretariat in Paris to those national committees that had not responded. Not all respondents answered every question, since some were not relevant to all countries (e.g., questions about arid and

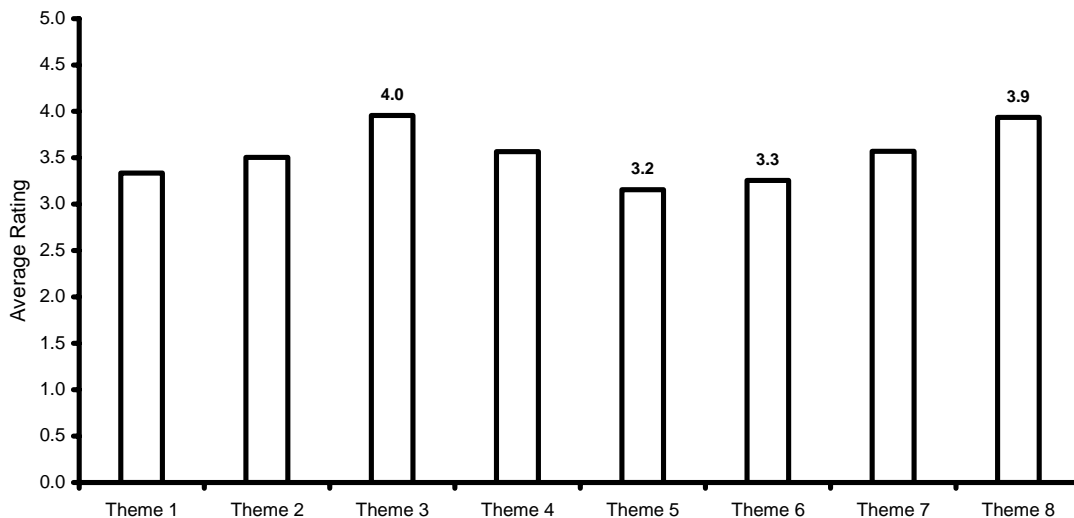
semi-arid zones, humid tropics hydrology and water management), and they were explicitly instructed not to rank responses to questions that did not apply to their countries.

2.4.1.2. Summary of Responses

The numerical ratings are summarized below: the highest rating for any category is 5, with 1 being the lowest. The more pertinent comments provided by the respondents are presented at the end of the section. Details of the eight themes are set out in the Questionnaire (Annex 2) their titles being:

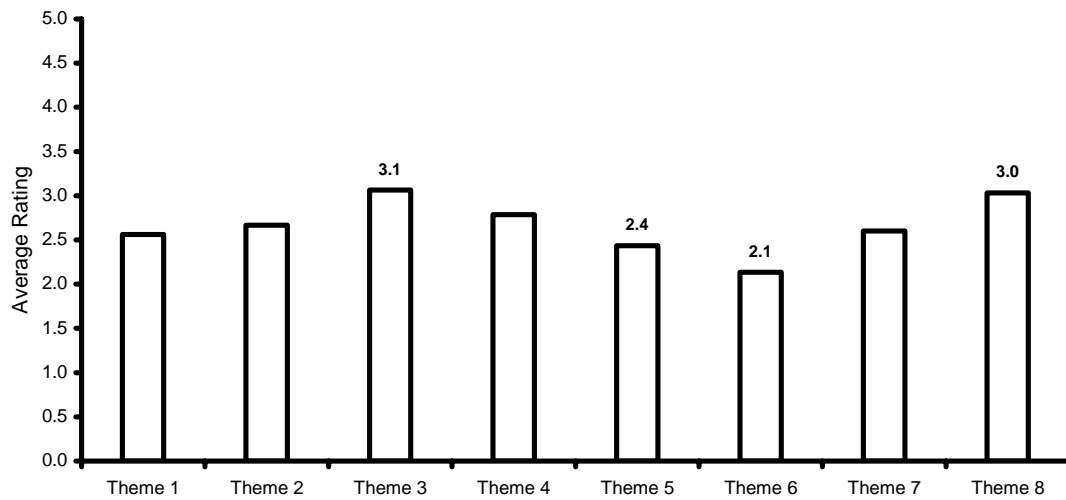
- 1 *Global hydrological and geochemical processes*
- 2 *Ecohydrological processes in the surficial environment*
- 3 *Groundwater resources at risk*
- 4 *Strategies for water resources management in emergency and conflicting situations*
- 5 *Integrated water resources management in arid and semi-arid zones*
- 6 *Humid tropics hydrology and water management*
- 7 *Integrated urban water management*
- 8 *Transfer of Knowledge, Information and Technology (KIT)*

Question 1. How relevant were the planned aims and objectives of Themes 1 to 8 of IHP V to the water activities in your country, or to your IGO or NGO?



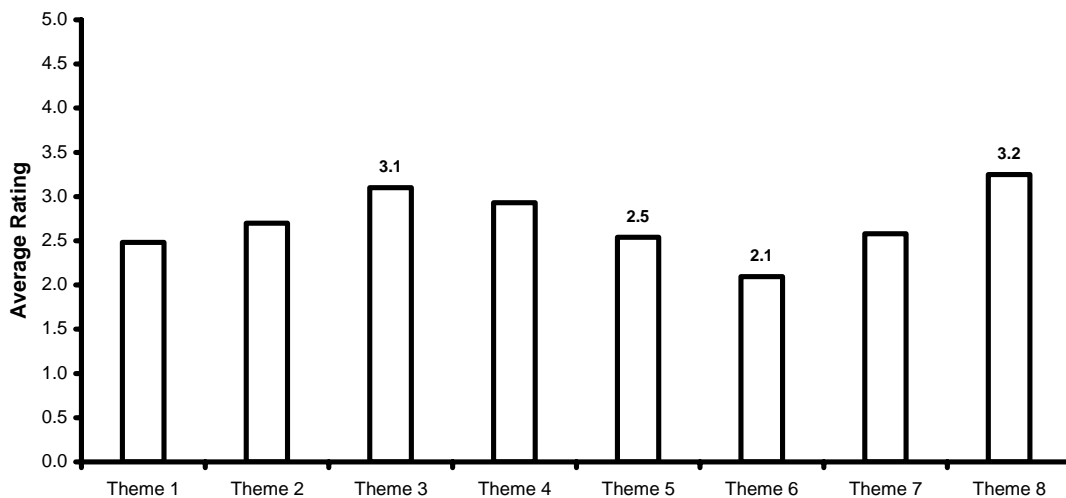
All themes were rated above average, but Themes 5 and 6 were rated lowest at 3.2 and 3.3, respectively. The Themes on Groundwater and KIT received the highest ratings. Several respondents correctly did not rate either Theme 5 or Theme 6 because they did not apply to their countries, but some may have incorrectly rated Themes 5 and 6 lower for the same reasons. There is no way to determine the actual reason or intent unless stated in the comments section. Overall the responses indicate that IHP V was relevant to water activities.

Question 2. To what extent have the planned objectives of Themes 1 to 8 of IHP V been achieved in your country, IGO or NGO?



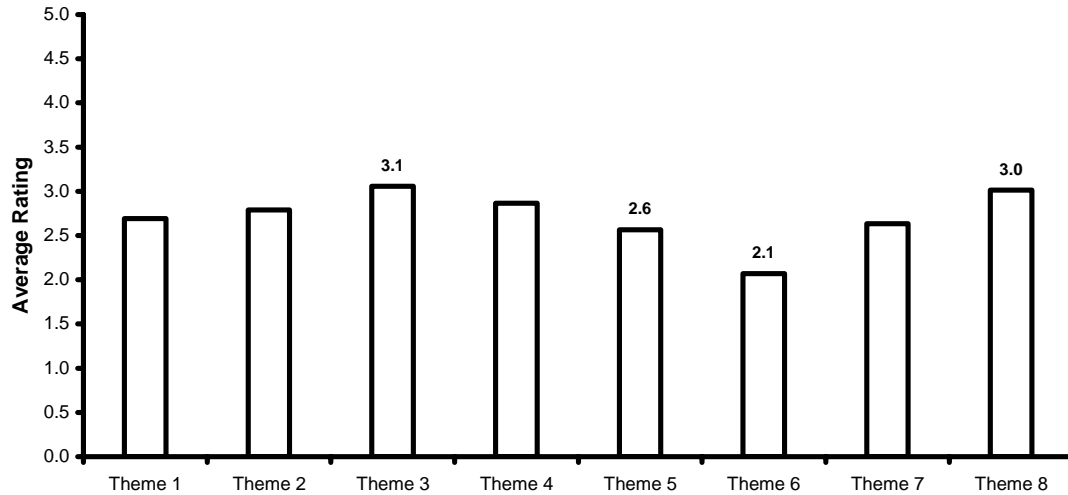
Themes 3 and 8 were rated slightly above average and average, respectively: all others were rated below average, with Theme 6 well below the average. Again this may be because of the problems raised in answers to Question 1. The responses appear to indicate that much of IHP V did not reach its objectives in the majority of Members.

Question 3. What is the level of the impact of the activities of Themes 1 to 8 of IHP V on water activities in your country, IGO or NGO?



Theme 8 (transfer of knowledge,) had the highest impact on IHP V activities, with a rating of 3.2, as reported by all of the respondents, with the groundwater theme in second place. This ranking reflects the pattern of ratings found for Question 1: as might be expected the impact of IHP V is highly correlated with its relevance to national water activities. However this analysis suggests that other than for Themes 3 and 8, IHP V did not have a significant impact on the water activities of Members.

Question 4. What was the level of impact of Themes 1 to 8 of IHP V on the hydrological sciences in your country, IGO or NGO?

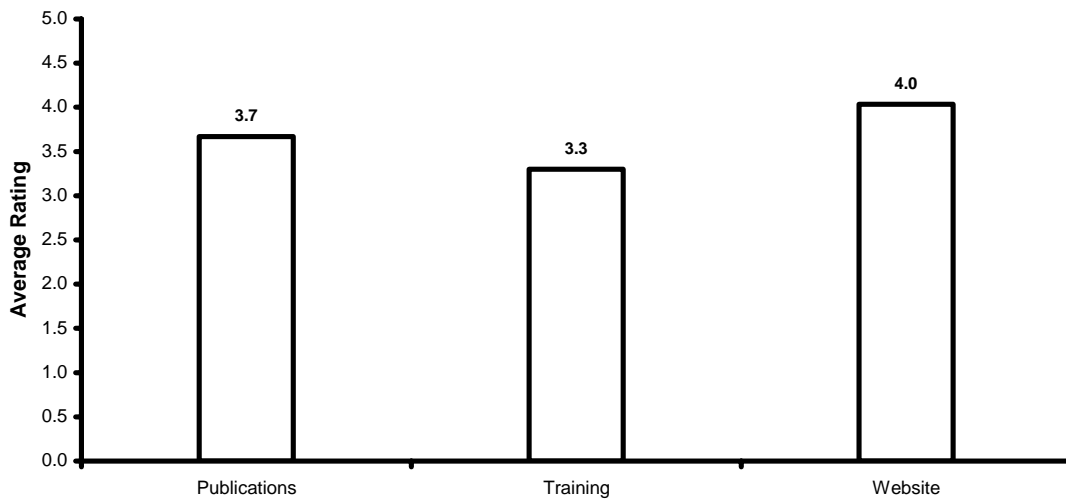


With the exception of Themes 3 and 8, rated at 3.1 and 3.0, all other themes were rated below average in terms of their impact on national hydrological sciences. A number of contacts suggested that national programmes in the hydrological sciences are more likely to be determined by national needs or those being advanced by economic groupings, such as SADC and the European Union, rather than by the IHP.

Question 5. What is the level of impact of IHP V, in general terms, on your national water activities, or on those of your IGO or NGO?

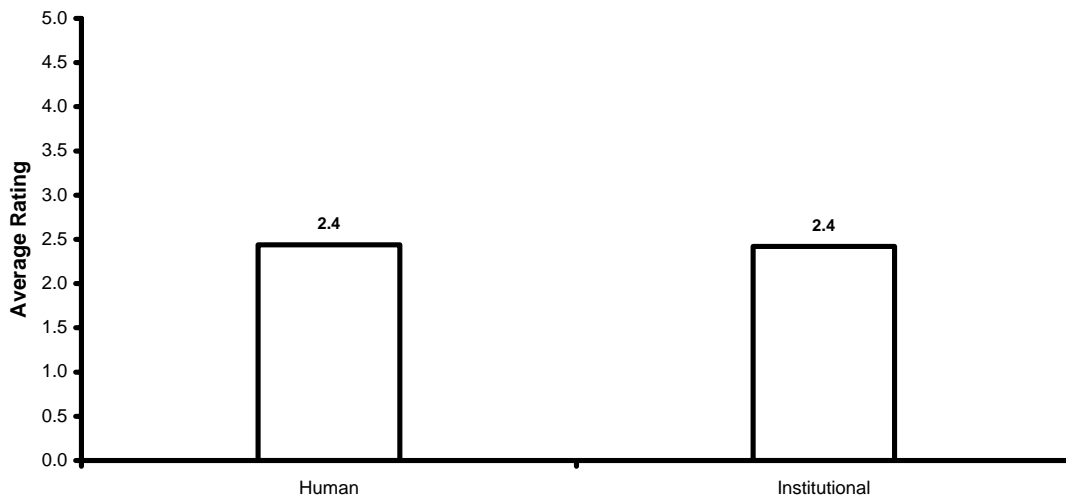
The respondents considered that the level of impact of IHP-V on their national activities was slightly below average (2.8), suggesting that there is still some room for improvement in this category. However, they rated IHP publications, training materials and the IHP website well above average (see below).

Question 6. Were (a) IHP publications, (b) IHP Training material and (c) the IHP website accessible to you?



As noted above, the combined responses rated access to IHP publications, training material and website well above average (3.7, 3.3 and 4.0, respectively). However, the African respondents rated these particular categories much lower (1.8, 1.8 and 2.2) than any of the respondents from the other regions, presumably due to much lower accessibility to any of these resources. For example, Central and South America and the Caribbean nations rated these categories as (3.3, 2.7 and 4.1, respectively).

Question 7. What was the level of the contribution of the IHP to (a) human and (b) institutional capacity building in your country?



Respondents rated the level of contribution of IHP to both human and institutional capacity building as below average (at 2.4 each).

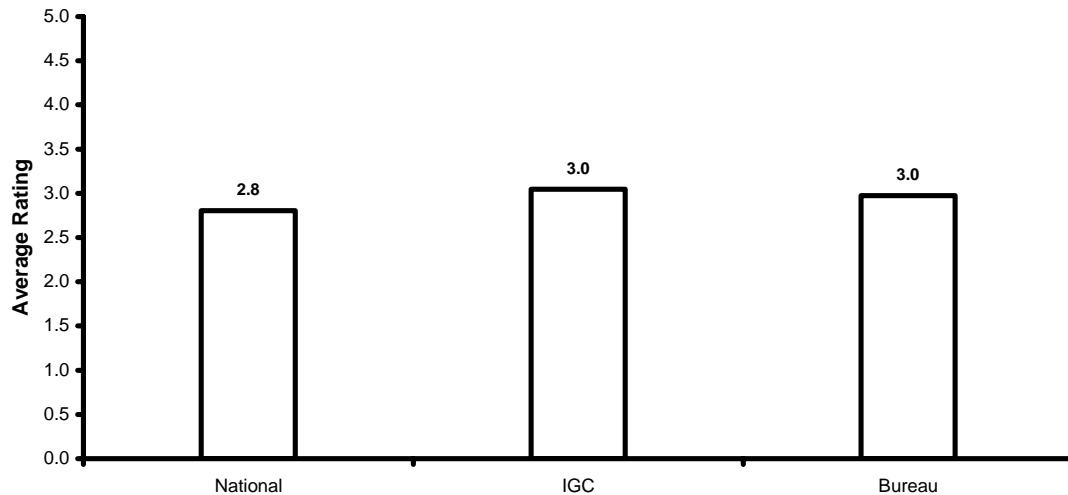
Question 8. To what extent did IHP V help to bring about effective national partnerships and effective collaboration including those with IGOs and NGOs and with civil society?

Consistent with their rating of the level of impact of IHP V, the respondents also rated the extent to which IHP V has helped in national partnerships and effective collaborations as below average, 2.6. Not surprisingly, the rating was higher for international partnerships.

Question 9. To what extent did IHP V help to bring about international partnerships?

The respondents rated IHP V slightly lower than average (2.9) in the role of bringing about international partnerships. However, there are real success stories, evident in terms of the presence of representatives from 20 countries (including several European partners and two Middle Eastern countries) at the inauguration of the new UNESCO center for arid and semi-arid zones (CAZALAC) in La Serena, Chile. Several of these countries are also providing substantial financial and technical support to CAZALAC. The event was also attended by high-level UNESCO-IHP administrators from Paris and the regional office, which added to its significance.

Question 10. What is the level of efficiency of (a) your IHP national committee (b) the IHP Intergovernmental Council (c) the Council's Bureau?

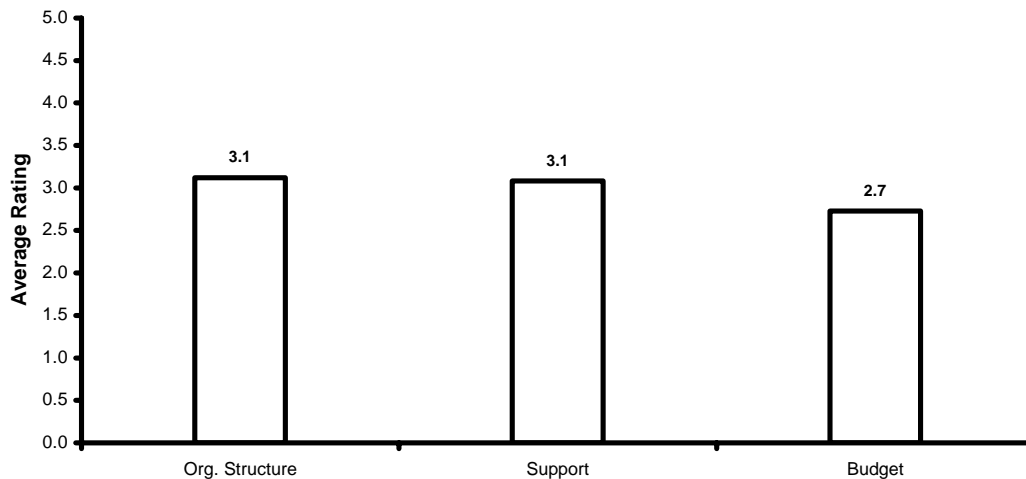


Interestingly, the rating was about average or slightly below average for each of the categories. Some IHP national committees rated themselves very high (5); however, a few of the responses were not from IHP national committees, and those ratings were not as laudative. In the African region the ratings were much lower for the IHP national committee (2.2) but slightly higher than the other regions for the Intergovernmental Council (3.5) and Bureau (3.5).

Question 11. Were the field offices of UNESCO effective in the implementation of IHP V?

The UNESCO field offices were rated about average (2.9) in terms of effectiveness in the implementation of IHP V. Some respondents appeared confused by the term “field offices” and did not answer the question. Again, the African respondents rated the field offices lower (2.4) than respondents from the other regions. Yet Central and South America and the Caribbean nations rated this category 3.1. In fact, one respondent from the region specifically lamented that it took too long to replace the previous outstanding regional hydrologist, and that this had had a detrimental effect upon the region. Nevertheless, that region rated managerial support at 3.3 (see below).

Question 12. Did UNESCO's institutional arrangements hold back or help the implementation of IHP V in respect of its (a) organizational structure, (b) managerial support and (c) budget?



UNESCO's institutional arrangements were rated slightly above average with respect to helping the implementation of IHP V in terms of organizational structure and managerial support, and slightly below average in terms of budget. Central and South America and the Caribbean nations rated managerial support at 3.3 (above the world average) and the other categories as follows (organizational structure, 2.6; budget, 2.9).

There were many comments provided by respondents that used the automated online versions (English and Spanish) of the questionnaire: these will be made available to UNESCO.

Comments related to the problems that held back the implementation of IHP V were:

1. Lack of adequate financial and technical support and human resources;
2. Weaknesses in organizational structure; the existence of too many water-related authorities;
3. Failure of some IHP national committees in internalizing IHP V themes, lack of integration of IHP V themes with national programmes;
4. Need to receive more publications in French, Arabic, or other languages; and improvement of KIT activities.

Factors that helped were:

1. The FRIEND project;
2. The presence of high quality scientists and specialists in hydrology and water resources,
3. The enthusiasm of professionals and the valuable international contacts.

2.4.1.3. Responses from International Governmental Organizations and International Non Governmental Organizations

The Questionnaire was sent to ten bodies and, of these, WMO, FAO, IAEA, IAH and IAHS replied. Because the design of the Questionnaire was directed to National Committees, "no comment", "not applicable" or a blank appeared a number of times in the returned Questionnaires. Questions 1,3,5,6, 8,9,10 and 11 received the most answers.

WMO and IAHS replied to Question 1, the relevance of IHP V to their programmes, with a mark of 5, IAEA answered with a 5 for some Themes. These three bodies answered Questions 2 and 3 with above average marks. Both IAH and IAHS saw their activities strongly driven by IHP V but IAEA's mark was below average. WMO gave a mark of 3 to 4 for the impact of IHP V on its own activities and mark of 5 to Question 6 about publications, training material and the web site, as did IAEA and IAHS. Most bodies rated the forging of effective international partnerships with a mark of 5 and they gave above average marks for the efficiency of the organs of IHP V.

It is difficult to decide how these replies assist in the Evaluation, as the pattern of responses is far more volatile than those of National Committees. However, it seems fair to say that overall, the responses were, in general, quite supportive of IHP V, while some were strongly supportive in certain areas such as IAH in respect of Theme 3 on groundwater risk.

2.4.1.4. Review of General Conclusions and Recommendations from the Sixth Kovacs Colloquium

The UNESCO/IAHS Sixth George Kovacs Colloquium was held in Paris from in June 2002 and was devoted to a scientific assessment of IHP V. The achievements of each of the eight Themes were discussed in separate sessions, the findings summarized in a final session and recommendations made. There are twenty nine of these conclusions and recommendations contained in the report of the Colloquium, some addressed to governments, some to UNESCO and the IHP and some to National Committees.

That national water planning and legislation should be based on the most up to date information, that stakeholders should be involved at an early stage of water resources development and that urban and rural water management should be linked to land use planning, health and heritage were those directed to governments. Giving increased attention to: data networks, wider communication by scientists dealing with climate and water, climate variation and change, ecohydrology, groundwater, conflict resolution, building partnerships across themes and with UN bodies and NGOs were seen as very important to UNESCO and to the future of the IHP. The IHP was also asked to take heed of the restoring of traditional water management practices, innovative technologies and their faster introduction and integration, new concepts for limiting water consumption and the consequences of floods and flood risk. The need to strengthen linguistic diversity and the use of local languages were points made for the IHP and national committees, along with the importance of the catalytic role of the IHP in education and training with the use of e-learning as a supplement and not a solution to the dissemination of training and information. The report stresses that the IHP should be seen as a catalyst and not as a donor and that National Committees hold the full responsibility for its successes and failures. There was recognition of the paradigm shift in the activities between the fourth and fifth phases of the IHP and this resulted in a strong recommendation that the IHP should not lose track of the need to solve "conventional" problems in hydrology and water resources management. The last and most compelling recommendation was that raising public awareness in respect of the IHP needs much more attention. Many of these sentiments are reflected in remaining sections of the CER.

None of the parties involved in these considerations of IHP V expressed any doubt about the clarity of its design, or its objectives and their attainability. The pattern of IHP V was that of a broadly based programme in hydrology and water resources which would appeal

to all Members. However it continued the trend towards an even broader base started in IHP IV, a trend which presented difficulties for some.

2.4.2. Theme 1. Global hydrological and Geochemical Processes

Improving knowledge of the impact of changes in land use and increasing greenhouse gas concentrations at scales from local to global hinges on enhanced understanding of the hydrological cycle and the associated biogeochemical cycles. Further gains can be made by coupling these enhancements to more realistic hydroecological/atmospheric models. Theme 1 objectives include application of methods of hydrological analysis using regional data sets, development and calibration of coupled hydro-ecological/atmospheric models, hydrological interpretation of global change predictions and strategies for water resource assessment and management under conditions of anthropogenic global climate change. Analysis of the Questionnaires showed that over the first four questions Theme 1 ranks a little below the average. However most of the projects in Theme 1 have been successful completed, even though there were some delays in the completion of project 1.2 due to start-up difficulties and limited financial resources. Project 1.1 is especially well managed and the desired results have been achieved. Projects 1.3 and 1.4 seem to have been largely implemented with the exception of some of the publications which were planned. FRIEND (Flow Regimes from International Experimental and Network Data) research has addressed the objectives of Theme 1 by developing improved understanding of hydrological variability and similarity across time and space, through the exchange of data, knowledge and techniques. These studies have helped to improve methods for the design and management of water resources. Environmental isotope methods have been applied in the study of the saturated and unsaturated zones. Theoretical models for studying the circulation of ground water systems have been put forward and this has also contributed to the study of global hydrological and geochemical process.

Priorities within each regional FRIEND project are determined locally by project participants. The topics addressed include studies of low flows, floods, the variability of flow regimes, rainfall/runoff modelling, processes of streamflow generation, sediment transport, snow and glacier melt, climate-change and land-use impacts. As a result of the interest FRIEND has generated, this project has been elevated to the position of a crosscutting theme in IHP VI. Its scientific output has been applied practically towards hazard mitigation and poverty alleviation. A major effort of regional FRIEND projects has been the establishment of regional hydrological databases and the sharing of data between countries used for FRIEND research. Such databases have made a real and lasting step towards international cooperation. They are now well established in the Northern European FRIEND and in the AMHY, West and Central Africa (AOC) and Southern Africa FRIEND projects. They are under development in the HKH, AMIGO and Asian Pacific FRIEND regions. The transfer of skills, knowledge and experience between regional projects at different stages of development is one of the key achievements of FRIEND. Much of the work on FRIEND has been undertaken with the active support of IAHS.

Stable isotope and radioactive isotope principles and methods were used in Theme 1. They offer reliable and effective methods for the study of the circulation and transformation of water on the earth, and good foundations for quantity and quality

modelling, assisting in development of water resources and their utilization by humanmankind

In cooperation with WMO progress has been made in the hydrology-hydrochemistry component of the Large-Scale Biosphere/Atmosphere Experiment in the Amazon (LBA), while the 2nd International Conference on Climate and Water was held in Espoo, Finland (August 1998). The analysis of long-term hydrological data sets was explored as part of the need to separate anthropogenic effects from the impact of climate variability. In the framework of the snow and ice component, documents on World Glacier Monitoring and the Fluctuations of Glaciers, 1990-1995, were published, along with the World Atlas of Snow and Ice Resources. The response in history of communities to changes in climate was documented for a number of geographical areas and time periods using historical and archaeological data. Aspects of Theme 1 will continue to contribute to IHP-VI. However, a number of the underlying issues have not been resolved—issues amongst those discussed in the International Symposium “Water: a looming crisis?” held in UNESCO in June 1998, jointly convened by UNESCO, IAHS and the WWC. These issues provide a daunting challenge to the international hydrological community and Theme 1 played a significant role in addressing many of them.

Considerable progress has been made in the implementation of Theme 1 adhering generally to the IHP-V plan. The FRIEND (Project 1.1) has emerged as a major cross-cutting theme which will be continued during IHP-VI. It is hoped that IHP-VI will see the continued expansion of FRIEND worldwide. Projects 1.3 and 1.4 have largely been implemented. Project 1.2. will continue into the first 2 years of IHP-VI.

2.4.3. Theme 2. Ecohydrological Processes in the Surficial Environment

Ecohydrology is a new approach to understanding freshwater systems that reflects a growing awareness of the link between drainage basin processes, and the need to conserve freshwater ecosystems. The catchment is recognised not only as the key determinant of stream hydrology, but it is also seen to be part of that ecosystem. Ecohydrology is a response to the growing awareness that humans depends not only on water itself, but also on the various goods and services that freshwater ecosystems supply. Human activities that degrade catchment ecosystems will also degrade the river system. Ecohydrology recognises the connectivity between the abiotic and biotic and between catchment and river. Degradation of the catchment leads to degradation of water resources, e.g. soil erosion and reservoir siltation. Overall, Theme 2 rated a little below average in the analysis of Questionnaires

The main aim of Theme 2 is the conservation of the natural resources, especially land and water, to assist in sustainable development. To achieve this objective two major areas in need of exploration have been defined which would lead to a better understanding of the vulnerability of the land-water system to human activities namely: land use, erosion, sedimentation: its consequences and control and the preservation and restoration of rivers and wetlands.”

There were four projects within the theme:

Project 2.1: Vegetation, land-water use and erosion processes

Project 2.2: Sedimentation processes in reservoirs and deltas

Project 2.3: Interaction between river systems, flood plains and wetlands

Project 2.4: Comprehensive assessment of the surficial eco-hydrological processes.

There was a clear difference in approach and philosophy between projects 2.1 and 2.2 and 2.3 and 2.4. The latter took the traditional approach of looking at impacts of vegetation and land cover change on hydrological processes. The hydrological response, sediment load and water quality are seen as the direct result of catchment conditions, with a strong emphasis on vegetation cover and land use change. Vegetation is seen as a physical component of the system that affects hydrological processes rather than as part of an ecosystem. In this approach there is no strong link to river ecosystems.

The main activities of these projects were three conferences that brought together researchers concerned with catchment sediment processes. No activities related specifically to project 2.2 (reservoir sedimentation) were reported. No on-ground research projects relating to 2.1 or 2.2 were supported by IHP-V. However the conference proceedings provide a valuable record of papers presented. In general these papers had a strong hydrological focus and few authors took an explicitly ecosystem approach. At a conference on ecohydrological processes in small basins, (Strasbourg 1996), most papers focussed on the impact of terrestrial vegetation cover on hydrological processes; they did not take an integrated approach as espoused by promoters of ecohydrology under projects 2.3 and 2.4.

Projects 2.3 and 2.4 took an overtly ecosystem approach, looking at structural linkages between ecosystem components, with an emphasis on ecotones. Project 2.3 looked specifically at river corridors and the links between the river, its floodplain and related ecosystems. Project 2.4 took a catchment scale approach, examining linkages and flow pathways within catchments. Much of the activity under these two projects has been devoted to:

- i) developing the concepts of ecohydrology
- ii) study courses and workshops bringing together students and/or researchers to present projects and to examine how an ecohydrological approach could be used to enhance the study.
- iii) organising conferences that bring together ecologists and hydrologists in common forums.
- iv) promoting research projects that take an ecohydrology approach.

The Ecohydrology theme of IHP-V has developed strong links to the Man and the Biosphere Programme (MAB) — a well developed programme that has focussed on Biosphere Reserves. Future cooperation between the two programmes as proposed by a joint IHP/MAB Main Line of Actions on “Land-Water Interactions: towards sustainable management” should be of mutual benefit.

All the conferences and workshops held under this theme produced useful proceedings and valuable additions to the literature. One of the main tasks of Projects 2.3 and 2.4 was to improve the transfer of knowledge across the gap existing between both sciences involved in ecohydrology. It is not clear if this task was successfully implemented.

2.4.4. Theme 3. Groundwater Resources at Risk

Degradation of groundwater is a very serious problem, not the least in those countries where groundwater comprises most or all of the water resource. It is vulnerable due to the planned and inadvertent introduction of pollutants to aquifers and because of its ready reaction with surface water, especially where rivers and lakes are polluted by point

sources and where infiltration is contaminated by diffuse sources, such as the over-use in agriculture of herbicides. Groundwater in coastal zones and small islands is also at risk from salt water intrusion. This Theme and Theme 5 were accorded priority amongst the eight themes of IHP V. There are four aims listed for Theme 3, two relating to contamination, one to the relationship between surface and groundwater and one to threats to coastal groundwater (Annex 2). The responses to the Questionnaire showed that overall; Theme 3 ranks higher than the other seven themes and above average marks for the first four questions in the Questionnaire. Indeed some Members in arid and semi arid regions marked groundwater resources at risk at or close to 5, the maximum value. Activities related to urban groundwater and groundwater resources in arid and semi-arid areas were coordinated with activities of Theme 7 and Theme 5 and with the UNESCO Cairo Office.

One set of activities on the groundwater contamination inventory (Project 3.1) focused on the preparation of a guidebook offering advice on the methodology for setting up an inventory of sources of contamination. This work was undertaken with the support of IAH and a CDROM of the guidebook is available. Another set of supporting activities were based on a number of symposia and workshops and the reports from them. These included the Third International Conference on Groundwater Quality Sheffield, UK, June 2001 with its proceedings published by IAHS, the 6th International Symposium on Land Subsidence, SISOLS 2000 held in September 2000 in Ravenna, Italy and the Guidebook to Studies of Land Subsidence due to Groundwater Withdrawal which is available on the IHP Website, the International Symposium on Present State and Future Trends of Karst Studies, Karst 2000, held at Marmaris-Turkey in September 2000 and the IAH International Conference on Groundwater: Past Achievements and Future Challenges, held in November-2000 at Cape Town. Also relevant were workshops at the 31st IAH Congress in Munich in September 2001 and allied actions on the Hydrogeological Map of Europe and the IAH World Hydrogeological Map which were in preparation. There were also a number of other contributions made to this project through activities shared with IAH, IAHS, IAEA, UNECE and FAO and those stemming from regional initiatives mounted under the auspices of the UNESCO Field Offices in Montevideo, Nairobi, Cairo and New Delhi. These are shown in Annex 6.

The aim of Project 3.2 Monitoring Strategies for Detecting Groundwater Quality Problems was to develop methodologies for optimal monitoring well layouts to serve as early warning and trend detection systems for possible water supply contamination of vulnerable water supplies. The scale of interest ranged from local to small regional.

The main thrust of activities in this Project was the preparation of a guidebook on "Introduction to a New Strategy for Detecting Groundwater Quality Problems" and this was supported by IAH. Working Group meetings were organized with the support of the IHP National Committees of Israel and Denmark in Israel and in Denmark. The book was to be published in September 2002. The forums provided by a number of symposia and workshops were also relevant, particularly the Third International Conference on "Future Groundwater Resources at Risk", Lisbon, June 2001. Work on the management of aquifer recharge enhancement supported by IAH, and several UK bodies was also relevant as was the Computer Aided Workshop on Groundwater Contamination arranged by the Jakarta Office in November 2001

Because of lack of funds, work on Project 3.3. Role of Unsaturated Zone Processes in Groundwater Supply Quality had to be postponed.

The IHP Network on Groundwater Protection in the Arab Region, launched by UNESCO's Cairo Office in cooperation with ACSAD and the Egyptian National Water Research Centre in 1994, played an important role in IHP V. The Network strengthened research activities on the assessment, development and management of groundwater resources and raised public awareness. It enhanced capacity building, technology transfer and the exchange of results of research through nine publications and through workshops and meetings, about a dozen in number. Notable was a seminar on the Training of Trainers on Groundwater Protection. Others included the IAEA Workshop on Application of Isotope Techniques in Groundwater Assessment and Management, held in Jordan in December 1997 and the Second and Third regional training courses on groundwater protection. There was also a joint Wadi Hydrology-Groundwater Protection Networks Steering Committee meeting.

To document the likely susceptibility of groundwater resources to present and future urbanization at local and regional scales was the objective of Project 3.4, Groundwater Contamination due to Urban Development. A Working Group meeting to prepare the book on Urban Groundwater Pollution was organized in parallel with the IAH XXX Congress, in Cape Town, in November 2000. The project on Urban Pollution in Africa was launched at a meeting held in Bamako, Mali, in December 2000, with the participation of seven countries, UNEP and several funding bodies

Project 3.5 Agricultural Threats to Groundwater Resources aims to identify the vulnerability of groundwater to agricultural practices concerning regional scale groundwater resources. Its main expression was the International Conference on Agricultural Effects on Groundwater and Surface Waters: Research and Policy at the Edge of Science and Society which was organized in Wageningen, The Netherlands, in October 2000 and convened jointly by the National IHP/OHP Committees of the Netherlands and of the Federal Republic of Germany. The Report and the Statement of the Conference provides recommendations to UNESCO and WMO. Contributions to this project were also made by several other conferences

The report of the 15th Intergovernmental Council (April, 2002) sums up the progress made in Theme 3: "Despite budgetary difficulties most of the planned activities of this priority theme have been successfully implemented". Support from IHP National Committees, international associations and UN Agencies such as WMO, IAEA and FAO facilitated this progress. Theme 3 has benefited greatly the arid countries where groundwater is the major water resource and where surface water resources are severely limited. In these countries science and technology in the field of groundwater has advanced significantly. Indeed the successes of Theme 3 can be considered as contributions to water resources in arid regions, in other word to Theme 5.

2.4.5. Theme 4: Strategies for water resources management in emergency and conflicting situations

Water and water resources become particularly precious during the onset of natural and human-induced disasters and in situations where conflict is occurring. In such circumstances the aquatic environment is also especially vulnerable. The focus of Theme 4 is strategies for water resources management in international water systems and the

promotion of the technical/scientific basis for negotiations. This was a new thrust for the IHP, emphasizing different aspects of the management of water resources than in previous phases. This Theme plays a very important role in linking the hydrological sciences that are basic to water resources and their sustainable management with social-economic demands. For instance, through UNESCO's Aral Sea Basin Initiative, the IHP took an active role in formulating the water-related vision for the region. The responses to the first four questions in the Questionnaire showed that Theme 4 was rated average overall, with a higher ranking for Question 1 than the other three. This Theme consisted of three projects namely: international water systems; comprehensive environmental risk and impact assessment; and non-structural measures for water management problems.

Several workshops and seminars were organised to promote this Theme with titles designed to indicate the directions to take such as: "Negotiations over water" and "Averting a Water Crisis in the Middle East: Make Water a Medium of Cooperation Rather Than Conflict". They addressed a wide range of topics: the psychological difficulties in dealing with water issues, representing the interests of future generations, water management models, the history of international instruments and institutions being some. They highlighted the continuing need to seek water resources management through integrated basin wide means and to find progress in other important issues stemming from the introduction of technical options that help build trust.

For the first project three global scenarios were devised from different concepts of the major forces driving the global water situation: economic, demographic, technological, social and environmental. The Business-as-Usual Scenario (BAU), the Economics, Technology and Private Sector scenario (TEC) and the Values and Lifestyles scenario (VAL) span a wide range of possibilities; all of them being plausible to a significant degree, according to the experts who devised and commented on them. They should be considered as explorations of the future based on present understanding and embodying a certain worldview, but they were not predictions.

The UNESCO Aral Sea Basin Initiative assists the seven Central Asian Republics in regional water vision consultations and scenario analysis, principally through regional workshops to promote cooperation and collaboration. The aim was to provide an administrative and politics-free framework to facilitate collaboration and co-operation. The preparation of the vision was an experiment in working together based on improved information management and access to knowledge leading to increasing the benefits derived from each unit of water and eliminating wastage. Upgrading education and training and reaching out to the public through better provision of information are important components of the project.

Progress in comprehensive environmental risk and impact assessment was stimulated by the International Training Workshop on Environmental Impact Assessment which was convened in 1997 in Bangkok. The Workshop considered environmental impact assessment case studies for a number of countries and regions and drew up a series of recommendations.

Non-structural measures are an attractive alternative or an addition to structural measures that may reduce the loss of life and property. Several workshops were organized for this project, for instance, the flood evaluation workshop in Mozambique in 2000, and the one in 2001 in London, Ontario, on non-structural water resources management. A more

integrated approach to measures such as insurance, forecasting, warning and land use planning was advocated along with more hazard-effective and sustainable relationships with the environment. The role of non-structural measures was identified in a set of actions that improve society's capacity to anticipate, mitigate, withstand, and recover from water-related problems. The IAHS Symposium on the Extremes of the Extremes: Extraordinary Floods (Reykjavik July 2000) and the proceedings which were published in 2002 made an important contribution.

Considerable progress was made in this Theme through the workshops listed and in others that took place during IHP V and through the Initiative. It is recognized that this is a most difficult area for an international programme to address, but the benefits of success are probably greater than those in most of the other themes. However the impression is that much remains to be done.

2.4.6. Theme 5. Integrated Water Resources Management in Arid and Semi Arid Zones

Water is a scarce commodity over much of the arid and semi arid zones. With population levels increasing rapidly and standards of living rising, this situation will worsen in the years to come, leading to a water crisis with untold consequences. This Theme was given priority status along with Theme 3 amongst the eight themes in IHP V. It has two main aims: to improve the knowledge of hydrological processes in arid and semi-arid conditions and water resources assessment methodologies; and to develop the integrated management of the scarce water resources and their conservation for an efficient water use. It is divided into four projects (Annex 2), the first three looked at hydrological process, water resources assessment and water resources management, while the fourth was concerned with water scarcity. In terms of its global rating, from the responses to the Questionnaires, Theme 5 is one of the lower themes overall, with a value of 2.7, which is below average. However, for some countries in the arid and semi arid zones, the rating was 4 and above, in contrast to countries in Europe where the rating was 2 and below, arid and semi arid conditions being absent from Europe, of course.

Activities under Project 5.1 aimed at improving knowledge of hydrological processes and those under Project 5.2 on improving water resources assessment capabilities seem to have been joined. A working group meeting was held at UNESCO Paris, January 1997, to prepare a manual covering the state-of-the-art on water resources assessment methodologies in arid regions and a second meeting was planned for 1999. But due to budgetary constraints, as well as lack of timely contributions from the members of the working group, it was delayed. At a late stage, the coordinator withdrew due to his retirement. Because of these developments, the Bureau agreed that this working group should be disbanded.

Several regional activities are important to these projects. A concept paper on the proposed project on the Iullemeden Aquifer System (shared by Niger, Nigeria and Mali) was submitted to GEF and a mission undertaken to the Iullemeden Basin for formulating the proposal. Preparations were made for the Pan-African Conference on Water Resources Management to be held in September 2003 in collaboration with other members of the UNSIA water cluster (UNEP, WMO and FAO). A special project on "Wadi Hydrology" was proposed aimed at assisting the Arab Countries in advancing knowledge on the special hydrological processes occurring in arid and semi-arid areas. A Regional Network on Wadi Hydrology was established in 1996, to provide high quality

data and encompassing the organization of regular training courses in Wadi hydrology, workshops, and the preparation of a state-of-the-art report on Wadi Hydrology—the Hydrology of Wadi Systems. This report was published by UNESCO in 2002 following the International Conference on Wadi Hydrology held at Sharm el Sheikh in November 2000.

Project 5.3. Water Resources Management for Sustainable Development in Arid and Semi-Arid Zones had the objective of developing strategies for the integrated management of water resources and their conservation and to establish a mechanism for technology transfer. It was promoted by the activities of a working group and several regionally based initiatives. This group held two meetings, the last in UNESCO, Paris in June 2001 to finalise a technical document which awaits publication. Several seminars and workshops were held to promote this project, such as those in Sana, Baghdad and Amman in cooperation with regional bodies, along with the 8th International Symposium on River Sedimentation which took place in Cairo in November 2001. An important contribution was made by the International Conference on Integrated Water Resources Management for Sustainable Development which was convened in December 2000 in New Delhi.

Coping with Water Scarcity, Project 5.4, aimed to develop methodologies to cope with the scarcity of water resources, the negative effects on the hydrological cycle and to develop public awareness. The second meeting of the Working Group on this project finalized the document on *Coping with Water Scarcity* in November 2000 in Egypt and the resulting publication was produced by UNESCO in 2002.

Establishment of a chair of excellence in Wadi Hydrology, the opening of centres for the study of arid zones in Chile and Egypt and the launching of the International Prize for Water Resources in Arid and Semi-Arid Areas are further important contributions to this project and Theme 5.

Progress within this priority theme has been remarkable with many professionals trained, technical meetings successfully organized and a number of publications produced or in preparation. The lesson learned is that arid zone problems are huge and will continue to require high priority consideration in the IHP for many phases to come. The impact of this Theme in the Arab countries has been considerable especially because of the guidance given by the officers of UNESCO who were involved.

The Kyoto Declaration put the improvement of water management issues, especially in arid regions, at the top of the world water agenda and at its last meeting, the Intergovernmental Council adopted a similar view. Much has been accomplished in Theme 5: research programmes, workshops, symposiums, conferences, training activities and the work of the Wadi Hydrology Network of Arab Countries. That this Network has been converted recently to an international network for arid regions indicates the measure of its success in IHP V. The inputs to Theme 5 from Arab and Asian Countries produced high rates of achievement and it is strongly recommended similar aspects of IHP-VI be strengthened.

2.4.7. Theme 6. Humid Tropics and Water Management

It is estimated that about one third of the world's population lives in the humid tropics, many in South East Asia and India. This region includes a large proportion of the world's water resources, ecologically sensitive areas open to exploitation and stark contrasts between some of the least developed locations, rapidly developing countries and a few of

the most developed. In the responses to first four questions in the Questionnaire, overall Theme 6 rated lowest of the eight Themes. This result may be a consequence of the small number of humid zone respondents; on the other hand, rather surprisingly, European responses rated this Theme higher than average in terms of its relevance to their needs (Question 1), as did respondents from South America and sub Saharan Africa, but this could have been expected.

Theme 6 was designed to: 1) assess the vulnerability of the humid tropical environment with respect to different water and land use techniques to assure sustainable development at short term and long-term scales; 2) to develop networks of water and water-related experts and research organizations involved in warm humid regions hydrology and water management studies; 3) to evaluate understand and define the spatial and temporal variability of key hydrological measures that are strongly needed along with modelling of hydrological processes in the tropics at different scales; 4) to evaluate the impact of human activities on the hydrological cycle of the tropical forests to better understand the global climate system.

These aims were to be achieved through four projects (Annex 2), each of these projects having a number of objectives and proposed products. In reality these merged between the four projects, so no attempt will be made in this evaluation to consider the projects separately. The combined objectives of the Theme are given in Annex 7 A number of products were proposed, but as with many endeavours of this nature, some were achieved, others not, and a number of other new products also came about. These are documented below.

Two regional humid tropics hydrology centres were established during IHP-V: CATHALAC (Water Center for the Humid Tropics of Latin America and the Caribbean) which serves Latin America and the Caribbean (Panama) and The Regional Humid Tropics Hydrology and Water Resources Centre for South East Asia and the Pacific (Malaysia). At the end of IHP-V a proposal was made for a Regional Centre for Humid Tropics Hydrology and Water Resources Management in Africa, to be housed in the University of Ghana, but negotiations are still in process. Networks of co-operating institutions dealing with humid tropics hydrology and ecohydrology have been developed under this Theme. One example is the collaboration of the IHP with the IUCN World Conservation Monitoring Centre, in Cambridge, UK.

The two regional centres have been running seminars and short courses for hydrologists from their areas. CATHALAC has run seminars and short courses on Time Series, Environmental Data Analysis and Coastal Zones, while the centre in Malaysia covered: Extreme Rainfalls of Malaysia, Storm Water Analysis and Modelling, Rainwater Harvesting and Urban Hydrology. A Data Logging, Interpretation and Management Training Course took place in Townsville, Australia, in 2001. This led to a joint WMO/SOPAC/UNESCO project proposal for a three-year Pacific-wide hydrological training and capacity-building programme, aimed at extending UNESCO's efforts in the area of data logging and management to other areas of hydrological work in the region which awaits funding.

Among the list publications on hydrology and sustainable water resources development in the humid tropics several are noteworthy. The first was a popularised document Decision Time for Cloud Forests (UNESCO 2001), the second was volume 4 in the series Catalogue of Rivers for Southeast Asia and the Pacific containing data for 25 rivers

which was due to be published in 2002—work carried out with FRIEND. Others are Technical Document in Hydrology No. 36: The Impact of Forest Conversion on Hydrology: A Synthesis of French work in West Africa and Madagascar was published by UNESCO in 2000, while in 2002 Water management in the Mekong Delta appeared in the same series.

Contributions on the results of humid tropics research were made at various meetings, but the two key symposia were held in Panama in 1999 and Kuala-Lumpur in 2000. At Panama a special session on integrated water management was included in the Second International Colloquium (Panama, March 1999), the papers being published. The joint IHP/IUFRO Symposium/Workshop on Tropical Forest Hydrology resulted in a publication. A list of some of the other relevant scientific meetings is shown in 8.

A number of successful field projects have been mounted. A joint UNESCO/NIH/KFD project “Hydrological Evaluation of the impact of Forest rehabilitation strategies” Karnataka State Forests of Western Ghats, India, has been completed. The report is being finalised and proposals have been put forward to extend the project with a wider range of partners. In Africa a regional project financed by the German BMZ is investigating “Management of groundwater resources for sustainable development of the Lake Chad Basin.” Isotope analysis undertaken through the IAEA is an important component of this research. Urban hydrology is being researched in the Kerayong catchment in Malaysia and groundwater recharge and pollution have been investigated in the low lying coral islands of Bonriki, Kiribati and Lifuka, Tonga. These research projects have all gathered sufficient momentum for plans to be in place to extend them into a second phase.

The Panama conference brought together 43 participants from 27 countries, while in Kuala Lumpur there were 85 participants from 24 countries. Of some concern is the dominance of proceedings by scientists from outside the humid tropics region with most of the presentations coming from participants from outside the region

The two regional centres have played an important role in developing networks within their respective areas, as well as promoting a significant number of IHP-related activities. However to be effective these centres require strong leadership and the support of the national government. Where this is lacking the key role that they can play in research development, networking and capacity building is negated.

The Regional Humid Tropics Hydrology Centres play a leading role in developing hydrological sciences in their respective regions. Both centres have been active in promoting research, developing networks, organizing symposia, regional seminars and training courses. Such centres are able to be proactive to local needs and are in a good position to feed research results back to local stakeholders. They are also able to coordinate the needs and outcomes of projects from different themes. The Humid Tropics theme has close links with FRIEND as well as Ecohydrology, Groundwater at Risk and Urban Water Management.

The proposal for a similar centre in West Africa is fully supported. However this centre may not provide sufficient support for East African countries. The Lake Victoria Research Initiative, a project under the Lake Victoria Development Partnership (LVDP) funded by SIDA/Sarec and implemented by the Inter-University Council for East Africa, is a possible partner through which to promote IHP activities in the humid tropics of East Africa.

There is concern that research and managerial capacity is not being developed at a

sufficient rate in the less developed areas of the humid tropics. An overview of symposia and research products indicated that there have been only limited contributions from local scientists, with the main input being from foreign academics working through outside funding agencies. UNESCO must ensure that IHP endorsed projects promote partnerships between developed and developing areas that leads to true capacity building at the local level. “Extractive” scientific research of little benefit to local communities must be avoided as this only leads to resentment and lack of cooperation. Australia, a developed country with its own humid tropics area, is already playing an important research role, especially with respect to the Pacific islands. Australia should be encouraged to develop equal partnerships with researchers from less developed areas.

There is much scope for further research. Although the activities outlined in this report point to some impressive achievements, there is no match between the research outcomes of IHP-V and the vastness of the humid tropics and the complexity of its water related problems. There has also been to date a lack of progress in translating research outcomes into management guidelines. Partnerships must be developed between researchers and water management agencies to make sure that research is both relevant to local problems and assimilated into management strategies.

2.4.8. Theme 7. Integrated Urban Water Management

Between 1950 and 2000 the global urban population has more than tripled to reach 2.86 billion (UN, 2002). Although urbanization in developed countries has slowed down considerably, urban areas in developing countries accounted for 68% of the global urban population in 2000. For example, of the 17 largest metropolitan areas of the world in 2001, four are in Latin America: São Paulo, Brazil (18.3 million, ranked 2nd), Mexico City, Mexico (18.3 million, ranked 3rd), Buenos Aires, Argentina (12.1 million, ranked 11th) and Rio de Janeiro, Brazil (10.8 million, ranked 15th). In fact, in very large urban areas such as São Paulo significant inter-basin water transfers occur (Braga, 2000). The UNESCO IHP-V identified urban drainage, water supply, solid waste and sewage disposal as the principal components of urban water management that must be integrated (UNESCO, 1996). The outlook for the future (Maksimović and Tejada-Guibert, 2001) calls for new approaches to develop, test and/or apply the appropriate techniques for re-use of treated wastewater; and strategies for integrated stormwater, groundwater, water supply, wastewater management and water conservation.

The level of activity in IHP for this Theme has been substantial. Several symposia have been organized, and conference proceedings (e.g., UNESCO, 1997, 1998, 2001) and books published (Maksimović and Tejada-Guibert, 2001). A three-volume series was published within the framework of Theme 7 addressing urban drainage aspects in the humid tropics (Volume I), in cold climates (Volume II) and in arid and semi-arid climates (Volume III). The regional centres of IRTCUD (International Research and Training Centre on Urban Drainage) were activated: in São Paulo, Brazil for the humid tropics and in Oslo, Norway for cold climates. The Regional Centre on Urban Water Management was opened in Tehran, Iran under the auspices of UNESCO for arid climates. The aspects dealing with non-structural urban flood management were well covered in Sao Paulo in April 1998 and the publication of guidelines on the subject (Adjelkovic 2001) Public participation and community involvement guidelines were also published for water professionals and planners responsible for the formulation of integrated flood control

policies and for their implementation (Afeltranger, 2001). Related to urban water management is the impact of urban development on freshwater resources in small coastal cities and islands. An international conference addressing this issue was held in 1997 in Essaouira, Kingdom of Morocco, bringing together representatives from cities of the North African coast, and from cooperating cities of the northern Mediterranean and northern Europe, along with UNESCO and national and local counterparts. The proceedings and recommendations are available online [<http://www.unesco.org/csi/pub/info/info5.htm>].

Theme 7 was ranked well *above average* (3.8/5.0) in terms of relevancy to national water activities by respondents to the questionnaire sent as part of the IHP-V evaluation. Yet, Theme 7 was ranked *below average* (2.6, 2.4 and 2.6) by the national organizations responding from each country in terms of, respectively: the extent to which the objectives of Theme 7 were achieved on a national basis, the level of its impact on national water activities, and the level of its impact on national hydrological sciences. These ratings are in line with the perception of the general level of impact of all IHP-V activities on national water activities, reported as 2.6. Nonetheless, in view of the relevancy of urban water management and the implications of inadequate attention to this issue in the future, the results are not encouraging. It should be recognised that the results may be skewed by responses from countries that are not highly urbanized and from respondents who do not have responsibilities for urban hydrology.

2.4.9. Theme 8: Transfer of Knowledge, Information and Technology (KIT)

IHP-V set out to stimulate stronger interrelations and interactions between scientific research, application and education. Over 30 projects have been carried out, to promote the objective of Theme 8 which is the dissemination of knowledge through courses, awareness raising activities, and as a clearinghouse of water-related knowledge. Most of these activities are well documented on the UNESCO IHP-V Results to Date (1996-2001) Web site [http://www.unesco.org/water/ihp/ihp_five_results.shtml] and the Water Portal Web site [<http://www.unesco.org/water/>]. The extensive collection of IHP publications may be found online [http://webworld.unesco.org/ihp_db/publications/search_free.asp]. In fact, respondents to the IHP-V evaluation questionnaire ranked Theme 8 well above average in terms of its level of impact on their water activities (3.6 out of a maximum of 5), and slightly above average (3.1) in terms of its relevancy to their planned objectives, and generally above all the other themes. Access to the IHP Web site was ranked at the 84 percent level: suggesting that maintaining this level of success is a worthwhile investment, which at the same time enhances the UNESCO educational mission. Among the KIT activities during IHP-V were:

- Assessment of the education and training needs of the water resources management services of the Republic of South Africa. This joint DWAF/UNESCO/WMO mission is developing educational material for Computer-Aided Learning (CAL) as well as educational CD-ROMs.
- Geographic Information Systems (GIS). IHP-V has continued concentrating on the application of Geographic Information Systems (GIS) in water resources management and hydrology. The 2nd HYDROGIS Conference was held in Vienna, Austria (Kovar and Nachtnebel 1996). The development of a GIS application to water resources (water balance of South Africa) was concluded in collaboration with FAO.

- Awareness raising is an IHP task of increasing importance. UNESCO IHP-V was involved in the development of public information and non-formal educational material, television programmes, videos and CD-ROMs, and collaborated with the World Water Council (Marseille, France) on several awareness programmes.
- A special project on women and water resources supply and use was implemented in the Sub-Saharan region. The objectives of this project were to contribute to the improvement of the quality of life of women in rural and urban areas and to improve water resources management in the Sub-Saharan Africa.

A major issue that surfaced during the IHP-V evaluation regional visits is the need for further professional capacity building, particularly in the developing countries. An assessment of the past, present and future of postgraduate education was conducted in Prague in 1994, as part of IHP-IV, Project E-3-1 (Salz 1996). A similar workshop is highly recommended in the near future, perhaps with a broader vision; that is, including other types of training, technology transfer and distance learning in the hydrological and water resources disciplines. The 2nd World Water Forum (The Hague, 17-22 March 2000) did provide the impetus to UNESCO, UNDP, IHE-Delft, the World Bank Institute and UNU/INWEH to initiate action on water sector capacity building, focusing on education and training. A strategy paper, part of IHP-VI Theme 5 (Water Education and Training), summarizes the findings and their relevance to awareness raising, education and training (UNESCO, 2001). A section of the IHP Web page highlighting the breadth and depth of careers in hydrology and water resources with the education and training required would be a useful public service.

A worrisome aspect that has surfaced during the evaluation is the perception by respondents to the Questionnaire that IHP-V activities (with the exception of Theme 8) had a low level of impact on water activities in their country. Education can play a major role in reversing that perception. Documentation of IHP success stories, through all the media outlets and the IHP Web page, should be more aggressively pursued. However, serious thought should also be given to prioritizing disciplines within hydrology that place UNESCO IHP in a position of unique advantage. Intuitively, these should be those with a distinct international character, such as international transboundary hydrological fluxes (both quantity and quality) and the value of coupling in hydrology, such as hydrological/atmospheric coupling. The latter type of coupling, as well as the coupling of surface fluxes to subsurface processes in very large aquifers, inevitably results in exchanges or interactions across national boundaries. IHP-V Project 1.2 (Development and Calibration of coupled hydrological/atmospheric models) is an excellent example, as well as FRIEND and other initiatives in Theme 1. Thus, it is surprising that respondents perceived Theme 1 as having an impact on national water activities well below average (2.6).

A young scientist award scheme is currently administered by UNESCO's Man and the Biosphere (MAB) programme. A similar initiative should be seriously considered by the IHP, perhaps at different educational levels, which would be complementary to other efforts by the IHP to educate the public at an early age. Furthermore, opportunities for training and education in hydrology and water resources can be publicized through useful links to organizations providing funding.

2.4 10. Summary of the results of missions by members of the Team

Annex 10 provides the mission reports from the members of the Team. The conclusions of each report are included here

2.4.10.1. South America

IHP-V set out to stimulate a stronger relationship between scientific research, application and education. The emphasis was to be placed on environmentally sound integrated water resources planning and management. In general, to accomplish *integrated water management in a vulnerable environment* to the fullest in Latin America and the Caribbean (LAC) would have required and will require greater efforts in terms of water quality, which lags far behind regional capabilities and knowledge in terms of water quantity. In spite of evident partnerships and decentralization efforts throughout the region, the resources are inadequate, thus limiting capacity building initiatives. This does not diminish the tremendous progress evident over the past 15 years in several LAC countries in developing water balances, monitoring networks and databases: a lot of credit goes to the leadership provided by the UNESCO regional office in Montevideo. Furthermore it does not diminish many remaining challenges in quantifying flows accurately. In the entire region public health concerns have been raised over air and water contamination. Admittedly, the transport of contaminants across international boundaries presents unique social, political and economic considerations and barriers.

In terms of the effectiveness of governance and coordination mechanisms, it is difficult to judge how effective the IHP national committees have been in the region. Conversations with non-governmental participants at the workshop in La Serena resulted in very different opinions to those represented by national committee members. In fact, the initial response to the questionnaire from the region was dismal, in spite of the fact that the Questionnaire was translated into Spanish and a Web-based version was made available on the Internet for automated response. This suggests some apathy on the part of many IHP national committees in the region who did not even bother to respond. Private engineering consultants working in LAC countries provided valuable comments on meteorological data and on hydrological science and water resources practice: they remarked that the government agencies lack resources and the knowledge to establish consistent and reliable data collection/monitoring programmes. However, countries such as Brazil, Mexico, Panama, Argentina, Chile, and Peru were considered exceptions to the rule in that relatively good data are available, albeit not comprehensive.

In spite of significant investments in educating their water professionals in some LAC countries, greater capacity building is still being sought in the region. This provides even greater opportunities for advanced training and technology transfer as these remain high priorities. Nevertheless, it seems that the concept of managing water as an economic resource is widely understood and part of national water policy, and thus well worth the investment. This is particularly evident in countries with significant arid and semi-arid zones, such as Chile and Mexico.

Almost universally, the dissemination of knowledge acquired, including publications, through UNESCO IHP was praised and ranked as the highest accomplishment of the Programme. In particular, electronic access to publications has been recognized by IHP. Another partner of IHP, MAB (Man and the Biosphere), has aggressively pursued this path for dissemination of knowledge.

Some online educational materials are available, but more formal distance learning initiatives in the hydrological and water resources disciplines through UNESCO should be further explored.

2.4.10.2. Africa south of the Sahara

Africa is a continent beset with environmental and social problems that make its people vulnerable to environmental degradation, and to degradation of water resources in particular. For IHP-V to be successful in sub Saharan Africa, it had not only to tackle the water problems, but also to recognise the particular environmental and human context of Africa. People in Africa do not lack the will to tackle environmental problems, but they are often frustrated by a lack of institutional support to do so. The Regional Hydrologist and national committees together have an important role to help build institutional capacity. The following recommendations relate in particular to how this role could be made more effective.

- 1) The separate roles of UNESCO (Paris), the Regional Hydrologists and the National Committees must be clearly defined.
- 2) The Regional Hydrologist must be given full support by UNESCO Paris and by the host institution. The Paris HQ must ensure that the host institution provides an enabling environment with appropriate access to resources such as telephones. UNESCO must also ensure that sufficient funds are available to support all designated tasks.
- 3) To expect one Regional Hydrologist to work with 50 African countries is a tall order. It is not surprising that that person has tended to focus on those areas where communication is easiest and where there is sufficient capacity already available for some research activity. This, however, leaves the other countries feeling marginalised and frustrated. One answer would be to divide the area in to say three sub-regions, each with its own Regional Hydrologist.
- 4) The Regional Hydrologist needs to work with government agencies to promote the IHP and to ensure that they give support to IHP activities and to the National Committee. Alternative ways of funding National Committee activities may be needed in resource poor countries. For example, a proportion of donor project funding could go to support the National Committee.
- 5) The Regional Hydrologist must work with national committees to build their institutional capacity, to guide them with respect to proposal development, networking and so forth.
- 6) The Regional Hydrologist needs to ensure that national committees network effectively with the wider community and that IHP resources and activities are not confined to the committee members.
- 7) There should be better representation from Universities and researchers on the National Committee. Academics are the people with a commitment to research and education and are generally willing to make time and resources available for attendance at relevant meetings. It would be useful to include representatives from water related societies and professional bodies which could report back to their membership, for example at AGMs and could organise symposia on IHP related themes as part of their regular meetings. This would raise the general awareness of the research community.
- 8) The Regional Hydrologist and IHP Secretariat need to work through the national committees to identify national research priorities so that sub-regional research

programmes can address common needs. A more bottom up approach to programme design is needed.

9) The low level of resources and lack of available funding in many African countries for attendance at international meetings needs to be recognised and addressed. Travel to meetings within Africa should be encouraged. African countries have common problems and need a forum to share these.

10) A more structured approach to training in water sciences linked to a long term vision of capacity building in Africa is needed. The impression given of the present approach is that it is both underfunded and *ad hoc* in the disbursement of these funds. The Intergovernmental Council needs to put in place a monitoring system to ensure the sustainability of projects.

2.4.10.3. Europe excluding Russia

There are strong signals coming from Europe about IHP V and the IHP in general, some from the missions undertaken for the Evaluation and other contacts and some from the responses to the Questionnaire. Perhaps the most important is that while the impact of the IHP on hydrological sciences seems to be at a reasonable level, its impact on the water affairs of most nations appears to be low. The education, transfer of knowledge and capacity building activities of the Programme were seen as the most prominent and beneficial. Several expressions of these activities, the water portal and the quality of publications, for example, were considered to be excellent, but there was concern about the slow rate of production of publications. There was also concern about the Council, its membership and method of work and using membership of the Council to widen interest and commitment to the IHP. Should the membership of the Council be open to all Members of UNESCO and not just to those 36 who are elected? Should the membership of the Council be required to rotate more rapidly by not permitting consecutive terms to be served? Could the Council's work be made more efficient by limiting the time of presentations, particularly those by the Division of Water Sciences?

There were feelings against the idea of Regional Councils cast in the same mould as the Intergovernmental Council, but there was a measure of support for other means of decentralisation, for example by forging closer links between the IHP and sub-regional bodies such as SADC and through project-based regional initiatives, those within FRIEND, for instance. There were also worries that too much time had been spent debating this matter over the last six years or so, to the detriment of the overseeing of the Programme. There was great concern that the human resources of the Division of Water Science and the Regional Offices did not match the demands of the Programme. There was a suggestion that the number of staff in Paris should be increased by 50%, that all Regional Hydrologist posts be full-time and that there should be more of them. The alternative would be to reduce the size of the Programme by 50%. In this context of human resources, it appeared that moves towards further "decentralisation" would worsen this situation.

The budget for IHP V was another area of concern. The Fifth Phase started with cuts which curtailed activities, but it finished with a very welcome increase in the provision of funds. The establishment of the Finance Committee was seen as a valuable means of helping to secure a more stable budgetary climate and as an essential part of the machinery of the IHP. An underlying development was the greater transparency of financial matters—this was considered to be a very necessary improvement.

Partnerships were felt to be important to the IHP. At the global level this applied particularly to WMO and its activities, but there could also be benefit if national committees were to have joint responsibility for IHP and OHP matters. Partnerships between national committees could also be very effective means of promoting the IHP. Also at the global level there was considerable praise for the way in which the Director and members of the Division of Water Sciences had promoted the IHP in world water affairs and had secured UNESCO as the seat of the UN World Water Assessment Programme.

2.4.10.4 Asia and the Pacific

The hydrology and water resources problems of this vast region cover a very wide spectrum and require an eclectic approach from those involved in science, engineering and in the allied fields of endeavor.

Of the countries concerned, China is one of the most extensive and varied, containing a large sample of the difficulties facing the region as a whole. Consequently the survey of the activities of the Chinese National Committee for the IHP (CNC-IHP) encompassed floods, droughts, climate change, declining groundwater levels, increasing per capita demands for water, large scale water transfers, erosion and pollution and a number of other areas where the problems impede the advancement of the nation. Addressing these problems required a number of research projects to be launched, promoted by different sponsors and funded from a number of different sources within China and also by foreign donors. Although these projects were designed to meet national needs the projects were tailored to contribute initially to IHP V and then to IHP VI and also to other international programmes such as GEWEX. This Chinese experience points the way for others to follow. The harnessing of an international programme to meet national needs and vice versa is a propitious method of progress.

The CNC-IHP is linked very effectively to the Chinese Government and its programme, through the Chairperson, who must be the Director General of the Bureau of Hydrology of the Ministry of Water Resources. The CNC-IHP was very active in IHP-V, participating in most projects, particularly in Friend, organizing symposia and workshops and contributing to the Catalogue of Rivers. Contributions were also made to various national projects such as the "Study on ecological environmental change in west China". This was one of the key scientific and technological projects during the Ninth National 5-Year Plan. The issue of water shortages and related eco-environmental degradation in North China are among the major emerging problems facing the nation. The case study of the Haihe River was important to work aimed at overcoming these shortages. A number of the National Action Plans for Water Resources were related specifically to IHP V Theme 4. Through the understanding of changes to water resources and the causes of the vulnerability of water resources, the aim was to try to increase water safety. The CNC-IHP cooperated in these major projects by providing information and guidance on the better management of water resources through the organization of several National Workshops. A key project was the 5 year study of the Evolution of Laws of Water Resources and Maintaining Mechanisms of Water Renewability in the Yellow River Basin. It aimed to answer the question "What are the key factors controlling the renewable capacities of water resources in a watershed like the Yellow River basin?"

Increasingly during the 21st Century, the pressure on water resources in China will mount. Will the water current scarcity affecting the Yellow, Huai and Hai river basins

develop into a water crisis? Can actions in science and society avert this crisis? New challenges to hydrological research and water resources management must be faced and water-related professionals, policy makers and other stakeholders must be involved. The search for sustainable development must go on with hydrological research as one of the important tools.

Australia, another of the region's very large countries, also faces serious water resources problems stemming from the uneven distribution, the great variability and extreme sensitivity to change of the continent's hydrological cycle and its component processes. In response to these characteristics Australia's hydrological community continues to be very active in adapting scientific advances made overseas to meet these challenges and in developing and applying home-grown methods and techniques. Fortunately a small population and low densities go some way to moderating the problems of the nation's water resources. Australia has also succeeded in exporting areas of its expertise, in particular, to benefit the Pacific Island Nations. These include contributions to the IHP. Indeed the success of Australia's participation in IHP V should be measured more by the impact of its activities on developing nations and less by the effect of IHP V activities conducted within Australia. In fact with the exception of work on Groundwater Systems, there has been little impact of IHP V on the hydrological sciences in Australia. The involvement of the research and scientific community in IHP V activities has been difficult to obtain, as many scientists tend to see little value in their involvement. Opinion is that most of the hydrological science activity, of which there is a significant amount, would progress whether or not the IHP existed. The National Committee operates as the IHP Network purely as an information-down group. Members make little input unless requested and levels of awareness of the IHP are not high in Australia despite brochures, presentations at conferences and so on. There is very limited linkage of IHP activities to national programmes and there appears to be no effective coordination mechanism. Funding continues to be a problem, particularly seed money to prime activities and attract other funds. The UNESCO Field Offices are seen as excellent vehicles for promoting activities, particularly regional activities within IHP V. A greater emphasis on regional activities as opposed to global or national activities would be preferable. The managerial support from UNESCO is excellent considering the range of issues being addressed and the resources available. Because water issues are so high on the international agenda, the time is ripe for the IHP to make a difference. It should aim to make that difference where it can add value, not in the old and continually visited roles such as Global Water Resources Assessments, recognizing that the IHP is a global package designed to meet the needs of all Members.

Indonesia is another of the larger countries of the region, however in contrast to China and Australia it is comprised of a considerable number of islands, large and small. It experiences a wide range of water resources problems due to the vagaries of the monsoon, the dense population, the intensive agriculture, mining and industry. There are ongoing national projects which aim to combat these problems, together with those resourced from outside Indonesia. Some of these relate to IHP V which was considered most relevant to the Indonesian economy and to human life. However the IHP National Committee has very limited access to the executing agencies of the different sectors dealing with water resources projects because it is attached to the Indonesian Sciences Institute. Although members of the Committee represent agencies working in the

different sectors, they have very limited influence on policy. Thus the impact of IHP V was low except for the personal activities of some of the members. Dissemination of information on the IHP and its activities is poor, although the Technical Documents in Hydrology and other IHP publications are considered very valuable. This situation needs improving. Capacity building in the water sector also requires serious attention despite the fact that Indonesia has been the target for bilateral and multilateral support in this field for decades. Other major impediments to the effective development and implementation of IHP V are lack of communication and co-ordination between the different sectors and their executing agencies involved in water issues and with the IHP National Committee. The IHP is seen as limited to scientific and educational aspects of water resources without a source of funding. The availability of funding, easier access to information and programmes, more widespread and regular dissemination of publications, with support to improve human resource and institutional capacity building would vastly improve the situation.

The regional office in Jakarta and the field offices are well appreciated and the contributions made by the staff are esteemed. This performance would be enhanced with further support to the regional offices which provide the links between the IHP at the country level and at the regional and global levels.

2.4.10.5. Arab Countries

Most Arab countries are characterised by scant rainfall totals, fierce evaporation rates and minimal renewable water resource. However some nations have access to substantial volumes of non-renewable ground water, brackish water and sea water. Scarcity is widespread now, but as it worsens with a doubling of demand for water during the next twenty five years, the sustainable management of water resources must be an imperative in order to avoid water scarcity becoming more and more of a development constraint. Consequently it was evident that in IHP V, themes 3 and 5 were given precedence in the Arab region, to an even greater extent than elsewhere in the world. But it was clear that the impacts of IHP V and the IHP in general on the different water sectors in each country depend greatly on the effectiveness of the national committee for that particular country. To overcome this challenge, the suggestion is that:

- The hydrologist in each of the regional offices devotes more time to visiting each country especially where the national committees are not effective or not functioning. During these visits, discussions can be held with the top management at the water agencies, with decision makers, researchers, professors and NGO's to explain the IHP objectives, programmes, expected benefits, and procedures to form the national committees.
- A regional training workshop for representatives of national committees from different countries in the region could be held in the country which has an effective and known record of achievements in the IHP. This workshop could be used to train the new and weak national committees on the best way to benefit from the experiences of the successful national committees, and to exchange views during the course of the work on problems and solutions.
- More financial support is needed for national committees in completing and in expanding some of the studies for various IHP activities.

There was a clear acknowledgement and appreciation for the great effort, support, encouragement and guidance which had been provided to the national committees of the

countries of Arab Region by officers of the Division of Water Science and the UNESCO Regional Office in Cairo during IHP V.

2.5. LESSONS LEARNED AND CONSTRAINTS AND PROBLEMS WHICH IMPACTED THE PROGRAMME DELIVERY

Arguably the most important component of the IHP is the National Committee. An effective National Committee is more likely to lead to a successful national input to the Programme and to the bottom-up approach to the IHP that is frequently advocated. The availability of a relatively small amount of money to support the meetings of the Committee is essential to its success. The Committee may also be able to take part in the promotion of national research projects and this can give members the opportunity to tailor the outputs of these projects as contributions to appropriate IHP projects. Funds to support such projects or even some “seed money” administered by the national committee would enhance its status and effectiveness. Linking the national committee to the main drivers of national water policy would give it more meaning.

From the results of the missions of members of the Team and the number of responses to the Questionnaire and from other evidence, there is reason to believe that many national committees are ineffective. Guidance to national committees to promote their effectiveness would have been a vital but missing part of IHP V and this situation is continuing in IHP VI. Proposals for assisting committees and encouraging Members without IHP committees to establish them are contained in this CER. There are also the suggestions that national committees should be visited more frequently by the regional hydrologist and that the email addresses and fax and telephone numbers of the chairs and secretaries of national committees are updated regularly at the Division of Water Science. There is a further point about national committees that deserves airing. Many are not connected to their national commissions for UNESCO or equivalent body. There would be benefit in members of national committees sitting on their national commissions, one being the possibility of influencing national attitudes to and decisions on this major UNESCO programme made by the General Council of UNESCO.

A debate was started about the mandate and functioning of national committees during IHP V but it did not progress far. However it seems essential for this matter to be pursued with vigour. Recommendation 2.6.1 below to national committees contains a number ways of activating them. In addition it would be appropriate to consider an evaluation of the state of national committees in order to further promote their work and render them effective.

Most IHP projects are implemented through working groups and many groups complete their remits with credit. However, this is dependent on the choice of the members of the group and that a sufficient number of meetings of the group can be held, factors, which are themselves dependent on adequate financial and human resources being provided by UNESCO and the Division of Water Science. There is concern expressed in this Report that the Division is understaffed and that it has been underfunded. Is this concern supported by the no progress or slow progress reported for several IHP V projects? Is it a factor limiting the speed of publication? Are there other expressions of this apparent discrepancy between the demands and the resources of the Division?

Representatives from thirty six national committees come together in UNESCO as the elected Intergovernmental Council once every two years, with observers and representatives of IGOs and NGOs. The 15th Session of the Council, which was held in June 2002, addressed a fifteen-item agenda containing thirty or more sub-items. Many of these were reports where the Council was not faced with a decision. There have been calls in the past for improving the efficiency of the Council and, in response to the TOR, this CER suggests shortening the agenda and limiting the time for presentations. Separating documents into those for “decision” and those “for information” and discussing only the former would be an additional way of upgrading the Council’s efficiency and effectiveness. This Report also goes into the matter of regional councils which has occupied the attention of the Council for some years. It is still being debated by the Ad Hoc Governance Committee, while the “test system” of regional meetings is being continued. Several suggestions have already been made here. For the option of a regional council to be left to each region, might be seen as a better expression of democracy than a solution imposed from the top. Some regions may find regional meetings to be beneficial, others may not. IHP V was executed without a system of regional councils. Would it have been more productive with a regional system in place? It is very difficult to judge. Some projects, Friend in particular, are regionally based and offer a good platform for considering a region’s problems and steps to their solution. Worries surfaced at the Kovacs Colloquium that in broadening IHP IV and V, many of the fundamental problems in hydrology and water resources management were being neglected. IHP VI could be looked on as continuing this pattern. Should a clear long term vision be established of the future directions and objectives of the IHP before the Programmes 30th birthday? Such a vision should also consider the framework for the future Programme in terms of targets and deliverables which can be measured, together with an effective system for monitoring progress. The Evaluation Team also has a number of comments for consideration in the establishment of a team to assess IHP VI and those for future phases. These are contained in Annex 11. Important amongst them is that IOS must be involved in all stages of the evaluation.

2.6. RECOMMENDATIONS

A number of recommendations appear in the body of this Report. The most important are captured here for further consideration. Some are directed to the Council, some to national committees, some to UNESCO and the Division of Water Science and some to partner organizations. Ways and means of instituting these recommendations are proposed.

2.6.1. To National Committees

- 1) Strengthen National Committees for the IHP, especially those in Africa.
 - Secure governmental funding to support the work of the Committee.
 - Meet at least once a year.
 - Draw the membership from bodies involved with a wide range of the nation’s water activities especially national water policy.

Establish partnerships between national committees in the developed and developing world and between neighbouring national committees.
Establish partnerships with NGOs.
Seek to lead or be involved in national research projects and tailor them to contribute to the IHP.
Combine the committee for the IHP with the committee for WMO's equivalent Programme and share responsibilities.

2.6.2. To The Intergovernmental Council and the Bureau

2) Make sessions of the Intergovernmental Council and the Bureau more efficient and effective

Work with shortened agendas,
Give priority to discussion of matters that need decisions.
Place time limits on presentations.

3) Improve the Process of Planning the IHP

Seek to institute a more bottom-up approach to the planning of IHP VII and future phases.

Achieve a better balance between the ambitions of the Programme and the resources available.

Continue to encourage the participation of partner organisations.

Engage in discussions of the long term future of the IHP culminating in a gathering of all stakeholders to mark the 30th anniversary of the launch of the Programme. These discussions must also consider the IHP input to the UN International Decade for Action, "Water for Life". 2005-2015

4) Give more guidance to national committees.

Draw up guidance material for publication in the IHP series on the role and responsibilities of national committees and on additional means of improving their effectiveness.

Disseminate this guidance material through a series of workshops held in Africa and selected parts of the rest of world.

Organise more visits to national committees by members of the IHP Secretariat and Regional Hydrologists, especially those that need encouragement.

5) Monitor projects more effectively.

Introduce a system of regular reporting by Working Groups.

Set targets for projects and measure whether they have been achieved

2.6.3. UNESCO, the Division of Water Science and the Regional Offices

6). Balance the human and financial resources against the needs of the Programme in a better fashion.

Maintain conditions where the resources available match the requirements of the Programme or vice versa.

Ensure support to the regional hydrologists.

Encourage regional hydrologists to make more frequent visits to national committees.

7) Increase the speed of publishing.

Introduce tighter schedules for the production of UNESCO/IHP publications and encourage authors to keep to them.

Give preference to outside publishers with short turn-around times.

8). Make publications more readily available.

Investigate the destinations of IHP publications and whether the numbers of publications are adequate.

Give preferences to outlets which ensure distribution to the largest number of stakeholders.

Increase the advertising of publications.

Encourage more national committees to translate the whole or parts of IHP publications into their own languages.

Survey user opinion.

Favour joint publications, such as with WMO and IAHS.

Increase the use of electronic means of publishing

9) Maintain the level of advocacy for the IHP

Continue to give a high level of visibility to the IHP and UNESCO in the water affairs of the UN system and in the forums where world water issues are debated.

Raise the amount of effort devoted to public relations.

Contribute to the work of partner organisations.

Institute a prize for young persons

2.6.4. To Partner Organisations

10) Share in the activities of the IHP to a greater extent and encourage links between programmes.

Take part in the planning process for the IHP

Send an observer to meetings of the Council

Take on the responsibility for certain projects.

Participate in working groups.

Produce publications, or joint publications, contributing to the IHP.

2.7. CONCLUSIONS

Taken as a whole, IHP V appears to have achieved its objectives to a considerable degree. However, in more detail, its achievements seem to be unevenly distributed across the themes and regions. It stimulated the hydrological sciences, particularly through Theme 3, Groundwater Resources at Risk and through the FRIEND Project of Theme 1. It was praised for the transfer of knowledge motivated by Theme 8, for its publications and website, with the possible exception of Africa. There seemed to be some doubt, however, that IHP V reached its planned objectives in some of the themes other than 3 and 8, while its impact on national water activities was also not proven. Nevertheless IHP V continued to be a broadly based programme which extended beyond the traditional fringes of the International Hydrological Programme into a number of allied areas. It was a phase of the IHP which attracted a considerable volume of support from the global hydrological community.

While the TOR given to the Team concentrated attention on the results and achievements of IHP V, it was inevitable that thinking was initiated about the future of the IHP. "What should be the shape and form of future Programmes beyond IHP VI?" was a question raised a number of times. It is a question which needs to be considered against the background that when the IHP was launched in 1975, the Programme was virtually unmatched by similar initiatives on the global water stage. Closest then was the World Meteorological Organization's programme in operational hydrology which largely complemented rather than competed with the IHP, as it still does. At the start of the new millennium however, the situation was rather different. New players had entered the stage and IHP V had been given a broader role, albeit one sharing certain scenes with others. The Global Water Partnership, the World Water Council, the International Geosphere/Biosphere Programme and its components, together with the World Climate Research Programme are promoting activities such as integrated water resources management, water resources assessment and global water systems which impinged on or overlapped with IHP V. That effective links are developed and maintained with these players and their activities is essential to the Programme. Nevertheless the IHP must be considered to have a competitive edge over these activities, by reason of its depth and breadth, together with its organisation and delivery, particularly in education, training and publications. How this position is to be maintained needs to be addressed soon. IHP V saw the initiation of a number of international and regional centres dealing with particular aspects of the Programme. The UN World Water Assessment Programme was established subsequently at UNESCO. The future IHP also needs to be considered against these developments and how they relate to the Programme ten or twenty years hence. Water continues to grow in prominence on the international agenda. One recent indication is the impending UN International Decade for Action, "Water for Life", 2005-2015. Through the IHP UNESCO can contribute extensively to this Decade and contribute to the water-wellbeing of every man, woman and child on this planet.

3. ANNEXES

ANNEX 1. TERMS OF REFERENCE FOR THE EXTERNAL EVALUATION OF THE FIFTH PHASE OF THE INTERNATIONAL HYDROLOGY PROGRAMME
HYDROLOGY AND WATER RESOURCES DEVELOPMENT IN A VULNERABLE ENVIRONMENT

ANNEX 2. MEMBERS OF THE EXTERNAL EVALUATION TEAM

ANNEX 3. QUESTIONNAIRE FOR THE EXTERNAL EVALUATION OF THE FIFTH PHASE OF THE UNESCO INTERNATIONAL HYDROLOGICAL PROGRAMME (IHP V) "HYDROLOGY AND WATER RESOURCES DEVELOPMENT IN A VULNERABLE ENVIRONMENT"

ANNEX 4. LIST OF RESPONDING COUNTRIES AND ORGANISATIONS

ANNEX 5. ANALYSES OF RESPONSES FOR THEMES 3 AND 5

ANNEX 6. REGIONAL ACTIVITIES WITHIN THEME 3

ANNEX 7. LIST OF COMBINED AIMS OF PROJECTS IN THEME 6

ANNEX 8. LIST OF SOME OF THE SYMPOSIA, SEMINARS AND WORKSHOPS RELEVANT TO THEME 6

ANNEX 9. SELECTED REFERENCES FOR THE THEMES

ANNEX 10. REPORTS ON MISSIONS UNDERTAKEN BY MEMBERS OF THE
EVALUATION TEAM

ANNEX 11. PROPOSALS FOR IMPROVING THE EVALUATION OF IHP VI

ANNEX 12. IHP V BUDGET

ANNEX. 13 IHPV HUMAN RESOURCES