

International Hydrological Programme

40th session of the IHP Bureau
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UPDATED DRAFT STRATEGIC PLAN FOR THE 7TH PHASE OF THE IHP (2008 – 2013)

Item 6.1 of the provisional agenda

SUMMARY

The Strategic Plan for the Seventh Phase of IHP (IHP-VII) for the period 2008-2013, as endorsed by the 17th session of the Intergovernmental Council, consolidated with additional Member State consultations is presented in this document. This update of the Plan includes a fully developed Theme V on Water Education for Sustainable Development, which has benefited from input by an ad-hoc Working Group called to provide advice on the subject as a UNESCO wide contribution to the UN Decade on Education for Sustainable Development.

The Strategic Plan is supported by a Supplementary Document (Appendix I), which records in detail the Member State endorsement of the Plan. An outline for the formulation of the Implementation Plan has also been prepared for consideration by the Bureau (Appendix II).

The Bureau is requested to review the Plan and to endorse it for an 'out of session' approval as authorized by the 17th Intergovernmental Council, and to agree the 'next steps' set out in Section (G) para 96.

Abbreviations and Acronyms

CHy	Committee on Hydrology (of WMO)
CPCW	Cooperative Programme on Water and Climate
DRA	Demand responsive approaches
EU	European Union
FAO	Food and Agriculture Organization
FRIEND	Flow Regimes from International Experimental and Network Data
GEF	Global Environmental Facility
GEF-STAP	GEF-Scientific and Technical Advisory Panel
GEMS	Global Environmental Monitoring System
GEOS	Global Environmental and Ocean Sciences
GEST	Global Evaluation of Sediment Transport
GEWEX	Global Energy and Water Cycle Experiment
GIWA	Global International Waters Assessment
GRACE	Gravity Recovery and Climate Experiment
GRAPHIC	Groundwater Resources Assessment under the Pressures of Humanity and Climate Changes
G-WADI	Global Network – Water and Development Information for Arid Lands
GwES	Groundwater in Emergency Situations
HELP	Hydrology for the Environment, Life and Policy
IAEA	International Atomic Energy Agency
IAH	International Association of Hydrogeologists
IAHS	International Association of Hydrological Sciences
IBSP	International Basic Sciences Programme
ICHARM	International Centre for Water Hazard and Risk Management.
IFI	International Flood Initiative
IGBP	International Geosphere Biosphere Programme
IGO	Intergovernmental organization
IGRAC	International Groundwater Resources Assessment Centre
IHD	International Hydrological Decade
IHP	International Hydrological Programme
INBO	International Network of Basin Organizations
INWEB	International Network of Water-Environment Centres for the Balkans
IOC	Intergovernmental Oceanographic Commission
IRTCES	International Research and Training Centre on Sedimentation and Erosion
IRTCUD	International Network of Research and Training Centres for Urban Water and Centres for Urban Drainage
ISARM	International Shared Aquifer Resource Management
ISDR	International Strategy for Disaster Reduction
ISI	International Sedimentation Initiative
IUGS	International Union of Geological Sciences

IWA	International Water Association
IWRM	Integrated water resources management
JIIHP	Joint International Isotopes in Hydrology Project (UNESCO-IAEA)
JUWFI	Joint UNESCO/WMO Flood Initiative
MAB	Man and the Biosphere
MAR	Managed Aquifer Recharge
MDG	Millennium Development Goal
MOST	Management of Social Transformations
NEPAD	New Partnership for Africa's Development
NGO	Non-governmental organization
OAS	Organization of American States
OSCE	Organization for Security and Co-operation in Europe
OSS	Sahara and Sahel Observatory
PCCP	From Potential Conflict to Co-operation Potential
PRSPs	Poverty Reduction Strategy Papers
PUB	Prediction in Ungauged Basins
PWRI	Public Works Research Institute
SADC	Southern African Development Community
SDG	submarine discharge of groundwater
SIDS	Small Island Developing States
TIGER	An initiative led by the European Space Agency focusing on the use of space technology for water resource management in Africa
UNDESD	United Nations Decade of Education for Sustainable Development
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNESCO-IHE	UNESCO-IHE Institute for Water Education
UNESCWA	United Nations Economic and Social Commission for Western Asia
UNILC	United Nations International Law Commission
UNITWIN	University twinning and networking scheme
UNU	United Nations University
UNU-EHS	United Nations University-Environment and Human Security
UWMP	Urban Water Management Programme
WCDR	World Conference on Disaster Reduction
WECB	Water, education and capacity building
WHO	World Health Organization
WHYMAP	Worldwide Hydrological Mapping Assessment Programme
WMO	World Meteorological Organization
WSSD	World Summit on Sustainable Development
WWAP	World Water Assessment Programme
WWDR	World Water Development Report

Updated Draft Strategic Plan of the Seventh Phase (2008-2013) of IHP

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Updated Draft Strategic Plan for the VIIth Phase of IHP (2008-2013)

Water Dependencies: Systems under Stress and Societal Responses

INTRODUCTION AND BACKGROUND

1. At its 17th session the Intergovernmental Council (held 3 – 7 July 2006) of the IHP examined the draft Strategic Plan for the VII the Phase of the IHP and endorsed it in principle, inviting all Member States to comment on the draft within two months. The Council authorised the Bureau of the IHP to consolidate the draft with the comments made in the course of the Council debate and the later consultations, and to submit it for out of session approval, in accordance with article 28 of the Rules of Procedure. This, the Sixth Report of the Task Force set up to prepare the Strategic Plan, incorporates the new comments received from Member States following the Council meeting, and is submitted to the Bureau for consideration at its 40th meeting in June 2007. The current version of the Strategic Plan has been strengthened in response to the additional requests made by Member States, with changes to some focal area titles. It includes a focus on hydrological issues that affect snow & ice dynamics in cold regions. It also includes a fully developed Theme V on Water Education for Sustainable Development, following the findings of a Working Group that was established in the intervening period, in accordance with the Council Resolution XVII-12.

2. The 'next steps' for the finalisation of the IHP Strategic Plan are given in Section G of this document. The Bureau is requested to approve these next steps.

3. In September 2004 the 16th Intergovernmental Council endorsed the preliminary Concept for the Strategic Plan. The Concept was formulated by a Task Force of experts established by the IHP Bureau at its 35th session. The Task Force was convened for the first time in early 2004 to independently appraise the past three decades of work of the IHP, and on the basis of their own expertise, and with the inputs received by the IHP National Committees on their thematic priorities, to assist in putting forward a Draft Strategic Plan for the VII th Phase. As of June 2007, the Task Force met several times and updated the Strategy, in its Sixth Report, which constitutes the Updated Draft Strategic Plan for the VII th Phase of IHP. The Phase VII Concept, that gradually evolved into the Updated Draft Strategic Plan for IHP-VII, has been subjected to periodic reviews during the 38th (June 2005) and 39th (May 2006) sessions of the IHP Bureau. The Concept, and later the Draft Strategic Plan, has also been widely consulted in several interactions, with IHP's National Committees, most recently following the July 2006 Council meeting, as well as all major partners of the IHP. This Sixth Report contains the most up-to-date proposals for the Phase VII Strategic Plan, consisting of a final definition of the main themes and their focal areas. An outline for the formulation of the Implementation Plan has also been prepared for consideration by the Bureau (See Appendix II.)

4. The Sixth Report of the Task Force, prepared by the Chair, includes contributions received from member States in the most recent round of consultations (between July - September 2006). The 39th Bureau recommendation, concerning new developments in connection with a UNESCO-wide water education programme, has been implemented through a special Working Group, which has provided input for the Theme V. A Supplementary Document to this Report (See Appendix I) contains a detailed analysis of all the contributions and suggestions made by the Member States as to their priorities for the IHP's VII th Phase. The composition of the Task Force is given in Annex 1. A summary of the Themes and Focal Areas as developed in the Sixth Report is given in Table 1.

5. The Task Force would like to record its deep appreciation for the support provided by the IHP Secretariat in hosting the meetings and for the very valuable advice on the many issues that are intrinsic to the success of IHP. The Task Force would also like to

acknowledge the Secretariat's extensive work involving the process of analysing the wide ranging inputs received from the Member States between July and September 2006.

6. The structure of this report follows that of the fifth report and is set out in seven sections, is as follows:

- (A) Establishing the baseline conditions for IHP – three decades of hydrology
- (B) Assessment of the coming decade – hydrology for environmental sustainability
- (C) Setting the targets for IHP Phase VII – water, central in global ecosystems
- (D) Transition from Phase VI to Phase VII – continuity with change
- (E) Making IHP-VII action-oriented and policy-relevant – support to the global agenda
- (F) The themes and the focal areas of Phase VII
- (G) The next steps, including completion of the Implementation Plan

(A) ESTABLISHING THE BASELINE CONDITIONS FOR IHP
- *three decades of hydrological effort*

7. It is now widely accepted that water in its many manifestations is of principal concern to most sections of the economies of all countries and fundamental to global sustainability, thanks in a large part to the three decades of IHP's scientific leadership. In considering the baseline from which the IHP-VII would go into operation, the Task Force noted the importance of policy relevance of the IHP and through it, of the research conducted at the national, regional and global levels. The success of the outputs of the previous six phases of IHP can be summarized by the wide recognition of the quantified hydrological cycle being at the heart of integrated water resource management (IWRM). The quantitative definition of the various components of the hydrological cycle, frozen freshwater, surface water and groundwater, provides a powerful engine that drives all the processes in IWRM, and a large number of other partners from related sciences have joined forces, forming a wide constituency, continuously improving the assessments. In recent years the number of partners, all striving to interlink the various components and sub components of the hydrological cycle, IWRM and environmental sustainability, has increased exponentially. The UNESCO hosted and led World Water Assessment Programme (WWAP) with the contribution of twenty four UN Agencies, and with the active cooperation of UNESCO-IHP has issued two major World Water development Reports (2003 and 2006). The sheer number of submissions to any global forum devoted to water, such as the World Water Forum (WWF) or the Stockholm Water Week is the undisputed evidence of the increasing constituency of water as being central to all global ecosystems. It may be argued that the success of the IHP could have been its downfall, had the science not maintained its policy relevance and orientation. As a programme of a specialized UN agency, the IHP has ensured its complementarity and reinforced the areas of its comparative advantage among the many global initiatives. Looking back, since the 1970s, the different phases of IHP have operated under the three pillars of 'hydrological science, water resources assessment and management, education and capacity building'.

8. In the last three decades, from 1975, six successive phases of IHP have engaged the 'water constituency'. Such engagement ensures that understanding the scientific and the quantitative basis of hydrology is essential for sound management of scarce water resources in arid zones, and melting freshwaters in the Polar regions, in the context of integrating it into social and economic frameworks with their competing demands. The focus of IHP in the early years was on developing techniques, methodologies and approaches to identify and measure the components of regimes in order to better explore hydrological phenomena. By the early 1990s, sustainability in the development of essential water resources, in the face of rapidly changing natural and built environments became an issue of prime concern. By the mid-1990s, IHP's focus shifted to improving the management of increasingly scarce water

within the planet's recognizably vulnerable ecosystems, which stretch from the hot arid zones to the frozen landscapes of the polar regions. These transitions can be also noticed in the titles of the IHP themes that have been adopted in the various phases of the programme, as summarized below.

Previous Phases of the UNESCO International Hydrological Programme (IHP)

- 1965-1974 IHD: Experimental Basins, World Water Balance and Water Resources of the Earth**
- 1975-1980 IHP-I / 1981-1983 IHP-II / 1984-1989 IHP- III**
- 1990-1995 IHP- IV Hydrology and Water Resources for Sustainable Development**
- 1996-2001 IHP-V Hydrology and Water Resources under Vulnerable Environments**
- 2002-2007 IHP-VI Water Interactions: Systems at Risk and Social Challenges**

9. In the course of the on-going Phase VI, water has come to occupy a clearer and a central position on the international environmental agenda. During this phase, the Johannesburg Summit, the adoption of the Millennium Development Goals (MDGs), the launch of the Water for Life Decade can be considered to be significant markers of the global community's concern about water. The theme chosen for IHP's Phase VI, was an appreciation that water is at the centre of interactions between many of the Earth's systems; the theme subtitles suggested that earth systems were at risk, and that this gives rise to social challenges. In the current phase also, two cross-cutting programmes, FRIEND and HELP, which are IHP-led initiatives, have provided a framework for bringing the different audiences of the water constituency together, including scientists, water resource managers, ecologists and policy-makers to address locally defined water challenges. Initiatives such as these identified water resources to be an undisputed component for ensuring sustainable development and for the sound functioning of vulnerable ecosystems.

10. An independent and in depth review of the actions and achievements of Phase VI is planned after its conclusion in 2007. During 2006 and 2007 a UNESCO Science Programme Review has been conducted, as discussed in the following paragraph, which does not specifically deal with IHP VI. As noted in that review the world faces new challenges related to unequal economic development, environmental degradation, and globalisation. The Task Force is of the opinion that through IHP and its partners, the science of hydrology has been mobilised to respond to such challenges. The results of IHP's work corroborates the findings of related sciences that many of the planet's systems (hydrological as well as social and ecological) are strongly interdependent, and that a number of these systems are now under identifiable stress from population growth, urbanization, land conversion or the accumulation of many different anthropogenic pollutants. Global programmes such as GIWA and the Millennium Ecosystems Assessment have made the same findings. Stress levels in some regions are so elevated that the global community is now prepared to respond. There is no silver bullet that provides a simple fix to the global water issue: as the conclusion of the 2nd UN World Water Development Report (WWDR, 2006) shows, only through creating the links and synergies can the issues be addressed appropriately. In the 2nd WWDR, the linkages where synergies are to be built are, 'water and poverty', 'water and governance', 'water and environment'. Here, then is the baseline for making the transition from IHP-VI to IHP-VII, for the years 2008 to 2013.

11. In organizational terms, the above developments have been translated from a series of decisions of the Member States of UNESCO. The 31st General Conference of Member States first decided to make water and associated ecosystems a principal priority of

UNESCO for the 2002-2003 biennium, and later the 32nd and 33rd General Conferences continued this priority status through to 2006-2007. The 33rd General Conference adopted a Resolution requesting the UNESCO Director General to undertake a review of the Sciences Programmes in the light of the Organisations mandate, country and regional priorities and global needs as a contribution to overall programme planning. The findings of the Review have been presented to the 176th Executive Board of UNESCO. The Director General's Report (176/Ex/7, 5th April 2007) on this review has largely confirmed that the IHP has already adopted many measures that were of concern to the Review Team.

(B) ASSESSMENT OF THE NEEDS OF THE COMING DECADE
- hydrology for environmental sustainability

12. The Mission Statement of UNESCO's Medium Term Strategy for the years 2008 – 2013 states that “as a specialised agency of the UN, UNESCO contributes to the building of peace, alleviation of poverty, sustainable development and inter cultural dialogue through education, the sciences, culture, communication and information”. The Strategy is built on five overarching objectives that will be translated into fourteen strategic programming objectives. Based on this policy direction and the focus provided by this strategy, the IHP is one of the concrete thematic and policy style responses in a problem based approach to major challenges at the global, regional and local levels, with emphasis on Africa & gender equality. Although the organisation wide programming is based on biennial sectoral priorities, IHP Phase VII is conceived to be operational through the full Medium Term. The IHP forms part of the Major Programme II – Natural Sciences, and is to be principally conducted under the Biennial Sectoral Priority 1, though it will also contribute to other sectoral priorities¹. The focus of this Major Programme is on the contribution of science and technology to poverty eradication, peace and sustainable development. To respond to these, IHP aims to promote research and capacity building for the sound management of natural resources.

13. In making an assessment of the needs in the coming decade therefore, several key drivers need to be considered. Today in the midst of the decade in which Millennium Development Goals are to be achieved, water is linked to **poverty** through ensuring that it is supplied to all, through ensuring that basic sanitation is available and that basic health is assured. Water is also linked to the **environment**, through its increasing scarcity, through water related disasters, and through its pollution and transboundary sharing. Yet there are challenges: **water & governance** is linked through lack of adequate financing, through its poor valuation and through the need to adopt, often intricate, integrated resource management principles. Many of these concerns have to be placed in the context of the rapidly amplifying impacts of globalisation, a measurable warming up of the planet, a consideration of ‘water’ in its various manifestations in global ecosystems. Clearly, then, water related education for sustainable development is essential. The subsequent sections consider these issues before introducing and setting out the specific targets for IHP's VII th Phase.

The impacts of ‘globalization’

14. For the vast majority of the partners in the water constituency, water in the hydrological cycle acts as the essential ‘bloodstream’ for all terrestrial and coastal systems. Although well understood by specialists in the past, it is now much more widely accepted that water provides environmental services, as well as being a vital resource, both in the built (human) and the natural environments. At the local scale, especially in the water-scarce regions of the

¹ Biennial Sectoral priority 2 is concerned with fostering policies and capacity building in science technology and innovation, with special emphasis on basic science and energy; Biennial Sectoral priority 3 is concerned with contributing to disaster preparedness and mitigation.

world, water could be a reason for potential conflict, but it is also a reason for significant and sometimes unexpected cooperation. In assessing the needs of the coming decade, the Task Force carried out a degree of informed prognosis: the underlying presumption of this prognosis is that in nature there are few discontinuities, rather an evolution of changes. By observing the nature of the changes and the rate at which these changes occur, it might be possible to assess the needs to which IHP must respond. As is clear from innumerable walks of life, the past few years are characterized by globally widespread and accelerating changes. The often repeated dictum is that 'we live in a globalized world' – when translated from the more general application, this signifies that in the current geopolitical socio-economic arena, the intensity of interactions is on the increase, in a way that has never happened in the past. Interactions taking place on one side of the globe can be rapidly translated into far-reaching impacts in another part of the world – a decision by a multi-national enterprise with agro-interests in another part of the world can mean major changes in crop and the related changes in the demand of water or change in land use. Additionally, each social or economic interaction involving international relations results in multiple related interactions, each bringing with it multiplicity of related changes that are transposed into modifications in land use, demand and new pressures on natural resources, energy needs, and so forth. Thus there is an exponential increase in these types of changes at the global and local scales. Superimposed upon these scale-related changes is the time factor – the pace of the change taking place frequently leaves the natural and anthropogenic systems with much reduced resilience to recover if the impact is significant. The science of hydrology, expressed through the IHP, must therefore be capable of giving scale-related, timely and appropriate policy-relevant advice, while at the same time dynamically developing tools and methodologies that will meet such regularly changing challenges.

15. Responding to these new demands at a global scale, IHP should thus see its role as promoter of the study, observation and quantification of uncertain global impacts that arise from the continuing expansion of human populations and infrastructure (cities, road networks, dams, canals, and irrigation schemes). Some such inadequately quantified global impacts include the release of frozen water from melting glaciers, changing balance of global sediment transport and the increasing pollutant accumulation in the aquatic environments. At the local scale, IHP's role is more complex, involving as it does the interrelations with the physical, social and economic aspects of water.

Water in its various manifestations

16. Water is fundamental for societal needs in terms of ensuring environmental sustainability (which is one of the Millennium Development Goals). From such a vantage point, IHP could ensure that the important function of the ecohydrological 'services' in the planet's life support system are addressed in several key areas, not least in water for food security, in assuring the vital ingredient for human survival and in alleviation of water-health related problems. Water is also the raw material for the generation of hydro power, leading to a competition in its services. As the global temperatures rise, the melting freshwaters in the frozen polar regions and high mountainous regions will be released into hydrosphere, with uncertain impacts. At the catchment scale, IHP's role in water-environment management, such as impacts of release of frozen water in tundra regions (& possible associated methane release), erosion, dilution of waste, in translating land-use activities into ecological sustainability involving secure habitats for aquatic biota cannot be forgotten. In addition, at this scale, also known as the landscape level, water is perceived as much more of a finite resource, and so its wise sharing between water-dependent human activities is a challenge that IHP cannot ignore, specifically the social as well as the economic aspects. In the forthcoming IHP Phase VII should therefore clearly define its position in the 'constituency of water' to help address scientific aspects of quantitative hydrology, through to its role at the landscape level.

Release of frozen freshwater into the hydrosphere

17. The largest store of freshwater on the planet is contained in the polar frozen regions – it far exceeds all the remaining freshwater. Global average temperatures are rising but in the Peninsular region of the Antarctic it has risen 2°C in the past 50 years, even though in the early Pleistocene (55 M years ago) the Arctic Sea water temperatures were nearer 20°C. In the northern hemisphere, in 1996 Greenland was losing about 100 km³/year in mass from its ice sheet; by 2005, this had increased to about 220 km³/ year. Although a complete melting of the Greenland ice sheet is uncertain, if it did, it would be equivalent to a 7m sea level rise. Permafrost melt in the northern land masses have potentially significant impacts, including the possible release of methane into the atmosphere, a very potent greenhouse gas. The Arctic Region is intimately tied to the global climate system, and potential disruptions from the changing hydrological balance here, have the potential to generate worldwide changes - albeit over long timescales, much longer than the scale of IHP Phase VII. Possibly the most powerful link would be via the thermohaline circulation, the global conveyor taking warm water along ocean surfaces and returning colder water at depth. The IHP National Committee's of the affected regions have highlighted these problems that could have a global impact, as being considered in the course of the International Polar Year 2007-8 (www.ipy.org).

The UN Decade of Education for Sustainable Development

18. For the period 2005-2014, UNESCO has been designated as the lead agency within the United Nations system for the UN Decade of Education for Sustainable Development. The decade provides a new and a forward-looking framework for intersectoral cooperation within UNESCO, notably for water education across its whole programme. The final draft Action Plan for the UN Decade includes several thematic programmes, one of which is devoted to 'Education for Sustainable Water Management'. To be effective, programmes related to sustainable development should link water education to social and cultural values. IHP is designated to play a pivotal role in the development of the UNESCO intersectoral strategy on education for the sustainable management of freshwater resources. The contributing partners for this include UNESCO's Education Sector, UNESCO-IHE, Culture Sector, and Social & Human Sciences Sector. The entry into the Organization in July 2003 of the UNESCO-IHE Institute for Water Education has considerably strengthened UNESCO's capacity to respond effectively in this regard.

19. Water education is the strategic entry point in developing a new ethic for water governance and management. This assertion follows from the recognition that education is the most effective means society possesses for confronting the challenges of the future, as it is education that will shape the world of tomorrow. Education is therefore a key dimension of the international response to sustainable development as well as to responding to the world water crises. Education about water issues will have to occur at all levels to equip people with skills, knowledge, and values to play a role in protecting the resource and maximising their own potential. Doubtless, the full resources of UNESCO would be mobilised to provide such education at the appropriate levels, as part of primary & secondary school curricula through to education of the public, the decision makers and policy adopters. This has been deliberated on by the Working Group² that was appointed after the preparation of the fifth Task Force Report. In this, the sixth report of the Task Force, the Education Working Groups findings and input have been incorporated into the IHP Strategic Plan for Phase VII.

20. The Working Group has advised UNESCO, the IHP and partners, on key issues, initiatives and strategies for raising awareness and advancing water education for the

² Group on Water Education and Capacity Building for Sustainable Development, (GWESD) set up in response to 166 EX/Decisions 3.6.1 and IHP-IC resolution XVII-12

community, via the mass media and other communication channels, and for the school education and the technical and vocational education and training (TVET) sectors. It is operating under the leadership of UNESCO-IHP and will lead activities towards, and contribute to, an implementation strategy for Thematic Programme 8 on Education for Sustainable Water Management of the UNESCO Action Plan for DESD, with a particular focus on the Millennium Development Goals and the International Decade for Action 'Water for Life'.

UNESCO IHP Centres

21. Following on from the foregoing, education, training and capacity building will continue to be a priority in Phase VII of IHP, including technical training, building public awareness and the transfer of technology. In recent years, IHP has generated growing interest in its approach at national and regional levels and has developed an international network of collaborating scientific institutions. This network of institutions or centres has now reached a point where it can play a substantial role in influencing change in behaviour towards water use and management. As reported at the 17th Intergovernmental Council coordination among UNESCO water education-related networks will be strengthened by setting up a strategy among UNESCO Centres, Chairs and Institutes so that they can contribute in the implementation of activities under IHP at global, regional and local levels. A Task Force to address this issue was recommended by the Council. The work of the Task Force is to be presented to the 40th Bureau Meeting (June 2007). The Task Force will address activities that UNESCO and its water education centres are doing to make it more visible, as also efforts of UNESCO Chairs and Regional Centres. The strategy will be developed around the principle that these centres provide significant training to prepare scientists and technicians for the future, while also broadening appreciation of the water cycle's importance and its interrelationship with other systems.

UNESCO-IHP complementarity and comparative advantage within the UN system

22. Since 2000, 24 agencies of the UN system have been cooperating under the World Water Assessment Programme (WWAP). UNESCO has hosted the programme's secretariat and contributed to the preparation of the first (2003) and second (2006) World Water Development Report (WWDR). Preparations are underway for the production of the Third Report to coincide with the 5th World Water Forum to be held in 2009. There are also a number of other important initiatives underway. These will improve cooperation and joint activities within the UN system under the aegis of the UN-WATER group. Cooperation will also be fostered within the framework of the International Water for Life Decade. It can therefore be anticipated that, by 2008, UNESCO's work in water sciences will require tighter coordination with other UN agencies, organizations and programmes. The close cooperation with WMO, FAO, IAEA, UNECE, UNESCWA, UNU, WHO, UNEP and GEF that was already established during the VIth Phase of IHP will need to be strengthened in Phase VII.

Practical assessment of needs relative to IHP

23. Interpreting these large issues into practical assessment of the needs in the coming decade for IHP Phase VII, the three pillars of hydrological research; education for sustainable development, wide scale training and capacity building; and sensitive water resource management, still remain the foundations upon which to build the next phase, as discussed below. The issues represented by these three pillars remain relevant now, at the full range of scales: global through to the local and in places even at the micro level. IHP thus needs to retain the scale relevant structure, while at the same time ensuring that the cross cutting issues provide the framework for the actions.

(C) SETTING THE TARGETS FOR IHP PHASE VII
- *water, central to global ecosystems*

24. In formulating the Concept for IHP Phase VII, the Task Force had taken a broad view of the targets and audiences that IHP would need to address in the years from 2008 to 2013. These targets arose from the concerns that have been expressed in many contexts, as discussed above. In the course of preparation of the Fifth and Sixth Report, the Task Force has revisited these targets again and taking account of the different audiences that will be engaged, has subjected the proposed structure of IHP to a peer review. As a result of this process no changes in substance is merited, though in detail quite a few new subtleties can be introduced, such as the reference to the Polar Regions and the melting glaciers in high mountainous regions. These subtleties have been incorporated in the definition of the theme titles and their focal areas and are given later. For completeness of this report, the main points for IHP targets are reintroduced below.

Social and economic issues in water management

25. As at its fifth review, in the sixth report the Task Force remains of the view that there is a need to mainstream social and economic issues in IHP's work on hydrology, for example by strengthening cooperation among hydrologists, practitioners, and socio-economists, especially in the debate on the 'right of access to water' and 'water as a common good'. These are issues that have been addressed in the 2nd World Water Development Report, where it has been noted that water is a fundamental right and that the fast socio-economic and environmental change is making the water crisis more severe in some areas. IHP-VI made a good start in this area by launching the HELP project, the Water Ethics project and PCCP. To address these types of issues, developing greater cooperation among disciplines is crucial for building bridges between hydrology, economics and the social sciences. Cooperation is also necessary for ensuring sound financing for natural resources management, which in turn can lead to socio-economic benefits at national level. Moreover, strengthening cooperation would make it easier to include the 'water sector' in national economic development plans, many of which are now formulated as Poverty Reduction Strategy Papers (PRSPs).

26. IHP should therefore continue to contribute to the debate on the economical and financial issues linked to water. The implementation of integrated water resources management (IWRM) is often constrained by the inadequate and 'sectoral' flow of funds, mainly because investment policies fail to recognize the full spectrum of true environmental costs and benefits. For example, financing for flood alleviation projects is rarely linked to direct financing for integrated basin management (basin wide forest replanting, soil conservation, erosion reduction measures) and to the affordability levels of populations. Similarly investments in major road-rail projects, that create a new linear feature, often cutting across a river basin, and thus creating not just a barrier, but also pathway that can cross the natural hydraulics, does not often include investment components to integrate them into the hydrological regime. Furthermore, financing for the sustainable management of the hydrological unit, the basin, can be frustrated by the difficulty of finding concordance between administrative units (which provide the necessary socio-economic base, both at the national and the international scale) and the river basin, which forms the unit for natural resources management.

Water governance for sustainability

27. It is said, and it has been emphasized in the 2nd WWDR, that the water crisis is essentially a crisis of governance, as experienced through the fragmented nature of water management. Institutions lack the capacity to overcome conflicting approaches in the use and allocation of water from within one basin or aquifer system, both at the national and transboundary level. For example, the way certain economic instruments are being used for environmental management provides a case in point. While they can be very useful, there are significant shortcomings in the manner in which they have been applied. The free market economic system treats water, which is a common pool resource, as a good to be priced and traded (given the trend towards privatization and commercialisation), which, by its nature, ignores the value of aquatic environments as a habitat for biodiversity and other services noted earlier. The ultimate consequence is the degradation and the depreciation of Nature's capital. Experience has shown that practitioners and decision-makers often lack a common platform for addressing these kinds of issues. As a consequence, the water resource is not viewed in holistic terms. Rather, it is treated simply as a raw material for society's needs under conditions of high uncertainty and complexity, where all competing demands cannot possibly be met over the long term. The definition of good water governance remains elusive, but notions of ethical use, cultural diversity, transparency, equity, accountability, all come into play, to achieve sustainability. The science of hydrology and its practical applications have much to contribute to this developing area of concern. Thus governance for sustainability will be one of the themes for IHP-VII.

Water for life support systems

28. The planetary life support systems require a reliable supply of wholesome water. This subjective statement can be turned into objective requirements when it is related to human health. The relationship between water consumption and human health has been demonstrated in many studies. Less well defined is the impact of modification of catchment water quantity and quality on the health of populations. With the anticipated increased reuse of water within the basin, an understanding of the health consequences of water in the supply system that is found 'before the pump' is needed. Alteration in water dynamics at basin level can impact health of organisms, for example the through passage of endocrine disrupters through the basin. The water logging of communal living areas may lead to health problems. Methodologies are needed for a common understanding of how integrated river basin water resource management can contribute to the good health of populations. A better understanding of the fate of contaminants and pathogens passing through the water cycle of basins would also benefit from integrated studies. The scientific knowledge gained would provide insights to help achieve UN Millennium Development Goals.

Ecohydrology for sustainability

29. Earlier phases of IHP implicitly recognized ecology as an integral component of land habitat hydrology. IHP Phase V had adopted a theme to investigate 'ecohydrological processes in the surficial environment'. Now there is need for an explicit ecohydrology platform in IHP-VII, one that incorporates environmental sustainability at the landscape level.³ Such an approach would broaden IHP's constituency and promote efforts to strengthen 'soft engineering' solutions to supplement hard engineering. As noted above, this calls for improved understanding of water-landscape level management of the environment, taking full account of interactions among ecosystems⁴ and their dependent habitats.

³The Millennium Projects Task Force no. 6 on environmental sustainability identifies 'Environmental management at the landscape level' as one of the problems requiring urgent action (see www.unmillenniumproject.org)

⁴An ecosystem is defined as a dynamic complex of plant, animal and micro-organism communities and the abiotic environment interacting as a functional unit, with humans forming an integral part.

Agrobiodiversity and the related sustainable land use, is one example of the types of issues that need to be emphasized. When food production, and the environmental services that support it, are disconnected in terms of land management, the subtle changes that result from this can have far-reaching, long-term impacts, such as the reduction in the recharge potential for aquifers. These changes can be also associated with nutrients (biogeochemistry) and water cycles that feed the systems. For example, modifications resulting from land-use changes can be the source of such impacts. It is understood that human life-support activities might generate more or less unavoidable environmental problems due to the physical and chemical landscape manipulations they involve. In the worst case, these actions can affect ecosystems to the point where they are unable to deliver ecosystem services, such as fresh water, productive soils or maintenance of valuable biodiversity — with direct consequences for livelihoods, vulnerability and security.

Groundwater resources integrity

30. While 'integrated watershed and aquifer dynamics' has been one of IHP's themes during Phase VI, there is still insufficient attention being given to the long term management of groundwater resources and its scientific underpinnings. The large storage capacity of groundwater resources, many of which are transboundary, can play a crucial role in supporting adaptation measures for coping with impacts from climate variability, global changes, hydrological extremes and natural disasters. The accelerated use of groundwater resources in the absence of good long range management has already caused serious local problems in many locations. To a large extent, this reflects the existing lack of scientific knowledge about aquifers and lack of investment in developing appropriate groundwater resource management strategies. The need to examine groundwater more closely has now been recognized. For example, the Global Environmental Facility's (GEF) focal area of 'international waters'⁵ and its Scientific and Technical Advisory Panel (STAP)⁶ have decided to stress groundwater resources in their own future programmes, especially with regards to SIDS, in cooperation with UNESCO. In IHP-VII, there should be a new emphasis on groundwater resources and their sound management at all scales, continental, through to small islands developing states. This would include formulating science-based policies and principles, preparing appropriate regulations to curb over-exploitation, developing technologies and policy instruments that would help to replenish overdrawn systems, and the sustainable management and use of groundwater resources. Closer attention should be paid to transboundary aquifers, non-renewable groundwater resources, enhancement of aquifer recharge, adaptation measures to climate variability, groundwater quality, groundwater protection, groundwater-dependent ecosystems and urban groundwater management.

Urban water management for increasing demands

31. Over half of the world's population will live in cities by the year 2010, a large part in an increasing number of megacities. Urban water problems are growing more complex and acute all over the globe. The developing world is faced with uncontrolled expansion of large cities confronting extreme conditions: dense population concentrations further exacerbated by high rates of rural migration and large income disparities between the wealthier and poorer segments of the population, and the explosive growth of periurban areas. Widespread mismanagement of water resources, growing competition for the use of freshwater, degraded sources – sometimes by pollutants of unpredictable effects – only heighten the depth of

⁵ The GEF IW focal area is devoted to the sound management of transboundary water, be they marine or terrestrial and has established a partnership with the UNESCO led ISARM Programme

⁶ UNESCO was requested by the STAP of GEF to provide expert consultations on the significance of groundwater in GEF operations. Groundwater will be explicitly emphasized in future GEF financing in all of its focal areas, with the exception of the ozone layer. Final reports on this can be accessed from www.gefweb.net under STAP documents.

these problems. Cities in the developed world also face critical challenges often including deteriorating infrastructure, a degrading environment and inability to face successfully extreme events. Improving freshwater management to provide improved access to safe drinking water and basic sanitation, as called for by the MDGs, particularly in the urban environment in developing countries, now commands a greater sense of urgency and is seen as a necessary pre-condition for health and success in the fight against poverty, hunger, infant mortality and gender inequality. These problems can only be addressed properly through a concerted effort which involves scientific, social and institutional approaches. New paradigms for improved urban water management are emerging – reflecting integrated management of all components, and emphasizing more efficient water use and reuse and solutions adapted to the particular physical and socio-economic settings. IHP has already made significant inroads into urban water management in IHP-V and IHP-VI; now, in the light of the growing and evident need of facing urban water problems the world over, particular emphasis shall be placed in this area in IHP-VII through the UWMP

Box 1
Urban Water Management Programme (UWMP) in IHP

IHP has an active and continuously evolving programme aimed at the development approaches, tools, guidelines and capacity building means to allow cities to assess their urban water situation and to adopt more effective urban water management strategies and practices. The IHP-V Phase already addressed integrated urban water management (IUWM), which included nonstructural measures for flood management, surface and ground water management, and urban drainage modelling in different climates. During IHP-VI, with a broadened outlook, nine major topics were addressed:

- Data requirements management for integrated urban water management
- Processes and interactions in the urban water cycle
- Towards sustainable urban groundwater management
- Integrated urban water system interactions: complementarity among urban water services
- Integrated urban water modelling and management under specific climates
- Urban water security, human health and disaster prevention
- Urban aquatic habitats in integrated urban water management
- Socio-economic and institutional aspects in urban water management
- Urban water education, training and technology transfer

This approach will be continued and expanded in IHP-VII.

A new emphasis on water education for sustainable development

32. Education, training and capacity building will need to retain strong emphasis in IHP VII. This is reinforced through the final draft of UNESCO's Action Plan for the UN Decade of Education for Sustainable Development. As this is to be a One-UNESCO Action plan, its overall goal is to integrate values inherent in sustainable development into all aspects of learning that will encourage changes in behaviour for a sustainable economically viable and a just society. The expected results of the DESD activities will be evidenced by an increase in the number of senior decision makers in Member States committed to DESD, undertaking demonstration projects and, in the course of periodic reviews, if it is revealed that countries are addressing the objectives of Education for Sustainable Development. The Thematic Programme 8, of the Action Plan Education for Sustainable Water Management, is led by SC / HYD, and IHP VII Strategic Plan will be the primary driving force for this responsibility. The expected results of this Thematic Programme includes, delivery of capacity building activities in each of UNESCO's regions, completion of demonstration projects and publication of

books, case studies and Briefing Papers. As an example of an important contribution of related activities was the launching of the First Regional Flagship Project on Water for ASP-net schools in the Arab region. The meeting was held in Abu Dhabi (UAE) and it brought together UNESCO Associated Schools Project Network, National Coordinators and teachers from UAE, Egypt, Jordan, Kuwait, Lebanon, Oman, Palestine and Qatar. In the Strategic Plan for IHP VII, these types of initiatives will be complemented by education at tertiary levels and education for decision makers.

Convergence of cross-disciplinary dialogue between specialists

33. One important target for the IHP will be to bring to a convergence cross-disciplinary dialogues that can help in solving global problems through a common effort, using contributions from natural scientists (both physical and biological), from social scientists and from policy makers. Theory suggests that cross-sectoral and 'integrated' approaches put forward in cross disciplinary forums, that can consider the trade-off between different freshwater ecosystem services, are more likely to contribute to sustainable development than many existing sectoral approaches. For specialists engaged in a narrow field of research this is not an easy task. Each discipline will rely on its own semantics, that facilitates internal dialogue, but creates barriers to cross-disciplinary convergence of ideas. Cooperation and dialogue among stakeholders, water specialists, policy makers and the general public are inevitably affected by some implicit assumptions and specialized meanings of words; this can become an invisible hindrance to broader cross-disciplinary dialogue. One of the objectives of the education component of IHP VII should this aim at addressing this; still intangible; but important barrier.

(D) TRANSITION FROM PHASE VI TO PHASE VII - *Continuity with change*

34. Since its establishment the IHP VII Task Force has been concerned with the need to make a smooth transition into Phase VII and to avoid a step change. While some of the programs that were formulated in the earlier phases have reached maturity and have either achieved their objectives, or have been taken over by other agencies, several others are still relevant and need to be continued. In discussion for the Sixth Report the Task Force again reaffirmed this position.

35. Given this background, IHP-VII is being crafted to make a seamless transition from Phase VI's 'water interactions' to 'water dependencies'. Research results of the previous three decades of scientific hydrology suggest that water-interactions in practically all terrestrial ecosystems are water-dependent. There is good scientific evidence that within natural, as well as the built systems, there are inter-dependencies connected by water. Further, there is a direct causal link between the quantity and quality of the water delivered to an ecosystem that may be undergoing stress. Experience shows that switching the water regime of an aquatic ecosystem by a small amount results in a changing balance of its components. Given time, the in-built resilience of the system will adapt to the switched regime and to the stress imposed. A more radical switch intuitively suggests that an ecosystem may not be able to mobilize its resilience to the stress and readapt, with the result that it will collapse. The quantitative transition point between 'small' to 'large' switches in stress levels remains elusive in large ecosystems, though in smaller ones such interactions can be quantified and demonstrated. Consequently, in addition to water-dependencies, the notion of stress and its management has become an important component of environmental management and is to be used in IHP Phase VII.

36. The Phase VI's 'systems at risk and social changes' has identified and characterized the types and scope of risks, and the consequent stresses being experienced, as exemplified

in the Millennium Ecosystems Assessment. The social changes that take place when systems are at risk include the human migration from rural to urban habitats, the increases in urbanization and the associated decline in the productivity of land that may have been abandoned. Such social changes create new challenges faced by all stakeholders, especially for those to whom water acts as an essential life support system when linked to productive landscape ecosystems. Phase VII would thus seek to address the linkages between the systems under stress and the societal responses to these stresses. Evidence from communities that are the most affected indicates that local actions are being taken and that they are effective and many of these local measures consist of adaptation measures to the most serious impact of global changes, including that of climate. Communities in many arid zones have started to work together to operate rainwater harvesting, managed aquifer recharge and other measures to reduce erosion and replenish exhausted aquifers. At the global level there is similar evidence of response from society. Some globally relevant societal responses to which IHP has already made a substantial contribution in Phase VI are the shared water resources and related conflict resolution initiatives. In addition the UN system-wide triennial WWDR, provides a global measure of the state of the resource and to which the IHP-VII will have a pivotal role.

37. From the foregoing the transition of Phase VI into Phase VII is based on the principle of *continuity with change*, with IHP building on lessons learned from results achieved in earlier phases of the programme.

38. IHP's Phase VII is entitled: 'Water Dependencies: Systems under Stress and Societal Responses'. The Task Force's Fifth Report re-visited this overarching title, the four original themes and their focal areas, as well as the supporting analyses. For the Sixth Report the process was repeated with a detailed review of the contributions made by the National Committees of the IHP and the other partners during consultations held from July to September 2006. All the responses have been provided in the Supporting Document (Document IHP/Bur/XL/11-Appendix I) In the large majority of the comments from the member States, the comments and suggestions made were incorporated into the scope of the various themes. As a result of this process the theme titles were adjusted to increase or re focus the scope.

39. As regards the 'education for sustainable development', the contributions made by the Working Group have been incorporated in the structure of the IHP VII Strategic Plan. At the heart of this contribution is the draft paper entitled: 'Issues in World Water and their Educational Implications' (5th April 2007), which has been extensively used in developing Theme V. To be effective, the new water education programmes will have to create a new generation of water managers and decision makers who are able to apply a holistic, integrated multidisciplinary approach to water resources, as the main underpinning foundation of economic development. At the same time, appropriately structured sub-tertiary water education programmes are needed to promote community-wide understanding of, and commitment to, sustainable water use and its management for sustainable development. These concerns represent the two thrusts of the water education for sustainable development activities within IHP-VII.

40. The process of the review of the themes for Phase VII developed in the fifth Report included a second step, this one involving a peer review group. After the explanation of the revised and updated themes the members of the peer review group were posed with two key points for testing the validity of the themes. The key points tested were: what has been missed in the scope of the themes and what could be considered redundant? This 'gap and superfluities' assessment is a recognized approach in strategy evaluation, and applying this, with the participation of the peer review group, the previous Draft Plan for IHP-VII has been refined.

41. The final output of the Task Force and that of the Peer Review Group is presented in detail in the following sections and summarized in Table I.

(E) MAKING IHP-VII ACTION-ORIENTED AND POLICY-RELEVANT
- support to the global agenda for sustainability

42. In this advanced stage of development of the Draft Strategic Plan, for review by the IHP Bureau, the Task Force has been conscious of the need to ensure that IHP-VII is action-oriented and policy-relevant, not least in response to the previous recommendations by the Bureau, but also the generally perceived contemporary needs.

43. The Task Force and Peer Review group captured these concerns by summarizing the headline tasks of the IHP-VII, as shown below.

Box 2
IHP-VII Headline Tasks

- *Integrating interdependencies of water sciences and policy making through research and education, underpinned by culture and communication;*
- *Understanding water interdependencies in physical, biological and social environments;*
- *Promoting participatory decision making in interdependent water-related health, food and energy systems and security in a changing world.*

Building upon the previous three pillars of the International Hydrological Programme and focusing on the demands arising from a rapidly changing world, creating partnerships and initiatives for greater synergies, the IHP-Phase VII will maintain its comparative advantage in promoting and leading international hydrological research, facilitating education and capacity for enhanced water management towards meeting the UN Millennium Development Goals on Environmental Sustainability, Water Supply, Sanitation, Food Security and Poverty Alleviation. It will add value to localized research and experience by providing a policy-relevant context and harvesting the knowledge of researchers, educators, practitioners, and policy-makers so as to maximize the value of scientific outcomes and engender confidence in innovation and reform. It will provide a solid scientific underpinning for the UN Decade of Water for Life. Outcomes of IHP-VII should establish pathways and benchmarks for water management in the decades to come. They should contribute to sustaining human and environmental health wherever water-dependent systems are under pressure and effective societal responses not yet in place. The results achieved during the VII th phase of IHP should be practical so that both the scientific communities and civil society can apply and benefit from them.

44. These headline tasks can be related to the three pillars of the IHP through the following activities:

- *promoting leading edge research that provides timely and appropriate policy-relevant advice to Member States;*
- *facilitating education and capacity development responding to the growing needs linked to sustainable development;*
- *enhancing governance in water resource management to achieve ecosystem sustainability.*

45. In the fifth report the Task Force elaborated the theme titles and the focal areas for each to make them more action-oriented in due consideration of the different audiences of the IHP-VII Plan. In the sixth report they have been further fine tuned. IHP's audiences can be grouped into four categories: governments, the scientific community, international agencies and the committed stakeholders, such as water users represented by NGOs. While the first and second category would seek policy-oriented research actions in the IHP-VII Strategic Plan, the third category would seek actions that provided complementarity between their programmes and those of IHP. The fourth category would seek actions that produce some tangible benefits at the local level.

46. Since the IHP remains a dynamic demand driven programme it is anticipated that in the course of each biennium, some theme and focal areas could be revised at the request of Member States. There will be a further opportunity to conduct one final round of consultation at the outset of the biennium in order to finalise the Implementation Plan as requested by Member States. This will allow for a period of advocacy and consolidation within the Regional Groupings of IHP. The timeline for this would be before the UNESCO General Conference in November 2007.

47. Figure 1 provides an overview of the linkages between themes and the cross-cutting programme components FRIEND and HELP, and Table 1 provides an overview of the core component themes and focal areas of the IHP-VII.

(F) THE THEMES AND THE FOCAL AREAS OF PHASE VII

- ***THEME 1: Adapting to the impacts of global changes on river basins and aquifer systems***

Background and challenges

48. Global changes brought on by climate change, urbanization, ozone depletion, population growth, expansion of infrastructure, migration, land conversion, pollution are altering the Earth and the way it functions. Although these changes are global, no institution or country can face the challenges they pose alone. But UNESCO-IHP, as the only intergovernmental programme on water sciences in the UN system, can foster the cooperation needed to bring all players together, whether they are Member States, research institutions, UN agencies, NGOs, or national or international associations. Its mission under IHP-VII will be to strengthen scientific understanding of the impacts from global changes on water systems, and to link scientific findings to policies for promoting sustainable management of water resources.

49. It is important to realize that most of the world's river basins and aquifer systems are poorly gauged or completely ungauged. In addition, the hydrological monitoring network is declining. While the pressure on available water resources is increasing (particularly in sensitive areas), it is becoming more difficult to obtain reliable predictions of hydrological variables resulting from global changes. Moreover, the most widely used tools in applied hydrology and water resources management depend on hydrometric (gauged) data. Major difficulties arise when applying these tools to river basins and aquifers for which little or no hydrometric data are available, or where the hydrological boundary conditions have been changed. The challenges in this respect are to reduce predictive uncertainty and to develop new prediction methods (less based on historic data sets) that can take into account influences and feedbacks from various global changes and apply this information to support decisions for managing water resources in a sustainable way.

50. Because global changes cut across disciplinary and national boundaries, some form of interdisciplinary and international cooperation is needed to study and deal with them. Under IHP-VII, UNESCO and WMO will jointly coordinate and implement several activities, such as the World Climate Programme (WCP). The UNESCO-IAEA Joint International Isotopes in Hydrology Project (JIHP) will also contribute to this theme, fostering the valuable application of isotope techniques for surface and groundwater resource assessment and management. Another valuable initiative is the Cooperative Programme on Water and Climate (CPCW) in The Netherlands. Close cooperation with the International Association of Hydrological Sciences (IAHS) and the project 'Prediction in Ungauged Basins' (PUB) is also envisaged.

51. During Phase VII, particularly stressed areas (i.e. arid and semi-arid regions, the Polar regions, glaciated mountainous, urban areas and coastal regions) will be assessed and, as a result, Member States can develop mitigation strategies and policies based on institutional synergies to diminish these stresses. Issues of international interest and impacts within drainage basins and aquifer systems will get more attention. Lessons learned from the FRIEND Programme, regional trends and data sets will be compared, making use of HELP and IGRAC facilities and databases. Regional trends will be evaluated and case studies will be developed with the support of the IHP Centres and Chairs, as well as other agencies. This will also lead to a better integrated approach for managing frozen water, surface and groundwater resources that takes into consideration inter-dependencies with other systems and users (society, ecosystems). UN agencies and existing international research programmes will be asked to cooperate with IHP and UNESCO centres in coordinating efforts.

Focal area 1.1 - Global changes and feedback mechanisms in hydrological processes in stressed systems

Objectives

52. IHP-VII will spell out the effects of global changes, as well as their feedback in hydrological processes.

53. These changes include urbanization, land-use change, population increase and all other changes that may affect water availability and water demand, including both water quantity and quality. Consideration will be given to processes such as erosion, sedimentation, landslides, *snow melt floods* and mudflows in the context of glaciated mountainous regions, their development and mitigation of risk arising from such changes. The focal area will address evaluation of the impacts of global changes on coastal zones, small islands, *present permafrost zones and glaciated areas*, and megacities.

Activities

- Development of indicators that may be used for assessing the effects of global changes of different origins on water resources and hydrological systems.
- Development of methods of identifying adaptation measures for global changes in different hydro-climatic zones.
- Evaluation of changes in global dynamics in hydrological systems under stress, from drought in arid zones & from rising temperatures in cold regions.
- Consideration of processes such as thaw in permafrost, erosion, sedimentation, landslides and mudflows in the context of highland development and risk mitigation.

Outputs

- Documentation of best practices and capacities to prevent and/or remediate impacts of global changes on the hydrological cycle and water resources in stressed systems, with particular focus on stressed regions of Africa and developing countries.
- Cooperative actions with the International Sediment Initiative (ISI) on research of erosion and sediment processes and their interaction with global changes.
- Evaluation of the impacts of global changes on coastal zones, small islands, and megacities.

Benchmarks

- Setting up inter-regional networks in cooperation with other UN system organizations, and international and national associations.
- Publication of guidebooks with examples of best practices for coping with global changes in different hydro-climatic regions.

Focal area 1.2 - Climate change impacts on the hydrological cycle and consequent impact on water resources

Objectives

54. This focal area seeks to assess the impacts of climate change on the hydrological cycle within the broad spectrum of global changes, including changes associated with rising global temperatures. More specifically, it aims to facilitate and support local research and capacity in developing countries and to develop capacities for management to cope with climate change impacts on water resources in cold climates and high altitudes. Climate change is believed to account for only about one-fifth of the impacts of global change, but is the dominant impact on hydrological systems in some environments. Impacts of global change in arid and semi-arid regions are addressed in a separate focal area.

Activities

- Participation of IHP Focal Points and National Committees in the development of case studies and the dissemination of the guidelines.
- Development of methods to assess the impacts of climate change, and analysis of associated uncertainties.
- Development of indicators of impacts from climate change on water resource systems.
- Improved understanding of the spatial and temporal aspects of impacts from climate change on water resources through improved access to remote sensing imagery.
- Development of networks to exchange information on best practices in cold climates, including changes in snow and ice and glacier mass balances; and setting up networks between Nordic countries, and those with similar conditions, focusing on impacts of climate change in cold climates.
- Improved understanding of the modifications in the hydrological cycle in the cold regions, resulting from global changes
- Maintaining and strengthening links with the 'Prediction of Ungauged Basins' (PUB) initiative and improving modelling of gauged and ungauged basins.
- Development of methods to mitigate impacts from continuous worldwide decline of hydrometric networks (gauging stations, monitoring wells, etc.) and to predict effects of climate changes with more certainty.
- Maintaining and strengthening links with HELP and FRIEND.
- Strengthening and improving links with observation and modelling programmes (WCRP-GEWEX, *Arctic-Hydra* and UNESCO-ESA TIGER initiative in Africa)

Outputs

- Guidelines and case studies from the established network of IHP Focal Points and National Committees.
- Documentation of best practices on methods for risk assessment and on coping strategies to prevent and/or remediate impacts from climate change on surface water and groundwater systems.
- Compilation of case studies, with lessons learnt, related to mountain areas (publications, training courses, seminars).
- Improved capacity in monitoring and collecting water quantity and quality data.
- Valuation of the snow & ice resources in the stabilisation of global climate changes

Benchmarks

- Collaboration with the PUB initiative, HELP and FRIEND.
- Contributions from IAHS, IAH, ICHARM.
- Contribution from strengthened links with observation and modelling programmes (WCRP- GEWEX, and UNESCO-ESA TIGER initiative in Africa).
- Cooperation with database centres at regional and international level. Support provided by IGRAC on related groundwater issues, in coordination with the IHP National Committees.

Box 3 **A network of FRIENDs**

As uses and users of inland waters become more diverse and more demanding, and droughts, floods and snowmelt remain a constant threat, the analysis and dissemination of hydrological data on a regional scale is becoming more important than ever.

FRIEND (Flow Regimens from International Experimental and Network Data) is an international IHP research programme that helps to set up regional networks for analysing hydrological data. It aims to develop better understanding of hydrological variability and similarity across time and space, through mutual exchange of data, knowledge and techniques at the regional level. FRIEND research covers a diverse range of topics including low flows, floods, variability of regimes, rainfall/runoff modelling, processes of streamflow generation, sediment transport, snow and glacier melt, climate-change and land-use impacts. Initiated by four Northern European countries some 20 years ago, FRIEND has since developed into a worldwide network of eight regional programmes (Northern Europe, Alpine and Mediterranean, Southern Africa, Asia-Pacific, Nile, Western and Central Africa, Hindu Kush Himalayan, and Latin America and Caribbean), with the participation of 141 countries from around the world. It is one of IHP's most important cross-cutting programmes, and will continue to enjoy a high level of support from member countries during Phase VII (2008-2013) of IHP.

FRIEND at work

The FRIEND network aims to integrate research on a regional scale; projects such as [ARIDE](#) (Assessment of the Regional Impact of Droughts in Europe) and [ASTHyDA](#) (Analysis, Synthesis and Transfer of Knowledge and Tools on Hydrological Droughts Assessment through a European Network) are examples. It also supports capacity building in hydrological research for developing FRIEND regions.

The Northern European FRIEND has evolved into a well-developed network of hydrologists who are implementing an active research programme in five project areas: European Water Archive; Low Flow; Large-Scale Variations in Hydrological Characteristics; Techniques for Extreme Rainfall and Flood Runoff Estimation; Catchment Hydrological and Biogeochemical Processes in a Changing Environment

Sharing information

Over the last decade, Northern European FRIEND participants have produced more than 410 publications, including journal and conference papers, contract reports, software, and spatial and temporal databases. This research is being transferred to the user community through national partnerships between research groups and hydrological agencies in the field.

Box 4

A need for HELP

Although there has been much progress in data collection and the prediction of climate variability and change, there has been much less progress in translating these technical and scientific advances into information useful to water managers and policy makers worldwide.

HELP (Hydrology for the Environment, Life and Policy) was established in 1999 as a joint UNESCO and WMO (World Meteorological Organization) initiative, and is led by IHP. The programme was conceived to develop a new approach to integrated catchment management by building a framework for water law and policy experts, water resource managers and water scientists to work together on water-related problems. Since then it has grown into a global network of some 67 basins, with four regional coordinating units (RCUs): Australia and South East Asia, Latin America and the Caribbean, North America and Europe.

HELP activities focus on assessment, research and implementation. For example, this work may involve synthesizing existing knowledge; simulating future change scenarios (e.g. in land use, demography, socioeconomics, water cycle, supply/demand for different catchment states); checking model predictions; defining 'gaps' in scientific knowledge; and developing a technical implementation strategy by hydrologists and basin stakeholders and managers.

The HELP programme is by definition an interdisciplinary programme that takes a comprehensive approach to water basin management. HELP activities are contributing to our understanding of a wide range of interrelated issues:

Water and climate; Water and the environment: Water quality and human health;
Water and food; Water and conflict: Improving communication.

The difference HELP makes

Being part of the HELP network makes it possible for people in different regions around the world to share experiences in the implementation of integrated water resources management. Some of the HELP basins have been implementing IWRM for more than four years and can offer experiences and guidelines to others on how to do it. The HELP network can also provide advice on how to dialogue with different stakeholders, and improve communication between several 'water-related' communities (i.e. scientists, lawyers, basin managers, economists, stakeholders) in order to better integrate land and water resources management. HELP has been adopted by many UNESCO Member States and benefits from good support.

**Box 5
Arctic-HYDRA**

As recently noted by the IHP Intergovernmental Council (16th Session, Resolution XVI-6), the Arctic is especially sensitive and vulnerable to human and climate impacts, and Arctic warming and its consequences has regional and world-wide hydrological implications.

Recognizing the need for enhanced understanding of cold regions hydrologic processes, a core project has been established within the International Polar Year (IPY) 2007-8 on the Arctic Hydrological Cycle (AHC) Monitoring, Modelling and Assessment under the acronym of Arctic-HYDRA. The scientific goals of the Arctic-HYDRA project are: To characterize variability in the AHC and to examine linkages between atmospheric forcing and continental discharge to the ocean; to assess the historical response of the Arctic Ocean to variations in freshwater input from rivers and net precipitation over the ocean; to attribute to specific elements of the AHC or to external forcing the sources of observed spatial-temporal variability in the land-ocean-ice-atmosphere system; to detect emerging changes in the contemporary state of the AHC in near real time and to place such changes into a broader historical context.

Given the scope of these goals and the relatively short time-frame of the IPY, Arctic-HYDRA also forms part of the parallel longer term (10-15 yr) objectives of the ICARPII (International Conference on Arctic Research Planning II) Working Group 7 (WG7) project "Terrestrial Cryospheric & Hydrologic Processes and Systems". The project is also supported by WMO HWR, WMO CHy, WMO CBS, WCRP/CLIC and with participation from all the member countries of the Arctic Council. Noting that the scientific, institutional, and political legacies of the International Geophysical Year (IGY) 1957-8 endured for decades, many to the present day, the Arctic-HYDRA core project is expected to take hydrological science and monitoring in the Arctic to a new level, and will therefore hopefully be one of the legacies of the IPY, with implications beyond the 2008-13 timeframe of IHP-VII.

Summing up the considerations and facts above, and noting that IHP-VII Focal area 1.2 is concerned with global changes and feedback mechanisms of hydrological processes in stressed environments, the Arctic-HYDRA project and its planned continuation under the ICARPII WG7 umbrella fits particularly well within the objectives of IHP-VII.

Focal Area 1.3 - Hydro-hazards, hydrological extremes and water-related disasters

Objectives

55. This focal area addresses both natural and man-induced catastrophic events that could adversely influence human health and life with the aim of mitigating, reducing and/or preventing certain disasters. A disaster is said to occur when an extreme event coincides with a vulnerable physical and socio-economic environment, surpassing society's ability to control or survive the consequences. Extreme hydrological events should be considered as part of integrated water resources management at catchment scale. Persistent and pervasive droughts, which result from hydro-climatic extremes, are slow processes whose impacts are a feature of an area's vulnerability. Other water related hydro-hazards include tsunamis and hurricanes. In high altitude regions, snow melt can result in catastrophic emptying of lakes dammed by ice, resulting in severe social and human losses. Factors that aggravate water-related disasters such as erosion, sedimentation and landslides, include changing global dynamics in aquatic environments, degradation of ecosystems, especially fragile ecosystems susceptible to accelerated sea-level change, coastal sediment imbalance, and accumulation of pollutants.

Activities

- Supporting capacity building in member countries in order to gain and advocate better understanding and handling of hazards, vulnerabilities and benefits involved with floods and other water-related disasters.
- Proposing effective methodologies for identifying and establishing an inventory of surface and groundwater bodies less vulnerable to natural and man-made impacts in selected pilot regions and presenting relevant case studies.
- Publishing guidelines for the identification, investigation, development and management of strategic surface and groundwater bodies to be used in emergency situations that result from extreme climatic and geological events, and in case of conflicts.
- Promoting of cooperation by riparian states of transboundary basins to facilitate integrated and coordinated basin management with respect to combating hydro-hazards and hydrological extremes and disasters.
- Improving the predictability of hydrological extremes by using new measurement technologies and promoting local use of satellite information for river basin management. Developing linkages with International Flood Initiative (IFI) of UNESCO, IAHS and WMO.
- Developing linkages with ICHARM.
- Establishing an international network to address groundwater resources management in emergency situations (GwES).

Outputs

- Documentation of best practices on risk assessment and a compilation of case studies of representative critical water-related disasters (urban, rural, small island).
- Inventory of strategic surface and groundwater bodies to be used in emergency situations that result from extreme climatic and other events.
- Partnership with GEOS, established and linked with UNESCO's new initiatives IFI, ISI, GwES.
- Toolkits for assessing hydrological components of hydro-hazards and extreme hydrological events.
- Adaptive strategies for environmental security, ecosystem protection and maintenance of productive capacity.

Benchmarks

- Networking on water hazard and risk management, coordinated by ICHARM.
- Data collection, case studies, and seminars organized at regional level.

Box 6
International Flood Initiative (IFI)

The preparatory meeting of the International Flood Initiative (IFI) was held on 12-14 July 2004 in Tsukuba, Japan with the purpose of drafting a concept paper (the Tsukuba paper). A parallel concept paper was drafted (known as the Geneva paper) by a WMO task team on 28-30 July 2004 in Geneva, Switzerland. WMO and UNESCO then combined the products of both these meetings and the revised concept paper (the Joint UNESCO/WMO Flood Initiative, also called the JUWFI paper (documents IHP/IC-XVI/Inf.14 and Inf.14. Add.) was adopted at the 16th session of the IHP Intergovernmental Council (September 2004) and the 12th session of WMO CHy (October 2004), respectively. To incorporate comments and suggested amendments made at the IHP Council and WMO CHy, as well as from the UNU, ISDR and IAHS, another preparatory meeting was held on 10-11 December 2004 in London (Ontario), Canada.

After consultation with other agencies, IFI was formally launched by the Director-General of UNESCO in the presence of the Executive Heads of WMO and UNU during the UN World Conference on Disaster Reduction (WCDR) held on 18-22 January 2005 in Kobe, Hyogo, Japan. The launch of the IFI the UN Under-Secretary-General for Humanitarian Affairs. The concept paper was further revised at the inaugural UNESCO/ WMO joint IFI meeting held in co-operation with the UNU, ISDR and IAHS, Geneva, Switzerland, 21-22 March 2005.

The International Centre for Water Hazard and Risk Management (ICHARM) was chosen to act as Secretariat of IFI. Accordingly, in April 2005, the ICHARM Secretariat was strengthened. Extensive preparatory activities for the establishment of the Centre have been undertaken and its planned formal launching fits in well with the first year of the International Decade for Action 'Water for Life'. (2005-2014) as well as the United Nations Decade of Education for Sustainable Development (UNDESD) (2005-2014).

At the 4th World Water Forum, the 'Collaborative Approach among International Agencies for Effective Flood Risk Management: International Flood Initiative (IFI)' session was held on 20 March 2006. The session was convened by the Public Works Research Institute (PWRI), UNESCO and the WMO.

Current partners of IFI are as follows:

- UNESCO IHP <http://www.unesco.org/water/ihp/index.shtml>
- ICHARM http://www.icharm.pwri.go.jp/centre/index_e.htm
- WMO <http://www.wmo.ch/index-en.html>
- IAHS <http://www.cig.ensmp.fr/~iahs/>
- UNU <http://www.unu.edu/>
- UNISDR <http://www.unisdr.org/>
- IIASA <http://www.iiasa.ac.at/>
- IAHR <http://www.iahr.net/site/index.html>
- PWRI <http://www.pwri.go.jp/eindex.htm>

This interagency initiative with a wide range of intellectual and professional partners will continue during the IHP-VII period.

Box 7
International Sediment Initiative (ISI)

The 16th session of the IHP Intergovernmental Council approved the International Sediment Initiative (ISI). It endorsed the expansion of the task force group to form a steering committee to plan and execute the proposed programme. The Council also approved that the International Research and Training Centre for Erosion and Sedimentation (IRTCES) of Beijing, China play a key role in implementing the ISI. The resolution emphasized the development of the decision support framework for sediment management, in order to provide guidance on legislative and institutional solutions, applicable to different socio-economic and geomorphic settings. Hence in response to the importance of sedimentation, the ISI has been launched by UNESCO, as a major activity of the current 6th Phase (2002–2007) of the IHP.

ISI became fully functional as of 2005. The activities of ISI focused on its overall objectives, aimed at increased awareness about sediment dynamics and erosion issues in all spheres of water management, aimed at the promotion of sustainable management of soil and sediment resources at local, regional and global scale. Within the scope of ongoing activities, considerable progress has been achieved in the Global Evaluation of Sediment Transport (GEST-Project) and in setting up the Sediment Information System (an establishment of more than a database) in IRTCES in Beijing, China, under the auspices of UNESCO, as technical secretariat of ISI. The ISI Information System will accomplish three main purposes and these could each be achieved through three mechanisms: (a) Information access: through the creation of a global information resource portal; (b) Information repository: through the establishment of a sediment database and other information; and (c) Information development: through the implementation of strategic training activities. These three purposes and mechanisms are mutually supportive.

The activities of ISI in a nutshell are:

- Global Evaluation of Sediment Transport from land to the marine environment;
- Development of representative case studies in order to verify socio-economic and environmental risks caused by erosion and sedimentation processes;
- Comprehensive review of global erosion and sediment-related research; education for sustainable sediment management;
- International cooperation within the UN system, regional networks, NGOs and other international associations active in this field.

To achieve these results, a number of regional workshops on ISI have been held and more are planned. The first International Sediment Initiative Conference was held in Sudan in November 2006. This conference was the first attempt of ISI to invite worldwide relevant institutes, agencies and individuals to come up with an initiative to deal with sediment. It will help international communities achieve practical outputs through partnership, pooling resources, focusing science, coordinating efforts, sharing information and experiences, and generating a broad basis of support.

Focal area 1.4 - Managing groundwater systems' response to global changes

Objectives

56. Groundwater is the largest store of fresh water. It provides a buffer to short-term variations in precipitation and maintains river baseflow. In many areas and for most of the year, it is the only locally available source for rural as well as urban water supply. Uncontrolled water use leads to over-exploitation, falling water levels and base flow to rivers and wetlands, with consequent ecological degradation. Unless protected, groundwater quality deteriorates as older waters are accessed, and from saline intrusion and pollution from agricultural and urban activities and uncontrolled wastewater disposal.

57. Both the quantity and quality of groundwater will be impacted by global change (i.e. deforestation, large-scale irrigation, urbanization, sea level rise), and especially climate change will impact on recharge patterns. Sustainable management of groundwater, in conjunction with surface and other water resources, requires an understanding of the water resources available, the processes controlling their movement and quality, and the rate of change being imposed on them by human activity and climate change. Protection and sustainable use of groundwater is essential, especially through management of both recharge and demand.

Activities

- Raise awareness of decision-makers, implementers, users and the general public of the importance of groundwater as a store of fresh water in order to encourage improved protection and sustainable use of groundwater – through leaflets, publications, media, education and training.
- Assess the impacts of global change (e.g. climate change and human pressures) on groundwater resources and support Member States in addressing regional needs through global coordination.
- Improve understanding of how groundwater contributes to the global water cycle and evaluate the changes to groundwater storage and groundwater flux (recharge and discharge rates) – and bring together county/regional and transboundary assessments via seminars/conferences.
- Better define growing population pressures on groundwater resources, global warming impacts on groundwater recharge rates, rising sea levels and saltwater intrusion – and bring together county/regional assessments via seminars/conferences, etc.
- Improve understanding of the effectiveness of Rainwater Harvesting as it applies to Managed Aquifer Recharge (MAR), through continued support of initiatives such as those of IAH-MAR, and related activities, publication of findings and demonstration projects.
- Better define submarine discharge of groundwater (SDG) to the ocean. Undertake groundwater resource assessment and future forecasting under various population pressures and climate change scenarios.

Outputs

- Documentation of methodological approaches – (i) database and monitoring, (ii) satellite GRACE (Gravity Recovery and Climate Experiment), (iii) modelling and simulation and (iv) paleohydrology – to facilitate better management of water resources.
- Implementation of the 'Groundwater Resources Assessment under the Pressures of Humanity and Climate Changes' (GRAPHIC) project to investigate physical fluxes, state variables and their interaction with management of groundwater systems. in coordination with IHP National Committees, ICHARM, IGRAC, GEWEX, GEOS, IUGS, IAHS, UNU-HES, and Category I and II Centres.

- Evaluation of the availability of renewable and non-renewable groundwater resources, with a particular focus on less developed countries.
- Coordination of small islands networks with IHP National Committees on capacity assessment, protection, adaptation and remediation measures.
- Toolkits for assessing response of groundwater (as a component of the hydrologic cycle) to climate change, urbanization and landscape change at the basin scale
- Case studies in representative critical situations – semi-arid, hard rock, coastal, small island, etc. including integrated surface water-groundwater-wastewater management.
- Set up close cooperation between UNESCO-IHP and UNU to develop a joint programme on groundwater resources and human security
- Adaptive strategies to secure groundwater supplies and protect baseflows and ecosystems, etc., as part of the managed hydrologic cycle (MAR, reuse, demand management, dams, desalination).

Benchmarks

- Information leaflets, publications and media coverage of groundwater related issues.
- Education and training material and courses/workshops/conferences.
- Demonstration projects and research catchments relating to monitoring the impacts of global change, effective coastal groundwater management and MAR in a variety of hydro-climatological settings.

Focal Area 1.5 - Global change and climate variability in arid and semi-arid regions

Objectives

58. Arid and semi-arid regions are particularly vulnerable to small climate changes, with consequences that may have very serious social and environmental effects. Special attention will be given to these regions, making use of results obtained from preceding focal areas, with additional efforts to include factors typical for these regions.

Activities

- Define global changes, including climate change and variability in the hydrology processes of arid and semi-arid regions.
- Improve monitoring, data collection, processing and storage systems at regional level.
- Evaluate impacts of climate change on drylands, including methods to achieve sustainable land use.
- Prepare guidelines, best practices, and compilation of case studies.
- Develop regional networks and inter-regional transfer of knowledge with the participation of IHP National Committees and the UNESCO Category II Centres for Hydrology in arid zones.

Outputs

- Dissemination of information on water and development for the arid lands GWADI project.
- Regional network programme developed in Central Asia and SADC countries.
- Guidelines for monitoring hydrological processes in arid and semi-arid regions.

Benchmark

- Setting up regional networks.
- Adoption by key stakeholders of the guidelines and the best practices

Box 8

Water and Development Information for Arid Lands (G-WADI): a global network

G-WADI's main mission is to strengthen the capacity to manage the water resources of arid and semi-arid areas around the globe through a network of international and regional cooperation. It does this by integrating selected material from existing networks, centres, organizations and individuals. More specifically, G-WADI hopes to:

- improve understanding of the special characteristics of hydrological systems and water management needs in arid areas;
- build capacity of individuals and institutions, so as to be able to match supply with need;
- broadly disseminate information about water in arid zones to the user community and the public, especially as a basis for improved management;
- exchange experience, for example through case studies;
- share data to support regional research and the development of global research facilities, and strengthen data networks to underpin sound management;
- raise awareness of the potential of advanced technologies for data provision, data assimilation, and system analysis;
- promote integrated basin management and the development and use of appropriate decision support tools.

It also intends to:

- expand the G-WADI community through greater involvement of UNESCO centres and regional offices, and the development of links in new areas (e.g. in sub-Saharan Africa);
- promote and encourage the participation of the wider scientific community in G-WADI through web contribution and discussion;
- develop web-based access to global data sets and modelling tools of specific relevance to arid and semi-arid zones;
- continue to develop workshops on such new thematic areas groundwater modelling, water harvesting and aquifer recharge;
- support new areas of interest like hydrological models and applications, hydroclimatic forecasting and use of tracers in semi-arid region studies.

- ***THEME 2: Strengthening Water Governance for Sustainability***

Background and challenges

59. Water is central to promoting socio-economic development, protecting the environment, and achieving the United Nations MDGs. Poor management of freshwater resources is characterized by lack of integration, sectoral approaches, and institutional resistance to change by large public agencies in the context of increasing competition for scarce water resources. Yet, human and natural water-related systems are interdependent, and they have to be managed in an integrated manner. Moreover, IWRM has to be tailored to consider cultural, ethical and socio-economic elements.

60. The first World Water Development Report (2003) indicates that many of the solutions to water problems lie in better governance, and the 2nd World Water Development Report (March 2006) lists 'sharing water' as one of the key challenges that water governance faces. These various challenges are connected and should be addressed in a basin-wide and

multidisciplinary manner. A primary concern is the sharing of, and competition for water resources nationally & internationally⁷, which is closely related to good water governance. Providing water to feed growing populations, water for environmental flows and for industry, and balancing this with all other demands on water, preventing conflicts over water and developing a dialogue over shared water are some of these challenges. An important step towards better water governance is raising awareness, providing education and building capacity with regard to water issues.

61. More specifically, if water governance is to be effective, it needs to integrate water management into the economic development of the concerned area, and adopt adequate financing and pricing systems. It also needs to be capable of dealing with the problems related to climate variability, sustainable land use and landscape change, including rapidly growing urban areas. Moreover, it should take into account local, regional and international governance related to the historical and cultural aspects of a region, e.g. traditions and customs, and also provide information to stakeholders and the public and take their responses into consideration.

Focal area 2.1 - Cultural, societal and scientific responses to the crises in water governance

Activities

- Develop methods and practices to study the relationship of a population to water, based on its historical, cultural and ethical traditions, and then use the responses to develop effective water governance.
- Foster public and stakeholder information and participation.
- Develop better understanding, tools and best practices for integrated water resources management, taking into account the management of the total water cycle, covering both surface and groundwater, clean and waste water treatment, and questions of both quantity and quality.
- Develop better understanding of groundwater, its availability and vulnerability, for policy-makers, the public and scientists of other environmental disciplines.

Outputs

- Development of practical systems for public participation and adoption of best practices in the water sector.
- Identification and analysis of critical case studies on water issues, including those that concern gender.
- Dissemination at all levels of lessons learned from this analysis.

Benchmarks

- Conducting a series of public participation events
- Adoption by key stakeholders of the best practices

⁷ Studies conducted by many agencies have shown that there are 263 river basins that are transboundary in nature, covering 45% of the world's surface area; 40% of humanity lives in one, or another transboundary basin. The situation with transboundary aquifers is analogous and probably more extreme, though a global inventory is being conducted through collaboration among many agencies facilitated by the ISARM Programme.

Focal area 2.2 - Capacity development for improved governance; enhanced legislation for wise stewardship of water resources

Activities

- Promoting cooperation with among water basin authorities, regional basin commissions, and regional institutions; working with the support of the IHP National Committees, international institutions, such as INBO, UNILC, FAO, UNECE, and the EU, in relation to its Water Framework Directive; support to new institutional settings, with the objective of strengthening existing legislation and administrative procedures.
- Capacity building and development of training material (cross reference Theme 5).
- Ensuring that due regard is paid to cultural traditions and to the development of appropriate technologies.

Outputs

- Case studies and best practices on public and stakeholder participation.
- Organization of training courses, i.e. for lawyers, engineers, and water scientists.
- Comparative studies with FAO and UNESCO-IHP Centre in Dundee.
- Case studies and networking with international and national organizations.

Benchmarks

- Cooperative meeting and exchange of information among basin / river agencies
- Dissemination of training materials that include cultural traditional approaches

Focal area 2.3 – Governance strategies that enhance affordability and assure financing

Activities

- Establishment of sustainability targets for water-related development.
- Evaluation of direct costs, external economic effects, water-driven jobs and opportunities for extra income, in cooperation with other UN Agencies.
- Promotion of best practices to assist local authorities in their choice of financing options for capital investment (i.e. infrastructure construction, management and maintenance).
- Support to partner UN Agencies in promotion of local credit schemes to provide water at an affordable price to poorer communities, aimed at reducing poverty.
- Comparative analysis of various financing systems and the role of water pricing at various levels of development, in cooperation with partner UN and other agencies.

Outputs

- Development of techniques for the establishment of future targets under different climatic conditions and stages of economic development.
- Comparison of tools presently available for meeting such targets.
- Handbook of best practices for planning and financing at all levels for ensuring sustainability.

Benchmarks

- Adoption, at pilot scale, affordability issues in water related investments by Member States
- Dissemination of best practices regarding costs and economic externalities

Focal area 2.4 – Managing Water as a Shared Responsibility across Geographical & Social Boundaries

Activities

- Compilation of reports concerned with different interests and management policies for sharing common resources.
- Development and implementation of cooperative and joint national and international, management tools based on previous experience and training for both stakeholders and the general public.
- Assessment of existing approaches for joint multi national use of groundwater and of the interaction between surface water and groundwater.
- Inventory and assessment of vulnerability of regionally integrated aquifer systems.

Outputs

- New reports complementing the existing series of reports prepared under the on going programmes
- Examples of successful resolution of basinwide problems, through national and international cooperation.
- Increased knowledge of the essential factors in managing basin wide water resources for the benefit of all parties that rely on it.

Benchmarks

- Adoption by countries of internationally agreed norms for the management of shared resources
- Joint approaches to international financing agencies for technical and financial support of programmes that aim for global environmental gains (as defined by agencies such as GEF & the UN)

Box 9
PCCP: Sharing water resources...peacefully

There are 263 shared water basins in the world that cross over a multitude of natural, socio-economic and political international boundaries, covering an area of roughly 45% of the earth's surface with nearly half of the human population living there. Competition between different stakeholders over limited water resources often arises, creating real opportunities for collaboration...or conflict.

Following successful projects of similar nature in earlier phases of IHP, UNESCO launched the project From Potential Conflict to Co-operation Potential (PCCP) as part of a UN-wide initiative to promote water security in the 21st century, the [World Water Assessment Programme](#). PCCP aims to foster cooperation between stakeholders in the management of shared water resources, while helping to ensure that potential conflicts do not turn into real ones. PCCP gives priority to water conflicts that are international in nature and may cause tension or even open conflict between sovereign states.

The work

PCCP is active in three areas – research, education and technical assistance – with a focus on the development of tools for the anticipation, prevention and resolution of water conflicts. Broadly, this includes developing educational material, helping to build appropriate institutional frameworks, creating methodologies for the resolution of water conflicts, and the development of cooperation. It also includes improving legal tools for the management of shared water resources, and disseminating results and best practices.

The people

PCCP's priority target groups are institutions and individuals that manage shared water resources. These include:

- Decision-makers in government, who have the obligation to respect, protect and fulfil their citizens' right to water.
- Leading water professionals and policy-makers, who possess the capabilities to bridge the gap between government and the public, and can raise awareness on the benefits of cooperation around water resources.
- Civil society networks, whose influence in water management and decision-making can be crucial, in particular since they operate at the local level, where water conflicts tend to be most intense.
- Educators at different levels, who are training the next generation of transboundary water managers.
- Students specializing in water-related disciplines, as they will become the managers, educators and decision-makers of water resources in the future.

Box 10

Working arm-in-arm for water : ISARM

Transboundary aquifer systems are a vital source of fresh water, particularly under arid and semi-arid climatic conditions. The ISARM (Internationally Shared Aquifer Resources Management) initiative is a UNESCO-led, multi-agency effort to improve the understanding of scientific, socio-economic, legal, institutional and environmental issues related to the management of transboundary aquifers. Partners include: the International Association of Hydrogeologists (IAH), UN Food and Agriculture Organization (FAO), UN Economic Commission for Europe (UNECE), Organization of American States (OAS), International Network of Water-Environment Centres for the Balkans (INWEB), the Sahara and Sahel Observatory (OSS), UN Economic and Social Commission for West Asia (UNESCWA), University of Dundee (Department of Law), Organization for Security and Co-operation in Europe (OSCE), and others.

Work at hand

ISARM's general aim is to foster global cooperation in the sustainable management of transboundary aquifers, which also involves ensuring their environmental, economic, social and political security. It seeks to:

- Establish a network of experts from different disciplines for identifying and defining transboundary aquifers.
- Promote a scientific, legal, socio-economic, institutional and environmental assessment of transboundary aquifer resources.
- Identify, through regional consultation, several transboundary aquifers as case studies, and have multidisciplinary expert teams conduct detailed studies of them; then learn from the case studies which issues are relevant to good management of transboundary aquifer resources.
- Make policy and decision-makers aware of the importance of transboundary aquifers, for example by sharing with them, and others, the lessons learned from the case studies.
- Promote cooperation among experts, who come from countries that share aquifers, by making available to them the scientific tools, water resource management options and methodologies that apply to transboundary aquifers.
- Widely disseminate existing information on transboundary aquifers, and prepare a bibliography and database of internationally shared aquifers.
- Contribute to the preparation of maps that show potential risks and groundwater vulnerability of transboundary aquifers.
- Organize an international conference on transboundary aquifer systems to evaluate and compare the results and experience obtained in different regions.

Focal area 2.5 - Addressing the water-energy nexus in basin-wide water resources

62. In many countries of the world there are multiple demands for water from basin resources; this might be hydropower energy generation, on the one hand, and irrigation needs on the other. In the first case water is required for release in the cold season for power generation to provide power & heating, while in the second, the same water needs to be stored, for use in the growing season for irrigation. Residual water is still required for environmental flows in the river, for its aquatic habitats. Experience from regions where this nexus appears, can be illustrated through a matrix in which one axis consists of national or

international policy, institutional frameworks and investment strategies. On the other axis the issue can be addressed on three economic sector levels: the national single economic sector level (irrigation, or hydropower), the multi-sectoral level (several demands such as flood prevention, irrigation, power) and the national policy level. Member States are addressing these issues in international fora⁸. The water, environment and energy nexus becomes more complicated in transboundary basins and still needs to be addressed in many parts of the world such as Central Asia, Southern Africa and East Asia.

Activities

- Identification of the key drivers that characterize the multiple demand for water as a resource vs water as a source for energy, drawing on case studies in several regions of the world with differing and contrasting requirements.
- Building the capacity of scientific agencies in order to address the multiple demands of the hydropower sector in relation to the sustainability of ecosystems in river basins.
- Developing methodologies for stakeholders to address the water and energy needs so that they can better coordinate and link the use of resources.

Outputs

- Case studies and regional analyses of examples of the water and energy nexus in water-stressed regions of the world.
- Consultative and participatory seminars and technical meetings to help Member States address the most critical issues concerning the water and energy nexus.
- Development of management tools (e.g. models of hydro-economics and energy demands and constraints) that can be applied to support decision making.
- Creation of operational networks of scientists and hydro-power technical experts to build synergies.

Benchmarks

- Intersectoral coordination among different sectors of the economy for sharing the resource
- Development of new agreements, through scientific & technical support at a national level that demonstrate addressing such multiple demands

- **THEME 3: Ecohydrology for Sustainability**

Background and challenges

63. Earlier phases of IHP recognized the importance of biotic systems as integral components of land habitat hydrology. IHP-V adopted the theme 'ecohydrological processes in the superficial environment', which focused mostly on terrestrial processes. That theme was further developed in IHP-VI, which looked at the hierarchy of factors regulating ecological processes (implicitly water quality) in catchments and water bodies of different morphology and climatic zones.

⁸ Quoted from International Conference on "Water, Environment, Energy & Society" to be held in national Institute of Hydrology, Roorkee, India, Dec 2007: *Water is also an important source of energy. Falling under gravity it turns the blades of turbines, which generate electrical energy. Every source of energy generation has an associated environmental cost and a comparative evaluation of various sources is necessary to evolve the strategy to meet energy requirements while causing the minimum damage to the environment and society. In the future, considerably more water will be required for domestic, irrigation, hydropower and other uses. The need for better management of available water resources to meet the basic necessities for ever-increasing population and industrial activities and to provide hazard-free water for the society has never been more important.*

64. Theme 3 builds on the results achieved in the previous phases of IHP. These show that in the last decades human activities have become the major driver of the Earth's biosphere. The deterioration of water quality, overexploitation of freshwater resources, hydrological hazards and adverse effects of landscape degradation and sectoral management pose a risk for human health and for economic and social development. On the other hand, this also affects the functioning of ecosystems and their ability to provide goods and services on which human well-being depends. Therefore a better understanding of water as both an abiotic resource and a service delivered by ecosystems is needed. This understanding would make it possible not only to identify and quantify the critical linkages that regulate the interrelationships of hydrology and biota, but also to see how the control of these linkages may contribute to environmental sustainability. Today, the management approach has to go beyond protection and restoration and recognize the carrying capacity of ecosystems in the face of increasing human impact, find ways of improving and transferring solutions across a variety of environments.

65. Theme 3 also proposes to address three further issues. Firstly it will fill existing knowledge gaps by addressing issues related to critical water systems, such as those in arid and semiarid zones, coastal areas and estuaries, and urbanized areas (cross-cutting with Theme 4) where ecohydrological processes have not yet been sufficiently addressed, and the problems of environmental sustainability are still pertinent. Secondly it will show how better knowledge of the interrelationships between the hydrological cycle and biota can contribute to more cost-effective and environmental-friendly management. Thirdly, it will provide system solutions and technology transfer.

66. The overall objectives of this theme are:

- Contributing to a better understanding of water as both an abiotic resource and a service delivered by ecosystem processes, which will help to identify, quantify and improve the critical interrelationships between water and biota, necessary for sustainability, particularly in critical ecosystems (arid and semi-arid zones, coastal areas and estuaries, and urbanized areas).
- Providing transdisciplinary, cost-effective solutions to water-related issues, including harmonization of structural engineering solutions with ecosystem biotechnologies, in a variety of ecosystems and climatic zones, and addressing economic and social issues.
- Improving the knowledge on ecohydrology of groundwater-dependent ecosystems.
- Supporting strategic studies of scenarios, early warning systems and policy-relevant options for mitigating impacts.

Focal area 3.1 - Ecological measures to protect and remediate catchments process

Objectives

67. Global changes have resulted not only in degradation of the physical environment but also in considerable modification of landscape processes, including water and biogeochemical cycles and energy flow through ecosystems. In turn, this results in increased risk, deterioration of the environment, reduction of biological diversity and the ecosystem's ability to provide goods and services. A scientific basis for establishing water management policies is needed to ensure sustainable landscape development that can meet increasing human demands and aspirations while maintaining ecosystem quality and services. Arid and semi-arid regions should be given particular attention. Biota should be seen not only as a protection target but also as a means for controlling hydrological and biogeochemical processes. This focal area addresses measures based on the 'dual' control of hydrological

processes by regulation of biota and by the evolutionary adaptations developed between them.

Activities

- Managing erosion, sedimentation, landslides, and mudflow by ecological measures.
- Minimizing mobile solvents, nutrients and pollutants transport by ecological measures.
- Managing interdependencies between the water cycle and terrestrial/aquatic biota for restoring biogeochemical cycling and biological diversity.
- Bio-remediation and phyto-technologies for water bodies and landscape rehabilitation.
- Enhancing water retention in the landscape and developing ecohydrological methods for flood and drought mitigation.
- Sustainable landscape development and land-use planning.

Outputs

- Inventory of regulatory feedbacks between hydrological and biogeochemical processes across a variety of ecosystems and climatic zones for improving the efficiency of the mitigation of hydrological extremes, water quality, biodiversity and ecosystem goods and services.
- Setting up criteria for water management policies to ensure sustainable landscape development and planning that addresses ecosystem quality and services.
- Demonstrating best ecohydrology applications in various ecosystems and climatic zones.

Benchmarks

- Strengthening cooperation with HELP Basins and MAB for reinforcing a network of UNESCO-IHP demonstration projects in ecohydrology for monitoring, research, education and implementation of ecohydrological measures.
- Strengthening cooperation with WWAP, UNEP GEMS/WATER and other worldwide databases for quantification of ecological processes across scales and geographical regions and assessment of their application potential.
- Elaboration of mathematical models to quantify ecohydrological processes and provide a basis for the development of problem-specific tools under global changes.

Focal Area 3.2 - Improving ecosystem quality and services by combining structural solutions with ecological biotechnologies

Objectives

68. Existing solutions in water management are mostly based on a technical approach, without considering the functioning of ecosystems. This over-engineering of the environment raises management costs and often does not ensure sufficient ecological quality and services. Efforts to develop 'soft-engineering' technologies to complement 'hard-engineering' solutions should be strengthened. This should be based not only on wider applications of ecological biotechnologies, but also emphasize the potential for harmonization of traditional uses of hydrotechnical infrastructure (e.g. hydropower production, water supply, harvesting/reducing of risk of flash floods) with ecosystem needs and services (e.g. regulation of water level by dams for improving quality of water in and downstream of the reservoir, conservation of biodiversity in adjacent ecosystems, improving connectivity between river and floodplain). This focal area should actively participate in the elaboration of trans-disciplinary, cost-effective approaches to water management in catchment scale, reducing existing environmental risks and providing economic and social benefits based on

ecosystem goods and services (e.g. improvement of the quality of life, increase of employment opportunities based on biodiversity, tourism, bioenergy production, and others).

Activities

- Combining structural solutions with ecological biotechnologies for risk mitigation (e.g. flood and droughts, water quality decrease, biodiversity decline);
- Defining indices of assessment of sustainability, carrying capacity of ecosystems and opportunities/limitations for their enhancement;
- Improving knowledge of the use of hydrological processes-biota interrelations for enhancing efficiency of ecosystem biotechnologies (soft-engineering) for complementing structural solutions; and
- Assessing of the ecological effects of structural solutions (e.g. dams, ditches, channels, hydropower infrastructure) and recognising their potential to regulate adjacent ecosystems, enhance ecological gains (e.g. water quality improvement, preserving biodiversity) and create additional economic and social benefits.

Outputs

- Development of models/tools and operational procedures for harmonising structural solutions in water resources with ecosystem biotechnologies, including assessment of their impact on social systems and the economy.
- Creation of an effective system for incorporating transdisciplinary solutions into national legislations, coordinated with IHP National Committees.

Benchmarks

- Setting up a demonstration network of successful cases showing how 'hard-engineering' technologies can be complemented with 'soft-engineering' technologies.
- Reporting on additional benefits that can result from the implementation of modified operational procedures for hydrotechnical infrastructure (e.g. dams) in a range of ecosystems, outlining implementation and social, economic and environmental outcomes.
- Training and technology transfer toward increasing the appreciation of harmonized solutions, mainly among hydrotechnicians, engineers and decision-makers.

Focal Area 3.3: Risk-based environmental management and accounting

Objectives

69. Overexploitation of resources, modification of the physical structure of the environment, adverse effects of landscape degradation and sectoral management all pose risks, such as hydrological hazards, landslides, mudflows, water quality deterioration, affecting human health and economic and social development. Management strategies for risk mitigation and disaster management should include profound environmental risk-based assessment, and take into account uncertainty that results from increasing global changes. The major objective of this focal area is to establish quantitative techniques for assessing risk-based environmental water requirements and to provide a basis for elaboration of the respective guidelines.

Activities

- Strengthening risk-based environmental management under uncertainty, especially in the context of global (including climate) change threats to ecosystems.

- Elaboration of methods of risk mitigation, including effects on water quality, biodiversity and ecosystems stability.
- Elaboration of methods of disaster management addressing both social and environmental aspects (*cross-cutting with Theme 1*).

Outputs

- Establishing principles for risk-based environmental management and accounting and protective policies.
- Increasing awareness and disseminating information about risk-based environmental management and mitigation.
- Report on the transferability potential of the above methods.

Benchmarks

- Establishing links with observational and modelling programmes/networks for risk and disaster assessment, management and accounting.
- Networking on water hazard and risk management coordinated by ICHARM (*cross-cutting with Theme 1*).
- Producing information leaflets, publications and media coverage of environmental risk-related issues.

Focal area 3.4 – Groundwater-dependent ecosystems identification, inventory and assessment

Objectives

70. So far, IHP has undertaken several studies related to groundwater/surface water interactions and groundwater-dependent ecosystems; however there is a need for further research on groundwater-dependent ecosystems, their identification, inventory and assessment. Ecohydrological research should be strengthened for improving the understanding of groundwater/surface water interactions in the critical areas of catchments (e.g. wetlands, river corridors, ecotone zones) and the role of feedbacks between ground/surface water and vegetation as a regulatory tool. Special emphasis should be given to ecohydrological processes in critical areas, such as arid/semi-arid zones and estuaries/coastal zones.

Activities

- Ecohydrological management of groundwater dependent ecosystems, especially in the critical areas (arid zones, coastal areas, small islands).
- Understanding water linkages between surface/groundwater interactions.
- Understanding water linkages and exchange between freshwater/saline water.

Outputs

- Improved understanding of the ecohydrological processes in groundwater dependent ecosystems, and their implication for water resources management.

Benchmarks

- Improved integrated approach for management of surface and groundwater resources considering interdependencies with ecosystems.
- Identifying best practices, risk assessment methods and strategies to mitigate climate change impacts on groundwater-related ecosystems (*cross-cutting with Theme 1*).
- Identifying and establishing relevant case studies in selected critical regions for quantification of ecohydrological processes and measures for the management of groundwater related ecosystems (*cross-cutting with Theme 1*).

- **THEME 4: Water and Life Support Systems**

Background and challenges

71. Human activities and uses of water resources have had a profound effect on the resource stock and quality of water over most of the inhabited world. These stresses threaten the sustainability of societies. This is particularly problematic in arid and semi-arid areas, in coastal areas and small islands, and where population density and industrial activity are greatest. Surprisingly, societal response to warning signs of depleting groundwater levels, dry streams and polluted water has generally been inadequate. While there are some good examples of polluted systems being restored and biodiversity returning, and also of innovations in water conservation, reuse, groundwater augmentation and desalination, these are still relatively few and their potential applications are constrained by a range of factors. Scientists have been insufficiently influential in contributing to water management policies, and the time is ripe to establish internationally applicable principles for more comprehensive and systematic approaches to sharing resources equitably among users to enable a sustainable balance between supply and demand.

72. Theme 4 addresses this important need to improve the management of water for productive purposes. Its four focal areas deal with protecting water quality from natural and anthropogenic sources of contamination; water augmentation methods applicable in the most water stressed areas; and the particular issues and complexities of achieving sustainable water utilization in urban and rural areas.

73. This theme clearly aims to contribute to achieving the twin UN MDGs of providing safe water and sanitation in developing countries. It recognizes the need to apply existing knowledge and new innovation with regard to water, particularly in semi-arid and arid regions, in urbanising areas and on small islands. A sound understanding of catchment and aquifer water quality protection by regulators, planners, local government, water utilities, industry and, in many cases, whole communities, is central to achieving these goals. Increased awareness of the consequences of management of human, municipal and industrial wastes and of agricultural chemicals and fertilizers is a starting point. This needs to be supported by scientific knowledge of local catchment and aquifers, including knowledge of natural sources of contaminants, flow pathways, residence times and attenuation processes and kinetics to define actions needed for water safety plans.

74. In many locations the indirect and unplanned human reuse of water that occurs via rivers and aquifers is unavoidable or essential, and in some locations this is safe but in others increases risk to human health of water-borne disease. Sanitation may also have impacts on ecosystem values and bathing water. Water systems most at risk should be the focus of this theme, including those where the quantity of drinking water supply is already heavily constrained or will be by population growth, or changes in land use or climate. Means of safely augmenting supplies warrant the dissemination of existing knowledge and research and the development of innovative approaches, such as rainwater harvesting, management of aquifer recharge and planned water reuse, within the context of water safety plans.

75. In the future, more intelligent water resources management will make efforts to match quantity and quality of supplies with their uses to avoid unnecessary treatment of water, and enable productive reuse of nutrients in agriculture. This will increase reliance on natural treatment processes and allow investment to be focused on treatment technologies where they add most value and are most effective. Improved water quality protection will be significantly less expensive than treating polluted water, but requires knowledge and awareness among urban planners and water suppliers in order to achieve this desired state. Human health and well-being are strongly dependent on readily available and safe water to

meet basic livelihood needs of health and food production. For societies under pressure from population growth, urbanization, national and regional conflicts, climate change or desertification, the access to adequate sources of water has been severely impacted through degradation of these resources and conflicts over traditional and new sources of water. Societies in these circumstances are losing their traditional coping mechanisms and are often poorly served by national and local governments, because of a lack of understanding of their specific needs. While these needs have highest priority in international/regional/national development goals and strategies (e.g. poverty eradication and the Millennium Development Goals), governments and their service providers are struggling to move forward from basic water and sanitation infrastructure provision to an integrated development approach.

76. Critical responses to this situation include appropriate governance, strategic assessments of ways to meet these needs and integrated development actions at all levels. The particular challenge of IHP under this theme is to merge traditional and modern scientific knowledge, information and values into a participatory development programme that addresses access to water resources, their augmentation and the safeguarding of their quality for the support of livelihoods.

A few specific suggestions are:

- cooperate in the basin-scale on freshwater vulnerability assessments that UNEP has initiated in Africa, South-East Asia and Latin America as strategic basis for local action.
- utilize the HELP programme to achieve cooperation and develop pilot approaches;
- share information and experiences (key role for the UNESCO Centres);
- IHP National and Regional Committees to participate more actively in water-sector issues.

Focal area 4.1 - Protecting water quality for sustainable livelihoods and poverty alleviation

Objectives

77. This focal area aims to develop and use knowledge of surface water catchments and groundwater systems in order to attenuate microbial, organic and inorganic contamination in these water sources and help to protect the quality of current and future water supplies for all their uses. This will take into account natural and anthropogenic contaminants from point and diffuse sources, and contribute to the UN MDG for safe water supplies and sanitation.

Activities

- Provide an inventory of natural contaminants in groundwater resources and geochemicals and provide an assessment of risk due to human activities (e.g. arsenic, selenium, nitrate, fluoride, radioactivity).
- Develop scientific evidence for reliable and sustainable evaluation of contaminant attenuation rates under environmental conditions relevant for a wide range of surface water and groundwater situations, particularly in relation to human wastes, including pathogenic microorganisms, nutrients, organics and hydrocarbons.
- Disseminate information on methodologies for assessing residence times in aquifers and streams in order to form a scientific basis for developing risk-based preventive strategies, including defining well-head, catchment and riparian protection zones.
- Provide a scientific basis for planning future water supplies and sanitation, especially in expanding urban areas, coastal and island communities and water stressed areas.
- Build public awareness on water quality protection and the role of the community.

Outputs

- Guidelines for the assessment and evaluation of natural and anthropogenic contaminants, for hydrological procedures to identify water quality risks to water

supplies, and for the design of protection strategies for existing and proposed future water supplies from rivers, lakes and aquifers.

- A database on attenuation rates of pathogens and contaminants under a range of well-defined environmental conditions as a global resource to assist in risk assessment for water supplies and aquatic ecosystems.
- Case studies of good practice, including implementation of protection zones, management of pollutant sources, and planning for future supplies as an integral part of water safety plans.
- Incorporation of all of the above in curricula, training programmes and regional symposia on hydrology, water resources, water supply and urban planning, and in public awareness programmes conducted at national, city and community levels on steps towards better protection of water supplies.

Benchmarks

- Significant uptake of methods for water protection with targets adopted by Member States in support of achievement of water supply and sanitation MDGs, and substantially contributing to the UN Decade of Water for Life.

Focal Area 4.2 - Augmenting scarce water resources, especially in SIDS

Objectives

78. This focal area aims to identify and evaluate methods of augmenting water supplies in water-stressed urban and rural areas, particularly those subject to climate change or population growth in arid and semi-arid areas or on islands or coasts. Methods include water storage and reuse, using combinations of engineered and passive environmental treatment processes, such as managed aquifer recharge (MAR), where water of various qualities is used to produce safe drinking, industrial or irrigation supplies, or to protect against saline intrusion or land subsidence.

Activities

- Expand methodologies for harvesting rainwater and increasing water retention in the landscape, in support of strategies for groundwater management, protecting biodiversity, and reducing erosion.
- Improve methods for managing aquifer recharge (MAR) from various water sources to augment water supplies and protect groundwater quality and downstream human and environmental uses, reduce overexploitation of water resources, and assist communities to adapt to climate change and population growth.
- Provide scientific support to acknowledge human and environmental health implications of existing unintentional water reuse and to guide planning and implementation of safe water reuse for a wide range of applications within a catchment and groundwater system, considering salinity, nutrients, metals, pathogenic organisms and trace organics, including pharmaceutically active chemicals, endocrine disruptors, personal care products and flame retardants.
- Undertake research to enhance resilience of water supplies of coastal, island and arid area communities, to mitigate saline intrusion and land subsidence, to flush saline aquifers using low energy methods, such as MAR, to find uses for desalination brines or ways of safely disposing of these in inland areas, and to evaluate the environmental impact of large scale desalination.
- Identify means of conjunctive use of different sources of water, in particular surface water and groundwater, finding appropriate combinations of engineered and sustainable environmental treatments to minimize energy requirements, and make water supplies safer and cheaper.

Outputs

- Review of innovation in methods available, including MAR, rainwater harvesting and water reuse for improved urban and rural water management, and report exemplar case studies that document implementation, effectiveness, durability and limitations of these strategies in addressing water scarcity and water quality issues.
- An established network of exemplar sites developed in partnership with local and national bodies.
- Regional training programmes conducted and curricula developed in concert with the relevant UNESCO Centres and Chairs.
- Biennial symposia run in partnership with IAH and associated with international workshops conducted to foster research and dissemination of new knowledge on water issues.
- Guidelines on MAR and water reuse that highlight synergies with complementary natural resources management programmes related to biodiversity, sediments, salinity and land degradation and broader adaptations to climate change for improved water and food security.

Benchmarks

- Significant uptake of MAR and water reuse, substantially contributing to UN MDGs for water supply and sanitation and the UN Decade of Water for Life.

Focal Area 4.3 - Achieving sustainable urban water management

Objectives

79. This focal area aims to develop scientifically sound support for the integration of water management in urban areas. Its purposes are manifold. They include, sustaining drinking and industrial water supplies, sanitation services, surface water bodies and water-dependent ecosystems, increase efficiency of water use, improve the quality of life in cities, mitigate the risk of flooding and reduce contaminant discharges into receiving waters; institutional and capacity building aspects will be incorporated as necessary components in order to formulate and apply effective urban water management strategies (see Box 1, UWMP). Emerging paradigms and novel approaches and tools, particularly those applicable to cities in the developing world, will be duly considered.

Activities

- Generate and document approaches for best practices in integrated management of the water cycle in urban areas and surroundings in different climatic, hydrological and hydrogeological, and topographic settings, for megacities, cities, towns and villages with a range of characteristics, including existing water infrastructure, industries and capacities for adaptation.
- Assess effectiveness of, and explore promising directions for, water management strategies – including water conservation, demand management, pricing, stakeholder involvement, institutional frameworks, wastewater treatment, water reuse and conjunctive use of surface water and groundwater – on stocks and flows of urban water, on water security, water quality, flood risk, quality of life and on environmental footprints of urban areas.
- Evaluate strategies to improve the quality of life of periurban dwellers through alternative institutional and capacity building arrangements and alternative water supplies, stormwater management and waste management practices.
- Evaluate urbanization pressures and methods to assess ecological status for urban waterways, receiving waters, aquatic habitats, groundwater and changes due to

improved treatment and management of waste discharges (that is, in order to evaluate the environmental consequences associated with waste discharge from household sewage, industry and stormwater).

- Promote best practices and policies that lead to increased efficiency and sustainability in the use of water and better integration within and across water use sectors through recycling and reuse, and evaluate and take into account associated environmental, social and economic factors.
- Strengthen capacity building and educational capabilities in urban water management aimed to relevant target groups, including decision-makers, planners and practitioners, with special emphasis on developing countries.

Outputs

- Reports and guidelines on innovative urban water management in a range of cities, outlining implementation and social, economic and environmental outcomes.
- Establishment and evaluation of alternative water systems for improving the quality of life and safety of periurban dwellers.
- Reports and guidelines on monitoring methods and impacts on urban water environments, biodiversity and quality of life of integrated urban water management strategies.
- Analytical tools for the assessment urban water conditions and for the enhancement of integrated urban water management in various natural and climatic settings.
- Capacity building and educational components, encompassing the design, production and/or incorporation of the appropriate tools and approaches and enhancing the IHP training and technology transfer platform.

Benchmarks

- Major steps in improving urban water environments, improving the quality of life of urban dwellers, in particular those who live in slums and periurban areas, improving efficiency of urban water use and reducing discharge of wastes to receiving waters.
- Dissemination of expanded knowledge base on improved approaches for integrated urban water management and strengthened network for this purpose.

Focal Area 4.4 - Achieving sustainable rural water management

Objectives

80. This focal area aims to develop scientific and public support for water management in rural areas in order to sustain the quantity and quality of drinking water supplies, surface water bodies and water-dependent ecosystems, and meet the water needs of irrigation, aquaculture and industry. Issues of over-allocation, and in some cases lack of allocation policy, are particularly severe in arid and semi-arid areas. Sustaining the value of water resources in these cases requires increased efficiency of water use, and improved management of pesticides and fertilizers and sanitation.

Activities

- Undertaking strategic assessments of the socio-economic role and benefits of water in various forms in different rural environments, and taking into account climatic variability.
- Appropriate archiving, disseminating, and, where necessary, piloting of best practice information nationally, regionally and internationally for the sustainable utilization of water resources in rural areas.

- Application of methods for resource assessment to develop knowledge of sustainable rates of surface water and groundwater utilization, accounting for linkages between resources, and for the development of water sharing policies and participatory procedures to enable over-exploited resources to be brought into a balance.
- Development of policies and practices for the management of fossil groundwater based on strategic assessments of its present and future values.
- Specific focus on the safeguarding of water quality to ensure human health and food security in a rural environment, with emphasis on the impacts of erosion, salinization, poor sanitation, and fertilizers and pesticides.
- Systematic advocacy at all levels to anchor best practice knowledge in national and regional governance processes (e.g. guidelines, legislation, participatory processes).

Outputs

- Reports on methods and case studies demonstrating and highlighting best practices and the benefits of effective water management in rural areas, including means of equitably addressing community needs where water resources are over-exploited and setting wise policies for management of fossil groundwater.
- Development of materials for improved agricultural and aquaculture production in water stressed areas using recycled water, and protection of water resources from salinization, pesticides and fertilizers in partnership with FAO, Member States and NGOs focused on food security and natural resources.
- Assuring good water quality for drinking and food production, including access and appropriate technologies for supply development and maintenance.

Benchmark

IHP programme accepted as part of national/regional development programmes.

- ***THEME 5: Water Education for Sustainable Development***

Background and challenges

81. The challenges for IHP, as regards Theme V, in providing water education for sustainable development have been well articulated in the discussion document “Issues in World Water and their Educational Implications”, prepared by the Group on Water Education (mentioned above in para 20) and need not be repeated here. That document sets out the drivers of change and their educational implications, identifying seven drivers of change, as follows: demographic, technological, economic, social, environmental, governance and gender related. Each of these drivers has an implication for education. IHP Phase VII could not be expected to take direct responsibility for each of these, but will stimulate responsive actions through its partners across UNESCO and the UN System, as well as through its National Committees within Member States. The work that started in the sixth phase of the IHP (2002-2007), and led to substantial extension of IHP’s action in the field of water education, through IHE, and with an ever-increasing emphasis on interdisciplinary and multidisciplinary activities, needs to be consolidated and continued. During the seventh phase (2008-2013), water education, responsive to those drivers of change, will occupy centre stage at UNESCO.

82. The Issues Paper mentioned above identifies four constituencies for the delivery of water related education. These are: education for communities of social learning, education for schools and capacity building of teachers, education for vocational training, education for sustainable communities and mass media professionals. To these the IHP Task Force would add one more, education for ‘innovators / change makers’, this additional constituency

consists of those groups of people, NGO's and other concerned leaders of social movements, that have a strong voice, and can mobilise important public opinion, which influences the decision makers. For each of these constituencies, the IHP, under Theme V, would need to formulate and package the findings of all of its scientific hydrological research into appropriate messages such that sound science truly influences policies, perceptions, attitudes and behaviours.

83. To reach these constituencies, the IHP-VII will need to continue to improve and update the teaching of hydrological sciences and related scientific disciplines. It will need to foster the ideas contained in the Issues Paper to instil water education into sustainable development and it will contribute to finding the means to gain convergence of cross disciplinary dialogue, that is, between disciplines and their specialists. The relevance of 'other' disciplines to water resources management for sustainable development cannot be overemphasized. For example, the new dimensions of water governance include anthropology, history, sociology, political sciences, law, engineering and economics. Building up a converging dialogue between natural and social sciences is essential towards better understanding of the possible impacts from global changes, and to better prepare societal responses, set up preventive actions, and develop adaptation measures.

84. There is also a need for a much wider dissemination of scientific research results and for communication and adoption strategies to be made an integral part of all IHP projects. This can include the preparation of plain-language "Project Briefs" that complement technical reports arising from the other four Themes, by summarising results and identify major policy implications. Training workshops focused upon explaining these results and policy implications may also be used, especially for each of the constituencies mentioned above and for water professionals, policy and decision makers in developing countries, and with particular support for African countries.

85. As stated earlier, the UNESCO-IHE has significantly increased UNESCO's capacity in water education being the only entity in the UN system that is accredited to confer MSc and PhD degrees. It also delivers water education and training in many other forms, including short courses tailored to specific needs, and online courses. During IHP-VII, the Institute will coordinate actions with IHP regional and international water related category II Centres and Chairs. This will help to further build a strong network of partnerships that could do much to fulfil the professional-level needs for water education and training of Member States.

86. These tertiary and professional dimensions of water education will be supplemented in IHP-VII to also include a focus on water education for schools, Technical and Vocational Education and Training (TVET), the general community and the mass media. This is a reflection not only of the increasing role of education, training and capacity within IHP-VI, but also of developments within UNESCO, firstly, as the lead agency within the UN system for the UN Decade of Education for Sustainable Development and secondly, the adoption of an action plan for UNESCO's intersectoral activities on water education under the leadership of IHP. The action plan involves all of UNESCO's programme sectors to ensure that all forms and levels of education are included and that UNESCO as a whole has a coherent, integrated policy and strategy in water education⁹. The formulation of the focal areas of theme 5, follow the above developments and reflect the new needs.

87. The theme 5 focal areas respond to the needs of the constituencies identified above from the Issues Paper and the proposed Work Plan for the Thematic Programme 8 (Water

⁹ UNESCO's responses to these two developments were reported in the IHP document (IHP/Bur-XXXIX/14, April 2006) that was presented by the IHP Secretariat at the 39th Session of the IHP Bureau, and also in the UNESCO Executive Board document 174EX/Inf.13 (Item 48 of the Agenda 6 April 2006: "Follow-up to 166 EX/decision 3.6.1. Concerning the proposal for the elaboration of an education programme for sustainable management of freshwater resources")

Education for Sustainable Development) of the Action Plan for the UN Decade of Education for Sustainable Development (presented in Annex V of the document IHP/Bur-XL/14).

Focal area 5.1: Tertiary water education and professional development

Objectives

88. This focal area aims to enhance tertiary education and training programmes for water scientists, engineers, managers and policy makers through an extended suite of activities designed to educate a new generation of water managers and decision makers who are able to apply a holistic, integrated multidisciplinary approach to water resources. It also seeks to catalyse the wide dissemination of scientific research results and for communication and adoption strategies to be made an integral part of all IHP projects. UNESCO-IHE and the UNESCO Category 2 water-related centres will be key partners for the implementation of this part of the focal area.

Activities

- Develop interdisciplinary materials, such as guidelines, briefing papers, prototype professional development programmes and case studies connected with water education for sustainable development, in coordination with other Themes and Programmes of IHP.
- Develop strategies for fostering dialogue across disciplines, especially to ensure that cultural values, local traditions and historical factors are taken into account in water resources development and education.
- Set up a strategy to strengthen collaboration between UNESCO-IHE Institute for Water Education, the water-related UNESCO Category II Centres and UNESCO Chairs, other UN system agencies and programmes, and existing international water-related education programmes.
- Assess regional needs and priorities in water education and strengthen water education capacities in developing countries.
- Contribute to a UNESCO-IHP international conference and book on water education.

Outputs

- Guidelines to solve problems of communicating interdisciplinary information on water.
- Recommendations for broader curricula, exemplar educational materials and case studies
- Assessment and pilot studies of regional needs in water education.

Benchmarks

- Increased coordination of university and professional development courses across UNESCO-IHE Institute for Water Education, the water-related UNESCO category II Centres and UNESCO Chairs, and other UN system agencies on water-related education programmes.
- Promote interdisciplinarity among university and professional development courses.

Focal area 5.2: Vocational education and training of water technicians

Objectives

89. This focal area aims to expand the integration of principles and technologies for sustainable water supply and treatment, community-based water and sanitation services, and water conservation into TVET level training of water technicians.

Activities

- Survey and prepare case studies of examples of leading practices in sustainable water management in water technicians training.
- Analyse case studies and prepare guidelines and Briefing Papers on sustainable development and sustainable water management for TVET decision makers.
- Conduct workshops to build understanding of guidelines and Briefing Papers
- Provide technical support to national demonstration projects in selected Member States on TVET for sustainable water management, and establish a process to learn the lessons from them and share the lessons widely.
- Contribute to a UNESCO-IHP international conference and book on water education.

Outputs

- Guidelines for integrating sustainable water management in water technicians training.
- Case studies, best practices and publications on water education within TVET.

Benchmarks

- Increase in the capacity of countries and courses to focus on sustainable water management for technicians.

Focal area 5.3: Water education in schools

90. This focal area aims to build the capacities of primary, middle and high school education systems to make water a significant in the K-12 curriculum so that young people have an opportunity to develop an understanding of water issues in both local and global contexts, a commitment to a water ethic, and skills for contributing to sustainable water management in the local community. This will be done by providing technical assistance to the Education Sector of UNESCO and other partners.

Activities

- Provide technical support to the development of interdisciplinary support materials, such as guidelines, briefing papers, and case studies connected with sustainable development, e.g. on leading practices in K-12 water education, curriculum development, and the management of shared water resources, in coordination with other Themes and Programmes of IHP and other Sectors of UNESCO.
- Provide technical support to national demonstration projects in selected Member States on K-12 water education.
- Contribute to a UNESCO-IHP international conference and book on water education.

Outputs

- Guidelines for integrating water education related to sustainable development into the K-12 curriculum, with emphasis on “learning by doing” or “experiential learning” approaches.
- Prototype education support materials at the regional level.

Benchmarks

- Improved tools for the teaching of water issues in the K-12 curriculum.

Focal area 5.4: Water education for communities, stakeholders and mass-media professionals

Objectives

91. The aim of this focal area is to build the capacities of water scientists and managers in Member States to utilise a wide range of community education strategies in order to promote community-wide water conservation and sanitation, as well as skills in local co-management of water resources.

92. This focal area also intends to promote awareness of water issues using mass and community media resources and to keep an accurate reporting of water management on top of the media agenda. For this purpose, it will contribute to the understanding of the importance of world water issues among journalists and the producers of radio, television, film, multimedia and other mass and community media resources, as well as their capacities to communicate water issues accurately and effectively.

Activities

- Provide technical support to the preparation of case studies and guidelines based on leading practices in community-based water education.
- Provide technical support to the preparation of case studies and guidelines based on leading practices in mass and community media reporting on water issues and the training of media professionals on water issues.
- Develop a UNESCO-IHP website on community education resources and strategies to assist Member States in promoting community-wide water conservation and sanitation, as well as skills in local management of water resources.
- Contribute to a UNESCO-IHP international conference and book on water education.

Outputs

- Production of guidelines, supported by practical examples, for community-based water education and media reporting of water issues.
- A community education website managed by UNESCO-IHP.
- Demonstration projects on community-based water education strategies in several Member States focused on action learning approaches, and the diffusion of their evaluations.

Benchmarks

- Improved strategies for community-based water education.
- Improved strategies for media reporting of water issues.

(G) THE NEXT STEPS

93. The Sixth Report of the Task Force suggests the following next steps towards the final adoption of the Strategic Plan for Phase VII and the proposed Implementation Plan (provided in document IHP/Bur/XL.Appendix II)

94. The next steps are three-fold. Firstly to achieve Bureau approval of the Strategic Plan; secondly for the Secretariat to circulate the approved Strategic Plan to IHP Council Members to receive an out of session approval by the 1st September 2007, and following this to circulate it to the IHP National Committees, the UN Agencies, IGOs, NGOs. This wide circulation will receive proposals for actions, commitments, confirmation of benchmarks and identification of partners who will participate in Phase VII, on the basis of their agency complementarity and comparative advantages. Thirdly, for the Secretariat with the support of the Task Force, to complete the proposed Implementation Plan, including the monitoring and evaluation plan for the IHP-VII.

95. Concurrently with these three activities, as recommended by the Bureau the Secretariat will continue the preparation of a short user-friendly document describing IHP-VII for the larger audiences, using media experts. The user-friendly version will be released as soon as the 34th session of the General Conference (2007) adopts the IHP-VII Plan.

Preparation of the Implementation Plan

96. The Implementation Plan that has been prepared allows for flexibility and the possibility to introduce new elements to address new situations and emergencies, and take into account the evolving water sector framework and the UNESCO setting. For each Phase VII theme, the Implementation Plan will describe and list methods, partnerships, cooperation possibilities and extrabudgetary fundraising for implementation, in addition to details of execution. The Implementation Plan should indicate the expected results and evaluate if they suit the needs of those who would benefit from the deliverables. The aim is to make it easier to identify, execute and evaluate IHP-VII endorsed research and other programmes. To be successful, governments need to be involved in the implementation process and strong links should be established between governments and the IHP National Committees. To this end, it has been suggested that each country should designate a focal point at ministerial level. IHP National Committees could also establish focal points at technical level if they wish to take responsibility for the execution of specific tasks related to Phase VII themes and focal areas.

97. Other considerations to be addressed in the Implementation Plan include strengthening the role of the IHP National Committees in implementing IHP activities at regional level during IHP-VII. Considering the magnitude of water-related problems in developing countries, and especially in Africa, a particular effort will be needed to set up north-south and south-south partnerships among IHP National Committees.

98. In an effort to facilitate monitoring and coordination, efforts have been made to set realistic outputs for the five themes proposed for Phase VII. However, this matter could be given further consideration in light of IHP's success in leveraging support from cooperating agencies. For example, the partnership established with GEF is proving very effective and

could provide real benefits to IHP National Committees in developing countries. More associations of this type could broaden the scope of IHP-VII themes and focal areas.

99. Another consideration is that the decision on the regular budget allocated by the UNESCO General Conference for execution of the 2008-2009 biennium of the IHP-VII plan will only be assured by the 34th session of the General Conference at the end of 2007. This makes it difficult to prioritize actions in advance of that allocation.

Table 1
Overview of the Core Programme Themes of the Seventh Phase of the IHP (2008-2013)

WATER DEPENDENCIES: SYSTEMS UNDER STRESS AND SOCIETAL RESPONSES

Theme 1: ADAPTING TO THE IMPACTS OF GLOBAL CHANGES ON RIVER BASINS AND AQUIFER SYSTEMS

- Focal area 1.1 - Global changes and feedback mechanisms of hydrological processes in stressed systems
- Focal area 1.2 - Climate change impacts on the hydrological cycle and consequent impact on water resources
- Focal area 1.3 - Hydro-hazards, hydrological extremes and water-related disasters
- Focal area 1.4 - Managing groundwater systems' response to global changes
- Focal area 1.5 - Global change and climate variability in arid and semi-arid regions

Theme 2: STRENGTHENING WATER GOVERNANCE FOR SUSTAINABILITY

- Focal area 2.1 - Cultural, societal and scientific responses to the crises in water governance
- Focal area 2.2 - Capacity development for improved governance; enhanced legislation for wise stewardship of water resources
- Focal area 2.3 - Governance strategies that enhance affordability and assure financing
- Focal area 2.4 - Managing water as a shared responsibility across geographical & social boundaries
- Focal area 2.5 - Addressing the water-energy nexus in basin-wide water resources

Theme 3: ECOHYDROLOGY FOR SUSTAINABILITY

- Focal area 3.1 - Ecological measures to protect and remediate catchments process
- Focal area 3.2 - Improving ecosystem quality and services by combining structural solutions with ecological biotechnologies
- Focal area 3.3 - Risk-based environmental management and accounting
- Focal area 3.4 - Groundwater-dependent ecosystems identification, inventory and assessment

Theme 4: WATER AND LIFE SUPPORT SYSTEMS

- Focal area 4.1 - Protecting water quality for sustainable livelihoods and poverty alleviation
- Focal area 4.2 - Augmenting scarce water resources especially in SIDS
- Focal area 4.3 - Achieving sustainable urban water management
- Focal area 4.4 - Achieving sustainable rural water management

Theme 5: WATER EDUCATION FOR SUSTAINABLE DEVELOPMENT

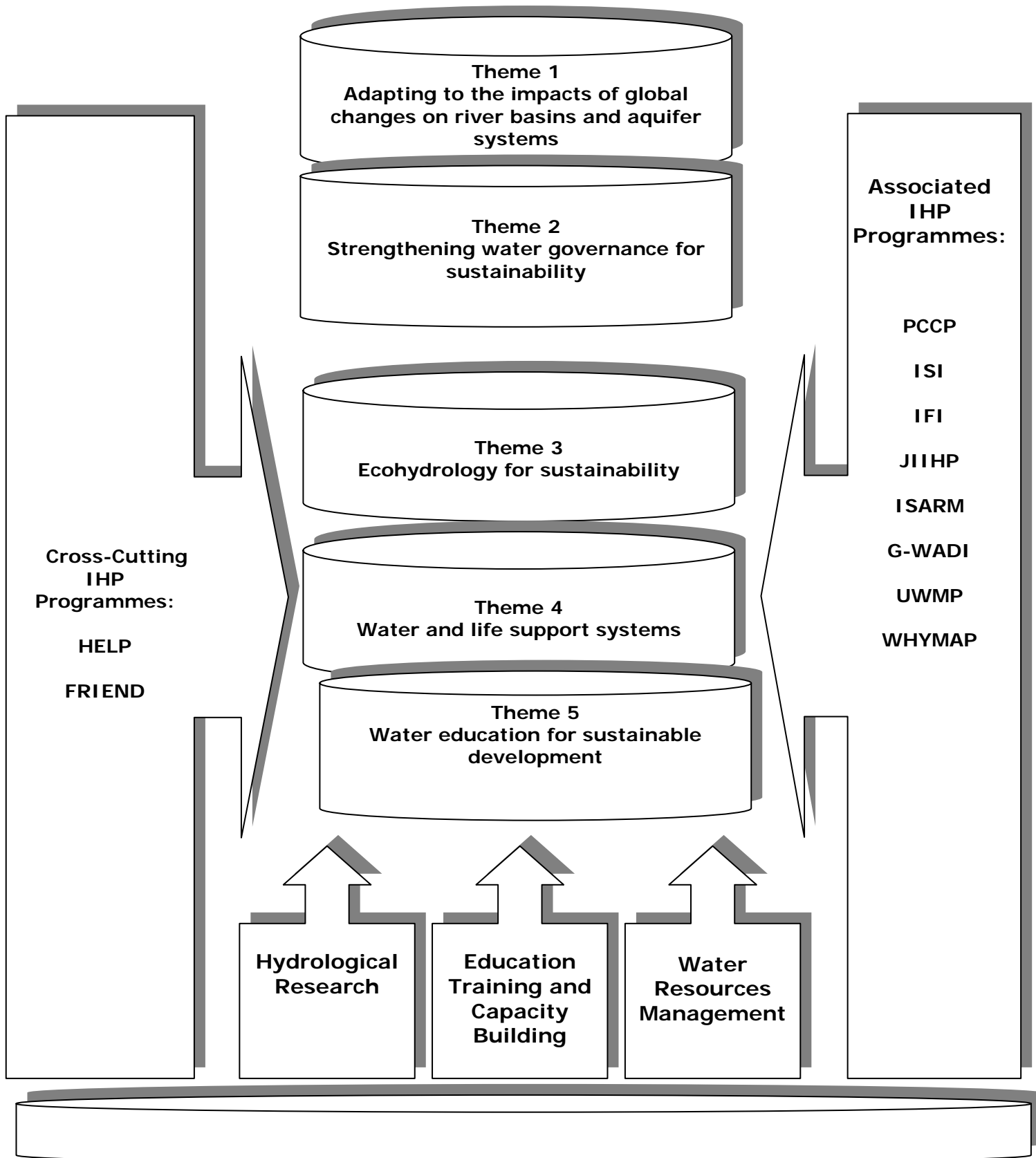
- Focal area 5.1: Tertiary water education and professional development
- Focal area 5.2: Vocational education and training of water technicians
- Focal area 5.3: Water education in schools
- Focal area 5.4: Water education for communities, stakeholders and mass-media professionals

Cross-cutting programmes: HELP, FRIEND

- Associated programmes:**
- International Flood Initiative (IFI)
 - International Sediment Initiative (ISI)
 - Water for Peace: From Potential Conflict to Cooperation Potential (PCCP)
 - Joint International Isotope Hydrology Programme (JIHP)
 - Internationally Shared Aquifer Resources Management (ISARM)
 - Global Network on Water and Development Information in Arid Lands (G-WADI)
 - Urban Water Management Programme (UWMP)
 - World Hydrogeological Map (WHYMAP)

Education, Training and Capacity Building across all the themes

Figure 1
Overview of the relationships between the Core Themes of IHP-VII, and the cross-cutting and the associated programme components



Annex I
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Annex II

IHP Phase VII Themes, Focal Areas and Linkage to Ongoing IHP Initiatives, Contribution to MDGs, Support to the Water for Life Decade and the UN Decade of Education for Sustainable Development

<i>Themes and focal areas for IHP Phase VII (2008 – 2013)</i>	<i>Continuing and strengthened initiatives under IHP Phase VII</i>	<i>IHP Phase VII and Millennium Development Goals</i>	<i>IHP and 'Water for Life' Decade (2005 -2015)</i>	<i>UN Decade of Education for Sustainable Development</i>
<p>Theme 1: ADAPTING TO THE IMPACTS OF GLOBAL CHANGES ON RIVER BASINS AND AQUIFER SYSTEMS</p> <p>Focal area 1.1 - Global changes and feedback mechanisms of hydrological processes in stressed systems Focal area 1.2 - Climate change impacts on the hydrological cycle, and consequent impact on water resources Focal area 1.3 - Hydro-hazards, hydrological extremes and water-related disasters Focal area 1.4 - Managing groundwater systems' response to global changes Focal area 1.5 - Global change and climate variability in arid and semi-arid region</p>	<p>HELP / FRIEND ISARM PC-CP G-WADI ISI IFI</p>	<p>Focus on MDG 7: Ensure environmental sustainability</p> <p>Assess the interlinkage with other MDGs such as: MDG 1: Eradicate extreme poverty and hunger, TARGET 2: <i>reduce by half the proportion of people who suffer from hunger</i> – especially through IHP Focal area 1-4 by developing means and policies that will maintain terrestrial ecosystem function and diversity as a prerequisite to the sustainable production of the world's food resources – especially in water stressed regions</p> <p>MDG 6: Combat malaria and other water-borne diseases, TARGET 8: halve and reverse the incidence of malaria and other water related diseases – especially through IHP focal area 1.3 – review the feedback mechanisms involved in</p>	<p>Early in the decade, IHP could promote and provide networking resources for experts to develop long-range, large-scale, integrated 'water for life'* modelling tools, which could deliver early warnings on ecosystem functions to help inform and develop regional policy frameworks. These models would target improvements in global modelling approaches described by Simonovic (2002) – World Water Dynamics – and deliver policy-relevant messages for actions by governments, financing agencies and informed stakeholders</p> <p>Water for Life – in this context is understood to mean the physical resource, its abiotic</p>	<p>IHP-VII (2008-2013) will extend IHP's action in water education, with an ever-increasing emphasis on developing the capacity of water scientists, managers and other actors to make interdisciplinary responses to the changing global environment and its impact on water, eg increased rainfall variability, natural disasters, etc. This could involve training packages and courses on: groundwater, managing ecosystem health and environmental flows, water modelling, and early warning systems and disaster response management. The looming adverse impacts of climate change on Africa and Asia, of their vulnerability and adaptative capacity, will require increased capacity building in the areas of water and ethics and of water and sustainable livelihoods.</p>

breeding grounds for malaria bearing mosquitoes and other organisms that propagate infectious diseases

MDG 8: Global partnership for development, TARGET 14: special needs of landlocked countries and small island developing states – IHP focal areas 1.2 and 1.4 would contribute to achieving these goals through better guidelines from improved predictive models

quality, its biotic resource, water balance and demands, within consistent hydrological units – river basins and aquifer systems.

Theme 2: STRENGTHENING WATER GOVERNANCE FOR SUSTAINABILITY

Focal area 2.1 - Cultural, societal and scientific responses to the crises in water governance

Focal area 2.2 - Capacity development for improved governance; enhanced legislation for wise stewardship of water resources

Focal area 2.3 – Governance strategies that enhance affordability and assure financing

Focal area 2.4 - Sharing the Responsibility for and Benefits of Basinwide water resources

HELP / FRIEND
ISARM
PC-CP
G-WADI
ISI
IFI

The relevance of MDG 7 is stressed: the fundamental importance of water as a dividing line between poverty and prosperity can be noted on the world map of global income distribution – high priority countries for MDGs identified in the Human Development Reports are largely in the arid zones where water scarcity and drought frequency intensify the incidence of poverty, an aspect that could be addressed through IHP focal area 2.3, with the development of methodologies for effective IWRM and secure flow of

The 'actions' component of a future 'Water for Life' Decade may well take forward some of the past commitments made by *governments*. If so, IHP Phase VII could take a pro-active role in promoting the 'governance' and the 'capacity building-knowledge sharing' components of the Bonn Action Plan (2001), which was adopted by Ministers but lacks a time frame. The key actions that IHP Phase VII, Theme 2 could take up include:

Water governance

Education, training and capacity building in this theme could represent a major area of growth in IHP's project development, research and education activities. There could be at least three levels of work in this area.

The first level concerns training in international, national and local water law and governance, water and human rights, incorporating cultural factors and gender issues in water sciences and management, and the implications of public vs private ownership of water and sanitation services and the increase in public-private

Focal area 2.5 - Addressing the multiple demands on basin-wide water resources

funds

TARGET 9: Integrate principles of sustainable development into country policies and programmes – IHP focal areas 2.1 and 2.2 should have a key role in *developing* principles that integrate sustainable water resource development into national and sub-regional policies and programmes, especially by providing financing agencies with a scientific basis for their lending and assistance programmes

Ensure water infrastructures are designed to delivers to the poor
Promote gender equality in water and sanitation
Manage water at the lowest appropriate level

Capacity building - knowledge sharing
Focus education and training on water wisdom
Share knowledge and innovative technologies
Encourage governments to play more actively their role in water governance

partnerships for water and sanitation. This involves multidisciplinary understandings from studies in anthropology, history, sociology, geography, political and policy sciences, law and economics. Strengthening dialogues between natural and social sciences is necessary to better understand possible impacts from global changes and to better prepare societal responses, set up preventive action, and develop adaptation measures. The second level involves training and capacity building for water managers in participatory and community-based approaches, especially at the village, township and catchment scales. The third is the training of community members in order to enable them to participate effectively in water management.

Theme 3: ECOHYDROLOGY FOR ECOSYSTEM SUSTAINABILITY

Focal area 3.1 Ecological measures to protect and remediate catchments process
Focal area 3.2 - Improving ecosystem quality and services by combining

HELP / FRIEND
ISARM
PC-CP
G-WADI
ISI
IFI

Continuing and strengthened initiatives under IHP Phase VII

MDG 7: Ensure environmental sustainability, TARGET 10: halve the proportion of people without sustainable access to safe drinking water – especially under IHP focal area 3.3; urbanization pressures threaten local water sources; many residents of megacities access local

By the close of the 'Water for Life' Decade (2015), the number of megacities in the world will have increased several folds from the 23 in 2000. The pressure on water as a resource, and water as solvent for waste water, will rise inexorably. Such

The development of educational and capacity-building activities on ecohydrology provides an opportunity for IHP and its partners to educate a new generation of water managers and decision makers. They will need to be trained to apply a holistic and integrated

structural solutions with ecological biotechnologies
 Focal area 3.3 - Risk-based environmental management and accounting
 Focal area 3.4 - Groundwater dependent ecosystems identification, inventory and assessment

shallow groundwater, poor / absent sanitation contaminates these sources; this situation is replicated in cities, towns and villages, though with decreasing intensity; methodologies for ecological management of wastes in urban conditions could be developed

TARGET 11: Achieve significant improvement in the lives of at least 100 million slum dwellers – IHP focal area 3.3 could focus on increasing the sustainability of water services (non conventional water) for the use by slum dwellers in cities and megacities

Most MDGs involve water’s many functions in the planet’s life support system – as a basic component for crop production, landscape agent, mobile solvent – issues that are addressed in IHP focal area 3.1

pressures will extend to other urban centres – possibly the migration to cities will release pressure in rural areas, though poor land management in the interim will have left significant pollutants to threaten ecosystems (e.g. nitrate in unsaturated zones, agrochemicals in degraded land, etc)

IHP Phase VII could sponsor and support strategic studies at the opening stages of the Decade – assessing these scenarios, stressing early warning signals and policy relevant options for mitigating impacts on critical ecosystems

approach to water resources, creating bridges not only across the ecological and hydrological sciences but also across the social sciences. This needs to involve a degree of up-skilling of some hydrologists, technicians, water professionals, and policy and decision makers who may not be used to working in a transdisciplinary manner, and who may not be used to making decisions based on understanding of the complexity and uncertainty that are characteristic of real-life situations.

Theme 4: WATER AND LIFE SUPPORT

Focal area 4.1 - Protecting water quality for sustainable livelihoods and poverty alleviation
 Focal area 4.2 - Augmenting

IFI

HELP / FRIEND
 ISARM
 PC-CP
 G-WADI
 ISI

Focus on MDG 7: Ensure environmental sustainability

Provide sound policy-relevant scientific basis to achieve TARGET 10, especially in

The JPOI initiative targets water and sanitation directly – but health and agriculture are directly linked to water availability and water quality. Assuming that the key

Like Theme 2 on water governance, this theme requires education, training and capacity building across several levels. First, it requires water scientists and managers to hydrological systems and

scarce water resources especially in SIDS
 Focal area 4.3 - Achieving sustainable urban water management
 Focal area 4.4 - Achieving sustainable rural water management

connection with human health; water-borne diseases constitute a major obstacle to *improving human health* – especially in regions where 90% of sewage and 70% of industrial waste are disposed untreated into surface water systems

issues in the 'Water for Life' Decade could be translated as:
 water for food security
 water for human health
 water for ecosystem operations

threats to their sustainability from global environmental change and human impacts. Second, it requires specialist training in the management of water supply, and quality to ensure the sustainability of economic activities, human settlements, and health and well-being across different ecosystem types. Third, there could be a major emphasis on training for community-based strategies for water and sanitation, especially in fragile environments and for the rural poor.

Theme 5: WATER EDUCATION FOR SUSTAINABLE DEVELOPMENT

Focal area 5.1: Tertiary water education and professional development
 Focal area 5.2: Vocational education and training of water technicians
 Focal area 5.3: Water education in schools
 Focal area 5.4: Water education for communities, stakeholders and mass-media professionals

During the sixth phase of the IHP (2002-2007), there has been a substantial extension of IHP's action in the field of water education, with an ever-increasing emphasis on interdisciplinary and multidisciplinary activities. During the seventh phase (2008-2013), water education will occupy centre stage at UNESCO.

Consideration should be given to developing a dissemination and adoption strategy for all IHP projects, eg through which technical reports are supplemented by plain-

As with water, education is central to all the MDGs. Meeting MDG 7 and its wide range of environmental targets requires a population that has "environmental literacy" and specifically "water literacy".

The MDG goals related to gender equity, child and maternal health, among others, also require basic water education as a pre-requisite.

The Water for Life Decade coincides with the UN Decade of Education for Sustainable Development. This provides an opportunity to make education integral to the former and water integral to the latter. While a limited amount of educational materials have been prepared for the Water for Life Decade, this provides an opportunity for IHP to take a leading role and ensure that all appropriate activities in its water education programme are co-branded with the Water for Life Decade and linked to its materials and those of other partners in UN-

IHP is taking the lead in the development of a UNESCO-wide strategy for water education at all levels. It is doing this by taking responsibility for Thematic Programme 8 Water Education in the UNESCO Action Plan for the Decade of Education for Sustainable Development. Themes 1-4 in IHP VII relate to the Decade of Education for Sustainable Development though activities at the tertiary and professional level (as above). These will be complemented under Theme 5 by activities directed to schools, TVET, the general

language “Project Briefs” that summarise results and identify major policy and other practical implications

In its role as the lead agency for the UN Decade of Education for Sustainable Development (2005-2014), UNESCO will place special emphasis on water education across a wide range of audiences, as reflected in Focal areas 5.1-5.4.

Water.

community and the mass media.



International Hydrological Programme

40th session of the IHP Bureau
(UNESCO-IHE, Delft, 13 – 15 June 2007)

APPENDIX I

SUPPLEMENTARY DOCUMENT TO THE UPDATED DRAFT STRATEGIC PLAN FOR THE 7TH PHASE OF THE IHP (2008 – 2013)

Item 6.1 of the provisional agenda

SUMMARY

This document (Appendix I) contains supplementary information in support of the Draft Strategic Plan for IHP's Phase VII. It includes a full record of each round of the detailed consultations that have taken place with IHP National Committees of the Member States. Annex II includes a record of the endorsement by the National Committees of the scope and the contents of the Strategic Plan.

The Bureau is invited to take note of the information presented.

Supplementary Document
to the Updated Draft Strategic Plan for the VIIth Phase of IHP (2008-2013)
Water Dependencies: Systems under Stress and Societal Responses

Abbreviations and Acronyms

CHy	Committee on Hydrology (of WMO)
CPCW	Cooperative Programme on Water and Climate
DRA	Demand responsive approaches
EU	European Union
FAO	Food and Agriculture Organization
FRIEND	Flow Regimes from International Experimental and Network Data
GEF	Global Environmental Facility
GEF-STAP	GEF-Scientific and Technical Advisory Panel
GEMS	Global Environmental Monitoring System
GEOS	Global Environmental and Ocean Sciences
GEST	Global Evaluation of Sediment Transport
GEWEX	Global Energy and Water Cycle Experiment
GIWA	Global International Waters Assessment
GRACE	Gravity Recovery and Climate Experiment
GRAPHIC	Groundwater Resources Assessment under the Pressures of Humanity and Climate Changes
G-WADI	Global Network – Water and Development Information for Arid Lands
GwES	Groundwater in Emergency Situations
HELP	Hydrology for the Environment, Life and Policy
IAEA	International Atomic Energy Agency
IAH	International Association of Hydrogeologists
IAHS	International Association of Hydrological Sciences
IBSP	International Basic Sciences Programme
ICHARM	International Centre for Water Hazard and Risk Management.
IFI	International Flood Initiative
IGBP	International Geosphere Biosphere Programme
IGO	Intergovernmental organization
IGRAC	International Groundwater Resources Assessment Centre
IHD	International Hydrological Decade
IHP	International Hydrological Programme
INBO	International Network of Basin Organizations
INWEB	International Network of Water-Environment Centres for the Balkans
IOC	Intergovernmental Oceanographic Commission
IRTCES	International Research and Training Centre on Sedimentation and Erosion
IRTCUD	International Network of Research and Training Centres for Urban Water and Centres for Urban Drainage
ISARM	International Shared Aquifer Resource Management
ISDR	International Strategy for Disaster Reduction

ISI	International Sedimentation Initiative
IUGS	International Union of Geological Sciences
IWA	International Water Association
IWRM	Integrated water resources management
JIIHP	Joint International Isotopes in Hydrology Project (UNESCO-IAEA)
JUWFI	Joint UNESCO/WMO Flood Initiative
MAB	Man and the Biosphere
MAR	Managed Aquifer Recharge
MDG	Millennium Development Goal
MOST	Management of Social Transformations
NEPAD	New Partnership for Africa's Development
NGO	Non-governmental organization
OAS	Organization of American States
OSCE	Organization for Security and Co-operation in Europe
OSS	Sahara and Sahel Observatory
PCCP	From Potential Conflict to Co-operation Potential
PRSPs	Poverty Reduction Strategy Papers
PUB	Prediction in Ungauged Basins
PWRI	Public Works Research Institute
SADC	Southern African Development Community
SDG	submarine discharge of groundwater
TIGER	Topologically Integrated Geographic Encoding and Referencing
UNDESD	United Nations Decade of Education for Sustainable Development
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNESCO-IHE	UNESCO-IHE Institute for Water Education
UNESCWA	United Nations Economic and Social Commission for Western Asia
UNILC	United Nations International Law Commission
UNITWIN	University twinning and networking scheme
UNU	United Nations University
UNU-EHS	United Nations University-Environment and Human Security
UWMP	Urban Water Management Programme
WCDR	World Conference on Disaster Reduction
WECB	Water, education and capacity building
WHO	World Health Organization
WHYMAP	Worldwide Hydrological Mapping Assessment Programme
WMO	World Meteorological Organization
WSSD	World Summit on Sustainable Development
WWAP	World Water Assessment Programme
WWDR	World Water Development Report

**Supporting Document to
Updated Draft Strategic Plan of the Seventh Phase (2008-2013) of IHP**

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Supplementary Document
to the Updated Draft Strategic Plan for the VIIth Phase of IHP (2008-2013)

Water Dependencies: Systems under Stress and Societal Responses

PURPOSE OF SUPPLEMENTARY DOCUMENT

1. The purpose of this Supplementary Document to the Updated Draft Strategic Plan for the IHP Phase VII is to present in detail the consultations that were undertaken with Member States of the IHP, between the July Intergovernmental Council and September 2007. At its 17th session the Intergovernmental Council (held 3 – 7 July 2006) of the IHP had examined the draft Strategic Plan for the VII th Phase of the IHP and had endorsed it in principle. However, the Council invited all Member States to further comment on the draft within two months. The Council did authorise the Bureau of the IHP to consolidate the draft with the comments made in the course of the Council debate and the later consultations, and to submit it for out of session approval, in accordance with article 28 of the Rules of Procedure.

2. In response to the request of the Council, the Secretariat of the IHP has re circulated the Draft Strategic Plan to all Member States for a further round of consultations. This document presents, in detail, the results of all the consultations that have taken place since the formulation of the Plan.

3. This document is a Supplementary Document to the IHP/Bur/XL-12, and should be read in conjunction with it. It provides the findings of the consultations with the IHP National Committee's. The results have been presented in a series of annexes that have been included. The annexes contain the following

- | | |
|------------|--|
| Annex I: | Contains a list of IHP National Committees that have participated in the preparation of the IHP VII Strategic Plan |
| Annex II: | Includes a record of the endorsement of IHP VII, |
| Annex III: | IHP National Committee Inputs and expressions of interest by Focal Area |
| Annex IV | Activities proposed by National Committees. |

SUMMARY OF PRINCIPAL FINDINGS OF CONSULTATIONS

4. The formulation the IHP VII Strategic Plan involved the Secretariat conducting several consultations with the IHP National Committees. These consultations have been undertaken in: February and June 2004, April 2005, April 2006, July 2006, September 2006

5. Principal findings :

- A total of 82 IHP National Committees have provided individually their inputs and comments. The answers received from the National Committees (Annex I, II, III, IV) and in particular the ones sent by 28 IHP National Committees in September 2006 (Consultation undertaken by the secretariat in July 2006) indicate the endorsement of the IHPVII Strategic Plan such as it is presented in its version of July 2006 contained in the document IHP/IC-XVII/Inf. 9 at the 17th Session of the IHP Council
- The vast majority of the countries agreed with the IHP VII guiding principle of strong interrelation between scientific research, applications and education being the outcome of the views received from several countries.
- The validity of IHPVII Strategic Plan was also discussed during the regional meetings of the IHP National Committees of Sub-Saharan-Africa, Arab States and the reports of

approvals have been received. The main concept for the IHP VII was fully endorsed by IHP National Committees during the African countries meeting in Abuja (Nigeria, Ghana, Gambia, Burkina Faso, Benin, Mali, Niger, Senegal, Cote d' Ivoire, Togo) in March 2006. They noted that it reflects Member States concerns and priorities. They welcomed the suggested Themes and Focal areas.

- Most of the countries recommend that the IHP VII should develop best practices and communicate them to the governments. Most of the countries requested greater emphasis to management and governance issues, including shared water resources management and conflict prevention (Annex III).
- Group of countries have emphasized the importance of conducting studies and research on the hydrologic process in different climatic regions. Particular emphasis is given to Cold climate and the Arctic hydrology and Arid Zones (Information Box was included at the request by Nordic Countries during the 17TH Session of the IHP Council). As result the IHP VII Strategic Plan includes both artic and cold climate hydrology as well as semi-arid and arid zones hydrology.
- The need for the focus on hydrological systems and their interdependencies with other systems, has been stressed and their organization into themes and focal areas.
- It is suggested that strong interactions between the different Themes and the different Focal areas be developed.
- It is also agreed that the new theme on “Water Education for Sustainable Development” should consider not only the support to the DESD but also to IHP National Committees and include IHP-VII activities per se.
- It is acknowledged that the various UNESCO IHP Centres around the world are potentially focal points for project implementation as well as vehicles for getting external funds for such projects. IHP Centres can play an important role in the implementation of regional programmes. A strategy for the IHP centres is in preparation for presentation at the IHP Bureau session of June 2007. The strategy aims to provide better guidelines for developing the governance of these centres and for starting new ones.
- In an effort to facilitate monitoring and coordination, it was recommended to set up realistic outputs for the five themes proposed for Phase VII.
- It is necessary to set up a clear structure for the implementation plan
- Detailed proposals should be provided by the IHP national Committees and UNESCO partners in order to formulate the Implementation plan.

ANNEX I

List of IHP National Committees that have participated individually or by group to the preparation of the IHPVII Plan

1. Argentina
 2. Azerbaijan
 3. Australia
 4. Belgium
 5. Benin
 6. Bolivia
 7. Brazil
 8. Bulgaria
 9. Canada
 10. Chile
 11. China
 12. Colombia
 13. Congo
 14. Costa Rica
 15. Croatia
 16. Dominican Republic
 17. Ecuador
 18. Egypt
 19. El Salvador
 20. Finland
 21. Germany
 22. Haiti
 23. Hungary
 24. Iceland
 25. India
 26. Indonesia
 27. Iran
 28. Ireland
 29. Israel
 30. Italy
 31. Japan
 32. Jordan
 33. Kazakhstan
 34. Kenya
 35. Kirghizstan
 36. Korea (The Republic of)
 37. Kuwait
 38. Latvia
 39. Lebanon
 40. Lesotho
 41. Madagascar
 42. Malaysia
 43. Mauritius
 44. Mexico
 45. Moldova
 46. Namibia
 47. Nepal
 48. Netherlands
 49. Nigeria
 50. Norway
 51. Pakistan
 52. Palestine
 53. Peru
 54. Romania
 55. Russian Federation
 56. Saudi Arabia
 57. Slovakia
 58. Slovenia
 59. South Africa
 60. Spain
 61. Sudan
 62. Syria
 63. Sweden
 64. Switzerland
 65. Thailand
 66. Tunisia
 67. Turkey
 68. United Kingdom
 69. United States
 70. Uzbekistan
 71. Venezuela
 72. Yemen
 73. Nigeria
 74. Ghana
 75. Gambia,
 76. Burkina Faso
 77. Benin
 78. Mali
 79. Niger
 80. Senegal
 81. Togo
 82. Cote d' Ivoire
- Consultations with the IHP National Committees have been undertaken in: February and June 2004, April 2005, April 2006, July 2006
- The IHP National Committees had also the opportunity to comment during of the regional meetings coordinated by the IHP regional hydrologists. The IHP National Committees of the Sub-Saharan African countries had the opportunity to discuss and provide comments during the meeting organized by the IHP National Committee of Nigeria in Abuja in march 2006.

Annex II

Endorsement of the IHP VII Strategic Plan (Themes and Focal Areas)

IHP National Committees	Expression of support to the IHPVII Plan including preliminary expression of interest in specific IHPVII Themes and/or Focal areas	Endorsement of the IHP VII Strategic Plan (Themes and Focal Areas) such as in its version of July 2007 contained in the document IHP/IC-XVII/Inf. 9 presented at the 17 th Session of the IHP Council and sent to all IHP National Committee 19 July 2007	Inputs sent in March 2004 June 2004 – May 2005 May 2006 and September 2006	Preparation of the Implementation Plan- -Offer to take responsibility for a particular activity, events, specific projects and -Propose detailed activities to be developed in the biennium 2008-2009 -Designated national Focal point for Theme and/or Focal areas -Send list of national experts and their CV
Argentina	YES -	YES	YES	No
Azerbaijan	YES -	YES	YES	No
Australia	To be confirmed	To be confirmed	YES	No
Belgium	YES	To be confirmed	YES	No
Benin	YES	To be confirmed	YES	No
Bolivia	YES	YES	YES	No
Brazil	YES	To be confirmed	YES	No
Bulgaria	YES	YES	YES	No
Canada	YES-	YES	YES	No
Chile	YES	YES	YES	No
China	YES-	YES	YES	No
Colombia	YES	YES	YES	No
Congo	YES	YES	YES	No
Costa Rica	YES-	YES	YES	No
Croatia	YES	YES	YES	No
Dominican Republic	YES	YES	YES	No
Ecuador	YES	YES	YES	No
Egypt	YES	YES	YES	No
El Salvador	YES	YES	YES	No
Finland	YES	YES	YES	no -
Germany	YES-	YES	YES	No
Haiti	YES	YES	YES	No

Hungary	YES-	YES	YES	No
Iceland	YES	YES	YES	No
India	YES	<i>India has recognized that the version of the IHPVII in the documented IHP/IC-XVII/Inf. 9 is considerably modified to incorporate the views of the Indian Ministry of water resources conveyed earlier. Nevertheless there is no agreement in participating in the implementation of Focal Area 2.4 and Focal area 2.5.</i>	YES	No
Indonesia	YES	<i>To be confirmed</i>	YES	No
Iran	YES	YES	YES	No
Ireland	YES	<i>To be confirmed</i>	YES	No
Israel	YES	<i>To be confirmed</i>	YES	No
Italy	YES	YES	YES	No
Japan	YES	YES	YES	No
Jordan	YES	YES	YES	No
Kazakhstan	YES	YES	YES	No
Kenya	YES	YES	YES	No
Kirghizstan	YES	YES	YES	No
Korea (The Republic of	YES	YES	YES	No
Kuwait	YES	YES	YES	No
Latvia	YES	<i>To be confirmed</i>	YES	No
Lebanon	YES	<i>To be confirmed</i>	YES	No
Lesotho	YES	YES	YES	No
Madagascar	YES	YES	YES	No
Malaysia	YES	YES	YES	No
Mauritius	YES	YES	YES	No
Mexico	YES	YES	YES	No
Moldova	YES	YES	YES	No
Namibia	YES	YES		
Nepal	YES	YES		
Netherlands	To be confirmed	To be confirmed		

Nigeria	YES	YES		
Norway	YES	YES		
Pakistan	YES	YES		
Palestine	YES	YES	YES	No
Peru	YES	YES	YES	No
Romania	YES	YES	YES	No
Russian Federation	YES	YES	YES	No
Saudi Arabia	YES	YES	YES	No
Slovakia	YES –	YES	YES	No – The IHP National Committee informs that Implementation plan on national level is under preparation.
Slovakia	YES	YES	YES	No
Slovenia	YES	YES	YES	No
South Africa	YES	YES	YES	No
Spain	YES	YES	YES	No
Sudan	YES	YES	YES	No
Syria	YES	To be confirmed	YES	No
Sweden	YES	To be confirmed	YES	No
Switzerland	YES	YES	YES	No
Thailand	YES	YES	YES	No
Tunisia	YES	YES	YES	No
Turkey	YES -Turkey will host the 5 th WWF – The 5th Forum draft issues are already reflect the topics of the IHPVII	There is no agreement to contribute with the Water as a shared responsibility IHP VII topic	YES	No
United Kingdom	YES	To be confirmed	YES	No
United States	YES	To be confirmed	YES	No
Uzbekistan	YES	YES	YES	No
Venezuela	YES	YES	YES	No
Yemen	YES	YES	YES	No
The IHP National Committees had also the opportunity to comment during of the regional meetings coordinated by the IHP regional hydrologists				

ANNEX III

National Committee Inputs and indications of interest related to Themes and Focal areas

IHP VII Themes and Focal areas	Inputs and indications of interest related to Themes and Focal areas, received from the IHP national committees as results of the consultations have been undertaken in: February and June 2004, April 2005, April 2006, July 2006, September 2006
Theme 1:	
Focal area 1.1	<p>Argentina, Australia, Bulgaria, Iceland –Germany- Finland and other Nordic countries</p> <p><i>Cooperation is envisaged to further the necessary and fundamental research for adapting to global changes impacts on the Arctic Hydrological Cycle. Develop activities in the framework of the Arctic-Hydra programme within the framework of the International Polar Year 2007-2008 (IPY). On the basis of this program cooperation on this field of research will be continued under the IHP-VII period.</i></p> <p>Island -Evaluation of the impacts of global changes on coastal zones, small islands, present permafrost zones and glaciated areas, and megacities. -Evaluation of possible influences of global change on their temporal and regional occurrences and magnitude include e.g. changes in the position and movement of major weather systems as well as changes in snow melt</p> <p>Canada- and Nordic Countries , Chile, Colombia, Costa Rica, Eastern Africa sub-region Egypt, Finland, Hungary, Iceland –Germany- Finland-Sweden and other Nordic countries, Iceland, Ireland , Italy, Japan, Kuwait, Kyrgyz Republic, Madagascar, Nepal, Norway, Pakistan, Peru, Spain, Sudan</p>
Focal area 1.2	Eastern Africa sub-region , Australia, Bulgaria, Congo, El Salvador, Finland, Germany, Iceland, Ireland and a group of Nordic countries, Jordan, Namibia, Russia, Saudi Arabia, Spain, Sudan, Thailand
Focal area 1.3	Egypt , India, Ireland, Italy, Japan, Malaysia, Namibia, Nigeria, Norway, Peru, Spain, Sudan
Focal area 1.4	Australia, Canada, Egypt, Haiti, Hungary, Japan ,Jordan, Kyrgyz Republic, Kuwait, Mauritius, Mexico, Norway, Romania, Saudi Arabia, Tunisia
Focal area 1.5	Egypt , India, Italy, Israel, Jordan, Namibia, Pakistan, Spain
Theme 2:	
Focal area 2.1	Australia, Bulgaria, Dominican Republic, Eastern Africa sub-region, Hungary, Mauritius, Peru, Saudi Arabia, Spain
Focal area 2.2	Brazil, Bulgaria, El Salvador, Egypt, Haiti, Kuwait, Ireland, Romania, Slovenia, Spain, Thailand, Tunisia
Focal area 2.3	Australia, Chile, Finland, Eastern Africa sub-region , Haiti, Italy, Jordan, Kuwait, Kyrgyz Republic, Madagascar, Malaysia
Focal area 2.4	Australia, Eastern Africa sub-region, Egypt, El Salvador, Finland, Hungary, Iran, Kyrgyz Republic, Latin American Countries (ISARM of the Americas), Lesotho, Malaysia, Mexico, Nigeria, Romania , Russia, Tunisia

Focal area 2.5	Italy, Nepal
Theme 3:	
Focal area 3.1	Australia, Bulgaria, Canada, Chile, Eastern Africa sub-region , Japan, Jordan, Malaysia, México, Kuwait, Thailand
Focal area 3.2 -	Australia, Eastern Africa sub-region , Korea, Lesotho
Focal area 3.3 -	Australia, Jordan, Ireland, Malaysia, Norway
Focal area 3.4 -	Australia, El Salvador, Italy, Saudi Arabia
Theme 4:	
Focal area 4.1 -	Australia. Canada, Chile, El Salvador, Eastern Africa sub-region ,Haiti, Jordan, Kyrgyz Republic, Mauritius, México, Moldova, Pakistan, Peru, Thailand
Focal area 4.2 -	Australia, El Salvador, Egypt, Haiti, India, Jordan, Korea, Kuwait, Malaysia, Pakistan, Saudi Arabia, Spain, Sudan, Tunisia
Focal area 4.3 -	Australia, Eastern Africa sub-region, Japan, Malaysia, Saudi Arabia
Focal area 4.4 -	El Salvador
Theme 5:	Australia, Bolivia, Chile, Dominican republic, Eastern Africa sub-region. Egypt, Finland, Germany, Haiti, Hungary, Italy, Japan, Jordan, Kuwait, Kyrgyz Republic, Madagascar, Malaysia, Mauritius, Mexico, Namibia, Nigeria, Norway, Romania, Saudi Arabia, Sudan

ANNEX III (continuation)

INPUTS AND INDICATIONS OF INTEREST RELATED TO THEMES AND FOCAL AREAS

THEME 1: Adapting to the impacts of global changes on river basins and aquifer systems

▪ Focal area 1.1 - Global changes and feedback mechanisms in hydrological processes in stressed systems

Argentina, Australia, Bulgaria, Iceland –Germany- Finland and other Nordic countries

Cooperation is envisaged to further the necessary and fundamental research for adapting to global changes impacts on the Arctic Hydrological Cycle. Develop activities in the framework of the Arctic-Hydra programme within the framework of the International Polar Year 2007-2008 (IPY). On the basis of this program cooperation on this field of research will be continued under the IHP-VII period.

Iceland

-Evaluation of the impacts of global changes on coastal zones, small islands, present permafrost zones and glaciated areas, and megacities.

-Evaluation of possible influences of global change on their temporal and regional occurrences and magnitude include e.g. changes in the position and movement of major weather systems as well as changes in snow melt

Canada- and Nordic Countries , Chile, Colombia, Costa Rica, Eastern Africa sub-region Egypt, Finland, Hungary, Iceland –Germany- Finland-Sweden and other Nordic countries , Iceland, Ireland , Italy, Japan, Kuwait, Kyrgyz Republic, Madagascar, Nepal, Norway, Pakistan, Peru, Spain, Sudan

▪ Focal area 1.2 - Climate change impacts on the hydrological cycle and consequent impact on water resources

Eastern Africa sub-region , Australia, Bulgaria, Congo, El Salvador, Finland, Germany, Iceland, Ireland and a group of Nordic countries, Jordan, Namibia, Russia, Saudi Arabia, Spain, Sudan, Thailand

• Focal Area 1.3 - Hydro-hazards, hydrological extremes and water-related disasters

Egypt, India, Ireland, Italy, Japan, Malaysia, Namibia, Nigeria, Norway, Peru, Spain, Sudan

▪ Focal area 1.4 - Managing groundwater systems' response to global changes

Australia, Canada, Egypt, Haiti, Hungary, Japan ,Jordan, Kyrgyz Republic, Kuwait, Mauritius, Mexico, Norway, Romania, Saudi Arabia, Tunisia

• Focal Area 1.5 - Global change and climate variability in arid and semi-arid regions

Egypt, India, Italy, Israel, Jordan, Namibia, Pakistan, Spain

THEME 2: Strengthening Water Governance for Sustainability

- **Focal area 2.1 - Cultural, societal and scientific responses to the crises in water governance**

Australia, Bulgaria, Dominican Republic, Eastern Africa sub-region, Hungary, Mauritius, Peru, Saudi Arabia, Spain

- **Focal area 2.2 - Capacity development for improved governance; enhanced legislation for wise stewardship of water resources**

*Brazil, Bulgaria, El Salvador, Egypt, Haiti, Kuwait, Ireland, Romania, Slovenia, Spain
Thailand, Tunisia*

- **Focal area 2.3 – Governance strategies that enhance affordability and assure financing**

Australia, Chile, Finland, Eastern Africa sub-region, Haiti, Italy, Jordan, Kuwait, Kyrgyz Republic, Madagascar, Malaysia

- **Focal area 2.4 - Water as a shared responsibility: managing water across geographical and social boundaries**

Australia, Eastern Africa sub-region, Egypt, El Salvador, Finland, Hungary, Iran, Kyrgyz Republic, Latin American Countries (ISARM of the Americas), Lesotho, Malaysia, Mexico, Nigeria, Romania, Russia, Tunisia

- **Focal area 2.5 - Water and energy**

Italy, Nepal

THEME 3: Ecohydrology for Sustainability

- **Focal area 3.1 - Ecological measures to protect and remediate catchments process**

Australia, Bulgaria, Canada, Chile, Eastern Africa sub-region, Japan, Jordan, Malaysia, México, Kuwait, Thailand

- **Focal Area 3.2 - Improving ecosystem quality and services by combining structural solutions with ecological biotechnologies**

Australia, Eastern Africa sub-region, Korea, Lesotho

- **Focal Area 3.3: Risk-based environmental management and accounting**

Australia, Jordan, Ireland, Malaysia, Norway

- **Focal area 3.4 – Groundwater-dependent ecosystems identification, inventory and assessment**

Australia, El Salvador, Italy, Saudi Arabia

THEME 4: Water and Life Support Systems

- **Focal area 4.1 - Protecting water quality for sustainable livelihoods and poverty alleviation**

Australia, Canada, Chile, El Salvador, Eastern Africa sub-region, Haiti, Jordan, Kyrgyz Republic, Mauritius, México, Moldova, Pakistan, Peru, Thailand

- **Focal Area 4.2 - Augmenting scarce water resources, especially in SIDS**

Australia, El Salvador, Egypt, Haiti, India, Jordan, Korea, Kuwait, Malaysia, Pakistan, Saudi Arabia, Spain, Sudan, Tunisia

- ***FOCAL AREA 4.3 - ACHIEVING SUSTAINABLE URBAN WATER MANAGEMENT***

Australia, Eastern Africa sub-region, Japan, Malaysia, Saudi Arabia

- ***Focal Area 4.4 - Achieving sustainable rural water management***

El Salvador

THEME 5: Water Education for Sustainable Development

Australia, Bolivia, Chile, Dominican republic, Eastern Africa sub-region. Egypt, Finland, Germany, Haiti, Hungary, Italy, Japan, Jordan, Kuwait, Kyrgyz Republic, Madagascar, Malaysia, Mauritius, Mexico, Namibia, Nigeria, Norway, Romania, Saudi Arabia, Sudan

ANNEX IV

ACTIVITIES FOR THE IHP VII 2008-2013 THE IMPLEMENTATION PLAN AND ACTIVITIES PROPOSED BY THE IHP NATIONAL COMMITTEES

THEME 1: Adapting to the impacts of global changes on river basins and aquifer systems

- **Focal area 1.1 – Global changes and feedback mechanisms in hydrological processes in stressed systems**

Argentina

Case studies on Integrated surface water, groundwater resources management

Australia

National and regional case studies; lessons learnt from the Murray Darling River basin and GEWEX related research activities

Bolivia

-Better understanding of the scale problem especially in mountain areas and Atlantic-pacific interaction areas

-Global circulation models which serve as a basis for the generation of climatic scenarios and the assessment of possible impacts on the water resources in national basins are not satisfactory. Thus it is necessary to enhance initiatives for regional and local studies on the climatic variability and water resources: and dissemination of methodologies to focalize on this problem.

-Development of a cartography allowing the analysis at the basin level.

- Institutional enhancement of information systems , GIS, satellite data, capacities should be integrated as a cross cutting element to support and develop the IHPVII Themes

Bulgaria

Contribution to the implementation of regional project on the assessment of climate change impact on the hydrological cycle elements in South East Europe

Iceland –Germany- Finland and other Nordic countries

Cooperation is envisaged to further the necessary and fundamental research for adapting to global changes impacts on the Arctic Hydrological Cycle. Develop activities in the framework of the Arctic-Hydra programme within the framework of the International Polar Year 2007-2008 (IPY). On the basis of this program cooperation on this field of research will be continued under the IHP-VII period.

Island

-Evaluation of the impacts of global changes on coastal zones, small islands, present permafrost zones and glaciated areas, and megacities.

-Evaluation of possible influences of global change on their temporal and regional occurrences and magnitude include e.g. changes in the position and movement of major weather systems as well as changes in snow melt

Canada- and Nordic Countries

Set up a network of institutes to better evaluate hydrological process and climate change impacts in the Arctic and cold regions. These regions are particularly stressed by climate variability and change, evaporation increase, permafrost degradation and loss of surface water retention, reduced snowmelt recharge of the hydrologic system, ozone depletion, expansion of industry and infrastructure, pollution, increased demand for water supplies. Develop case studies and link with Focal area 1.2

Canada

- Case studies on cold climates.
- Develop links to the PUB initiative.
- Cold regions hydrology connections to the global climate system. Consideration of the freshwater inputs to the polar seas because they may have an extremely important role in regulating ocean circulation and global climate.
- Adaptation to drought, and evaluation of the speed of change and the variability. Particular focus on impacts on prairies

Chile

Analysis of the relation between el Nino and the hydrological processes

Groundwater mining and contamination

Groundwater recharge and discharge rates due to climatic changes

Water management and land cover and use, impact of groundwater overexploitation on land use and land degradation

Implementation of watershed contract for great basins and integrated management strategies

Colombia-

Proposal to provide national case studies and the experience and methodology developed in the national report

Costa Rica-

Proposal to develop a case study

Eastern Africa sub-region - Contribution proposed by the working group meeting held in Abuja March 2006

- Develop monitoring network through the early warning system (data, collection, model)
- Assessment of data available
- Develop a feedback mechanism (national, sub-region and regional levels)

Egypt

Development of programmes to protect coastal zones from land based activities

Finland

Dam safety

Hungary

Develop a cross-cutting programme on the (regional) international hydrological co-operations in selected great river basins (such as that of the Rivers Danube, Rhine, etc.), focusing on the aspects of Theme 1 Impacts of global changes.

Iceland –Germany- Finland-Sweden and other Nordic countries

Cooperation is envisaged to further the necessary and fundamental research for adapting to global changes impacts on the Arctic Hydrological Cycle. Develop activities in the framework of the Arctic-Hydra programme within the framework of the International Polar Year 2007-

2008 (IPY). On the basis of this program cooperation on this field of research will be continued under the IHP-VII period.

Iceland

-Evaluation of the impacts of global changes on coastal zones, small islands, present permafrost zones and glaciated areas, and megacities.

-Evaluation of possible influences of global change on their temporal and regional occurrences and magnitude include e.g. changes in the position and movement of major weather systems as well as changes in snow melt

Ireland

-Implementation of the national flood policy and IWRM development in the EU Water Framework Directive-IFI

-FRIEND

-Increasing water demand and degradation of water quality associated with human activities.

Italy

Better understanding of impacts on extreme anomalies on moisture distribution at global scale

Japan

-Global water cycle assessment :IHP contribution to Global Earth observation System of Systems (GEOSS)-University of Tokyo

-Second phase of Prediction of Ungauged Basins (PUB) project in cooperation with the IAHS

-Community-based integrated river basin management as a HELP follow-up (Kyoto University)

Jordan

-Planning for creation of new surface water storage

Kuwait

Surface-groundwater flow to the ocean

Kyrgyz Republic

-Tools to cope with the decline of networks of hydrological measurements stations

-Impacts on Mountain areas, water allocation in mountain's transboundary basins for sustainable water resources management-link with Focal area 2.4

-Low flow and global impacts

Madagascar

Global change and islands water resources management

Global change and national monitoring systems

Improve networking and cooperation, data and experience exchange

Nepal

Glacier lake inventory and its mapping in Nepal-Study of snow cover area change in the Himalaya-Participation in IFI and ISI -Set up a coordinated action with other IHP national Committees

Norway

-Climate change and human impact in river basins-improve modelling tools including better understanding of the hydrological role of vegetation and wetlands

-Continue ongoing efforts to improve ungauged basins modelling

-Water resources management-implementation of the EU WFD requires new structures for

the classification of water bodies, setting of ecological targets, planning of relevant measures, and monitoring.

-Integrated use of infrastructure-multipurpose and flexible uses of infrastructure should be foreseen

Pakistan

National activity on the reactivation and updating of Indus basin model for operational studies and management of Indus basin irrigation system

Development of computer models for irrigation/water scheduling at watercourse command level

Peru

Water resources management

Hydrology of international basins

Spain

Groundwater and surface water resources assessment. Characterization of the non altered water regime

Sudan

International Sedimentation Initiative (ISI)- surface water structures : dams, turbines, pumping stations, irrigation canals and hafirs efficiency reduction and economic feasibility

▪ Focal area 1.2 - Climate change impacts on the hydrological cycle and consequent impact on water resources

Eastern Africa sub-region - Contribution proposed by the working group meeting held in Abuja March 2006

- Documentation and adoption of Indigenous technology that could be replicated in other areas (construction, sand dams for storing water, water harvesting etc.)
- Develop mechanisms of information exchange among the countries
- Develop networks of the Early warning system be put in place for informing the region- real time data. This networks could be linked to the other systems in other regions
- Awareness creation on the on the existence of the warning system
- Upgrading of the early warning system into a sub-regional and regional centres
- Hydro meteorological data collection and documentation
- Clear land use plans
- Assessment of the available equipment
- Study water resources in emergency situations for the sub-region and develop crises guidelines management.

Australia

-Hydrological extremes in sensitive and stressed biomass and hydroclimatic zones e.g. small islands developing states

-Develop research activities involving the pacific islands countries

Bulgaria

-Further development of the regional project on the assessment of climate change impact on the hydrological cycle elements in South East Europe through a study on hydrological extremes (UNESCO -ROSTE) in the Balkan Peninsula.

-Case study on development of institutional synergies to provide priority activities in national plans.

Congo

Development of FRIEND Congo

El Salvador

Develop better knowledge on relations and conceptual and practical differences between the greenhouse effects and the albedo effects

Finland

Better investigation of hydrological impacts of climate change –case study and indicators development

Further development of hydrological modelling

3rd international Conference on climate and water by Finnish environment institute and Helsinki University of technology

Germany, Ireland and a group of countries:

Further development of FRIEND and HELP networks

Ireland

Climate Change processes

Island

-Development of networks to exchange information on best practices in cold climates, including changes in snow and ice as well as glacier mass balances and dynamics; and setting up networks in Arctic as well as relevant mountainous countries for research cooperation focusing on impacts of climate change in cold climates.

-Establishment of links with observation and modelling programmes (WCRP-GEWEX, Arctic-Hydra and UNESCO-ESA TIGER initiative in Africa)

Jordan

-Impact assessment of climate change on rainfall distribution and intensity surface water groundwater and agriculture

Namibia

- contribution to FRIEND

-Impact of climate change on glacier lakes and water resources

Russia

Offer studies and generalization of data on water resources on regional and global scale to implement a reliable assessment of renewable water resources (surface and groundwater) to develop a detailed analysis of water uses in region facing water shortage. Set up of an international group of experts. Recent reports show too different data due to the difference in the methodology.

Saudi Arabia

Climate change impacts on aquifer recharge

Spain

Climatic change effects in the frequency of heavy rainfall and its influence in the design of hydraulic infrastructures

Sudan

Indicators of climate change impacts on the hydrological cycle

Thailand

Support hydrological research on climate change , risk management

• **Focal Area 1.3 - Hydro-hazards, hydrological extremes and water-related disasters**

Egypt

Flood and drought assessment and mitigation

India

Real time flood forecasting

Flood inundation zoning for different return period

Ireland

Evaluate possible link between the IHPVII and the Implementation of the EU Floods Directive

Italy

Case studies on impacts of climate variability and global changes on frequency and recurrence of hydrological extremes

Japan

-Case studies on human security and water related disasters

-Best practices on water risk management

-Provide ICHARM coordination as focal point for possible networking activities

-Improving the predictability of hydrological extremes in ungaged or poorly gaged basins using new measurement technology and promoting the local use of satellite information for improved river basin management in partnership with GEOSS.

-Hydro-hazards and their impact on society

-Flood management (proposed by Kyoto University, Public Works Research Institute, IFNet)

Malaysia

Hydrological extremes in sensitive and stressed hydro climatic zones: small islands developing states, highlands and urban areas

Namibia

Extreme events process and management case studies

Nigeria

Risks assessment and management of water resources systems for water security

Norway

Change in frequency and magnitude of extreme events- floods and drought. In Atlantic maritime climates drought events seem to take a new importance
Extremes forecasting and foster regional cooperation as extremes often occur on a scale which reaches beyond national borders

Peru

Surface water- groundwater management and climate change impacts
Andean Hydrology

Spain

Extreme hydrological events

Sudan

Participation at International Flood Initiative (IFI)

▪ **Focal area 1.4 - Managing groundwater systems' response to global changes**

Australia

-Case studies on the great Australian artesian basin and associated research activities
-Better definition of frameworks for determining sustainable yield of aquifers
-Impacts on groundwater resources recharge

Canada

Improved methodologies for clean up of groundwater pollution. Case study on the arsenic in the groundwater of the Giant Mine in Yellowknife, NWT.

Egypt

-Groundwater protection and development for sustainable use with special emphasis on non-renewable systems
-Adverse effect of sea level rising on coastal aquifers

Haiti

Groundwater resources management in SIDS
Karstic aquifers

Hungary

Evaluate groundwater systems' response to global changes in the region and develop case studies

Japan

Groundwater resources assessment under the pressure of humanity and climate change (GRAPIC) –Japanese Research Institute for Humanity and Nature

Jordan

Groundwater resources management and use

Kyrgyz Republic

Better understanding of impacts on underground/thermal/mineral/waters

Kuwait

Groundwater assessment and characterization

Mauritius

Improved coordination and networking activities to compile best practices to minimize expected sea level rise effect on aquifers due to manage water demand and to raise public awareness for judicious use of water

Mexico

- Foster coordination/ establishment of international experts group for the development of more reliable and cost-effective methods for the assessment of groundwater resources; an evaluation of the feasibility of including transient groundwater overdrafting as a possible management tool, particularly in arid and semi-arid regions;
- Better estimation of groundwater recharge, accounting for the time-lag between surface and vadose zone infiltration and the actual recharge of the saturated zone,
- Develop examples on the joint optimal operation of dams and aquifers

Norway

Interaction of groundwater with surface water and marine waters

Romania

Management and protection of confined aquifers

Saudi Arabia

Groundwater resources under stress

Groundwater resources in coastal zones

Developing science-based policies and principles, preparation of appropriate regulations to curb overexploitation and foster sustainable management and use of groundwater – link with groundwater supported urban areas and ecosystems Theme 3 and 4

Assessment of impacts on groundwater resources at global scale

Management of fossil groundwater

Tunisia

Impacts on groundwater systems

- **Focal Area 1.5 - Global change and climate variability in arid and semi-arid regions**

Egypt

Management of Wadi systems

Drought assessment and mitigation

India

Water resources management under drought situation

Italy

Better understanding on accelerated desertification process in climatic stressed regions

Israel

Water under condition of stress in arid and semiarid areas

Integrative and quantitative management of water resources on national and international scales: cross reference with Focal area 1.1, 1.2, Theme 2, including water quality, desalination, water treatment, water allocation, and snow and ice

Jordan

Extreme dry period hydrology

Water resources management in drought situation

Namibia

Climate change impacts on water resources in arid and semiarid zones

Pakistan

Drought assessment at regional scale

Spain

Water resources management in drought situations

• **THEME 2: Strengthening Water Governance for Sustainability**

▪ **Focal area 2.1 - Cultural, societal and scientific responses to the crises in water governance**

Australia

Case studies on indigenous water knowledge and understanding

Pacific islands countries culture and water issues

Bulgaria

Best practices on early warning systems, floods, stakeholder participation and good governance.

Eastern Africa sub-region - Contribution proposed by the working group meeting held in Abuja March 2006

-Assess the cultural values of the people on water within the sub-region with a view to developing guidelines for legislation.

Dominican Republic

Learning from lessons at the sectorial level and building on existing experiences of

governance, may enhance possibilities of achieving other goals. Governance and waters users associations in the management of irrigation systems. Local level actions

Hungary

A close connection should be provided between the Focal areas 2.4 and 1.4, including the organization of regional workshops resulting in sound information about the existing transboundary cooperations. (There are many existing transboundary agreements in different languages, whose translation into English, systematic inventory and comparative evaluation may yield valuable contributions to both Focal areas mentioned).

Mauritius

Organization of short courses and seminars on rationalization of water rights

Peru

Good governance: economic and social aspects of water resources management

Saudi Arabia

Groundwater management in arid zones

Spain

Institutional and participation capacity building

▪ **Focal area 2.2 - Capacity development for improved governance; enhanced legislation for wise stewardship of water resources**

Brazil

-Establishment of appropriate institutional arrangements for public participation in water management issues
-Institutional arrangements such as public-private-partnership and consortium among municipalities

Bulgaria

Development of Balkans network of activities related to 2.2, 2.4, and 2.5 and tools for decision makers

El Salvador

Enhancement of efforts on agreements and governance, as necessary condition for the sustainable management of water

Egypt

Institutional capacity building. Including development of model legislation of integrated resources management

Haiti

Elaboration of adequate legislation

Kuwait

Groundwater legislation and abstraction rights

Ireland

Good governance capacity development and stakeholder's participation

Romania

Provide support to set up state guarantees for legalization of private sector involvement into water utility sectors, develop legal guidance on concession contract, including proprietary rights, terms and conditions of concession agreements

Slovenia

Water related data collection and indicators

Spain

Economic and social assessment of externalities in order to analyze different alternatives of using and management of water resources

Thailand

Dissemination of knowledge on water resources law, water rights, and water transfer to protect water resources, and prevent conflicts

Tunisia

Good governance and surface and groundwater sustainable management

- **Focal area 2.3 – Governance strategies that enhance affordability and assure financing**

Australia

-Implementation of IWRM in the pacific island countries (support SOPAC)
-Australian National water initiative

Chile

Development of strategies

Finland

-Set up of activities on the integrated water resources management in West Africa by Helsinki University of Technology

Eastern Africa sub-region - Contribution proposed by the working group meeting held in Abuja March 2006

- Evaluation of community based water projects with regard to their sustainability
- Study to prioritize water usage in different areas
- Increase water coverage and enhance quality

Haiti

Cross sectoral management strategies.

Italy

-Strategy for water allocation for transboundary water resources use in large basins which would be able to provide for a balance of upstream-downstream states

Jordan

-Economic and social assessment of externalities in order to analyze different alternatives for using and managing water resources

-Demand management, efficient water utilization and pricing link with

Kuwait

Private – public sectors partnership in water production and distribution
Demand management, efficient water utilization and pricing

Kyrgyz Republic

Elaboration and introduction of economic mechanisms into the transboundary water resources management

Madagascar

Support in the formulation of water resources national plans

Malaysia

Water financing and life cycle cost of water utilities
Social and economic and ecological impact of water resources development

- **Focal area 2.4 - Water as a shared responsibility: managing water across geographical and social boundaries**

Australia

- Evaluation of water markets and water trading approach
- Strengthen capacity for international exchange of data

Eastern Africa sub-region - Contribution proposed by the working group meeting held in Abuja March 2006

- Undertake review on transboundary water resources
- Awareness creation on value of cooperation (strengthening the PCCP programme)
- Undertake Training (different levels) on negotiation skills
- Enhance and strengthen awareness among the water professionals and decision makers

Egypt

Guidelines for the management of shared water resources-Sharing of information and technology

El Salvador

Develop best practices, cooperation strategies and agreements between countries sharing common water management problems, including transboundary basins

Finland

Development of “Typology of urban water conflicts” by Tampere University of technology

Hungary

- High priority is given to transboundary water resources management. Examples on national and regional case studies will be provided
- Better knowledge on groundwater resources in transboundary intermountain hydrogeological basins
- Danube river basin cooperation project. Successful example of national Committees cooperation in the management of international river basins.

Iran

Organization of a regional seminar on shared water basins and drought management -2008-2009

Kyrgyz Republic

-Activities advocating interstate water allocation through, including economic mechanisms and sharing benefits.

-Conflict prevention and water resources allocation and management

-Development of water disputes resolution techniques with due attention to unique peculiarities of the water issue of the basin

Latin American Countries

Publication of the ISARM of the Americas second phase and continue the participation in ISARM and PccP

Lesotho

Training courses on transboundary waters

Malaysia

Co-operative solutions, true valuation of common pool water resources

Mexico

-Develop Consensus building via science and modelling-based approaches in the framework of the PccP project. Improve consensus building strategies among stakeholders in watersheds and aquifers where the resource is scarce, and particularly in transboundary watersheds and aquifers based on the best available science and technology. Simulation and optimization models are ideally suited tools to not only guide the discussions for decision-making, but to engage stakeholders in the design of water-related public policies as well as operational rules that will facilitate the implementation of truly integrated water resources management and to achieve the aspiration of water resources sustainability .

Nigeria

Minimizing water conflicts and vulnerability by transboundary water management regional cooperation programmes

Romania

Establishment transboundary water management governmental and intergovernmental units for better management of boundary and transboundary water resources, and foster public participation in this issues-link with Theme I – Focal Area 1.1 and Focal area 1.4

Russia

Develop general principles and methodological basis of international laws for water resources use in international rivers and aquifer systems considering different characteristics
Develop training programme

Tunisia

Contribution to the ISARM project with regional case studies
Support cooperation amongst countries

- **Focal area 2.5 - Water and energy**

Italy

Water resources and energy, governance and users coordination

Geothermal energy

Hydropower and environmental sustainability, best practices

Nepal

Low flow for public water supply, irrigation and hydropower management

HYDROINFO: the development of a hydro-meteorological information base for hydropower development in Nepal

Canada

Colombia

Costa Rica

Dominican Republic

- ***THEME 3: Ecohydrology for Sustainability***
- **Focal area 3.1 - Ecological measures to protect and remediate catchments process**

Australia

-Contribution to a better understanding of global dynamics in aquatic environments: degrading ecosystems, especially those susceptible to sea level change, coastal sediment balance and pollutant accumulation

-Research activities involving the pacific islands countries

Bulgaria

Case studies compilation in European countries -Action is requested within the European Framework directive (FWD,2000/60/EC) that stipulates that surface water has to be in good ecological status which is defined also by biological quality elements

Canada:

Management of large lake systems (case study).

Develop a better understanding of wetland and peat hydrology

Chile

Rainfall-Runoff vegetation processes in arid zones

Salt water intrusion

Maintenance of low flow

Ecological treatment of waste water

Recycling of waste water

Eastern Africa sub-region - Contribution proposed by the working group meeting held in Abuja March 2006

-Develop guidelines for environmental protection

Japan

Participation in Ecohydrology research development

Jordan

Compatibility between land use, development and water resources use and the protection of the environment

Malaysia

Phyto and bio remediation; water bodies rehabilitation

Mexico

Better understanding of environmental services payment: water resource sustainability by designing and implementing financially sustainable environmental policies that include provisions for recognizing the valuable water-related environmental services of forests, for erosion and flood control, as well as infiltration augmentation

Kuwait

Water conservation best practices

Thailand

Public participation and capacity building
Technology transfer

- **Focal Area 3.2 - Improving ecosystem quality and services by combining structural solutions with ecological biotechnologies**

Australia

-Developing policy and programmes to support ecosystems enhancement through ecosystem services production

-National approach to biodiversity decline

Eastern Africa sub-region - Contribution proposed by the working group meeting held in Abuja March 2006

- Documentation/ Adaptation of suitable / appropriate new technologies in the area of ecohydrology in sub-region

Korea

Environmental flow and competing water use, including in-stream/off-stream water use. Assessment and security of environmental flow in the East Asian region- support to regional coordination and compilation of case studies

Lesotho

Lesotho is a landlocked country and should focus on invasion of alien species

- **Focal Area 3.3: Risk-based environmental management and accounting**

Australia

- Biodiversity and climate change
-

Jordan

- Risk assessment and management of water resources systems for water security
- Institutional and participation capacity building in real situations and ethical principles of application- link with Focal area 2.1 and 2.3

Ireland

Risk based water resources management under uncertainty – the present set of global ecologically-driven initiatives, such as the EU WFD need stronger understanding of the relationship between ecology and hydrology and hydrometric monitoring-link with Theme 1

Malaysia

Changing dynamics in Coastal zones aquatic ecosystems: sea level changes, coastal sediment and pollutant accumulation.

Monitoring of surface runoff and landslide due to uncertainty precipitation prediction-link with theme 1

Norway

Hydrological modelling under uncertainty

- **Focal area 3.4 – Groundwater-dependent ecosystems identification, inventory and assessment**

Australia

Set up a network to compile case studies in the Pacific

El Salvador

Relations and dependence between groundwater and wetlands

Italy

Groundwater vulnerability mapping

Groundwater and wetlands

Groundwater and depending costal ecosystems

Saudi Arabia

Groundwater and depending ecosystems; identification, inventory, assessment and protection plans

Groundwater and costal zone ecosystems

THEME 4: Water and Life Support Systems

- **Focal area 4.1 - Protecting water quality for sustainable livelihoods and poverty alleviation**

Australia

- Improving access to water methodologies. Lesson learnt from a major new research project on storing wetlands treated storm water in a brackish aquifer for recovering potable water. Evaluate possible transfer to developing countries.
- Climate variability and change and water resources for agriculture

Canada: Case study on remedial measures to pollution and the zebra mussels in the Great Lakes.

Chile

- Assessment of groundwater availability for food security
- Best Practices on Hazardous waste management
- Evaluation of non-conventional water resources use: desalination and water-reuse
- Evaluation of Health aspects of IWRM
- Development of water quality in land uses modelling
- Methods: Testing the relevant methodologies in experimental and reference catchments areas
- Case studies on mining activities and water quality

El Salvador

Preventive measures for contamination control

Eastern Africa sub-region - Contribution proposed by the working group meeting held in Abuja March 2006

- Undertake a comparative study on the interaction between surface and groundwater on water quality.
- Develop domestic water quality indicators for the sub-region
- Evaluate access to safe surface and groundwater for human health and food security for the sub-region

Haiti

Contamination prevention and protection national plans examples

Jordan

Water resources protection zones, vulnerability and hazardous studies

Kyrgyz Republic

- Water allocation at basin scale and improved food supplies to contribute to poverty eradication

Mauritius

Protection and sustainable development of coastal aquifers, monitoring

Mexico

Development and implementation of water-related appropriate technologies: compile information on such technologies that are available and have demonstrated their adequate

performance in contributing to the achievement of the water-related MDGs. -the use of artificial wetlands for municipal wastewater treatment; improved solar disinfection technologies; rainwater harvesting; fluidic devices for efficient irrigation on small agricultural plots; watershed conservation technologies, etc..

Moldova

Water quality, prevention and protection strategies. Contribution on case studies on Dniester and Prut rivers, status of aquatic community in Moldova

Pakistan

Better knowledge on natural contaminants (arsenic, selenium, nitrate and fluoride) and provide assessment of risk due to human activities

Peru

Contamination: prevention and protection

Thailand

Assessment of critical problems on water resources at basin level
Impact of land use and land based activities to water quality deterioration

- **Focal Area 4.2 - Augmenting scarce water resources, especially in SIDS**

Australia

Support the establishment of regional focal points that integrate research, application and education in this focal area

El Salvador

Enhancement of events and campaigns to develop awareness on saving and good use of water, including alliance between local sector, communities, governments and NGOs.

Link with Theme 5.

-Treatment sites maintenance in developing countries

Egypt

-Augmenting scarce water resources in arid zones:

Water harvesting

Water conservation techniques

Water reclamation technologies

Water reuse

Haiti

Strategies and best practices in SIDS

Management of aquifer recharge

India

Artificial recharge and groundwater assessment

Jordan

-Rainwater harvesting and artificial recharge

-Groundwater storage enhancement

-Planning for creation of new surface water storage link with Theme 1

-Non –conventional water resources use: desalination and water re-use

Korea

Rain water collection potential (using small simple device as nature friendly methodology to augment water resources availability)

Kuwait

Develop Network on Best practices for Artificial recharge

Desalination economics and technology development –foster coordination at regional level

Non conventional water resources-waste water treatment technologies and their cost

Malaysia

Optimization and utilization of rainwater

Urban storm management with respect to quality, quantity and flash flood -link with Focal area 4.3 and Focal area 4.1

Pakistan

Development of new water resources and adoption of water conservation measures.

Promote site-specific rainwater harvesting techniques in areas under rain-fed agriculture where no storage facilities are economically viable

Promote the use of non-conventional water resources and reuse of grey water

Saudi Arabia

Desalination techniques

Consideration of brackish water use, sea water and brackish water, wastewater reuse, management of aquifer recharge (MAR)

Considering process for securing clean drinking water in urban and rural area

Spain

Non conventional water resources use: desalination and water re-use

Sudan

Wadi hydrology and rain water harvesting-savannah belt improved water harvesting techniques

Tunisia

Water re-use

- **FOCAL AREA 4.3 - ACHIEVING SUSTAINABLE URBAN WATER MANAGEMENT**

Australia

Free exchange of information between the Australian Water Conservation Reuse

Eastern Africa sub-region - Contribution proposed by the working group meeting held in Abuja March 2006

Undertake impact assessment of urbanization on water resource management in the sub-region

Japan

Vulnerability assessment of urban groundwater resources in Asia and Oceania (Geological survey of Japan)

Malaysia

Islands urban areas

Saudi Arabia

Groundwater and urban supply

- **Focal Area 4.4 - Achieving sustainable rural water management**

El Salvador

The bio filters successful cases of waste water treatment in rural zones

THEME 5: Water Education for Sustainable Development

Australia

- Lessons learnt from the eWater cooperative Research Centre
- Assisting in training on MAR including management policies, code of practices

Bolivia

- Strengthen relations between the IHP national Committees and the established centres
- Enhancement of networks based on the regional centres established
- Improve information exchange and communication
- Improved use of information technologies

Chile

- Improving social awareness on climatic change and water use
- Training on water quality in land use modelling

Dominican Republic

To consider different target groups of educational activities. Primary, secondary and technical levels have to be considered. Water associations participation. Educating the general public is an important target as well as to develop techniques and efficiently use modern mass media tools. Communication skills and cultural expressions (arts, music) are driving forces not to be neglected. This could have some relationship with focal area 2.1 (cultural, societal and scientific responses to water crisis). These three areas could include activities like research on education and the development of networks to exchange experiences and information on best practices. Preparing a compendium on the use of communication tools and involvement of artists in the water topics.

Egypt

- Capacity building for public participation
- Development of relevant decision support tools
- Training and mentorship of tomorrow's decision makers
- Training on institutional aspects

Finland

- Information services development
- Improved use of internet facilities

-Development of the “Water and development research and education programme” by Helsinki University of technology

Germany

- Encourage national e-learning initiatives and incorporate them into the UNESCO-IHE programme
- Contribute modules dealing with various water related topics as results from the German national initiative on e-learning

Haiti

- Training for technicians
- Education at all levels
- Creation of national centres of water technologies

Hungary

-We propose to give more support and attention to the regional UNESCO courses and reoriented those to regional problems, thus playing a key role in implementing Focal area 2.4 (Water as a shared responsibility)

Italy

Strengthening the Committee’s role at the national, regional, and international levels

Japan

- Development of cross cutting activities on water education at all levels
- Development of capacity building in water disasters
- Capacity building for higher education programmes supported by ICHARM in cooperation with a number of Japanese universities
- Capacity building and education for observers for continuous monitoring of terrestrial environments in Asia (detailed contribution presented)

Jordan

- Promotion of water saving and water supply optimization at every level and sector
- Integration of water research in the university curriculum
- Increasing public awareness on water related issues
- Water conservation and socio-economic impacts
- Assisting developing countries in developing hydrometric equipment and calibration systems

Kuwait

- Public awareness building on sustainable water consumption
- Public awareness building on pollution, protection and renovation of water resources
- On-job training programmes for junior engineers and hydrologists
- Development of hydrological database and information systems

Kyrgyz Republic

- Foster active cooperation and mutual understanding between water user groups at all levels
- Foster interstate cooperation with respect to transboundary water resources -link with Focal area 2.4
- Training course on conflict prevention and water resources allocation and management
- Training courses and best practices on legal tools and water allocation schemes
- Improvement of the Internet access and technical base of the Committee to facilitate working partnerships, to promote compilation/exchange of information and technology transfer

Madagascar

Water education at all levels

Malaysia

-Development of generic course materials/outline for water education at secondary and tertiary levels. UNESCO-IHE to play a pivotal role in specialised courses such as the IWRM and Hydroinformatics.

-Devise ways to effectively coordinate with other organisations such as CapNet, IWA who has keen interest in training and education and capacity building.

Mauritius

-Organization of short courses and seminars on computerization of hydrological data

-Training on use of tracers (UNESCO-IAEA-JIIHP project) techniques to situate leakage in dam and reservoirs and to determine direction of groundwater flow

Mexico

-Develop cross references between the activities in the themes 2 and 5. Foster adequate public participation through a wider educational effort is needed to change societal attitudes toward water, as well as to develop not only a new and adequate water culture, but a true water ethic. Case studies development.

- *Foster dialogue among specialists*, develop interdisciplinary approaches to IWRM - to develop common language that could be shared and understood both by hard science and engineering experts, as well as social science experts.

-Print (and on line availability) of the third version of the hydrology glossary prepared by IHP and WMO and support glossary of water terms in each of the UN official languages.

Namibia

Transfer of appropriate technology

Nigeria

Water education at all levels

Norway

Education and capacity building should aim for more integrated approaches, where the traditional disciplinary and sector-oriented measures are replaced with trans-sectoral solutions and multi-purpose targets.

Romania

Water awareness connected with culture, ethics, and law

Involve ministries of education of all countries on courses based on water management

Saudi Arabia

Increase the number of research and training centres and chairs to fill the capacity building gaps, and expand the existing regional research networks such as hydrology networks and groundwater networks and establish new similar networks in different regions of the world

Sudan

Water better use and management

Eastern Africa sub-region - Contribution proposed by the working group meeting held in Abuja March 2006

-Develop water education strategies at all levels



International Hydrological Programme

40th session of the IHP Bureau
(UNESCO-IHE, Delft, 13 – 15 June 2007)

APPENDIX II

OUTLINE OF THE IMPLEMENTATION PLAN FOR IHP-VII : APPROACH TO THE OVERALL EXECUTION 2008-2013 AND FOCUS FOR 2008-2009

Item 7.2 of the provisional agenda

SUMMARY

This document includes an outline of the proposed Implementation Plan for IHP VII. It sets out the methods in which National Committee commitments to the implementation of the Themes and Focal areas will be collected and recorded. It also presents an IHP Information Management Tool (IHPIM) that will be developed and used to track, monitor and manage IHP wide information to respond to the 'results based framework' request from Member States.

The Bureau is requested to note the information provided and the approach being adopted by the Secretariat in developing the Implementation Plan.

Introduction

1. This document contains the outline for the Implementation of the Strategic Plan for the VIIth Phase of the IHP. The Strategic Plan was endorsed, in principle, by the 17th session of the Intergovernmental Council of the IHP. The Council authorised the Bureau of the IHP to consolidate the draft with the comments made in the course of the Council debate together with the later consultations with Member States, and to commence the implementation arrangements for the period 2008 – 2013, in outline, but with a focus on the biennium 2008-2009.

2. The draft Strategic Plan also contained suggested 'next steps' for proceeding with the process to make the Plan operational, through three steps. Firstly to achieve approval of the Strategic Plan at the 40th Bureau Meeting (June 2007); secondly for the Secretariat to circulate the approved Strategic Plan to IHP Council Members to receive an out of session approval by the 1st September 2007, and following this, to circulate it to the IHP National Committees, the UN Agencies, IGOs, and NGOs. This wide circulation will receive proposals for actions, commitments, confirmation of benchmarks and identification of partners that will participate in Phase VII, on the basis of their agency complementarity and comparative advantages. Thirdly, for the Secretariat with the support of the Task Force, to complete the proposed Implementation Plan, including the monitoring and evaluation plan for the IHP-VII.

3. Following on from the above, and taking account of the developments within UNESCO, the secretariat has started the preparation of the arrangement for the implementation plan, as noted above, and set out in the following sections.

Preparation of the Implementation plan

4. The following steps foresee the formulation of the Implementation Plan, including other consultations to be undertaken with the IHP National Committees between June and September 2007.

5. Member States have recalled that the implementation plan is to be prepared following a results-based programming methodology.

6. While general proposals and inputs for activities in the various Themes and Focal Areas have been received in previous consultations with National Committees, a more direct consultation has yet to be undertaken. This consultation to be initiated soon after the 40th Bureau Meeting will request Member States to set out in detail the proposals and inputs for activities, and outlines of projects that are to be conducted at national, regional and international level. Member States will also be asked to suggest the methodology for their implementation, as well as their evaluation proposals and the adequacy of financial resources to be mobilised. So that the IHP Secretariat could facilitate monitoring and coordination, the Member States would set realistic outputs for any of the five themes that they plan to propose for Phase VII. The Secretariat hopes to receive detailed instructions and proposals for activities, events, projects, networking, centres, giving emphasis to clear outputs and benchmarks.

7. Based on this information, the implementation plan will be prepared, compiling all the contributions and the proposals presented by the IHP National Committees and other partners. The consultation will be extended to include UN Agencies, IGOs, NGOs and other

partners. The IHP Bureau is asked to provide directions to establish criteria for the monitoring and evaluation of the IHP-VII.

8. A higher priority is to be given to the definition of the programme of the first biennium 2008-2009 of the IHPVII. The Implementation Plan for 2008-2009 would contain proposals for actions and commitments by IHP National Committees, Member States and partners. It should be noted that the regular budget that will be allocated by the UNESCO General Conference for execution of the 2008-2009 biennium of the IHP-VII plan will only be known only during the 34th session of the General Conference at the end of 2007, consequently it may be difficult to prioritize actions before that date.

9. With the aim of starting the definition of the Implementation plan the Secretariat has prepared standard proforma tables in which proposals, priorities and offers of contribution based on those already received from some of the IHP National Committees, should be set out in further detail.

10. The formulation of the implementation plan allows for flexibility, and the possibility to include new partners, and introduce new elements in the activities, to address newly selected situations and emerging issues, and take into account the evolving water sector framework as well as the UNESCO's own settings.

Components of the Implementation Plan

11. For each theme, the Implementation Plan should describe and list methods, partnerships, cooperation possibilities and extra budgetary fund raising for implementation, in addition to the details of execution. The Implementation Plan should indicate the expected results and evaluate if they suit the needs of those who would benefit from the deliverables. The aim is to make it easier to identify, execute and evaluate IHP-VII endorsed research and development programmes. To be successful, governments need to contribute in the implementation process and strong links should be established between governments and the IHP National Committees. To this end, it has been suggested that each country should designate a focal point at ministerial level.

12. IHP National Committees could establish focal points for the themes and the focal areas and provide indications for experts that could provide guidance at technical level if they wish to take responsibility for the execution of activities related to themes and focal areas. They should also indicate those activities they wish to participate in and time scale they offer to take a lead position or to coordinate the activity and the methodology to implement the activities.

13. Other considerations to be addressed in the Implementation Plan include strengthening the role of the IHP National Committees in implementing IHP activities at national and regional level during IHP-VII. Considering the magnitude of water-related problems in developing countries, and especially in Africa, a particular effort will be needed to set up north-south and south-south partnerships among IHP National Committees. In this regard consideration could be given in leveraging support from cooperating agencies. For example, the partnership established with GEF is proving very effective and could provide real benefits to IHP National Committees in developing countries. The Secretariat is willing to support IHP National Committees with the setting up of a mechanism for project preparation for GEF financial support. More associations of this type, with other financing agencies could broaden the scope of IHP-VII themes and focal areas.

PROFORMA's for the Responses from Member States

14. In order that the Secretariat may compile and make a consistent Implementation Plan, inclusive of all Member State actions as well of those of the UNESCO HQ and Field Offices, two PROFORMA's have been prepared. These are attached in the end of this document for completion and return to the Secretariat. A short explanation of each of the forms is given in the next para.

15. The PROFORM A: This form should be completed by any National Committee that wishes to record its activities as part of the IHP VII Programme, drawing on the Theme and Focal Area reference number. For ease of reference the TABLE 1 gives the Theme and Focal Area numbers as included in the Strategic Plan. The PART A1 is for entering yes / no responses in each of the columns for any of the proposed activities. The columns are self explanatory. The PART A2 is provided to indicate if the activity also is cross referenced to any of the IHP Cross Cutting Programmes or the Associated Programmes.

16. The PROFORMA B has been provided to enable the National Committee's to set out in more detail, their planned activity, responding to the points made above in para's 11, 12 and 13 – on the details of the activity proposed. This also has a PART B1 and B2, as above, for cross referencing purposes.

17. To get the process of this consultation and documentation underway, a draft Invitation letter to Member State IHP National Committees, requesting formal contributions to be made to IHP VII for the years 2008 – 2013), is included in Attachment 2. The draft letter will include a series of Annexes that have been compiled in document IHP/Bur-XL/11-Appendix 1. Once approved by the Bureau, the Attachment 2 will be extracted from this document and sent directly to Member States.

Monitoring, tracking and information management tool

18. In continuously considering ways to improve the performance of the IHP and its objectives, the Secretariat has been developing a variety of tools that will assist in the monitoring of the programme, tracking the progress through the whole of IHP VII and having access for information management. There are existing tools being developed for UNESCO wide application, such as SISTER. While SISTER provides an organization wide indicators and is currently being upgraded to be applicable in UNESCO Medium Term Strategy, there is still a need for some means by which the specific objectives of IHP can be measured. To this purpose the Secretariat is currently redesigning the IHP web portal and its layout. This is expected to more clearly reflect the Themes, Focal Areas and activities of the IHP VII. In addition to the web portal, the secretariat has commenced the preparation of a more accessible and simpler tool that will complement the web based presentation of the achievements and products of IHP VII. It will also be complement the SISTER system and provide a initial means for information processing that once, aggregated will be entered to SISTER – this entry could be automated by ensuring the IHP-information management tool can be uploaded into SISTER.

19. THE IHP Information Management (IHPIM) is still under design, but the initial layout and the key fields that it will contain have been prepared and currently undergoing an internal consultation among Secretariat Staff, A sample of the layout is shown in Attachment 1 of this document.

20. The IHP Information management tool will consist of five main fields. The lowest level of information that will be provided through the IHPIM will be the “activity” – much in the way that that SISTER holds its information. However, the difference is that each “activity” will then be linked in a clear and a simple way to indicators that can be aggregated upwards to demonstrate their contribution to the UNESCO overarching strategies. These overarching strategies and other IHP specific indicators will be monitored through any, or each, of the five fields. A brief explanation of each of the fields in the proposed information management system follows.

21. Field I will provide the headline information of the where and how a particular activity, or a set of activities belong to IHP Themes and Focal Areas. Field II lists a series of related IHP “activities” – this can a number of them or, if a large and a significant one, then just one. Field III indicates partners and participants that contribute to the activity – with brief references to the Countries, their contributions, measured either as cash contributions, or an equivalent in-kind contribution. Field IV will record the IHP Cross Cutting Programme to which the activity or a series of activities contribute, or to other UNESCO wide Programmes, as they are defined in the Medium Term Strategy. Field V lists each of UNESCO’s overarching objectives and strategic programmes to which the activity contributes. The fields and their descriptors have been chosen to enable upward aggregation by any of the desired fields, so that a clear judgement can be made both prior to approval and commencement of the activity of its relevance, as well as for a post project review.

22. The structure of the IHPIM is also aimed at providing a tracking tool for programme specialists and to Field Staff, so that as each biennium activities are planned and executed, the achievements can be monitored for results, in response to the request Member States that a results based framework of actions is adopted by the organization as a whole.

23. A preliminary example of the IHPIM, is shown on the following page, with annotations regarding the fields. This should be considered to be work in progress and it will be populated as part of developing the Implementation Plan for IHP VII.

ATTACHMENT 2

DRAFT LETTER, INVITING MEMBER STATE NATIONAL IHP COMMITTEES TO COMPLETE PRO FORMA'S A & B

**Subject: Invitation to contribute to the Implementation Plan for the
IHP VII 2008-2013**

Dear Sir/Madam

As you will no doubt be aware that after several rounds of consultations with all the International Hydrological Programme (IHP) National Committees, the Secretariat is now facilitating the preparation of the IHP VIIth Phase Implementation Plan. Consultations were conducted in February and June 2004, April 2005, April 2006, and July 2006 with the last round in September 2006. The Secretariat is pleased to record that 72 IHP National Committees provided their valuable inputs and comments, which are summarized in the following attachments to this letter:

- Annex 1: Endorsement of IHP VII,
- Annex 2: Countries responses on focal areas, and
- Annex 3 Activities proposed by National Committees.

As Annex 1 shows there is a general acceptance of the July 2006 Strategic Plan for IHP VII, (document IHP/IC-XVII/Inf. 9) that was presented at the 17th Session of the Inter Governmental Council of the IHP.

Drawing on the Country priorities listed in Annex 2, the Secretariat has pleasure in inviting further details from you of your planned IHP VII activities, to reach the Secretariat by 15th September 2007. To assist you in responding to our request, we attach a PROFORMA A & B, We would be grateful if you would complete these proforma's with details of Themes, Focal areas and Activities that would be undertaken by your National Committee in IHP VII (2008 to 2013). Please specify each activity that you would participate in, or would like to coordinate and/or take a lead role. For these we ask you to establish focal points and provide us with CV's of national experts who would guide the execution of relevant activities. The Secretariat would be pleased to liaise directly with the nominated experts.

This information is essential for the preparation of the IHP VII Implementation Plan. The implementation Plan will be a consolidation of all IHP activities and its preparation requires a detailed definition of the activities that will underpin the strategic objectives, as set out in the agreed Strategic Plan.

Since the UNESCO IHP is a demand driven programme, we foresee it further evolving in the course of 2008-2013 to respond to new challenges and emerging issues. Therefore the IHP VII Implementation Plan remains flexible and is open for contributions from not only Governments and Members States but also from the scientific communities and the civil society.

As you may know the funds for the implementation of IHP activities derive from a series of sources. UNESCO core funding provides a regular budget to the development of projects and activities. The implementation of IHPVII is based on a biannual detailed budgeting and planning, approved by the UNESCO General Conference. This depends on the level of the budget allocated by the General Conference every two years. The method of working of the IHP is therefore flexible such that it allows all National Committees to contribute to as appropriate. Extrabudgetary funds can be provided by donors at any point of the IHP VII implementation. In kind contribution are particularly relevant for the implementation of the

IHP and these are provided by IHP National Committees, Member states, scientific institutions and UNESCO partners. An IHP National Committee may propose the development of a particular activity that is not already listed in the approved plan provided it is in line with the objectives of the IHP programme.

We wish to thank you for your support during this process and we are at your disposal for any further information you may need.

Table 1

Overview of the Core Programme Themes of the Seventh Phase of the IHP (2008-2013)

WATER DEPENDENCIES: SYSTEMS UNDER STRESS AND SOCIETAL RESPONSES

Theme 1: ADAPTING TO THE IMPACTS OF GLOBAL CHANGES ON RIVER BASINS AND AQUIFER SYSTEMS

Focal area 1.1 - Global changes and feedback mechanisms of hydrological processes in stressed systems

Focal area 1.2 - Climate change impacts on the hydrological cycle and consequent impact on water resources

Focal area 1.3 - Hydro-hazards, hydrological extremes and water-related disasters

Focal area 1.4 - Managing groundwater systems' response to global changes

Focal area 1.5 - Global change and climate variability in arid and semi-arid regions

Theme 2: STRENGTHENING WATER GOVERNANCE FOR SUSTAINABILITY

Focal area 2.1 - Cultural, societal and scientific responses to the crises in water governance

Focal area 2.2 - Capacity development for improved governance; enhanced legislation for wise stewardship of water resources

Focal area 2.3 - Governance strategies that enhance affordability and assure financing

Focal area 2.4 - Managing water as a shared responsibility across geographical & social boundaries

Focal area 2.5 - Addressing the water-energy nexus in basin-wide water resources

Theme 3: ECOHYDROLOGY FOR SUSTAINABILITY

Focal area 3.1 - Ecological measures to protect and remediate catchments process

Focal area 3.2 - Improving ecosystem quality and services by combining structural solutions with ecological biotechnologies

Focal area 3.3 - Risk-based environmental management and accounting

Focal area 3.4 - Groundwater-dependent ecosystems identification, inventory and assessment

Theme 4: WATER AND LIFE SUPPORT SYSTEMS

Focal area 4.1 - Protecting water quality for sustainable livelihoods and poverty alleviation

Focal area 4.2 - Augmenting scarce water resources especially in SIDS

Focal area 4.3 - Achieving sustainable urban water management

Focal area 4.4 - Achieving sustainable rural water management

Theme 5: WATER EDUCATION FOR SUSTAINABLE DEVELOPMENT

Focal area 5.1: Tertiary water education and professional development

Focal area 5.2: Vocational education and training of water technicians

Focal area 5.3: Water education in schools

Focal area 5.4: Water education for communities, stakeholders and mass-media professionals

Cross-cutting programmes: HELP, FRIEND

Associated programmes: International Flood Initiative (IFI)
International Sediment Initiative (ISI)
Water for Peace: From Potential Conflicts to Cooperation Potential (PCCP)
Joint International Isotope Hydrology Programme (JIHP)
Internationally Shared Aquifer Resources Management (ISARM)
Global Network on Water and Development Information in Arid Lands (G-WADI)
Urban Water Management Programme (UWMP)
World Hydrogeological Map (WHYMAP)

Education, Training and Capacity Building across all the themes

**PRO FORMA TABLE A: CHECK LIST FOR NATIONAL COMMITTEE TO CONFIRM
PROJECT PROPOSAL CONFORMITY, ACTIVITY AND CONTACT**

PART A1

Name of the IHP National Committee	Country Priorities 2008-2009	Country Participation in Theme and Focal area 2008-2013	Events organized in the Country	Activity lead/ coordinated by the Country	List and CV of national experts designated as focal points for Themes and/or Focal areas *	CV of national experts *

IHP VII Themes and Focal areas						
Theme 1:						
Focal area 1.1						
Focal area 1.2						
Focal area 1.3						
Focal area 1.4						
Focal area 1.5						
Theme 2:						
Focal area 2.1						
Focal area 2.2						
Focal area 2.3						
Focal area 2.4						
Focal area 2.5						
Theme 3:						
Focal area 3.1						
Focal area 3.2 -						
Focal area 3.3 -						
Focal area 3.4 -						
Theme 4:						
Focal area 4.1 -						
Focal area 4.2 -						
Focal area 4.3 -						
Focal area 4.4 -						
Theme 5:						

* **NOTE** The national Committee is requested to provide the IHP Secretariat with the names, contacts & CV's of persons that will cooperate and contribute to Theme and Focal areas and the related activities to be undertaken

PART A2

Name of the IHP national Committee	Country participation Or activity coordination
Cross-cutting programmes	
HELP,	
FRIEND	
Associated programmes:	
International Flood Initiative (IFI)	
International Sediment Initiative (ISI)	
Water for Peace: (PCCP)	
UNESCO-IAEA Isotope (JIIHP)	
Shared Aquifer (ISARM)	
Global Network Arid Lands (G-WADI)	
Urban Water Management (UWMP)	
World Hydrogeological Map (WHYMAP)	

NOTE: Education, Training and Capacity Building activities are to be undertaken across all the themes

PROFORMA TABLE B: Definition of activities to be undertaken by National Committee
PART B1

Name of the IHP National Committee <hr/> <hr/> <hr/>	Activities suggested by the IHP National Committees and their method of implementation*
IHP VII Themes and Focal areas	
Theme 1:	
Focal area 1.1	
Focal area 1.2	
Focal area 1.3	
Focal area 1.4	
Focal area 1.5	
Theme 2:	
Focal area 2.1	
Focal area 2.2	
Focal area 2.3	
Focal area 2.4	
Focal area 2.5	
Theme 3:	
Focal area 3.1	
Focal area 3.2 -	
Focal area 3.3 -	
Focal area 3.4 -	
Theme 4:	
Focal area 4.1 -	
Focal area 4.2 -	
Focal area 4.3 -	
Focal area 4.4 -	
Theme 5:	
Focal area 5.1	
Focal area 5.2	
Focal area 5.3	
Focal area 5.4	

PART B2

Name of the IHP national Committee	Country participation Or activity coordination
Cross-cutting programmes	
HELP,	
FRIEND	
Associated programmes:	
International Flood Initiative (IFI)	
International Sediment Initiative (ISI)	
Water for Peace: (PCCP)	
UNESCO-IAEA Isotope (JIIHP)	
Shared Aquifer (ISARM)	
Global Network Arid Lands (G-WADI)	
Urban Water Management (UWMP)	
World Hydrogeological Map (WHYMAP)	

NOTE: Education, Training and Capacity Building activities are developed across all the themes

* Networks at regional or international level, Seminars, Conferences, publications, training material, Teaching modules, e-learning material, international experts working groups, compilation of case study, case study at national level, national programmes results and best practices, best practices at regional level, extrabudgetary fundraising, etc.