High Level Panel on Water:

Potential Water Data Initiative

# Introduction and Context

The High Level Panel on Water (HLPW) believes that good water data is critical to better water management, and has therefore agreed to launch an initiative on data that is intended to build on and accelerate a number of current initiatives across the water space. Further information about the HLPW and its Action Plan can be found at: <https://sustainabledevelopment.un.org/HLPWater>.

The Panel has a two year mandate (to around April 2018) and its basic purpose is to accelerate (or where necessary, kick-start) progress towards the water-related SDGs. It’s key resource is its own political capital, which it can use to draw together varying stakeholders, shine a light on what is working, and help focus efforts in areas where it is most needed – or where conditions are ripe for major breakthroughs.

## The Challenge

The world is waking up to the enormity of the water-related challenges it faces. Growing populations, more water-intensive patterns of growth, increasing rainfall variability, and pollution are combining in many places to make water one of the greatest risks to poverty eradication and sustainable development. Floods and droughts already impose huge social and economic costs around the world, and climate variability will make water extremes worse. If the world continues on its current path, projections suggest that the world may face a 40% shortfall in water availability by 2030, and economic growth in some regions may be cut by 6% due to water scarcity alone.

SDG6 outlines some of the key actions that the world will need to take on water, including providing universal access to services, improving water quality, increasing water-use efficiency, protecting and restoring water-related ecosystems, and more broadly, implementing integrated water resource management at all levels, including through transboundary cooperation. Such actions will also underpin the achievement of many other SDGs, not least those related to economic growth and poverty reduction, public health, energy, food security, disaster risk reduction, and sustainable cities.

However, each of these actions depends on information and data that in many places is currently incomplete, of uncertain quality, or simply doesn’t exist. In fact, in some key areas, the amount of water data is declining just as water stress is rising (see Annex 1). Accelerating global progress towards better water data is therefore a key concern of the HLPW.

## The Diagnostic

### What?

For the above challenges to be met, meaningful, multi-dimensional, accurate, timely and accessible information on water needs to be available to governments (at all levels), businesses, communities, and water professionals.

1. ***Meaningful information*** is not raw data, but rather information that is synthesized and presented in ways that is relevant to real-world problems that non-specialists routinely face: Will a city run out of water? Is this water too polluted to use for cleaning products? Will energy supply be curtailed by insufficient water? Is the level of groundwater pumping for farming sustainable? How are all of these problems linked together? etc. Most water is not managed by water managers but by farmers, mayors, factor managers, energy utilities, national planning staff, and others, which means that water information must be presented in ways that are meaningful to them, and provide links to the economic, social and environmental issues at stake. The problem is therefore not only to provide the information, but to provide a framework within which to understand the information.
2. ***Multi-dimensional information*** is required to manage water in an integrated way. Water differs in quantity, quality, spatial distribution and temporal distribution. Unless data is multi-dimensional a community that is flooded in January, facing droughts in August, and has contaminated groundwater in its industrial areas may be “on average” doing just fine according to unidimensional data.
3. ***Timely information is actionable information***. Managing flood or drought risk, maintaining water quality, or managing trade-offs in the allocation of water across competing uses are require regularly updated information, which in turn requires dynamic data.
4. ***Accurate information*** requires data that reflects reality, and where it is measured indirectly or modelled, the strengths and weaknesses of the data, including the margin of error, are well defined.
5. ***Accessible information*** means information that is readily available to those who need it. Information or data that is hidden behind physical or electronic doors is not accessible, but equally information or data that requires months of analysis and a PhD to understand it is not accessible to the vast majority of potential users.

### How?

Water data is generated in three main ways:

* ***Directly,*** where specific hydromet instruments measure water depth, flows, quality, rainfall etc., or where people report on the existence or functioning of local wells, pumps, etc. Direct measurements usually provide the most accurate information but usually provide very local information, and therefore need to be spread around hydrological systems to provide representative data. While hydromet systems are technically relatively simple they do require ongoing operation and maintenance, and hydromet systems in many countries are declining rather than expanding.
* ***Indirectly,*** where approaches involving remote sensing or earth observation (EO), are used to estimate a variety of water data. Innovation in this area is rapid. The quantity and quality of EO data is expanding rapidly, as are the analytic means to measure water – such as changes in large amounts of groundwater; local amounts of evapotranspiration; and some dimensions of water quality. However, the ability to access, process, and routinely apply EO data for water management varies greatly around the world.
* ***Modeling,*** where data is input into and generated by a variety of models at the local, regional, and global levels. Models may be used to fill in data gaps, but can also be used to estimate how hydrological systems may change according to different inputs. While models serve many purposes, and may be highly customized to a particular place or objective, there is a general trend towards open source, open access, and web-based systems.

In most applications some combination of these three approaches would be used, but some direct measurement is usually key for calibrating or validating the other approaches.

### Who?

There are multiple ongoing activities around the world that are contributing to progress on these challenges, including:

* Individual ***countries, businesses and communities*** that are measuring and managing water, with very vastly different levels of resourcing and capacity around the world;
* The ***UN system***, coordinated by UN-Water, which is leading the global effort to measure progress towards SDG6, and where individual agencies, such as FAO, UNEP and WMO, play leading roles in defining technical standards, organizing and hosting global databases, and so forth;
* ***Space agencies,*** which generate huge amounts of earth observation data that is being used to generate information on water;
* ***Universities, think-tanks and consultancies***, that are develop global and local water related models, which generate large amounts of data about water and the behavior of natural systems, as well as host databases, analytic and visualization tools that help translate the data into information.
* ***Technology firms and development agencies*** that support and host the development of water related data and tools.

A fuller description of these activities are contained in the Annex.

## HLPW call to action on data

Based on this understanding, the Panel agreed on six specific actions related to data that it would call for in its Action Plan – while acknowledging that the plan is a living document. These are to:

1. Initiate a strong political message on the critical importance of water data to effectively address water problems.
2. Encourage UN Water and other stakeholders to work towards defining a more integrated and standardized set of core water accounts and indicators – covering the core physical, economic, environmental and social issues, including gender and disability – that would enable governments, private sector and civil society to diagnose their challenges, set priorities, and guide their implementation efforts.
3. Encourage institutions and platforms to create a level playing field for the analysis and application of earth observation data.
4. Initiate a grand challenge process to unlock Water Data Innovation to improve the aggregation, integration, communication and application of water-related data.
5. Encourage interested stakeholders to develop better communication approaches in order to increase public and political understanding of water issues, such as through a global water atlas and a global water education campaign.
6. Encourage the international community to collect consistent and continuous gender disaggregated data on water-related disasters that will assist the development of indicators, and enable governments to set priorities, engage citizens in an inclusive way, and measure progress.

# The Initiative

These actions are being consolidated into an initiative with two inter-related elements:

1. Helping decision-makers prioritize and access information to manage their water better;
2. Increasing and equalizing global access to water-related data.

## Information for decision-makers

This component is largely an advocacy one where panel members:

1. Encourage global progress towards more consistent methods and language for compiling and communicating “national water accounts” which provide a simple, meaningful and comparable overview of a country’s water resources. This would build on:
   * The *System of Environmental-Economic Accounting for Water (SEEAW)*, published by the Statistics Division of UN-DESA in 2012, which provides a conceptual framework for organizing hydrological and economic statistics in a coherent and consistent manner.
   * The *Water Accounting +* approach, which builds on SEEAW, and attempts to operationalize water accounting primarily via earth observation methods in order to provide broader and more comparable coverage. This approach is driven by UNESCO-IHE, the International Water Management Institute, and FAO, with the broad support of UN-Water.
   * The experiences of numerous countries with water accounting approaches, including Australia and South Africa from within the HLPW countries.

Panel members are in a position to:

* + Draw attention to the value of national water accounts for policy-makers by talking about their own experiences in using such data to make key economic decisions (Australia; South Africa; others?)
  + Commit to strengthening their own national water reporting systems by implementing a Water Accounting approach
  + Support data gathering efforts for the measurement of SDG6, and particularly SDG 6.4 on the efficiency of water use, which requires ….
  + Encourage cooperation among global water actors to accelerate the continued development and implementation of a Water Accounting standard, including encouraging the commitment of resources to support the application of Water Accounting methods in priority countries.

1. Encourage the reversal of the current trend towards declining hydromet data by encouraging national and regional investments in hydromet networks, including in data for disaster risk management;

Panel members are in a position to:

* + Advocate through demonstration by increasing and/or drawing attention to domestic investments in water data, particularly for those indicators relevant to SDG monitoring;
  + Linking water data to the ability of a country – including businesses, cities and communities – to increase its ability to management disaster risks, particularly flood and drought management. This will help to place water data at the center of economic resilience in some countries;
  + Cooperate with neighboring countries – especially when sharing a river basin – to develop, operate and maintain compatible hydromet systems and share the data and benefits that flow from this.

1. Mandate a major public communications firm and relevant networks (e.g. Global Poverty Project) to work with relevant water specialists to develop a communications campaign and materials that would help build a shared understanding of the critical role of water in the economy, in the environment, and for all parts of society. This could build on SDG6, as well as some of the fundamental concepts of the Water Accounting approach while simplifying and targeting key messages that would be useful for political leadership to advocate on water.
   * Potential for developing materials and messages that will help communicate complex water issues in simple / powerful ways; possible to start injecting water resource issues into broader public investment planning, economic policy debates, business planning etc. i.e. attempt to bridge the gap between water experts and the farmers, city managers, industry councils, etc. who actually manage water

## Equal access to data

The pace of progress and innovation in EO is rapid. New satellites with greater capabilities are being launched; data from these satellites is becoming more cost-effective and in some cases free; cloud storage and computing platforms are spreading and becoming more economic; and drone technology is now emerging as a rapid and economic way to create local EO data. While this progress is not specific to water, it is highly relevant to water resource management, and as a result, the pace of progress and innovation in applications to water – including the relationships between water and other land-use changes and therefore the ability to understand water in a more integrated way – is equally rapid.

However, the ability to benefit from this rapid progress and innovation is limited by the ability to handle rapidly growing data volumes (free/open data is expected to increase by a factor of 10 over the next few years); limited computing capacity; slow internet; and low processing knowledge. A number of actors around the world are working on these challenges at the moment, and the HLPW may be able to make a contribution to accelerating progress in at least two areas:

1. **Analysis Ready Data.** The process to move from raw EO data to decision-ready information is a long and complex one, typically involving several months of calibration, noise reduction, xxxxx, and processing. As a result most of this work is done in universities, consultancies or within developed country governments and space agencies and is not accessible to policy makers, businesses, or the public at large. There is therefore a significant inequity in access to data both within and across countries. A number of actors around the world have been working on methods to address this issue for some time:
   * Google has worked with the global forestry community to use its Google Earth engine to display changes in forest cover over time in hotspot areas to the world at large.
   * Australia has developed a “data cube” that stores a time series of pre-processed or analysis ready data covering the entire country and that is freely available to all stakeholders. Given Australia’s water scarcity challenges, a number of applications flowing from this data cube have focused on water.
   * The Committee on Earth Observation Satellites (CEOS), representing 32 civilian space agencies around the world, has identified the development analysis ready data and an associated architecture (such as data cubes) as a key issue to work on.

Panel members are in a position to:

* + Use their convening power to bring together some of the key actors in this space to consider how to accelerate progress towards analysis ready data covering developing countries that can be used for better water resource management. In particular, this would include bringing together a cross section of space agencies, global technology providers, think-tanks, and selected countries to consider how they might work together on this challenge.
  + Consider sponsoring a “Grand Challenge” focused on creating cost-effective approaches to analysis ready data for developing countries.
  + Additional actions based on feedback on this concept note.

1. **Portals and platforms.** Large amounts of both top-down and bottom-up data are being collected and stored in various places, but remain difficult to access in the absence of central portal / organizing framework, as well as open data hosting facilities for smaller collections of data. Since the quantities of data are increasing every day, and the value of data increases with the ability to link it to other data, there is a need for progress. The challenge is not so much the number of trees

Panel members are in a position to:

* + Request UN-Water, building on the work already conducted for the measurement of SDG6 and the World Water Assessment Reports, to produce a brief summary of the current state of water databases, the sustainability of their storage, and gaps in the data and platform architecture.
  + Based on the above summary, to advocate for a clearer and less fragmented collection of water data, including scaled up resourcing to collect, store and organize water-related data at both the global and country levels.
  + Encourage the creation/strengthening of a platform for the organization and hosting bottom-up water data, such as from community water-point mapping exercises, so as to make this data more readily available to stakeholders.
  + Consider sponsoring a “Grand Challenge” focusing on linking bottom-up data to top-down / EO data and making the results part of a broader open data platform.

# Next Steps

1. Discussion by Sherpas

* Links to Grand Challenge
* Roles of Australia plus other countries
* Preparation for Davos

1. Sharing with experts and convening of a multi-stakeholder dialog on this initiative to appraise and improve the feasibility of this initiative, as well as identify what other stakeholders can contribute.

# Annex on Context:

(Based on WRI’s informal data framing note for the HLPW)

## The Challenge

* ***Good water resource management and service delivery requires good data.*** Measuring and monitoring the quantity, quality, spatial distribution, and temporal distribution of water is fundamental to managing it better, whether it be for economic planning, city management, water allocation, drought prediction, flood management, hydropower generation, or any of the myriad of other ways that we rely on water resources.
* ***Water is difficult to measure:***
  + ***Water related services***, including water supply, sanitation, irrigation, and wastewater management, can all be directly measured, but can still present significant data challenges – from household level metering to the financial sustainability of water utilities.
  + ***Water resources*** can be particularly difficult to measure given that water may be on the surface, underground, in soil moisture, ***or*** in the form of liquid, vapor, snow or ice.
* ***Water data is generated*** through direct measurement (e.g. hydromet stations), indirect measurement (e.g. remote sensing), and created through models (local, regional, global etc.). Each approach has pros and cons, but some direct measurement is usually key for calibrating or validating the other approaches.
* ***The last few decades has seen rapid growth in satellite based data but in situ measurement of water resources are in decline globally.*** Groundwater data is particularly lacking given the difficulty of measuring it. Global hydrological models are being used to simulate water systems, but are highly dependent on the quality of data – including in situ data to validate model estimates.
* ***Thanks to innovative public-private partnerships, earth observation techniques are being used to monitor global forest coverage on a daily basis – water resource measurement needs to catch up.*** High resolution satellite data and other analytic methods could provide regular water stock and flow snapshots from the global to local scales. Some dimensions of water quality can also be monitored through similar techniques. But the barriers to routine use are substantial for non-specialists, particularly in developing countries where large data storage, computing power, combined with fast broadband internet connections are in short supply.
* ***Water measurement techniques and data management is fragmented.*** While much excellent work is already been done, and there will always be a need for innovation, a greater degree of standardization in approaches to data capture and analyses is needed. Standardized data can be created through ***common and proven methods,*** be shared more easily, provide better comparisons, and simplify both national and global investments.
* At a higher level, ***SDG 6*** provides a set of goals and initial indicators that the world has already agreed to, and which cover all the key areas of the water agenda.
* At a more granular level, the need for greater standardization has led to a variety of ***Water Accounting*** frameworks being developed to create standardized water ‘balance sheets’ or ‘accounts’ that provide the key information required for better water resource management, and that can be ‘audited’ for monitoring, quality assurance, and accountability purposes.

## Ongoing Activities:

Following is a brief overview of the key actors and activities currently underway around the world associated with the global water data challenges described in Section 1:

* ***SDG 6 monitoring process.*** The UN system developed a number of global monitoring approaches for the MDGs, including the Joint Monitoring Program (JMP) – which, like the MDGs, focused on water supply and sanitation. For the new SDG targets including water quality, water use efficiency, integrated water resources management, and water-related ecosystems, a new integrated global monitoring initiative for water and sanitation related SDG targets, GEMI, was established in 2014[[1]](#footnote-1). GEMI is an inter-agency initiative composed of UNEP, UN-Habitat, UNICEF, FAO, UNESCO, WHO, and WMO operating under the UN-Water umbrella. The first phase of GEMI implementation (2015-2018) will focus on the development of monitoring methodologies to be integrated into a Monitoring Guide for use in countries, and the establishment of a global baseline. GEMI will take advantage of (and is intimately involved in) the other water data efforts described below.
* **Global hydrological modeling.** There are many global hydrologic models (GHMs), some of which focus more on particular aspects of the global water cycle, such as water demand and consumption, surface and groundwater interactions, land and water data assimilation, vegetation and crop water demand, and water and snow dynamics. Some of the best known integrated models include those developed by Utrecht University (PCR-GLOBWB), NASA (GLDAS), and University of Kassel (WaterGAP).
* **Satellite earth observation applications.**  This is a rapidly evolving space because of technology improvements, analytic innovations, and a growing recognition of the importance of mainstreaming these applications through Analysis Ready Data (ARD). Some of the leading research institutes and scientists include UNESCO-IHE ( ET and water accounting, particularly for agriculture), University of Maryland and NOAA ( development of the Atmosphere Land Exchange Inverse (ALEXI) model, used to monitor continental evapotranspiration, soil moisture, and drought), the European Space Agency (ESA) and NASA with their Tiger-Net and Servir initiatives focused on building access to water-related EO data in developing countries, Daugherty Water for Food Institute at the University of Nebraska (water productivity of agriculture), and the Australian Geosience Institute and CSIRO (development of the data cube, a key form of ARD), among others. More broadly the Committee on Earth Observation (CEOS), representing the major civilian space agencies, is seeking ways to globalize and popularize ARD.
* **Local modelling tools.** This is also a well-populated space. One of the leading tools is the Water Evaluation and Planning (WEAP) System by the Stockholm Environment Institute (SEI), widely used for river basin modeling and available in 17 languages. Other models include Colorado State University’s MODSIM-SS, the Technical University of Valencia’s AQUATOOL, and RIBASIM developed by Deltares (independent Dutch research institute), as well as many other catchment and basin modeling tools and applications developed by other universities, research institutes, and consultants.
* **Online platforms.** Tools that bring together and present water “raw” data via an online platform follow basically four types:
* *Databases of key water indicators.* The FAO’s Aquastat, the WMO’s xxx, WBG WDI etc.
* *Data analysis and visualization platforms.* Leading tools include World Resources Institute’s Aqueduct™ tool, World Wildlife Fund’s Water Risk Filter, and the Water Footprint Network’s interactive tools.
* *Data warehouses/clearinghouses.* Leading actors in this space include the University of Texas Center for Research in Water Resources, and the U.S. Water Partnership’s H2infO, among others.
* *Big data processing and storage.* Google has begun discussions with outside water experts on how it might provide an online platform of water data using Google Earth Engine.
* **Mobile phone-based geospatial data collection tools.** Rapid advances in the field of mobile phone-based and geospatial data collection tools make them attractive technologies for measuring WASH facilities in schools and health clinics and solid waste collection and treatment facilities, among other opportunities to collect information on the type, location and functionality of water and sanitation infrastructure[[2]](#footnote-2).

1. See <http://www.unwater.org/gemi/en/> [↑](#footnote-ref-1)
2. See UN Sustainable Development Solutions Network (2015), “Data for Development: A Needs Assessment for SDG Monitoring and Statistical Capacity Development. Available at http://unsdsn.org/resources/publications/a-needs-assessment-for-sdg- monitoring-and-statistical-capacity-development/. [↑](#footnote-ref-2)