ANNEX 1

SUMMARY
CONCEPT NOTE FOR THE EIGHTH PHASE OF THE INTERNATIONAL HYDROLOGICAL PROGRAMME (IHP) OF UNESCO (2014 – 2019)

As endorsed by the 19th Session of the IHP-Intergovernmental Council

BACKGROUND

The historical constant of the International Hydrological Programme (IHP), the flagship intergovernmental program of UNESCO in the field of water sciences and water resources management; is that of adaptation to the emerging needs of Member States and the enhancement of international cooperation to this end. The programme is aimed to serving Member States expand their knowledge of the various processes (physical, ecological, cultural, economical and/or social) that govern or affect water quantity and quality, distribution in space and time, and interactions with natural and anthropogenic systems. In this context, the IHP is a scientific cooperative program with the ultimate goal of supporting Member States to implement sound water management. Part of the IHP's ability to reflect and adapt to the needs of Member States in innovative ways is the mechanisms employed in designing its 6-year phases. Generally, the scope of each phase is arrived at after iterative and intense consultations with Members States, with the assistance of a Panel of Experts in the analysis and interpretation of Member States' comments. After further consultation with Member Stats and IHP partners, a draft strategic plan for the phase is drafted and submitted to the governing bodies of IHP for review and endorsement prior to the launching of each new phase. Currently, IHP is in its Seventh Phase (2008-2013), which focuses on *Water Dependencies: Systems under Stress and Societal Responses,* being in line with the setting of several worldwide initiatives such as the Millennium Development Goals (by 2015), the Decade of Education for Sustainable Development and the Water for Life Decade (2005-2014).

At its 43rd session, the Bureau of the Intergovernmental Council of IHP instructed the IHP Secretariat to initiate a process for developing the Eight Phase of the IHP (IHP-VIII). A Task Force of experts in various water-related disciplines coming from various regions of the globe was established to assist in this undertaking. The Task Force prepared a concept note aimed to serve as a baseline document for the initial detailed consultation with Member States and other key partners as part of the process of formulating the strategic plan of IHP-VIII. The aim of this concept paper is to provide elements to stimulate the response of in the consultation, but not to limit the scope of discussion or the ability of Member States and partners to propose new thrusts or emphases than those presented in the concept paper. The paper represents what the members of the Task Force perceived as major drivers of hydrologic and water resources issues for the next phase of IHP in line with the guidelines imparted by the IHP Bureau. The Task Force produced a draft concept paper (see document IHP/IC-XIX/Inf13), which was presented to the 44th Bureau for review. The Bureau commented on the paper, and instructed the Secretariat and the Task Force to produce a summary paper incorporating the views of the Bureau to serve as the basis for discussion by the 19th Intergovernmental Council of IHP and subsequent detailed consultation with Members States and partners. This document presents the above-described summary.

I. RATIONALE

Water is clearly a cross-cutting issue for sustainable development. The Johannesburg World Summit on Sustainable Development (2002) was a major milestone and has clearly encouraged Member States to manage their water resources through integrated water resources management (IWRM) action plans (national and regional). The Millennium Development Goals (MDGs) recognized the key role of water resources as shown by the analysis from the UN Secretary General's Advisory Board on Water and Sanitation, that estimated that water resources count for one third for the achievement of the MDGs; specific targets with respect to access to safe drinking water and basic sanitation were set. Yet, and despite of great efforts by countries and partners, many developing countries are not on track for the achievement of water-related MDGs targets, predominantly those related to sanitation in Africa. The various components of global change (climate change, population growth, land use and land cover change, globalization, among others) compound the difficulties. Countries coping with water scarcity now have to also cope with increasing vulnerability to and possibly with increasing frequency and intensity of water related extreme events (floods and droughts). Furthermore, rapid urbanization especially in informal settlements presents growing challenges to traditional approaches in urban water management along with increasing pressure on groundwater resources to supplement the limited supplies of surface water. It is evident that to deal with these complexities in the context of IHP-VIII, a holistic approach integrating population, ecosystems, water, culture and economy is needed.

This concept of water scarcity constitutes the basic foundation of the work of the IHP-VIII Task Force. Water scarcity, whether naturally occurring such as in arid zones, or as a result of increased water demands, as in cities, or as an indirect effect of water quality impairment, leads to increasing pressure on surface waters, and in particular on groundwater resources. Water scarcity has been a major aspect of the overall IHP programme in recent phases. More specifically, in IHP-V, the focus on water scarcity resulted in a comprehensive publication (Coping with Water Scarcity, 2002), which remains to date one of the most requested IHP publications. UN-Water has established in 2006 water scarcity as a thematic initiative and as a strategic issue and priority for system-wide action. As a construct, water scarcity is a relative concept, it can have a socio-economic dimension stemming from competing demands, or it can be the result of changes in the hydrological cycle brought about by climate variations or land cover land use changes. However, and as identified by UN-Water, in arid and semi-arid regions where the problem of water scarcity is most acute, it has its roots in water shortage, and is constantly compounded by frequent droughts, population growth and economic development.

In dealing with water scarcity, IHP-VIII can bring innovative methods: models, technologies and approaches into play in order to optimize resources and capitalize on the advances of water sciences and social and/or economic opportunities. In this context, IHP-VIII should aim at promoting and supporting state of the art and innovative scientific research especially in dealing with some of the most fundamental aspects of water scarcity such as: (a) its relation to water related disasters (drought), (b) better understanding of groundwater resources, which represents a critical component for coping with water scarcity, (c) improving the utilization and management of water (quantity and quality) in urban and populated areas, which are increasingly competing with other demands, and (d) the sustainable management of eco-systems, which tend to be overlooked as a priority when dealing with water shortage and water scarcity leading to further degradation of both ecosystems and water resources.

Today, IHP has various solidly grounded specific and crosscutting projects and programmes established to respond to Member States water-related needs and priorities. These need to be considered in the coming phase in the context of assuring continuity and while also

responding to new challenges. In the development and implementation of these programmes and projects a significant role is expected to be played by the ample network of water related centres under the auspices of UNESCO and the UNESCO Water Chairs. Likewise, UNESCO-IHE Institute for Water Education will be a significant collaborator in the overall efforts in education, capacity building and research to be undertaken in the IHP-Eighth Phase.

II. PROPOSED AREAS OF KNOWLEDGE

On this basis, the draft concept paper formulated by the IHP-VIII Task Force to stimulate responses from Member States and key partners in the future consultation process proposed the following knowledge areas as possible key elements of the next phase of IHP:

- Water-related disasters and hydrological change;
- Water and human settlements of the future;
- Groundwater in a changing environment; and
- Ecohydrology, engineering harmony for a sustainable world.

In addition, four cross-cutting areas were identified to be characterized in the context of the key areas of knowledge. These cross-cutting areas are:

1. IWRM in adapting to global changes;
2. Transboundary or shared waters;
3. Human dimension and governance; and
4. Water education.

Water-related disasters and hydrological change

Setting the stage

While human activities and water-related disasters have disrupted the natural hydrological and ecological regimes, population growth, economic development, and climate variations are important drivers that will significantly impact water-related risks and uncertainty. In response, the hydrological community must identify appropriate and timely adaptation measures in a continuously changing environment. Additionally, there is a need to be more active in transferring knowledge to policy and decision makers, to ensure that decisions are based on the best available knowledge.

Trends and needs

As humankind continues to live and interact with the changing hydrologic system, a better understanding of coupled human-natural ecosystems is needed. It is essential to strengthen existing and new technologies, data sources, and risk management practices to gain a better understanding of water-related hazards/risks, a task rendered more complex due to the fact that most of the world's river basins and aquifer systems are poorly gauged.

It is projected that water-related risks might increase as a result of human activities, population and economic growth, and poor water governance. The reduction and mitigation of water-related risks can be achieved by implementing appropriate measures within IWRM, such as education and capacity development, which is the key to reducing vulnerability. Recently, risk communication and stakeholders participation has emerged as an integral part of strategies for managing water-related risks.

The way forward: addressing the challenges
IHP may consider the following approaches to improve Member States' resilience to water related disasters and hydrological changes

- Support the adaptation of data collection, modeling, and water-related risk management strategies to (a) the continuously changing environment (hydrology, population, land cover/land use), (b) data availability and (c) the different needs of water managers.
- Support and encourage the integrated modeling of socio-hydro-ecological systems in water resources management decision making processes.
- Support the development and encourage the use of a coherent terminology, systematic approach and guidelines in uncertainty estimation in hydrological modeling and water resources decision making. This would reduce our vulnerability to water-related disasters, and assist Member States in developing a culture of resilience to water-related disasters and risk prevention.

Water and human settlements of the future

Setting the Stage
Urban areas, especially in developing countries, present multiple challenges to effective water and wastewater management given the increasing pressure from population growth due to immigration feeding the uncontrolled expansion of informal settlements, fragmented governance, and inefficient infrastructure and management practices that are often constrained by socio-political factors falling short on training and education.

Trends and needs
An integrated approach to urban water management should satisfy the water related needs and services of a city at efficient and sustainable cost levels whilst minimizing adverse environmental and social impacts and maximizing resiliency, including access to drinking water and sanitation, management of stormwater, and wastewater (reclamation and reuse), urban flood management, incorporation of urban groundwater, and provision of water services to periurban areas at efficient and sustainable cost levels whilst minimizing adverse environmental and social impacts and maximizing resiliency. The rural-urban interactions would also be taken into account.

Such an innovative approach would provide tools to analyze the interactions across the urban water cycle for a range of management and technological solutions and will enable urban water systems to be developed with sustainability criteria.

New approaches to the design methods of urban water systems, innovative concepts, tools and strategies, and a deeper understanding of governance issues within the water sector are all needed.

The way forward: addressing the challenges
To address the above described challenges within the frame work of IHP, IHP can:

- Foster innovations in demand management and water reuse provides an opportunity to improve water security through diversity
- Provide guidelines to Member States for the development of new and more efficient governance models that incorporate the cultural practices and diversity of the stakeholders
- Critically look into water use practices and develop strategies that maximize the benefits of water services while minimizing losses.
- Continue to work with partner agencies to promote water saving devices, consumer education and awareness building on water conservation at all levels.
- Reflecting the lessons of the MDGs, take into account innovative sanitation strategies.

- Together with UNESCO-IHE, aim to accelerate the transfer of knowledge to developing countries with regards to pollution prevention-based approaches to wastewater handling
- Foster a shift in paradigms that consider wastewater as a water resource, and that encourage the adoption of a decentralized approach to infrastructure planning and design for wastewater reclamation and reuse.
- Support the management of water, wastewater (municipal, industrial, ...), solid waste, and water reuse in an integrated way.
- Investigate the benefits of slum or informal settlements upgrading programmes and strategies to non-slum dwellers in order to meet the challenges to urban water management,.
- Address innovative finance and cost recovery mechanism as main research needs for the sustainable development in water and sanitation sector..

Groundwater in a changing environment

Setting the Stage

As groundwater's use increases, it needs to be integrated within broader economic, social and environmental dimensions. Previous IHP programmes have improved knowledge of groundwater resources' quality and quantity worldwide, however, the increasing global risk to aquifer function and to ecosystems dependent on them presents a major challenge whose solution needs development of new science-based methods and techniques to enhance the knowledge of groundwater systems.

Trends and needs

Renewable groundwater resources in the developing world are underutilized, yet groundwater development can help both increase food production and overcome the threat to food security posed by variable rainfall patterns.

The global increase in the use of and reliance on groundwater has led to increased demand for expertise in groundwater and allied fields (including among others: groundwater recharge and storage by satellite based techniques and models, groundwater quality and protection, groundwater pollution and depletion risk assessment, degradation of groundwater resources by natural disasters and human impacts, and the assessment of the impacts of climate change on groundwater resources).

Although there is need for improved scientific, technical and decision-making capacities in hydrogeology and related disciplines, limitations exist, such as the sharing of experiences and understanding in order to determine best practices and reduce inequities in capacity.

The way forward: addressing the challenge

IHP is uniquely positioned to:

- Enhance investigation, improve knowledge of and ability to assess the quality/quantity of deep aquifers and to develop methods for their sustainable management
- Support Member States in their efforts to develop water policies at national and regional levels that strike a sustainable balance between renewable groundwater resources and demand for groundwater while considering the critical role of groundwater in sustaining aquatic ecosystems and the services.
- Work with the scientific community develop improved methods for sustainable conjunctive management and use of groundwater and surface water resources at various temporal and spatial scales
- Assist Member States in implementing Management of Aquifer Recharge (MAR) methodology in arid and semi-arid regions to balance competing demands for ground water resources, enhance water harvesting and recycling, manage groundwater

recharge, and increase water use efficiency and security under the influence of climate change.
- Work with the scientific community to develop methodologies and improve appropriate climate models for predicting and assessing climate change impact on groundwater considering different types of aquifers.
- Work with the scientific community to model possible scenarios of sea water rise by climate change on Small Islands Developing States (SIDS) coastal aquifers and proposed relevant protective measures.
- Within ISARM programme, strengthen legal, policy and institutional frameworks to enable sound governance and equitable sharing of transboundary groundwater resources.
- Continue to pursue training and capacity building in ground water issues.

Ecohydrology, engineering harmony for a sustainable world

Setting the stage
In addition to the global challenges posed by social and environmental changes, the recent economic crisis should be regarded as an "early warning" signal for the urgent need for a more sustainable approach to resource use and consumption patterns, as well as a call for more innovative science based development approaches.

Trends and needs
It was previously believed that water scarcity could be solved by policies and/or technological measures.

The preservation of ecosystem services is crucial for the sustainable management of water resources and the implementation of ecohydrological measures.

One priority is identifying, evaluating, and incorporating ecosystem services into sustainable water supply and demand models.

Achieving healthy and sustainable water resources management is possible by three steps: 1) reduction of pollutants emissions, 2) shift from an end-of-pipe to a source approach and 3) enhancement of absorbing capacity and self-purification of landscape.

The way forward: addressing the challenge
In supporting this knowledge area, IHP can:
- Further develop and promote an integrated approach to water resource management, which includes ecohydrology as a tool for sustainable development.
- Support Member States to improve health and quality of life in urbanized areas and incorporate ecohydrological methods for city spatial planning.
- Assist Member States with research on plant-soil-water interactions through geophysical studies and comparative analysis of ecosystems.
- Continue to support the strengthening of trans-disciplinary education and trainings for professionals.

Cross-cutting areas

IWRM in adapting to global changes

It is envisioned that within the above describe knowledge areas, IHP would continue to promote the study, observation, and quantification of impacts that arise from global changes, such as population and economic growth and urbanization on water resources (quality and quantity).

Transboundary or shared waters

IHP will continue to support the Member States in developing the resilience needed to overcome difficulties related to the management of transboundary or shared waters, through capacity enhancement, knowledge development, and the support of necessary cooperation mechanisms within the context of UNESCO's mandate.

Human Dimension and Governance

The human dimension including its cultural and governance aspects is present in all four knowledge areas. IHP will continue to incorporate human dimensions into hydrologic studies because it has proven to be a more effective way to confront the complex challenges of water management and governance.

Water Education

Water education needs to be a long-term comprehensive effort in order to face all of the associated challenges, particularly in developing countries.

In cooperation with UNESCO-IHE and with existing and future network of water related centres and UNESCO water-related Chairs, IHP will continue to support Member States in the development and implementation of multiple water education programmes at all levels to equip citizens with the knowledge, skills, and values required to conserve, protect, and manage water in a sustainable manner, while maximizing the efficiency and diversification of its use.