UN-Water Recommendations for a Potential Global Goal on Water

Prepared by the UN-Water SDG Working Group

For discussion at the 19th UN-Water SPM meeting

This paper is the result of a consultation process including UN-Water members and partners. It proposes a set of targets and indicators to support a dedicated water goal and is conceived as a contribution to the Sustainable Development Goal (SDG) consultation process as well as to the discussions on the post-2015 development agenda. The paper draws upon content from multiple sources including, but not limited to, the reports of the High Level Panel of Eminent Persons on the Post-2015 Development Agenda (HLP), the UN Sustainable Development Solutions Network (SDSN), the UN Global Compact (UNGC), the UN Development Group (UNDG), the intergovernmental Open Working Group on sustainable development goals (OWG), as well as the results of the various thematic, national and regional consultations.

Contents

1 Why do we need a Sustainable Development Goal on water?

Water is the lifeblood of the planet and of critical importance for all socio-economic development and for maintaining healthy ecosystems. It plays a key role in the production and preservation of benefits and services for humans such as food and energy production. Water is at the heart of adaptation to climate change as it serves as the fundamental link between the climate system, human society and the environment.

For these reasons alone the development of a dedicated global goal on water would help to shape human development in coming decades. Such a goal and associated target areas would ensure that a concerted global effort is taken both to develop water supplies and sanitation services for all human domestic needs, but also to ensure that water – as a resource – remains of high quality, and is managed equitably and efficiently, in order to continue supporting all other efforts at eradicating extreme poverty by 2030.

Managing water sustainably to meet today's needs and future demands is more urgent now than ever before, as much is at stake. Continuing population growth and urbanization, rapid industrialization, and expanding and intensifying food production are all putting pressure on water resources and increasing the unregulated or illegal discharge of contaminated water within and beyond national borders. This development is occurring at a time when billions of people already lack access to even the most basic water supply and sanitation services. This situation presents a global threat to human health and wellbeing, with both immediate and long term consequences for efforts to reduce poverty whilst sustaining the integrity of our freshwater ecosystems on which we depend[1].

In many basins wasteful water use and pollution is already incurring immense costs and negative impacts that translate into environmental degradation and uneven access to both the direct and indirect benefits of water. Over 1.7 billion people are currently living in river basins where water use exceeds recharge, leading to the desiccation of rivers, depletion of groundwater and degradation of ecosystems and the services they provide[2].

As countries develop and populations grow and urbanize, their demand for water is projected to increase by 55% by 2050[3]. Already by 2025 two thirds of the world's population could be living in water-stressed countries if current consumption patterns continue[4]. Water supply crises have been identified by industry, government, academia and civil society as one of the top three global risks[5]. At the same time climate change is anticipated to increase the spatial and temporal

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[1] UNEP and UN-Habitat (2010): Sick Water: The Central Role of Wastewater Management in Sustainable Development, UNEP and UN-Habitat, Nairobi

[2] High Level Forum (2013): http://www.unwater.org/downloads/High-Level-Forum-Outcome-Statement-22Mar2013.pdf

[3] OECD (2012): *Environmental Outlook to 2050*. OECD, Paris.

[4] UNESCO (2009): UN World Water Development Report, UNESCO, Paris.

[5] World Economic Forum (2013): *Global Risks 2013: Eighth Edition*, World Economic Forum, Davos.

variability of water availability, as well as the frequency and magnitude of extreme events such as floods and droughts, which are already on the rise[6].

Freshwater is central to the three dimensions of sustainable development – social, economic and environmental. Water underpins societies and economies, and its effective management and protection is a basic requirement for all human well-being and development as well as the health of ecosystems and the services they provide. As water becomes scarcer in absolute and economic senses, the poorest and most vulnerable people bear the highest costs of diminishing and degrading water resources – directly challenging the fundamental objective of ending poverty.

Creating a dedicated goal on water provides a unique opportunity to address this situation. A goal on water will serve to ensure that water is managed to contribute to poverty eradication, gender equality and universal human development, while conserving the Earth's finite and vulnerable water resource base for current and future generations[7].

2 Building on existing commitments and experience

Work towards a post-2015 development agenda and a set of SDGs that include a goal on water needs to recognize and build upon successive commitments and previous experiences. The sub-headings in this section reflect the need to consider access to services with uses, along with the human, economic and environmental impacts and benefits; as well as the outcomes from the UN Conference on Sustainable Development held in Rio de Janeiro in June 2012 (Rio+20), which define agreed development priorities for inclusion in the post-2015 development agenda.

2.1 Access to water supply and sanitation services

The Millennium Development Goals (MDGs) aimed to halve the proportion of people without access to safe water and sanitation between 1990 and 2015. 768 million people still do not have access to improved drinking water sources and existing indicators do not address the safety and reliability of water supplies. The MDG target for sanitation is one of the most off-track, with 2.5 billion people currently lacking access to improved sanitation and over one billion still practicing open defecation; at current rates of progress, this target will be missed by over half a billion people.

The Human Right to Water and Sanitation, derived from ICESCR General Comment No.15 of 2002 and reaffirmed by resolutions of the UN General Assembly and the UN Human Rights Council in 2010, places legally binding obligations on all member states to make provision for progressive

[6] IPCC (2012): Summary for Policymakers: A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge and New York.

[7] It is recognised that water needs active consideration and integration into other relevant SDGs.

realization[8] of the right. Consequently, building on the existing MDGs and addressing "unfinished business" must remain a very high priority.

2.2 Sustainable use and development of water resources

A succession of high-level political declarations and negotiated documents over the last 20 years highlight the ambition of UN member states to improve the development and use of their water resources. These include the Earth Summit (Agenda 21, 1992), and the World Summit on Sustainable Development (Johannesburg Plan of Implementation, 2002), where countries committed to improving the integrated management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.

Recent results from a UN survey of more than 130 countries show that there has been widespread adoption of integrated approaches to water management worldwide, but significant challenges remain[9]. Without the required attention to the progressive decline in the sustainable use and development of water resources and the ecosystems which serves to provide them, the challenge of balancing water supply between multiple users and uses can be expected to accelerate[10]. As in the case of access to water supply and sanitation services, there is a clear need to address "unfinished business".

2.3 Improving water quality and wastewater management

In stark contrast to the "unfinished business" of service access and sustainable use and development above, the area of water quality has to date been very much neglected. This is perhaps most clearly demonstrated by the fact that 80% of wastewater is discharged to the natural environment without any form of treatment[11] [12].

With global water quality projected to continue to decline, the obvious impact of poor water quality on increasingly limited water supplies is becoming an issue of serious concern[13]. Moreover, there is growing recognition that the management of wastewater and protection of water quality is a prerequisite for ensuring sustainable development, poverty alleviation, job creation, human and environmental health and people's well-being. This concern and recognition was very clearly expressed at Rio+20 (see below).

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[8] The principle of 'progressive realization' acknowledges that some rights may be difficult in practice to achieve in a short period of time, and that states may be subject to resource constraints, but requires them to act as best they can within their means, to the maximum of their available resources, and including the adoption of legislative measures.

[9] UNEP (2012): *The UN-Water Status Report on the Application of Integrated Approaches to Water Resources Management,* UNEP, Nairobi

[10] UNEP (2005): *The Millennium Ecosystem Assessment*, UNEP, Nairobi

[11] UN-Water Task Force on Wastewater Management (2013): *Wastewater Management and Water Quality: Input Paper for UN-Water SDG Working Group*, Internal working document

[12] Wastewater can be defined as a combination of one or more of: domestic effluent consisting of blackwater (excreta, urine and faecal sludge) and greywater (kitchen and bathing wastewater); water from commercial establishments and institutions, including hospitals; industrial effluent, storm water and other urban run-off; agricultural, horticultural and aquaculture effluent, either dissolved or as suspended matter. UNEP and UN-Habitat (2010): *Sick Water: The Central Role of Wastewater Management in Sustainable Development*, UNEP and UN-Habitat, Nairobi

[13] OECD (2012): *Environmental Outlook 2050: The Consequences of Inaction*, OECD, Paris

2.4 Rio+20: The starting point for a post-2015 development agenda

The Rio+20 conference allowed for reflection on progress towards sustainable development over the previous 20 years, with a view to agreeing upon development priorities for inclusion in a post-2015 development agenda. These priorities were outlined in the outcome document, "The Future We Want" [14], which explicitly recognizes "that water is at the core of sustainable development". Furthermore, while reconfirming previous commitments made in the Johannesburg Plan of Implementation and Millennium Declaration, as well to the human right to safe drinking-water and sanitation, at Rio+20 Member States committed to[15]:

- the progressive realization of access to safe and affordable drinking-water and sanitation for all;
- significantly improve the implementation of integrated water resources management at all levels as appropriate;
- protect and sustainably manage ecosystems, as they play a key role in maintaining water quantity and quality;
- address water-related disasters, such as floods and droughts, as well as water scarcity;
- significantly reduce water pollution, increase water quality and significantly improve wastewater treatment;
- improve water efficiency and reduce water losses.

3 Positioning water within the post-2015 agenda

Since Rio+20 there has been a wide range of follow-up post-2015 consultation initiatives aimed at elaborating water priorities based on various perspectives. These include, but are not limited to, the global consultation (The World We Want 2015)[16], African Ministers' Council on Water regional consultations held in Monrovia and Tunis in early 2013[17], and a series of 22 national stakeholder consultations facilitated by the Global Water Partnership bringing together over 1,000 representatives of government, private sector, academia and civil society, both from within and without the water sector[18]. In addition to this, expert reports, such as those from the High Level Panel on the post-2015 development agenda and the UN Global Compact support a dedicated goal and targets on water in their post-2015 proposals[19]. This was reiterated in the

[14] A/RES/66/288. The Future We Want – Outcome Document of the Rio+20 Conference.

[15] The many linkages between water and other priority areas are also reflected in the Rio+20 outcome document, where references to water are included in, but not limited to, sections on: food security and nutrition and sustainable agriculture; sustainable cities and human settlements; health and population; biodiversity; desertification, land degradation and drought.

[16] http://www.unwater.org/worldwewant.html

[17] http://www.amcow-online.org/index.php?option=com_content&view=article&id=302&Itemid=164&lang=en

[18] http://www.gwp.org/gwp-in-action/News-and-Activities/Country-Consultations-on-Water-Speak-to-post-2015-Agenda/

[19] http://www.post2015hlp.org/; http://www.unglobalcompact.org/

recent progress report of the work of the OWG's first four sessions[20] where there was broad support for a water SDG due to the complex interrelations among various water-related concerns and the need for an integrated approach that would be better realized under a dedicated water SDG.

It was anticipated that targets could cover equitable, universal and sustained access to safe water, sanitation and hygiene, the sustainable development, management and use of surface and groundwater resources, including respecting ecosystem requirements, reduction of water pollution and collection and treatment of used water and wastewater, and reduced exposure to and impacts from floods, droughts and other water related disasters. A key cross-cutting element could be enhanced water co-operation and improved water governance.

Taken together, a consistent priority that emerges is achieving a balance between the competing uses and users of water for various purposes. This includes meeting basic human needs, meeting productive needs and maintaining ecosystems, not just in and of themselves, but because of the interdependency between the natural, social and economic values of water. Strengthening institutions and improving water governance is viewed as critically important, to manage risks and achieve desired development outcomes. In addition, there is broad recognition that the water challenge goes beyond "access to water supply and sanitation services for all" to encompasses water resources, wastewater management and related issues of water quality. The need to link access to services with uses and the human and environmental impacts is a critical challenge that needs to be addressed by the SDGs in the coming 15 years.

Possible post-2015 development goals need to address three priority areas, which broadly correspond to the dimensions of sustainable development and contribute towards poverty reduction: 'healthy people' (raising the floor by addressing minimum basic needs), 'shared prosperity' (sharing the available benefits), and 'healthy ecosystems' (minding the environmental ceiling by taking note of resource boundaries)[21]. In support of this approach water-related concerns can be grouped under three distinct areas: 1) universal access to water, sanitation and hygiene 2) sustainable use and development of water resources, and 3) improving water quality and wastewater management. These priority areas can directly support a goal on managing water to sustain people and the environment.

4 A proposed water SDG framework

The intention with UN-Water's recommendation for a potential global goal on water presented in this paper is to inform and contribute to the on-going process of shaping the post-2015 development agenda. The proposed water goal is shaped by the priorities agreed at the Rio+20 conference and draws upon content from multiple sources including, but not limited to, the

[20] http://sustainabledevelopment.un.org/content/documents/1927interimreport.pdf

[21] Reports of the High Level Panel of Eminent Persons on the Post-2015 Development Agenda (HLP), the UN Sustainable Development Solutions Network (SDSN), the UN Global Compact (UNGC), and the UN Development Group (UNDG).

reports of the High Level Panel of Eminent Persons on the Post-2015 Development Agenda, the UN Sustainable Development Solutions Network, the UN Global Compact, the UN Development Group, the intergovernmental Open Working Group on SDGs, as well as the results of the various thematic, national and regional consultations.

The goal on water is built round the emerging consensus to the structure of an SDG of having an aspirational goal supported by a limited number of measurable and time bound targets together with indicators to permit measurement and reporting of progress. The proposed framework can be tailored and scaled for different national institutional and policy contexts to arrive at a conceptual framing of the water SDG that is universal and responsive to national circumstances as discussed at the 4^{th} session of the OWG. The close interdependence between water and several of the discussed SDG themes such as food, land, energy, health, biodiversity and climate changes also calls for an adaptable framework to capture these connections.

A broad water goal is proposed, reflecting the fundamental importance of water to both humans and the environment. It underscores the deeply-embedded relationships between human well-being and the capacity for the environment to provide key ecosystem services and environmental capital. The water cycle connects the access, use, development, pollution and risks associated with water. Therefore the water SDG framework is structured into three thematic priority areas and two cross-cutting targets to capture these inter-linkages. It will ensure that a concerted global effort is taken both to develop water supplies and sanitation services for all human domestic needs, but also to ensure that water – as a resource – remains of high quality, and is managed equitably and efficiently, that wastewater is collected, treated, where appropriate reused and water quality improved in order to continue supporting all other efforts at eradicating extreme poverty by 2030.

Once agreed, the SDG on water will require concerted effort to implement. UN-Water members and partners can thereafter play a critical role in overseeing, monitoring and reporting against the goal and targets. UN-Water members and partners can support the implementation of the full water SDG framework. In common with all delivery challenges, it will involve breaking the pattern of creating plans and studies but not taking real action. This will require more and better skilled staff in government and the private sector. Costs of capacity development cannot be overlooked and should be investigated as a priority, especially in support of low-income countries.

The overarching goal “water managed to sustain people and the environment” and its associated structure is presented in the figure below; targets proposed are accompanied by suggested indicators, further details on which are set out in section five. Some associated costs and benefits are outlined in Annex 1.

GOAL

Water managed to sustain people and the environment

Universal access to water supply and sanitation

Targets by 2030

- No one practices open defecation
- Everyone has water, sanitation and hygiene at home
- All schools and health centres have water, sanitation and hygiene
- Water, sanitation and hygiene are sustainable and inequalities in access have been progressively eliminated

Sustainable use and development of water resources

Targets by 2030

- Bring freshwater withdrawals in line with sustainably available water resources while increasing water productivity for all uses by [x%]
- Maintain a threshold level of environmental flows in all countries [of y%]

Improved water quality and wastewater management

Targets by 2030

- Reduce both the urban population with untreated wastewater and untreated industrial wastewater flows by [x%]
- Increase urban and industrial wastewater reused safely by [y%]
- Reduce nutrient pollution from agriculture by [z%]

Crosscutting targets by 2030

- Improve resilience to floods, droughts and other water related disasters of all people by [x] and economies by [y]
- Improved governance and integrated management systems for freshwater and sanitation in place in all countries in accordance with national targets

4.1 Universal access to water, sanitation and hygiene

Proposed targets by 2030[22]:

Target 1. : No one practices open defecation

Target 2: Everyone has water, sanitation and hygiene at home

Target 3: All schools and health centres have water, sanitation and hygiene

Target 4: Water, sanitation and hygiene are safe and sustainable and inequalities in access have been progressively eliminated

The proposed targets for universal access to water, sanitation and hygiene follow the recommendations of international expert consultations facilitated by the WHO/UNICEF Joint Monitoring Programme during 2011 and 2012 which build on the existing MDG targets and address their shortcomings. The resulting proposal reflects a broad consensus among sector professionals and widely endorsed through the global water thematic consultation, that global post-2015 development goals should aim to achieve universal access to water supply, sanitation and hygiene.

A key feature of the structure of the targets is the focus on both increasing levels of service and numbers of people served. This is a significant development beyond the MDG targets, which focused on achieving a basic level of service only and greater emphasis placed on the actual use of water and sanitation services and that services are safe and sustainable.

The target is that by 2030, everyone will use a basic drinking water supply and have access to sanitation and hand-washing facilities when at home, and all schools and health centers will provide all users with a basic drinking water supply and access to sanitation. The removal of open defecation by 2025 is an important milestone as is the progressive elimination of inequalities. The process of achievement will involve progressively reducing and eliminating inequalities between rich and poor, urban and rural populations, slums and formal urban settlements, and between disadvantaged groups and the general population. Building on disaggregated data for these categories, the reduction of inequalities will be measured, and progress calculated, each year leading up to the date universal access is achieved.

[22] To achieve universal access to adequate sanitation at the global level by 2040 the access target by 2030 is 90%.

4.2 Sustainable use and development of water resources

Proposed targets by 2030:

Target 1: Bring freshwater withdrawals in line with sustainably available water resources while increasing water productivity for all uses by [x%] by 2030.

Target 2: Maintain a threshold level of environmental flows in all countries [of x%] by 2030.

Demand for water to serve growing food, water supply and energy needs will substantially increase in coming decades. Combined with uncertainty over future water availability under the impact of global warming, these factors make it imperative that resource governance and management continue to strengthen at all levels.

The proposed targets on water use and development focuses attention on securing and balancing the benefits of using the resource more efficiently and sustainably whilst improving the provision of water for environmental needs. Improving the efficiency of water use is emphasized and it explicitly builds in equity and the importance of all water uses, including for ecosystem services and livelihoods. It incentivizes action to reduce pressures on water resources that damage ecosystems, while encouraging responsible water resources development in those countries with significant unmet demand and exploitation potential.

Emerging from this target area is the concept of 'sustainably available water resources' (SAWR). This is conceived of as a way to overcome constraints to measuring progress on WRM. This provides a means to indicate whether water – ground, soil moisture and surface flows – is being managed in a sustainable way, balancing the social, economic and environmental demands and benefits for current and future generations. It takes the 'total available renewable water resources' in a country or basin and allocates a 'headroom' (or environmental flow) for critical environmental requirements and the delivery of essential ecological services.

The available renewable water resource comprises the total sum of surface and groundwater available to a country. It may also include any 'new' water, e.g. from reuse/recycling or from desalination.

4.3 Improved water quality and wastewater management

Proposed targets by 2030

Target 1: Reduce both the urban population with untreated wastewater and untreated industrial wastewater flows by (x%);

Target 2: Increase urban and industrial wastewater reused safely by (y%);

Target 3: Reduce nutrient pollution from agriculture by (z%).

The proposed targets involve managing the human and environmental impacts of poor wastewater management – including increasing re-use of wastewater for productive purposes. Whilst noting that sanitation, wastewater management and water pollution are often closely linked together, the separation of this target reflects the growing urgency of wastewater management and prevention of water-related pollution, including the significant public health, environmental and economic benefits deriving from improved wastewater management.

The High-Level Panel on the Post-2015 Development Agenda suggested a target to recycle or treat all municipal and industrial wastewater prior to discharge. The Rio+20 outcome document stressed the need to adopt measures to 'significantly reduce water pollution and increase water quality, (and) significantly improve wastewater treatment'). The health benefits significantly enhance those from sanitation – including reduced incidence of waterborne and water-washed diseases.

Additional and important health benefits also result from positive impacts on the environment, including improved water quality in rivers and lakes as decreased eutrophication of rivers, lakes and coastal areas improves ecosystem functioning in these areas and, by extension, provides improvements in ecosystem services that support beneficial social and economic activities.

4.4 Proposed cross-cutting targets

Proposed target by 2030:

Target 1: Improve the resilience of all people (by x) and economies (by y) to floods, droughts and other water-related disasters.

Target 2: Improved governance and integrated management systems for freshwater and sanitation in place in all countries in accordance with national targets set

Floods, droughts and windstorms are the most frequently occurring natural disaster events and account for almost 90% of the 1000 most disastrous events since 1990. Between 1980 and 2006 the number of people affected and estimated damages from water-related disasters have increased.[23] Climate change is anticipated to increase the frequency of heavy precipitation over many areas of the world, and to intensify droughts in some seasons and areas. Water management and development strategies have a pivotal role in reducing the exposure and vulnerability of people and assets to water-related extremes.

The proposed target 1 focuses attention on policy and action to reduce disaster risks (reducing exposure and vulnerability) as well as on policy and action to aid recovery. Exposure to floods and droughts is forecast to be the biggest driver of disaster risk between 2015 and 2030. Indicators of disaster impact (e.g. economic losses, mortality) meanwhile capture public and political attention. The wording puts 'people' first to emphasize equity, while also stressing 'economies' to underscore the fact that disasters can constrain growth especially in vulnerable economies. The target put emphasis on floods and droughts but retains scope to include other water-related hazards (e.g. major pollution events and windstorms) where these are relevant to countries.

The proposed target on water governance underpins all the water sub-themes. It directly responds to the Rio+20 outcome report that reaffirmed government commitments to key governance principles. These include progressive realisation of the human right to safe drinking water and sanitation; integrated water resources management (IWRM), water quality management; [24] and international cooperation and assistance, especially for developing countries (capacity building, resource mobilisation, technology transfer). The target further builds on the 2012 UN-Water Status Report as presented to the Rio+20 meeting (UNEP 2012) and the GLAAS report (WHO and UN-Water 2012). Both these initiatives arise from a recognition that equitable and sustainable outcomes in water depend on accountable and integrated management. The status report clearly shows the need to move beyond plans to accelerate implementation of an IWRM approach. A key message from the UNICEF/WHO joint monitoring process is the need to focus on tackling persistent inequities in WASH and building systems to sustain services. This is an enabling target to ensure the relevant policies and plans, institutions and management instruments are in place to improve water governance and management of water resources and services, including sanitation and water quality aspects. As such, the target aims to enable the desired outcomes, and underpins the other targets which focus more on outcomes.

[23] Adikari, Y. and Yoshitani, J. (2009) Global Trends in Water-Related Disasters: An Insight for Policymakers. ICHARM, Tokyo

[24] Agenda 21, Chapter 18 and the IWRM and Water Efficiency plans agreed in the Johannesburg Plan of Implementation

5 Towards measurable indicators[25]

5.1 Indicators for the WASH targets

Detailed definitions have been proposed by the JMP working groups[26] for the terms used and the minimum levels of water, sanitation and hygiene service considered acceptable in different settings. Wherever possible these build on existing standards and provide a valuable basis for continued development and refinement of post-2015 WASH targets.

Definitions and indicators also a need to align with the right to water and sanitation and in particular its 6 axes of: Availability, Safety, Acceptability, Accessibility (including reliability), Affordability and Equity.

The definitions and indicators specify the ambition of the targets such as the maximum time that should be spent collecting water from a source considered basic and the minimum quality of water to be provided by an intermediate supply. The sanitation definition specifies which types of sanitation are acceptable and how many people could share a sanitation facility which is a development beyond the MDG targets. The hygiene definition specifies standards for hand washing and menstrual hygiene management facilities. Detailed definitions outline the minimum levels of service in schools and health centres based on existing WHO standards. Further work is required to refine the existing list of definitions and indicators and where necessary add new ones. Further work will also be required in order to expand data accessibility and establish a baseline for monitoring post-2015 targets. The JMP working groups recommended building on and enhancing existing monitoring systems and exploring how these might be combined with new emerging sources of data in future.

The JMP proposals call for data to be disaggregated by four population groups (rich and poor, urban and rural, slums and formal urban settlements, disadvantaged groups and the general population). Building on these disaggregated data, the reduction of inequalities can be measured, and progress calculated in each year leading up to the date universal access is achieved. The targets will only be considered achieved if they are met for all relevant income and social groups. The JMP Working Group proposals provide a detailed methodology for measuring and monitoring progress on the way inequality could be measured, addressed and eliminated in practice.

5.1.1 Indicator A1 for: No one practices open defecation

- Percentage of population reporting practicing open defecation.

5.1.2 Indicator A2 for: everyone has access to drinking water and sanitation and hygiene at home

[25] The large number of indicators discussed in this section needs to be linked to in-country data availibility in order to be populated

[26] http://www.wssinfo.org/post-2015-monitoring/working-groups/water/

- Percentage of population using a “basic” drinking water service at home.
- Percentage of population with basic hand washing facilities in the home.
- Percentage of population using an “intermediate” drinking water service at home.
- Percentage of population using an adequate sanitation facility.
- Percentage of population living households whose excreta are safely managed.

5.1.3 Indicator A3 for: All schools and health centres have drinking water and sanitation and hygiene

- Percentage of pupils enrolled in primary and secondary schools that provide basic drinking water, adequate sanitation and adequate hygiene services.
- Percentage of beneficiaries using hospitals, health centres and clinics providing basic drinking water, adequate sanitation and adequate hygiene.

5.1.4 Indicator A4 for: water, sanitation and hygiene sustainable and inequalities in access have been progressively eliminated

- Percentage of population using water and sanitation service providers registered with a regulatory authority
- Percentage of population in the poorest quintile whose financial expenditure on water, sanitation and hygiene is below 3% of the national poverty line.
- Ratio of annual revenue to annual expenditure on maintenance (including operating expenditures, capital maintenance, debt servicing) and ratio of annual expenditure on maintenance (including operating expenses, capital maintenance, debt servicing) to annualized value of capital assets.
- Percentage of raw water quality tests within national standards for faecal contamination and either ratio of water production (lpcpd) to total water consumption (lpcpd) or per capita renewable water resources.

5.2 Sustainable use and development of water resources

The institutional implications range from developing monitoring capability, to building workable systems to assign and assure water allocations to more efficient and productive uses, to enhancing human capacity at all levels. Data to monitor progress is already available, but requires enhancement.

Target B1 proposes a new concept of ‘sustainably available water resources’ (SAWR) to overcome constraints to measuring progress on WRM. This presents a breakthrough by providing a means to indicate whether water is being managed in a sustainable way balancing the social, economic and environmental demands and benefits for current and future generations. It takes the ‘total available renewable water resources’ in a country or basin and allocates a ‘headroom’ (or environmental flow) for critical environmental requirements and the delivery of essential ecological services.

The available renewable water resource comprises the total sum of surface and groundwater available to a country, including any transfers from one country to another under any trade or other agreement. It may also include any 'new' water, e.g. from reuse/recycling or from desalination. Mining non-renewable groundwater may be justified where parallel investments are made for long-term substitutes. Temporary depletion of renewable groundwater can also be justified where it makes storage available for wet season recharge, reducing flood risk.

The first two indicators below are identified as most relevant globally and are therefore proposed for use should indicators be defined at global level. Other possible indicators are also identified to provide a menu of options should indicators be selected by countries.

5.2.1 Indicator B1: Sustainable water use ratio (withdrawals as % of sustainably available water resources)

This balances for water resources the 3 dimensions of sustainable development: social, economic and environmental. It requires definition across all countries of 'sustainably available water resources', the base reference is Total Actual Renewable Water Resources (TARWR), already collated from countries in the UN-Water Federated Water Monitoring System (FWMS). New technologies and techniques are available to enhance and cross-check estimates of TARWR, as well as of withdrawals. Methodologies developed at global[27] and country level (e.g. South Africa) provide a template.

5.2.2 Indicator B2: Water productivity index (TBC, e.g. value added across main water-using sectors per m3 withdrawals or consumptive use)

This indicator is proposed for use to measure the second part of the target ('increasing water productivity for all uses by [x%]') in the event that indicators and targets are set at global level. Further work would be needed to identify a feasible metric, likely a proxy or simple composite index, covering different sectors and values of water (including those harder to cost). It incentivizes more productive uses of water and could underpin a goal on sustainable production and consumption.

Basic datasets are already available for value added and withdrawals for agriculture and industry. Agricultural withdrawals would need to be disaggregated to highlight the component derived from irrigation. There are, however, a number of methodological challenges to developing water productivity indicators, including the risk that ecosystem services and water for livelihoods are ignored. Measures of consumptive use may be more relevant than withdrawals.

5.2.3 Other indicators which may merit consideration for particular countries include:

[27] Smakhtin, V., Revenga, C. and Doll, P. (2004) Taking into Account Environmental Water Requirements in Global-scale Water Resources Assessments, Comprehensive Assessment Research Report 2, Comprehensive Assessment Secretariat, Colombo.

- Water productivity in industry – value added per m3 withdrawals.
- Unaccounted for water – water for which costs not recovered, as % of total water supplied to city's network.
- Water storage/ irrigated area per capita [28]
- Value of water-related ecosystem services
- Ecosystem health/ biodiversity – key species index
- River fragmentation – dams per km river corridor
- Wetland extent – hectares designated and protected
- Annual groundwater abstraction as % of mean groundwater recharge
- Proportion of water obtained from nonconventional sources
- Brackish/ saline groundwater at shallow and intermediate depths

5.3 Indicators for Wastewater Management, Pollution Prevention and Water Reuse

Whilst the indicators selected have been primarily chosen to drive action and achieve outputs, it is recognized that they could also stimulate countries to review and revise their national standards and regulations with regard to water management in general and wastewater management and pollution prevention in particular. This would also encourage the adoption of standards that are incremental and permit a progressive realization of improvements and that are appropriate to the local context. A progressive approach to the levels of treatment applied needs to be recognized and this is encapsulated in the approach of conformity to national standards. It is also essential that the indicators do not inadvertently set up perverse incentives and encourage governments to pursue objectives that may not be in the national best interest.

To structure the indicators into a logical framework, it is suggested that they are required to address (i) public health protection (ii) protection of the environment (iii) promote the reuse of wastewater and sludges, (iv) support the multiple opportunities of water, nutrient and energy recovery. The indicators should also be consistent with and reflect the "3R" approach of: Reduce pollution (i.e. pollution prevention at source); Remove pollutants (through collection and treatment of industrial and urban wastewater); Reuse and recovery of water and its products (such as nitrogen and phosphorous).

One of the difficulties in identifying a coherent and constrained set of indicators is the wide range of sources of wastewater. Some degree of prioritization is necessary and it is therefore suggested that the indicators address: a) point source and diffuse pollution from urban wastewater, b) point source pollution from large scale industrial and agricultural activities, and c) diffuse pollution,

[28] This indicator can produce perverse incentives in those countries where water resources are substantially developed, with negative implications for ecosystems and society

primarily from agriculture. These are not the only wastewater challenges that exist, but cover the vast majority of the serious ones.

Using this framework enables a critical selection of suggested indicators and their refinement into the limited range of indicators required. The following indicators are proposed:

5.3.1 Indicator C1: Percentage of urban population whose wastewater is contained and collected safely:

A first and essential step in managing the wastewater component of the water cycle is to ensure that wastewater and the pollutants in it are contained and collected safely so that they do not flow in uncontrolled and dangerous ways throughout the human and aquatic environment. The concept of "containment" is included to encourage the isolation of key polluting elements in ways that prevents them entering the general wastewater stream. The challenge of defining "safely" will need to be addressed in a way that is practical and that reflects public health and environmental health benefits.

Collection can include the collection and transfer of specific effluents, including septage and sludge, using discrete processes such as tankers. It should also include sewerage systems and urban stormwater drainage arrangements. There may be some overlap with indicators proposed for WASH and therefore consolidation may be possible.

While the ideal would be to measure and monitor the volumes and concentrations of wastewater, given the current lack of reliable data and the difficulties of measuring volumes, it is suggested that enumerating population is a reasonable proxy indicator. A progressive approach to enumerating population should be taken. This might start with an estimation of the percentage of the population in settlements over a certain size that benefit from safe containment or collection. Ultimately this should be replaced with detailed census type data or records from service providers. Countries that set a higher level of ambition should certainly aim to identify volumes.

5.3.2 Indicator C2: Percentage of urban population whose wastewater is treated to comply with national standards:

Once wastewater has been collected it is necessary for it to be treated to remove harmful pollutants and reusable materials before it is returned to the natural environment. A progressive approach to the levels of treatment applied needs to be recognized and this is encapsulated in the approach of conformity to national standards. It must be recognized that treatment can be done in either individual or collective facilities and processes.

As with collection, the use of population as an initial indicator that can be applied worldwide seems the most practical approach. Countries wishing to set a higher level of ambition should certainly aim to identify volumes of pollution and possibly pollution by source. It should also be noted that it is common practice to measure treatment capacity in terms of "population equivalent". An indicator with its attendant collection and verification regime of this kind is already used by the OECD (15.1 Population connected to sewage treatment).

5.3.3 Indicator C3: Percentage of industrial wastewater flows from facilities not connected to public sewers that are treated to comply with national standards.

Significant flows and pollution loads emanate from industrial sites (including intensive livestock production) that are not connected to public sewerage systems. These flows need to be contained and treated safely before being discharged to the natural environment. It will also be useful for countries to consider how to include effective inventories of polluting sites and polluting substances and to link national regulations with both measures to prevent industrial pollution and create incentives for proper industrial wastewater treatment.

The percentage of volume of wastewater collected and treated under these circumstances is a realistic indicator.

5.3.4 Indicator C4: Percentage of water discharged from urban and industrial/commercial wastewater treatment processes that is safely recovered and reused:

In many locations where water resources are limited or under pressure from multiple demands it is becoming increasingly important to be able to recover and reuse water for other beneficial purposes. Initially, a simple measure of volumes would probably be sufficient. Countries that want to set a higher level of ambition should look to measures that indicate the pollution loads removed and the quality of the treated wastewater reused in relation to the different purposes it is used for (e.g. agriculture, cooling water, industrial processes, ecosystem restoration etc.).

At higher levels of ambition, and taking account of the desirability of a "life cycle" management approach to resources and materials, it would be necessary to have additional sub indicators that encourage, promote and track the recovery of reusable materials, and energy from wastewater, their beneficial use, and reduction in impacts such as greenhouse gas emissions.

5.3.5 Indicator C5: Percentage reduction in priority pollutants from diffuse agricultural sources as reported by regular national monitoring processes:

Recognizing that agriculture produces the greatest load of diffuse sources of nutrient pollution, to monitor and control this is considered necessary to protect the environmental and human health and economic activity. The ultimate objective would be to prevent diffuse pollution occurring, but prevention is something that does not lend itself to being monitored with an output indicator. For this reason, it is suggested that monitoring the levels of priority pollutants in the aquatic environment is the most appropriate approach. This should be combined with policies and regulations that promote pollution prevention.

At the most basic level, this could be done through monitoring and recording, on a regular basis, the loads of "nitrogen" and "phosphorous" pollutants in water bodies. For higher levels of ambition, organophosphates, pesticides, herbicides and persistent organic compounds could be measured. The OECD reports nutrient flows and balances. At the basic level, it might be sufficient to measure and report water quality on a limited range of parameters with a defined frequency at specific points, for example at the embouchure of major rivers or tributaries.

5.3.6 Indicator C6: Percentage of river length and areas of lakes where water quality is impaired by wastewater-related discharges (and runoff).

This is considered an optional indicator. The inclusion of an indicator related to overall water quality has some merit. Such an indicator would reflect the bottom line of a target focused on wastewater management and water quality. While it is one of the more challenging indicators in terms of measurement, it could be included in the set of indicators as it is the only internationally comparable measure of the environmental health of aquatic ecosystems.

This indicator is the only "outcome" indicator potentially available that adequately measures the desired outcome of the target – that is, to improve water quality by reducing wastewater pollution. The metrics for this indicator are readily available in a number of OECD countries (such as Australia, UK, France). The question of benchmarks or baselines can be established with ease in those countries for which data are available. It may not be so straightforward for those countries without established water quality measurement programmes.

The collection and consolidation of such information can be costly and would require the establishment of a capacity development programme for a number of developed countries and most developing countries. The use of ICT to facilitate remote sensing and data collection could reduce the cost and increase the efficiency.

5.4 Indicators for crosscutting targets

5.4.1 Indicators for the target on: Improved resilience to floods, droughts and other water related disasters for all people by [X] and all economies by [y].

All indicators in this section could be included under a disasters target, which could itself be included under a goal on poverty reduction, resilience etc. The proposed indicators include two indicators of impact and two indicators of exposure. For each, the [x%] or [y%] reduction would require setting against current benchmarks and future projections, to maintain ambition and achievability.

- Proportion of population at risk of (x) year flood line or living on flood-plains

  This incentivizes reducing the exposure of the population to flood risk.

- Proportion of population with rain-dependent livelihoods at risk of drought

This incentivizes reducing the exposure of vulnerable populations to risks of drought.

- Loss of life from water-related disasters (mortality per 1000 population, moving average).

  This incentivizes reducing the most critical and emotive impact of natural disasters – loss of life.

- Loss of economic value (as proportion of GDP/ insurance loss).

  The indicator for loss of economic value focuses attention on the politically important economic dimension of impacts and identification and protection of critical infrastructure (hospitals, energy and water networks, transport networks)

- Proportion of population with access to effective early warning systems.

  This encourages the provision of systems to reduce vulnerability by providing advance warning of disaster.

- Plans and strategies to manage flood and drought risk developed and implemented at national and basin levels (% of countries with developed/ implemented plans and strategies).

  This encourages flood and drought disaster risk reduction to be mainstreamed into land use and river basin development and management plans

Modelling of demographic change and remote-sensing to determine land-use can assist in developing dynamic estimates of exposure to flood. Also potential to focus on proportion of population in poverty at risk of flood/ living on flood plain, combining actual and modelled data.

Drought risk is best understood as a function of socio-economic as well as environmental factors and care is needed to disaggregate the relative contributions from these factors.

Multiple sourcing and triangulation of mortality data and development of appropriate baselines (counterfactual level of mortality) needed[29]. Agreement needed on common system for classifying severity of floods needed.

Loss of economic value would need to be established over long periods (e.g. 10 year average) and adjusted for inflation. May be more instructive to assess relative losses (e.g. as a fraction of GDP) rather than total losses.

[29] Guha Sapir, D. and Hoyois, P. (2013) Disaster Deaths. Proposed indicators for monitoring disaster-related mortality. In Mitchell, T., Jones, L., Lovell, E. and Comba, E. (Eds.) Disaster Risk Management in Post-2015 Development Goals. ODI, London.

ICT services likely to play role in early warning systems and monitoring their effectiveness/ coverage.

The data collection for plans and strategies to marry floods and drought risk is qualitative, but requires an agreed framework to score plans and strategies and assess extent of implementation.

5.4.2 Indicators for the target on: improved governance and integrated management systems for freshwater and sanitation in place in all countries in accordance with national targets

The indicators for this target need to measure progress on putting in place and implementing key governance functions. The indicators would cover aspects relevant to all countries acknowledging different contexts, and extend across WASH, wastewater management/ water quality, as well as water resources management.

As many issues are not easily or meaningfully measured by numerical methods, progress would be assessed by using periodic surveys and questionnaires (e.g. at five yearly intervals) starting in 2016 to get a baseline and ending in 2031. The monitoring would thus follow the model established for the GLAAS 2008, 2010 and 2012 reports and the 2008 and 2012 IWRM status reports but would cover a wider cross section of water uses and users (e.g., different survey questions could target the private sector and civil society as well as government).

The surveys would recognize that countries are hydrologically and socially diverse and aim to measure trends on a similar basis for all countries, but not compare country "performance". In accordance with global guidelines for status reporting all governments would set their own specific targets for the different indicators, with time bound programmes of action and financing strategies to achieve their specific targets. This would be an innovative approach that captures the spirit of Rio+20 which calls for targets that take account of different national realities and levels of development. Over time, monitoring of the indicators will help establish what governance reforms lead to what outcomes, in what contexts. The indicators for this target will also provide an early signal of where international and national finance and capacity support needs to focus.

The proposed arrangement puts the onus on each country to take responsibility for implementing water management and water governance reforms. There is a risk of a lack of ambition and temptation to continue with business as usual. The international community would, however, provide guidance for national target setting as part of the periodic reporting so progress can be monitored. Moreover, national targets could be monitored by stakeholders exchanging information on their progress at regional and international forums.

The indicators should focus on the key functions of water governance and management and assess how far these functions are being fulfilled. As such, indicators could focus on the following functions:

- Allocating water: formal or informal systems for allocating water on the basis of environmental, economic and social considerations
- Financing: systems for equitable budget allocation, investment planning, sourcing finance
- Planning: development and implementation of IWRM and water efficiency plans; sector wide approaches; links to other sectoral (e.g. food, health, energy) and national development plans
- Regulating: accountable and transparent mechanisms for regulating services with respect to principles of human rights, transparency, accountability, equity (including gender issues), inclusion, participation and supporting legal frameworks where appropriate
- Human resources: systems for capacity development and knowledge generation and sharing, with focus on marginalized groups (including, but not limited to, indigenous peoples, young people, women and people with disabilities)
- Coordination/joint decision making: institutional frameworks for coordination and cooperation across hydrological, administrative and sectoral boundaries, including transboundary waters
- Assessment, reporting, monitoring and evaluation: systems for gathering, analyzing and communicating water-related data to key stakeholders, internally and externally.

6 Annex 1. Associated costs and benefits

The cost and benefits for the suggested crosscutting targets are integrated in the three thematic headings below.

6.1 Water supply and sanitation

Current evidence suggests that under the most conservative estimates, WASH investments are likely to generate more economic benefits than costs (Hutton, 2012), and that historical spending on WASH has been 'highly cost-effective' on health grounds alone (DfID WASH Portfolio Review, 2012). The most recent estimates suggest that, globally, the benefits of achieving universal access to sanitation outweigh the costs by a factor of 5.5 to 1, whereas for universal access to drinking-water the ratio is estimated to 2 to 1.

Recent estimates put the cost of achieving universal access to a basic water service in developing countries (using existing MDG definitions of improved) at just 5.5% of the USD 111-190 billion per annum that developed countries are projected to spend on their water supply before 2030 (ODI, 2013). Even if the new and more ambitious definition of a basic level of water service were to double the costs, universal access would remain a comparatively low-cost and achievable global goal.

In 2012 WHO estimated the capital cost of reaching universal access to water and sanitation in developing countries (based on the levels of service defined for the MDGs) at approximately USD 535 billion. This works out at about 29.72 billion per year from 2012, not including operation and maintenance. It is anticipated that even with operation and maintenance, and demographic and climate change increasing costs, figures of this order of magnitude are achievable. However, two core challenges remain: establishing sustainable access to higher service levels and increasing levels of public spending. Both challenges require a clearer connection between improved access, savings in curative health service costs, gains in education and job creation, livelihood security and sustainable economic growth.

The proposed target for WASH incorporates a more demanding definition of basic access than that of the MDG targets with a stipulation that water collection should not require a round-trip of more than 30 minutes, and that in urban areas protected dug wells and protected springs should not qualify as basic infrastructure. Including collection time could have a significant impact in both rural areas, where people often have to walk long distances to collect water, and in urban areas, where queues for wells and standpipes can increase collection time.

Access to a basic water supply under the new definition is therefore likely to be far lower than is currently estimated, and the costs of improving services must be increased commensurately; an acknowledgement that in order to achieve substantial socio-economic gains a far higher level of service will be required.

In the most off-track MDG regions of S. Asia, S.E. Asia and Sub-Saharan Africa, 40%-50% of urban water use is 'other improved', of which many will be dug wells and springs which will no longer be considered improved. This has a double impact on cost estimates – it reduces current access estimates, and requires more capital-expensive infrastructure to increase access. The inclusion of universal access to a basic drinking water service in all schools and health centres further increases costs and levels of uncertainty, as disaggregated estimates for current access in these places are not currently systematically collected. For instance, available estimates suggest that around 40-50% of schools are currently not served.

For the intermediate service level, it may be more realistic to compare projected estimates for the developed world, where the assumption is for piped water supply and more advanced systems. According to ODI (Doczi et al 2013, p10) the costs associated with maintaining and extending services in 67 high income countries are in the range of USD111 billion to USD190 billion per year, so with approximately double the number of countries who are middle income countries and low income countries, but applying the lower end of the range in the expectation that they will not be installing the most expensive systems, the costs of universal intermediate services in the developing world may be closer to USD222 billion per annum. An ambition to increase the number of people using piped water at home implies partnerships and more sophisticated, utility-based management systems, which will require greater human resource capacity as well as increased infrastructure costs.

The WHO cost estimates for universal basic sanitation use the existing WHO/UNICEF definition of 'improved'. The definition developed for "adequate" sanitation differs slightly as it includes shared sanitation if facilities are shared among no more than five families or 30 persons, whichever is fewer, and if the users know each other.

The inclusion of some shared sanitation could significantly increase the number of people who are considered served, reducing the costs of reaching universal access. Among countries with less than 90% sanitation coverage under current definitions, on average 13% of the population use shared sanitation services of a type that would otherwise be considered technically acceptable. In a small number of countries, however, the proportion using shared facilities is much higher.

The proposed targets include an interim target of eliminating open defecation. Current practice is to achieve this through promotion and education. The 'software' inputs required have not been adequately quantified. The target that by 2030 excreta is safely managed from at least half the schools, health centres and households with adequate sanitation will significantly add to the cost estimates developed for reaching universal access using the MDG definitions. One estimate of the impact of including this element suggested that figures for those without access would increase from 2.5 billion to 4.1 billion (Baum et al.,) and again the capital expenditure required to provide fully-managed sanitation services is much higher than the basic level calculated by WHO (Hutton 2012).

There are other costs associated with achieving the proposed WASH targets that are difficult to quantify without considerable additional work. These include the costs of strengthening national and global monitoring to track the more complex targets proposed here, and higher management costs associated with the ambition of the targets, such as reaching all un-served remote rural communities and increasing the numbers of people served with piped water on premises, including through utilities.

There are some trends exogenous to the sector that could have significant implications for cost estimates[30]. These include climate related disasters such as related flood and drought situations, which one study, (Fankhauser & Schmidt-Traub, 2010) calculates could raise costs by 50%-100% in Africa, (ODI, 2013). In addition, as urban populations are likely to significantly increase, (both in existing urban areas but also through the growth of small towns and new industrial areas), this will increase the proportion of new infrastructure that must be 'intermediate' and thereby increase the associated costs, although this may also increase revenue available to cover for this.

Improving governance within the field of water supply and sanitation is important for ensuring that gains are both consolidated and built upon. This will require increased investment to build both technical and institutional capacity. With this type of investment, there is potential to recoup significant savings through efficiency gains. The Africa Infrastructure Country Diagnostic (AICD) (Foster and Briceño-Garmendia, 2009) estimates that nearly 75% of current African water supply sector spending was being wasted due to inefficiency (ODI, 2013).

6.2 Use and development of water resources

Meeting this target area will generate significant social, economic and environmental returns. However, assessing the benefits and costs of investment is challenging because multisector impacts are involved. For instance, many of the benefits of water resources interventions are external, and are associated with as-yet un-valued ecosystem services.

Some countries have yet to develop even a fraction of their sustainably available water resources, which is a key element in harnessing these resources for productive uses. Many of these countries are in Africa, where the costs of developing irrigation infrastructure have been estimated at USD2.6 billion and USD17.8 billion, for large-scale (not including storage) and small-scale irrigation, respectively. However, the same analysis estimates respective internal rates of return at 17% and 26%.[31] Without this investment poor countries will struggle to eradicate

[30] See WHO DFID (2009) Vision 2030: The resilience of water supply and sanitation in the face of climate change

[31] Foster, V. and C. Briceño-Garmendia (eds) (2010) Africa's Infrastructure: A Time for Transformation. Africa Infrastructure Country Diagnostic (AICD). The World Bank, Washington DC. http://siteresources.worldbank.org/INTAFRICA/Resources/aicd_overview_english_noembargo.pdf

poverty and hunger, particularly as rainfall patterns become increasingly variable and unpredictable, thus increasing water-related risks in agriculture, energy and other related sectors. Further work is urgently needed to understand country-specific investment needs for water resources management in developing and developed countries alike, taking account of hydrological and economic differences.

Many wealthier countries have already developed their water resources up to and beyond sustainable limits. They are now finding that working in harmony with ecosystems and the services they provide, including providing and regulating freshwater, can actually save money in the longer term. For instance, watershed protection initiatives in the US are estimated to have yielded USD7.5 to USD200, for every dollar invested, compared to conventional water treatment costs.[32]

Examples of the positive impact of water on economic growth and poverty reduction include irrigation in India (rapid decline in rural poverty), hydropower in China (doubling of local GDP). Efficiency savings can also be considerable, even where water is not priced since reducing the water required for a given crop-yield, product or process can save energy and lower other input costs. Making more productive use of available water resources makes economic sense: efficiency savings in irrigated agriculture have been estimated at USD115 billion, globally,[33] achievable in both the informal and formal economy. The direct total net benefit of providing water technology to an estimated 100 million poor farmers worldwide has been put at USD100-200 billion. [34]The value of wetlands for human security has been estimated at USD 15 trillion.

Water-related disasters are the most economically and socially destructive of all natural disasters. Since the original Rio Earth Summit in 1992 floods, droughts and storms have affected 4.2 billion people (95% of all people affected by disasters) and caused USD1.3 trillion of damage (63% of all damage).[35] Analysis of growth and rainfall statistics for most countries in the world indicates that a 1% increase in drought area is associated with a 2.8% reduction in economic growth, while a 1% increase in the area impacted by floods correlates with a 1.8% reduction in economic growth in a given year, with additional possible lagged effects into following years.[36]

The costs to provide enhanced protection against disasters are highly variable, and a single global cost estimate is likely to represent a best-guess. The World Bank has nonetheless estimated the additional costs associated with climate change adaptation, in relation to water resources, to be in the order of USD13-17 billion across all developing countries. This is a combination of hard and

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[32] Emerton, L. and Bos, E. (2004) Value: Counting Ecosystems as Water Infrastructure, IUCN, Gland, Switzerland and Cambridge, UK.
[33] McKinsey Global Institute (2011) Resource Revolution, McKinsey Global Institute
[34] Rijsberman, Frank (2004) The Water Challenge. The Copenhagen Consensus Challenge Paper.
[35] UNISDR (2012) Impacts of Disasters since the 1992 Rio de Janeiro Earth Summit, http://www.preventionweb.net/files/27162_infographic.pdf
[36] Brown, C., Meeks, R., Ghile, Y., Hunu, K. (2013) 'Is Water Security Necessary? An Empirical Analysis of the Effects of Climate Hazards on 13 National Level Economic Growth', *Philosophical Transactions of the Royal Society* (Accepted)

soft investments representing 3% of these countries' total GDP, underscoring the need for the costs of climate change adaptation to be shared globally.[37]

Much of the infrastructure required to make productive use of water – including soil and water conservation measures – can also mitigate its destructive effects – especially in agriculture-dependent economies. Soft investments alongside infrastructure can also increase communities' capacity to anticipate and respond to disasters (such as early warning systems), as well as protecting and restoring ecosystem services. As an example of the latter, the economic value of the Mississippi Delta, if fully costed, has been estimated at between USD330 billion and USD1.3 trillion (in 2007 values), for flood prevention, hurricane protection and other water-related services.[38]

While there is little argument about the necessity of good water governance and associated integrated management approaches, assessing the costs of improving what broadly remains an institutionally fragmented water domain has traditionally proved challenging. However, there is evidence that governance in many countries is not adequately funded and that there is a shortage of information on sustainable financing. It is surprising that in the 21st century very few countries (rich or poor) have any idea of how much they spend on WRM and what value it provides. As the world enters an era of natural resource and financing constraints this is no longer acceptable[39].

6.3 Water quality and wastewater management

There is significant public health, environmental and economic benefits to improved water quality and wastewater management both generally and to improve resilience to floods, droughts and other related disasters. The health benefits are a significant enhancement of those from sanitation – reduced incidence of waterborne and water-washed diseases. There are additional health benefits resulting from improved water quality in rivers, lakes, estuaries and near-shore waters as well as aquifers. The environmental benefits arise from reduced eutrophication of rivers, lakes and coastal areas, leading to increases in the ecosystem functioning of these areas and improvements in the ecosystem services provided. Economic benefits from improved wastewater management include, but are not limited to: reduced pre-treatment costs downstream (for drinking water and industrial/energy purposes); protection of commercial fish stocks and aquaculture; improved living conditions and human well-being (especially in urban areas); increase property and land values for riparian owners; enhanced

[37] World Bank (2010) The Cost to Developing Countries of Adapting to Climate Change. New Methods and Estimates. The Global Report of the Economics of Adaptation to Climate Change Study. Consultation Draft. The World Bank, Washington DC

[38] Batker, D., de la Torre, I., Costanza, R., Swedeen, P., Day, J., Boumans, R. and Bagstad, K. (2010) *Gaining Ground – Wetlands, Hurricanes and the Economy: The Value of Restoring the Mississippi River Delta.* Earth Economics, Tacoma, Washington DC. http://www.eartheconomics.org/Page12.aspx

[39] EUWI (2012): *Financing of water resources management: Experiences from sub-saharan Africa*, EUWI FWG, Stockholm

tourism and leisure activities; increased water supply for irrigation and drinking water; and saving on fertilizers through use of sludge.

Quantifying these benefits is challenging, however. There are very few studies that provide aggregate estimates of the monetary costs and benefits of investment in improved wastewater management and broader water quality governance across the economy or even across a sector. One of the justifications for a wastewater target would be to increase the impetus to identify and quantify such benefits. Studies that have been undertaken have generally focused on local initiatives and cannot be readily aggregated to national or international level. An example of an aggregated study looked at the quantified negative impacts of untreated wastewater discharges into the Bogota River, Colombia. The total annual value of costs linked to the lack of wastewater treatment was estimated at about USD 110 million, including considerable economic damages in different sectors.