Water Futures and Solutions: World Water Scenarios Initiative

Summary

BACKGROUND

In 2000, the World Water Vision[i] prepared under the aegis of the World Water Council was presented at the 2nd World Water Forum in The Hague. It was the product of a ground breaking, stakeholder-informed scenario development process that brought together leading global authorities both within and external to the water domain to think about possible world water futures and develop a joint vision for the future. Scenario development and analysis employed in the Vision exercise allowed decision makers to better understand the consequences of different decision paths on water sustainability and human development. These scenarios were widely used and applied in developing regional water visions, e.g. the African Water Vision, still being used as a guide by the African Council of Water Ministers.

More than a decade later, with pressure on the Earth's freshwater resources and ecosystems continuing to rapidly increase and over-abstraction apparent in many regions of the world, global leaders at Rio+20 acknowledged the core role of water to achieving sustainable development, stressing the critical need to take decisive action today in order to sustainably meet global development objectives. Additional calls for action, for integrated knowledge, policies and management across sectors and disciplines, and for improved assessment of impacts and options using multiple methodologies have been recently made by leading academic journals such as Nature[ii], and by the European Union in its Blueprint to Safeguard Europe's Water[iii].

The ramifications of the types of actions and decisions taken by water managers and other decision makers will impact sustainable development, given the inter linkages of water with poverty and hunger eradication, public health, food and energy security, ecosystem health, agriculture and rural development. In the meantime, events over the past decade have changed the situation in which the earlier scenarios were developed. Indeed, in a world of new technologies, globalisation, competing water demands and accelerating change and increasing complexity in all sectors, decision makers face increasing challenges in ensuring robust approaches to sustainable development.

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[i] Available at: http://www.worldwatercouncil.org/index.php?id=946&L=0target%3D_bla

[ii] Nature Climate Change (2012) "Water at a crossroads." Nature Clim. Change 2:12, doi:10.1038/nclimate1780

[iii] Available at: http://ec.europa.eu/environment/water/blueprint/

To address these challenges, the International Institute for Applied Systems Analysis (IIASA) and the United Nations Educational, Scientific and Cultural Organization (UNESCO), in partnership with the Ministry of Land, Transport and Maritime Affairs of the Republic of Korea, the International Water Association, and the World Water Council, and with initial support from the government of Norway, have joined forces to launch an initiative entitled *Global Water Futures and Solutions: World Water Scenarios*. Through the use of stakeholder-informed scenario development, the initiative will develop and assess a catalog of options for sustainable water resource development and provide a methodology to navigate through the options to find combinations of options that are effective, flexible and robust in different bio-physical and socio-economic settings. The initiative will build on the work accomplished in several international research and scenario assessment projects over the past decade, including IIASA's Global Energy Assessment, and on the initial phase of UNESCO's World Water Scenarios project, to become a key contribution to the global discussion in the related, key forums. The new generation of global and regional scenarios produced will provide a better understanding of the impact of different water-related decisions and choices on sustainable development and human well-being. The first phase of the initiative will culminate with the presentation of a first generation of global, regional, and selected national water scenarios and solution options at the 7th World Water Forum in March or April 2015 in Daegu and Gyeongbuk, Korea. Ultimately, the five-year initiative will provide a set of robust strategies, policies, technologies and solutions to better inform water-sector related decision making - both in public and public/private domains.

Initial work on a World Water Scenarios project began in 2009 under UNESCO-WWAP, with support from Italy, the World Water Council, the International Forum Committee, and Norway, and resulted in two initial reports[iv] released at the World Water Forum in Marseille in March 2012. The fourth edition of the World Water Development Report included a section on the analysis of the drivers, and a literature survey summary of existing qualitative and quantitative global and regional water-related scenarios was produced that served as background information for UN-DESA at Rio+20.

Water Futures and Solutions: World Water Scenarios is a new initiative which fully builds on previous activities and results, but has a significantly enhanced concept as well as scope. The initiative will harness IIASA's unique systems analysis capability in both data management and modeling, and be linked to the IPCC 5th Assessment scenarios work carried out at IIASA. Its global water assessment will utilize IIASA's experience from developing the Global Energy Assessment (http://www.iiasa.ac.at/web/home/research/researchPrograms/Energy/Home-GEA.en.html) that IIASA launched in Rio in June 2012, and the initiative will benefit from the monitoring and assessment capabilities and the reporting functions of the World Water Assessment Programme, in addition to the knowledge and experience of the membership of the World Water Council and International Water Association.

The initiative will be unique and innovative compared with earlier water foresight studies in several ways: (i) it will include quantitative as well as qualitative scenarios supported by information generated by multi-model assessments using new generations of socio-economic and

[iv] http://www.unesco.org/new/en/natural-sciences/environment/water/wwap/for-the-media

hydrologic models; (ii) The stakeholder-informed scenarios will be used to assess the robustness of solution options, policies and technologies, with the purpose of providing information for decision-making to deal with water issues and challenges at multiple scales in a variety of bio-physical and socio-economic settings. The scenarios will be accompanied by optional paths to achieving desirable water futures. In these paths, both autonomous and induced "solutions" will be incorporated over time, including major transitions which are likely to happen in coming years and decades in, for example, water governance and water related technologies; and (iii) the scenarios will be prepared in collaboration with major stakeholders in water dependent public and private sectors, which will significantly increase both plausibility as well as practicality of these scenarios. The inititative will elaborate scenarios with horizons of 2020, 2030, 2050 and 2100, each with an appropriate degree of detail.

In order for the initiative to accomplish its goals, operations are foreseen to be organized into five groups: a Governing Board, a Secretariat led by the Project Director who will also facilitate the Project Group, and two stakeholder groups (a Scenario Focus Group – SFG, and a Sector Actors Group - SAG). The Governing Board, including high-level representatives of the Initiative's partners and sponsoring, funding and collaborating agencies, is responsible for providing annual oversight and review. The Secretariat, based at IIASA, will provide strategic coordination, and administer funds. The Project Group will support the scenario development, both qualitatively and quantitatively, identify robust solutions, provide relevant sector and modeling expertise and analysis, and communications. The Scenario Focus Group, a representative group of decision makers, will develop the scenarios, ensuring their relevance, plausibility, and legitimacy. The Sector Actors Group will enrich the scenarios by grounding them within sector perspectives (including private sector and industry), better ensuring their implementation feasibility. The relationships are shown in Annex 1.

METHODOLOGY AND PROCESS

The process being followed is an iterative one of building qualitative scenarios and constructing and applying simulation models, in which the SFG engages scenario experts, stakeholders, data experts, modellers and decision-makers. Scenarios will be chosen to be useful to all decision-makers including those at sub-global levels that present differing characteristics; for example, in terms of the degree of law and order, financial systems, or human and institutional capacity.

The process began with an in-depth analysis of the evolution of the major external forces that have consequences for water managers and a discussion of existing scenarios. This was followed by the development of summaries of qualitative 'storylines' that describe how selected primary drivers could interact as they evolve. These storylines will provide an understandable and more transparent basis for understanding scenario assumptions and a more interesting method for communicating the substance of the scenarios than numerical data by itself, and represent the complex views of the individual members of the stakeholders and expert groups, including those from countries sharing important distinguishing characteristics. These will be reviewed and modified by the SFG with input from the SAG.

Based on these summary qualitative scenarios, using the most recent data sets and models available, and taking account of the guidance of experts in each of the driver fields, modellers will prepare quantitative projections. These will provide numerical data to be used in and make possible a consistency check of the storylines. These can cover such items as demographic change, energy production and associated estimation of water requirements in households, agriculture, industry, and energy production, the calculation of water availability and flows at the watershed level, and potential gains in water-use efficiency derived from the application of different and new technologies. This part of the work would be based on existing models, engaging their builders in providing simulations specifically geared to the questions of interest for the scenarios. Multiple-model ensembles will be employed to assess the degree of knowledge and uncertainty within the modelling itself. The fact that the scenarios will be based on the opinions of experts in each of the driver fields will add credibility to their feasibility if not probability.

The process involves harmonizing the qualitative and quantitative projections through an iterative process that relies on the facilitated interaction between the SFG, the SAG, scenario writers, data and sector experts, and other stakeholders. The interactive process encourages communication and discussion among these different actors.

During the process the team would also examine cases that are representative of different conditions. These could then be taken into account in refining the global scenarios and modelling them. A typology could thus be developed of situations or classes of countries sharing common issues to assess scenario boundary conditions during the later survey exercise we will conduct with representative actors and decision-makers. These typologies will then lead to the identification of combinations of options that are effective and robust under the conditions faced.

At the national and sub-national levels (river basin level scenarios and urban scenarios represent an especially relevant instance of the sub-national scale), the same general approach applies, with the difference that the scenario construction process, and the scenario findings, can be more directly related to the particular circumstances and characteristics at these levels and connected to the actors and decision-makers there, thus gaining in realism and usability. In those cases, the global scenarios can serve as suggesting a general direction and providing a perspective for the national and sub-national scenarios.

Such sub-global scenario exercises initially would be carried out in a few selected countries and trans-boundary river basins where there is an effective water management strategy or national water management plan; where data on water-resource quality, quantity and uses and economic and social development are available to construct useful indicators; and where there is an expression of interest and a willingness to work with and contribute to the scenario development process.

At the trans-boundary, national and sub-national levels, the establishment of good communication systems among the groups preparing scenarios will stimulate exchange of experiences, mutual learning and reciprocal capacity-building. The development of a scenario tool-box and training material by the Secretariat to be made available to the interested scenario groups would facilitate the task and increase comparability of the efforts. These would include tools to assess the

applicability, visibility and sustainability of options presented by the scenarios or to develop appropriate local scenarios.

The progress of the initiative would be presented at Stockholm World Water Weeks, COPs, and other relevant, high-level forums. As stated earlier the global and some regional scenarios will be presented at the 7th World Water Forum in Korea in March or April 2015. At its completion the initiative will have established a network involving information exchange, mutual learning and horizontal cooperation to connect teams of researchers and decision-makers exploring the scenario approach at national and sub-national levels, along with an appropriate self-organizing Internet site for interactions and exchange of experiences. A toolbox will reflect learning during the scenarios and options analysis process and include some software tools (for example, a description of options more likely to be valid in countries sharing important distinguishing characteristics). It would also contain links to tools not used in this process but in similar work. Regional multi-purpose workshops (ECA, MENA, Africa, East Asia, South Asia, LAC, SIDS) could present the global scenarios to government leaders, the private sector and civil society, as well as deliver specialized training in water scenario building to water managers and other stakeholders.

TIMELINE (tentative)

The draft timeline for the initiative includes the following key dates:

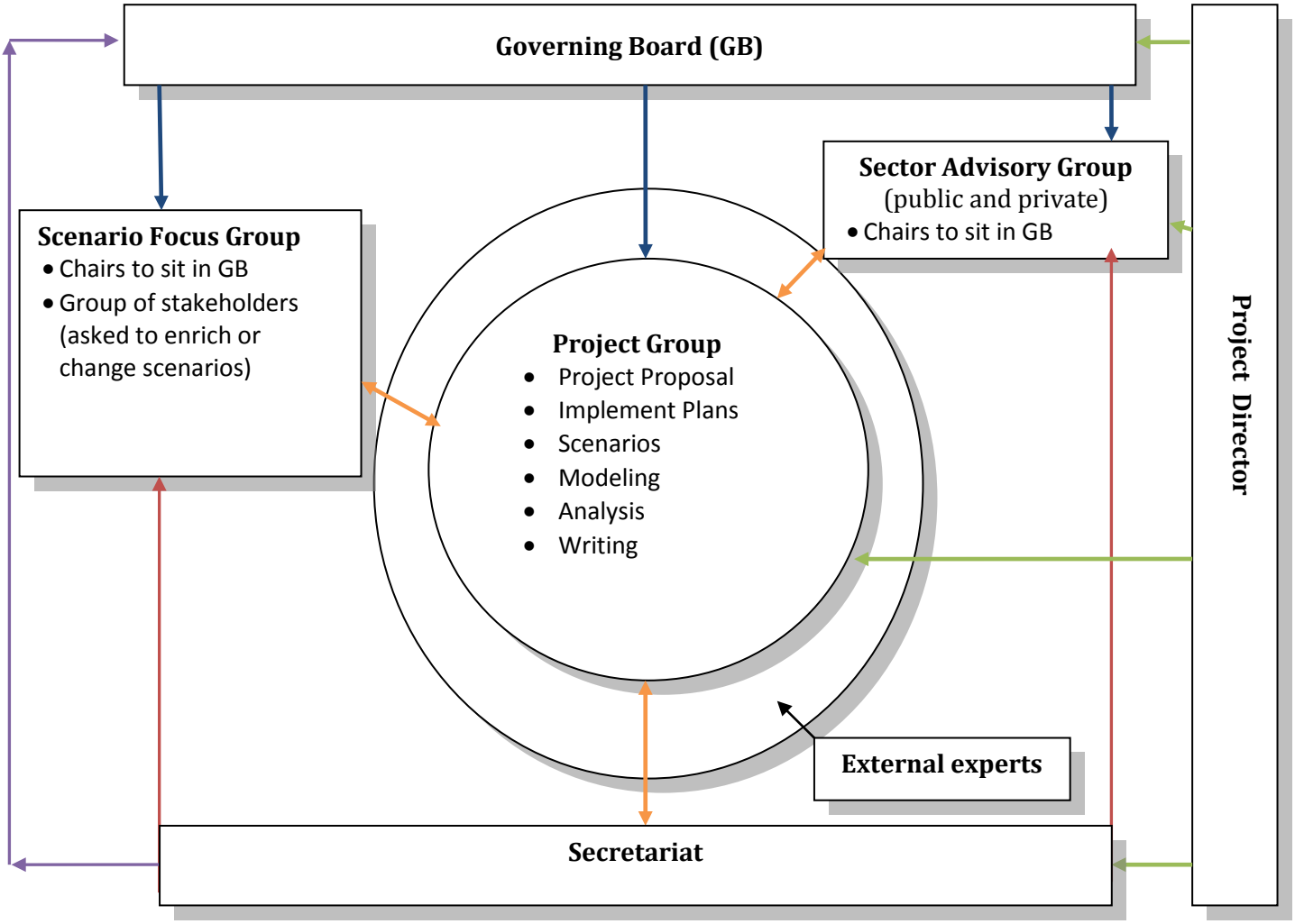
2013 February	Project Launch Meeting of High-Level Delegates
2013 April/May	Meeting of full Project Group (including external members and what regional leads have been identified at this point)
2013 April/May	First meeting of the Governing Board.
2013 May/June	First meeting of SFG and SAG (stakeholder groups)
2013 November	Second meeting of SFG and SAG
2013 November	Second meeting of Governing Board
2014 November	Third meeting of Governing Board, SFG and SAG
2014 October	Global and regional quantified scenarios completed
2015 March	Report on the first phase of the project published; 7th World Water Forum, Korea.

The dates for the remainder of the initiative will be detailed at a later stage, with a targeted completion date for the project 2016-12-31.

BUDGET

The estimated total cost of the initiative is about €7 million, of which about €3,4 million for the first phase which will culminate at WWF 2015.

Annex 1: Structure and Relationships in World Water Scenarios Initiative



Governing Board

Purpose:

The Governing Board plays a strategic advisory role, providing oversight and a review of the work plan and budget for the initiative, as well as monitoring targets and priorities. The Governing Board provides a forum for constructive exchanges and ensures the Scenarios Initiative is directed in a way that addresses the needs and interests of a broad cross-section of decision makers. Moreover, the GB will play a critical role in outreach and dissemination.

Activities:

The Governing Board will:

- supervise and review the initiative regarding strategic decisions and scope;
- facilitate outreach to key high-level stakeholders;
- review the work plan and agree to the timeline and budget;
- promote and communicate the initiative in relevant venues and settings; and
- represent the initiative at key international events.

Composition:

The Governing Board will be primarily composed of the high level representatives of the sponsoring and funding agencies of the initiative, representing the industrialized, emerging, and developing world.

Scenario Focus Group

Purpose:

The Scenario Focus Group (SFG) is an essential part of the initiative. It is a representative group of stakeholders whose role is to provide guidance to ensure the global and regional relevance and legitimacy of the scenarios.

Activities:

The SFG will meet physically on three occasions, and will interact electronically the rest of the time. Specifically, the SFG will:

1. reflect upon and discuss the scenarios prepared by the Project Team with input from the Sector Actors Group (SAG), and enrich them or change them if considered appropriate through an iterative process between the SFG, SAG and the Project Team; and
2. identify the essential attributes of a desirable global water future (to be developed technically by the Project Team and submitted to the SFG).

The SFG chairperson will sit as an ex-officio member of the Governing Board of the initiative to report about the deliberations of the SFG. The Group may define additional internal structures (i.e., rapporteur, specialized committees) as needed and justified by the size and complexity of the issues. The Group will receive support from the Project Team and the Secretariat (facilitation of the meetings, summaries of available information, driving forces report, circulation of scenario drafts, outputs from models, logistic support, etc.)

Composition:

The Group will be composed of broad-vision policy- and decision makers at different scales (from international water organizations to local water managers). While maintaining a primary water focus, the Group will also address issues important for the solution of water problems across a multitude of water-related sectors, such as energy, agriculture, environment, and development.

The total size of the SFG will be about 20 persons. It will be supported by the Project Team and Secretariat, who will participate in the discussions.

Sector Actors Group

Purpose:

The quality and use of the scenarios will benefit from the input, integration, and buy-in from sector actors. The Sector Actors Group enriches and grounds the world water scenarios by providing a range of sector perspectives and considerations during their development.

Activities:

The role and scope of the Sector Actors Group on the Scenarios Initiative includes:

- direct support of the development and revision of the global-scale water scenarios (two revisions in parallel with the SFG), including:
    - providing input on water requirements, cost considerations, technology, and management in different sectors,
    - consideration of the role of the private sector,
    - provision of information on when technology can come into play and the limitations of the technologies,
    - provision of a reality check on the scenarios and proposed solutions, and
    - examination of trade-offs between water use priorities;
- direct support of the development of the consensus Global Water Vision;
- assessing the impact of different options on the sectors represented.

The work will be supported by the Scenarios Project Team and the secretariat.

Composition:

The membership of the group will contain a mix of relevant sector experience and expertise including public and private sector representatives from high priority water users such as energy, health, agriculture, food, environment (i.e. biodiversity and ecosystems), urban and industry. The members will also include representatives of the water-related industries and technologies, focusing on water innovations and solutions.

There will be between 10-20 members in the group.

Project Team

Purpose:

The Project Team is tasked with carrying out and documenting the scenario development (both qualitative and quantitative), identifying robust solutions, and modeling and assessment work, based on the strategic direction provided by the Governing Board, and the substantive inputs from the Scenario Focus Group and Sector Actors Group. The Project Team ensures that the scenarios present an integrated, coherent and complete analysis of the issues and options, and are consistent with state of the art science. This will lead to some key outputs of the initiative, which are proposals for flexible and robust solutions which will themselves be developed in coordination with the SAG and SFG. The work will be performed at the global level as well as for a selected number of regions/basins or countries, including support for associated initiatives.

These tasks will then be organized according to the following categories, or work packages:

1. Development of qualitative scenarios: This task involves content support and process facilitation of the meetings of the Scenario Focus Group and the Sector Actors Group to efficiently communicate and elicit information and feedback. Those working within this task must also communicate the results and findings from the teams working to quantify scenarios and develop robust solutions back to the SFG and SAG. This task also includes the development and analysis of qualitative scenarios based on discussions with these groups. The work will be carried out by researchers with experience in scenario development and scenario processes from sectors associated with the main driving forces and of facilitators with expertise in stakeholder driven processes.
2. Preparation of quantitative scenarios: To the extent possible, qualitative descriptions (narratives) of indicators and drivers coming out of the Qualitative Scenario Development task will be translated into quantifiable indicators and variables for analysis by the mathematical models that are relevant and useful to the various water-related sectors. This work package serves as an intermediary between the qualitative scenario development and hydrologic and water resources modeling. Researchers in this work group are responsible for analyzing historic trends in indicators of the driving forces, future projections of trends in these indicators (both those existing and developed by the modeling task), and the feasibility and uncertainty of changes, rates of change, and critical values of the indicators. They are responsible for clearly communicating the trends and limitations to both the scenario development and modeling teams, as well as to the outside world. They also help explore the quantitative impact of solutions proposed by other teams.
3. Modeling: The modeling team will develop, adjust, coordinate, run, and analyze the set of hydrologic, sector, and integrated qualitative and quantitative assessment methods and models used to fully assess both the current state, where necessary, and the scenario trajectories, as well as the impact of proposed solutions. The modeling will be done with multiple models and methods to produce multi-model ensembles and assess model

uncertainties. The modeling team will agree to common driving datasets to use in the modeling and coordinate closely with the indicator and qualitative scenario teams. Modeling will be done iteratively with scenario development to refine both the models and scenarios. Input and output datasets for analysis will be made available both within the initiative and to the public where possible.

4. Uncovering solutions: Through the analysis of the qualitative and quantified scenarios, this task will research, analyze, and communicate possible robust political, managerial, and technological solutions to deal with the future change, variability, and uncertainty. It will employ backcasting as a technique to explore strategies to reach a desirable future. It will find ways that the data, modeling and knowledge of the initiative can be used effectively for decision support. This group will provide feedback through the scenario development task to the Scenario Focus Group and Sector Actors Group, so they can further enrich the scenarios and contribute to solutions. It will also provide information on suggested solutions to the quantification and modeling teams, so that those teams can test some solutions and provide feedback.
5. Communication and dissemination: Stakeholder processes and distributed, networked projects are built upon effective communication, both among the initiative's teams and between the initiative and the outside world. The initiative cannot be relevant or useful unless the knowledge brought together and produced can be made available and used for better decision making in water resource management. This Work Package is responsible for developing and implementing that communication strategy with feedback from the secretariat. It will assist members of the initiative by providing information and making suggestions on good communication skills within the initiative, employ communications technology to assist communication via online collaboration tools, and will produce consistent sets of materials, publications, websites, databases and toolboxes, taking advantage of any other technologies and opportunities that help disseminate the scenarios, tools, and solutions developed by the initiative.

Composition:

The Project Team will consist of full-time and part-time researchers and modelers, external advisors, and communications specialists, experts in the fields and sectors described in the tasks of the Project Team.

Secretariat

Purpose:

The secretariat provides strategic direction and will coordinate and administer the initiative. The secretariat is hosted by IIASA, and is responsible for all money management (budget), which will be executed by the Project Director under the direction of the Governing Board.