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# Water and Sustainability

## A Review of Targets, Tools and Regional Cases

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# Abstract

Governments, international agencies and development practitioners are increasingly engaged in target-setting initiatives to measure the impact of policy actions, assess development outcomes and evaluate aid effectiveness. This report reviews some current sustainability targets for the water sector (where water sector refers to the entire theme of water) and provides an overview of selected tools and approaches to assist decision-makers improve performance and achieve results – and ultimately, meet development targets.

The report reviews three widely known systems of water sustainability targets: (i) the water targets set under the umbrella of the Millennium Development Goals; (ii) the comprehensive water targets established as part of the European Union Water Framework Directive; and (iii) the target-setting process for the 6th World Water Forum.

These target-setting efforts have a strong rationale in that they have brought attention to water issues at different geographic scales and focus on results. However, there are questions about their effectiveness and ultimate impact on development. In many cases, the water targets are unrealistic wish lists, with no connection to existing or potential human, institutional or financial resources, that are generally not well supported analytically and rarely monitored. This report shows that the establishment of water sustainability targets would be more effective if it were to follow a systematic analytical framework; otherwise, there is a danger that targets will be defined casually through ad hoc processes that would be defective for evaluating long-term results, as well as possibly lacking legitimacy and credibility. An analytical framework – comprising a comprehensive definition of water targets specified by five attributes and fifteen analytical questions – is proposed as a tool to formulate and evaluate water targets. In addition, the report argues that targets should be closely linked to results within a framework for measuring the performance of policy actions and the outcomes of implementing development strategies.

The overview of tools to support decisions geared to results and outcomes includes diverse tools covering water resources management, water services and cross-sectoral approaches, as well as tools that are applied at country and project levels. The overview also focuses on wider UNESCO priorities such as gender equality and Africa. As shown in the report, problems in water resources management come about not from the lack of tools but from their application, which requires decision-making. These decisions are made or influenced by leaders in government, the private sector and civil society, who must learn to recognize water's role in achieving their objectives. These leaders and other professionals in the water resources sector should work very closely with decision-makers in an 'out of the box' fashion to achieve better policy outcomes.

The report presents five cases to highlight some of the practices followed to set water sustainability targets. These cases are distributed along the five UNESCO regions and include four river basins of different size (Danube, Mekong, Zambezi and Nile) and a large aquifer (Guarani).

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# Acknowledgements


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# Introduction

## 1 Objectives

The main purpose of this report is to contribute to the ongoing debate in the international development community on targets, tools and current practices related to water and sustainability. Contributing to such debate is timely and relevant considering the emerging interest of governments, international agencies, development practitioners and society-at-large in engaging in various initiatives of target setting to measure the impact of policy actions, assess development outcomes and evaluate aid effectiveness. While the debate comprises a broad agenda of water issues which go beyond the scope of this short report, it is hoped nevertheless that the report will be useful in enhancing the process of target setting in water sector development.

The report discusses current sustainability targets for the water sector as well as provides an overview of selected tools and approaches to assist decision-makers improve performance and achieve results – and ultimately, meet development targets. Considering the importance attached to setting appropriate targets to measure the water sector's performance, this activity was included in UNESCO's Programme and Budget for 2010–2011 under MLA-3, '*Promoting the sustainable management and conservation of freshwater, terrestrial resources and biodiversity*' and under the activity of '*Governance strategies that enhance affordability and assure finance for water*'.

## 2 Methodology

An analysis was made of selected documents and reported experiences about water and sustainability targets, indicators, tools and regional cases. These were found through leading international and intergovernmental programmes and institutions such as UN-Water and its World Water Assessment Programme (WWAP), UNESCO's International Hydrological Programme (IHP), and the United Nations Development Programme (UNDP), as well as through regional and international development banks, regional intergovernmental institutions (such as the European Union [EU]), academia and private organizations.

Two analytical approaches were used. One was based on a comprehensive definition of the concept of sustainable targets, specified by five attributes and fifteen analytical questions developed by the authors. The definition was applied systematically to review some of the most well-known and accepted water targets (those established under the Millennium Development Goals [MDGs], the EU Water Framework Directive [EUWFD] and the 6th World Water Forum [WWF]).

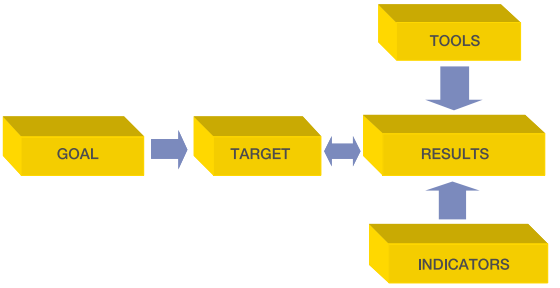
The second approach was based on the understanding that water sustainability targets (WSTs) are closely related to results, and should be seen within a framework for measuring performance of policy actions and the outcomes of development strategy implementation. A simplified results framework, which follows the current practice of aid institutions such as The World Bank, was adopted for this study (Figure 1). A results framework is also useful to visualize the synergy and close inter-relation of goals, targets, tools and indicators as they refer to performance (output and results and their outcomes).

Performance is in turn supported by tools comprising processes, products and services that permit the evaluation and comparison of targets relative to goals, standards, past results and other objectives. While this report touches on only two of the elements described in Figure 1 – targets and tools – a comprehensive results framework should also include monitoring and evaluation functions, as well as reporting, dissemination and internalization of the lessons learned.

The review of tools to support decisions geared to results and outcomes related to integrated water resources management (IWRM) is well represented by the comprehensive instrumentality proposed by the Global Water Partnership (GWP) in their toolbox (GWP, 2000). Other selected instruments linking targets, tools and water

Figure 1

A simplified results framework for the analysis of water sustainability targets



sustainability are also reviewed; namely, The World Bank's environmental and social safeguards policies (World Bank, n.d.); decision-making support tools commonly used in the water sanitation sector (WSP, 2010); and the Local Government Climate Change Adaptation Toolkit (ICLEI, 2008). In addition, the report reviews risk assessment tools at the national level, such as those developed by the United States of America (USA) federal agencies (US DOI, 2011); The World Bank Output Based Aid (World Bank, 2011); the Hydropower Sustainability Assessment Protocol (IHA, 2010); and tools used in water management in agriculture (Comprehensive Assessment of Water Management in Agriculture, 2007; World Bank, 2005).

A few regional cases linking WSTs and tools through the simplified results framework are also included in the report to illustrate the analysis. The cases were selected from each of the UNESCO regions. A draft report was circulated to relevant UNESCO partners, whose comments have been taken into account in the final report.

# 3 Definitions

A review of the literature reveals that there are no universally accepted definitions of 'target', 'tool', 'water sustainability' or other closely related concepts. Moreover, the interpretation of such concepts can be illusive and even deceiving because they generally adopt different meanings depending on the context in which they are used and by whom they are applied. This report starts with a short discussion of the language that is frequently used by the development community to describe sustainable development, water sustainability, goal, target, performance indicator and tool. Definitions are presented here to facilitate the interpretation of this report and should not be construed as official definitions established by UNESCO, IHP or WWAP.

## 3.1 Sustainable development

A short definition of 'sustainable development' is 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (WCED, 1987). This definition of the World Commission on Environment and Development (WCED) represented a conceptual landmark, and as such it is often cited in the literature. The WCED went on with additional observations to clarify the concept, pointing out that sustainable development requires that overriding priority be given to meeting basic human needs, especially those of poor people, and that it requires recognition of the limitations associated with technology and social organizations that impact the capacity of the environment to meet both present and future needs.

The WCED made the concept more specific by adding the following attributes:

- Sustainable development requires the integration of economic and ecological considerations in decision-making.
- Governments must make key national, economic and sector-specific agencies directly responsible for ensuring that their policies and activities support development that is economically and ecologically sustainable.
- No blueprint exists for sustainable development because conditions vary among countries. Each country has to create its own approach to reflect its needs.
- No quick-fix ways to sustainable development exist, and the journey is often as important as the end product.
- The outcomes will not always leave everyone better off. There will be winners and losers, always making achievement of sustainable development difficult.

The United Nations 2005 World Summit reaffirmed that development is a central goal in itself and that sustainable development in its economic, social and environmental aspects constitutes a key element of the overarching framework of United Nations (UN) activities. Cultural aspects are also often included as integral to sustainable development.

## 3.2 Water sustainability

This report adopts the definition of 'water sustainability' by which water resources and water services are able to satisfy the changing demand placed on them, now and into the future, without system degradation (ASCE, 1999). It also internalizes the Dublin Principles (1992), arguably one of the most influential international statements about water and sustainable development. These principles are as follows:

*Principle 1*: Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment.

*Principle 2*: Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels.

*Principle 3*: Women play a central part in the provision, management and safeguarding of water.

*Principle 4*: Water is a public good and has a social and economic value in all its competing uses.

However, a more robust and actionable definition of water sustainability could be achieved by making a stronger link between water and sustainable development, as

shown in these statements of key international agencies and declarations:

- Combating poverty is the main challenge for achieving equitable and sustainable development, and water plays a vital role in relation to human health, livelihood, economic growth as well as sustaining ecosystems (Third World Centre for Water Management, 2001).
- Water is a core cross-cutting element for reaching every other development goal. Access to water and sanitation is a prerequisite for ending poverty and hunger, achieving gender equality, and improving health and environmental sustainability, and should therefore be put higher on the agenda (SIWI, 2010).
- Water is needed in all aspects of life. The general objective is to make certain that adequate supplies of water of good quality are maintained for the entire population of this planet, while preserving the hydrological, biological and chemical functions of ecosystems, adapting human activities within the capacity limits of nature and combating vectors of water-related diseases (UNDESA, n.d.).
- The multi-sectoral nature of water resources development in the context of socio-economic development must be recognized, as well as the multi-interest utilization of water resources for water supply and sanitation, agriculture, industry, urban development, hydropower generation, inland fisheries, transportation, recreation, low and flat lands management, and other activities (UNDESA, n.d.).

Finally, the GWP, a principal global advocate of water and sustainability, argues that sustainable development will not be achieved without a water-secure world, and provides more precise characteristics that further enlighten the concept of water and sustainability (GWP, 2009):

- A water-secure world integrates a concern for the intrinsic value of water with a concern for its use for human survival and well-being.
- A water-secure world harnesses water's productive power and minimizes its destructive force. It is a world where every person has enough safe, affordable water to lead a clean, healthy and productive life. It is a world where communities are protected from floods, droughts, landslides, erosion and waterborne diseases. Water security also means addressing environmental protection and the negative effects of poor management.
- A water-secure world means ending fragmented responsibility for water and integrating water resources management across all sectors – finance, planning, agriculture, energy, tourism, industry, education and health. This integration is at the heart of the GWP's strategy.
- Achieving water security thus requires cooperation between different water users, and between those sharing river basins and aquifers, within a framework that allows for the protection of vital ecosystems from pollution and other threats.
- A water-secure world reduces poverty, advances education, and increases living standards. It is a world where there is an improved quality of life for all, especially for the most vulnerable – usually women and children – who benefit most from good water governance.

## 3.3 Goal

A generic definition for 'goal' or 'objective' is a desired result a person or a system envisions, plans and commits to achieve; it is similar to 'purpose' or 'aim'. In the development literature (Kusek and Rist, 2004), goal is defined as the higher-order objective to which a development intervention is intended to contribute, and it is noted that setting goals is part of governmental decision-making at every level; goals generally are long term; and setting goals in isolation leads to a lack of ownership on the part of the main internal and external stakeholders.

## 3.4 Target

A simple definition of 'target' is a goal to be achieved or an expected result of an intervention. However, for the purposes of the review conducted in this report, targets have to be seen within the context of sustainable development in order to gain analytical depth. As such, a sustainable target is understood as a specified goal that indicates the number, timing and location of what is to be realized (Kusek and Rist, 2004). The most recent conceptual attempt to specify WSTs was done by the World Water Council (WWC), which proposes that water targets should be SMART: specific, measurable, achievable, relevant and time-related. Definitions for each of these SMART components can be found in UNESCO's publication on results-based management (UNESCO, 2011). The WWC also proposes that targets should be established through a participatory process: Wide Involvement Stakeholder Exchanges (WISE).

## 3.5 Performance indicator

Indicators are quantitative or qualitative variables that provide a simple and reliable means to measure achievement, reveal the changes connected to an intervention, or help assess the performance of an organization against the stated target. In other words, a performance indicator is a parameter used to assess and measure the progress related to an expected result or an aspect of it and to identify to what extent beneficiaries/target groups have been reached (UNESCO, 2011). Combining all performance indicators captures the essence of an expected result. Indicators should be clear (precise and unambiguous); relevant (appropriate to the subject at hand); economic (available at a reasonable cost); adequate

(provide a sufficient basis to assess performance) and monitorable (amenable to independent validations) (Kusek and Rist, 2004). To be useful as management instruments, indicators should be associated with specific 'benchmarks' (achievable targets or measures to assess performance, ideally accompanied by baseline data describing the situation before the intervention and the means of verification).

There have been multiple and ongoing efforts to establish water indicators that could be applied worldwide. Unfortunately, results to date are below expectations because not all countries have the reliable data needed for most of the indicators that have been defined. The first edition of the *World Water Development Report* (WWDR) (WWAP, 2003) proposed 160 water indicators; the second WWDR (WWAP, 2006) proposed 62; and the third WWDR (WWAP, 2009) included 58 indicators, of which only 30 were used. In the end, only 15 were used (WWAP, 2012). The latest set of indicators is expected to provide a snapshot of the water sector, reflecting the status of the most critical water issues. Other relevant indicators on water supply sustainability have been proposed in the International Urban Sustainability Indicators List (IUSIL) (Shen et al., 2011). The importance of the need for sex-disaggregated indicators and data – able to depict the different roles of women in water-related issues and the differential impact on women of decisions taken – is increasingly being recognized.

The construction of relevant and reliable water indicators is crucial for many areas of sustainable development. In this light, UN-Water has created a Task Force on Indicators, Monitoring and Reporting (TF-IMR), which has representatives of 24 UN organizations with responsibilities extending to water. WWAP has established an Expert Group on Indicators, Monitoring and Databases (EG-IMD) to promote dialogue between potential users of data and indicators and experts in the provision and interpretation of data. In spite of such efforts, there is a broad perception that progress in establishing useful indicators to assess water performance worldwide is a complex and lengthy process.

It is not surprising then to find consensus within the water community 'box' – and outside it – on the fact that data and indicators on almost every subject related to water issues are usually lacking, unreliable, incomplete or inconsistent (WWAP, 2012). There is also agreement that merely collecting data and building indicators is not sufficient in itself – data must be compiled, analysed and converted to information of practical use; then this knowledge must be shared widely within and between countries and among stakeholders to focus attention on key water problems at all scales. It is only when the data have been collected and analysed that we can properly understand the many variables (hydrological, socio-economic, financial, institutional and political alike) that affect water and that must be factored into water governance.

## 3.6 Tool

A tool can be defined as anything used as a means of accomplishing a task or purpose. In this report, tools are elements, methods and approaches that support decision-making about water and facilitate achieving results and the ultimate targets of sustainable water development and management. Tools comprise a wide array of instruments that include mathematical models, organizational arrangements, financial instruments, policies, legal frameworks and other mechanisms.

## 3.7 Water resources and water services

Water is unique; it moves in space and time; it is ice, vapour and liquid; and it exists in a continuous and dynamic hydrological cycle which, among its key aspects, converts water vapour into rainfall, runoff and evaporation and infiltration into groundwater (see Figure 2 for a diagram showing some key aspects of the water cycle).

While there has been enormous progress in understanding water in the atmosphere, knowledge about the dynamic connection between water, soil processes and ecosystem responses to climatic signals is still being obtained. Climate change has brought to light a new level of complexity, represented by the immense challenge of predicting the non-linear behaviour of water in the atmosphere, the earth, and its interaction with the ocean.

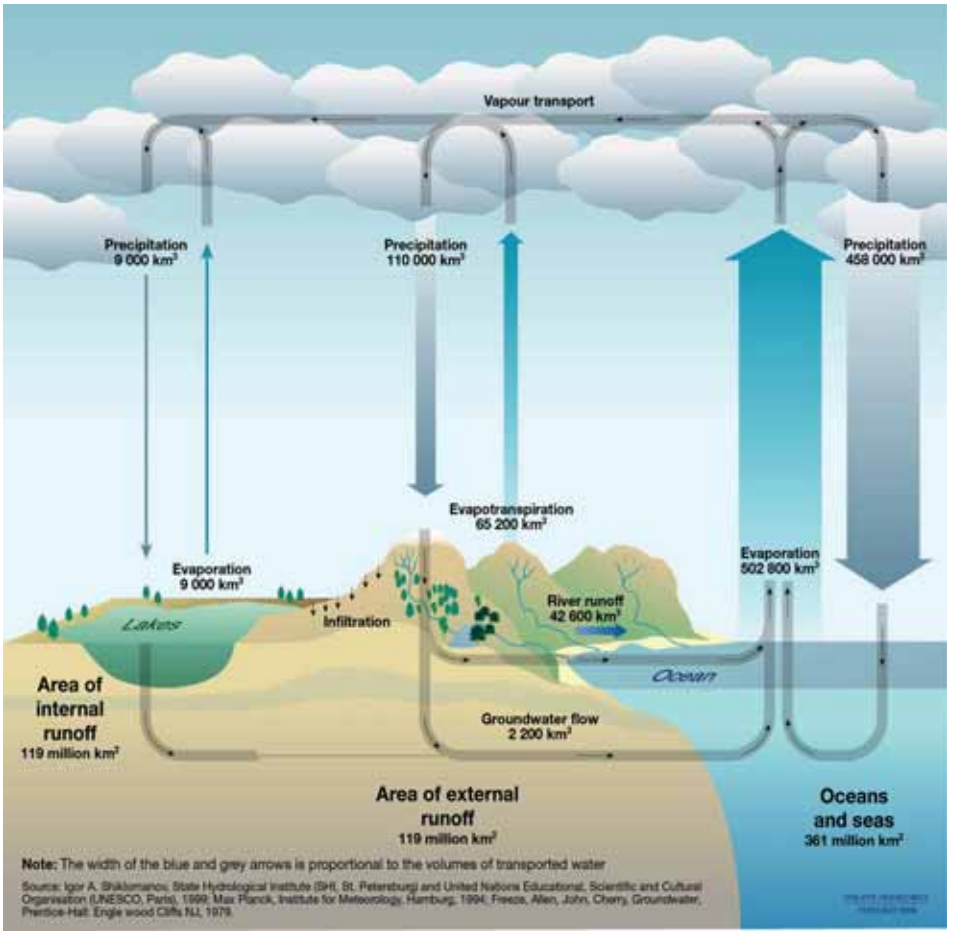
Water is essential for life and livelihoods; it is also a core infrastructure sector of the economy. Four out of every five people around the world are served by renewable freshwater services (MEA, 2005). But because the distribution of freshwater is uneven in space and time, more than one billion people live under water stress and only 15% of the world's population lives with relative water abundance. It is well established that vast changes with great geographic variability occur in freshwater resources and their provisioning of ecosystem services in all scenario considered under the Millennium Ecosystem Assessment carried out between 2001 and 2005 (MEA, 2005).

Water is also a key economic sector, with an annual turnover estimated at US$800 billion (World Bank, 2004). It is also the third most capital intensive industry after oil and electricity. According to Global Water Intelligence (GWI), in 2009 the water supply and wastewater sector alone represented a global financial flow of about US$500 billion (GWI, 2010).

The review of WSTs and tools considers that water is both a resource and a core infrastructure sector of the economy. The report also adopts the operational concept of the 'water comb' (Figure 3) proposed by the GWP in 1996 (GWP, 2000). Defining water as a central component of the development agenda should consider the complexity captured by the water comb concept.

FIGURE 2

The hydrological cycle




*Source:* Philippe Rekacewicz, UNEP/GRID-Arendal (http://www.grida.no/graphicslib/detail/the-water-cycle_171f)

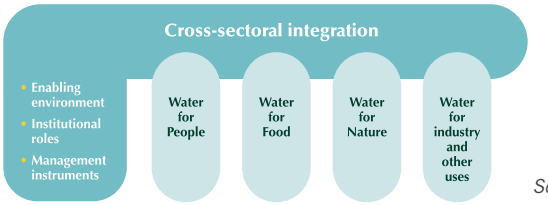
IWRM is a step-by-step process of managing water resources in a harmonious and environmentally sustainable way by gradually uniting stakeholders and involving them in planning and decision-making processes while accounting for evolving social demands due to population growth, rising demand for environmental conservation, changes in perspectives of the cultural and economic value of water, and climate change. IWRM can be seen as an open-ended process that evolves in a spiral manner over time as one moves towards more coordinated water resources management. IWRM has remained an important concept for water management since the Agenda 21 process of the United Nations Conference on Environment and Development in Rio de Janeiro in 1992 (UNESCO-IHP and NARBO, 2009).

A river basin approach, integrated river basin management (IRBM), in the implementation of IWRM is being recognized as a comprehensive basis for managing water resources more sustainably at the basin, sub-basin and aquifer (BSA) level (UNESCO-IHP, 2009). A basin-level perspective that is the basis of the IWRM approach enables integration of downstream and upstream issues, quantity and quality, surface water and groundwater, and land use and water resources in a comprehensive and practical manner.

The dynamic and evolving process of IWRM in a river basin using a conceptual 'IWRM spiral' model is shown in Figure 4. In this model, water resources development in a basin, along with management principles and objectives, evolves over time as new demands and needs emerge, and innovative solutions are added at each stage. The spiral model is a convenient graphical conceptualization of the iterative, evolutionary and adaptive management process, adjusting to new needs, circumstances and societal goals (UNESCO-IHP and NARBO, 2009).

Figure 3

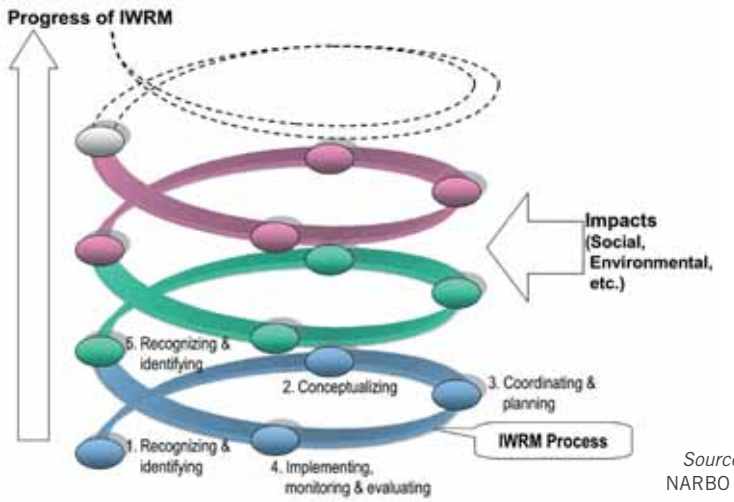
The 'water comb' concept




*Source:* GWP (2000, fig. 3, p.29)

Figure 4

The 'IWRM spiral' model




*Source:* UNESCO-IHP and NARBO (2009, fig. 1, p. 5).

## Box 1: Africa and water resources

Africa's total area of 30 million km$^2$ or 22% of the world's emerged landmass has internal renewable freshwater resources that average about 3,950 km$^3$ per year. This amounts to about 10% of the freshwater resources available globally and closely resembles Africa's 54 countries' share of the world population of 12%.

Africa is blessed with abundant water resources in its large rivers (the Congo, Nile, Zambezi and Niger) and its lakes (Lake Victoria is the world's second largest). It has more than 50 internationally shared river and lake basins. But Africa is also the second driest continent in the world, after Australia. Africa's extreme variability of rainfall – in time and space – is reflected in an uneven distribution of surface and groundwater resources. There are areas of severe aridity with limited freshwater resources like the Sahara and Kalahari deserts in the north and south, and areas with abundant freshwater resources like the tropical belt of mid-Africa.

Climate change and variability, population growth and associated increasing water demand, over-exploitation and environmental degradation have significantly contributed to the worsening of the state of freshwater resources in Africa, leading to an increasing number of countries whose water demand outstrips available resources. Fourteen African countries are already experiencing water stress; another 11 are expected to join them by 2025, at which time nearly 50% of Africa's predicted population of 1.45 billion people will face water stress or scarcity.

More than 2,600 freshwater fish species are known from Africa, and fish constitutes 21% of animal protein intake. Irrigation plays a minor role in agriculture, as food production in the continent is almost entirely rainfed. Almost half of the population suffers from one of the six major water-related diseases.

*Sources*:

Grey, D. 2002. *Water Resources and Poverty in Africa: Breaking the Vicious Circle.* Presentation at the Inaugural Meeting of AMCOW, Nigeria, 2002. Washington DC, The World Bank.

UN-Water. n.d. *The Africa Water Vision for 2025: Equitable and Sustainable Use of Water for Socioeconomic Development.* New York, UN-Water.

WWF (World Wildlife Fund). *The Facts of Water in Africa.* London, WWF.

# Part A Targets

## 1 The water resources sector: Context for establishing development targets

During the 1970s, the UN System organized a series of global mega-conferences at high decision-making levels on critical global issues. One of those issues was water, which was analysed at the Mar del Plata Conference in 1977. For a variety of reasons, water then disappeared from the international political agenda for about 15 years, until the 1992 UN Conference on Environment and Development (UNCED) held in Rio de Janeiro, where Chapter 18 of Agenda 21 was on water.

During the 1990s, the international focus on global water issues changed, largely because of the annual Stockholm Water Symposiums, the WWFs and other high visibility water international meetings; the formation of new institutions like the WWC and GWP; and the establishment of a high-powered blue-ribbon World Commission for Water in the 21st Century (Biswas, 2003).

The 1977 Mar del Plata Conference remains, however, the only major water meeting at a high political level ever held. Its visionary objective was 'to promote a level of preparedness, nationally and internationally, which would help the world to avoid a water crisis of global dimensions by the end of the present century' (UN, 1977). The Conference approved the Mar del Plata Action Plan with its two sections. The first has recommendations covering the essential components of water management, such as assessment, use and efficiency; environment, health and pollution control; policy, planning and management; natural hazards; public information, education, training and research; and regional and international cooperation. The second section has 12 resolutions on a wide range of specific subject areas.

While the Action Plan provided an excellent basic framework for actions at the national level and policy discussions in various intergovernmental forums, governments were not successful in its implementation to any significant extent. The Conference did, however, succeed in raising public awareness on the importance of water resources and started a process of changing perception about water as an unlimited resource – a perception that was clearly acknowledged by the UNCED in Rio in 1992 (Falkenmark, 1997).

The Action Plan has in fact become a living document that has evolved over time, finding its latest expression in Chapter 18 (Protection of the Quality and Supply of Freshwater Resources: Application of Integrated Approaches to the Development, Management and Use of Water Resources) and other relevant chapters of Agenda 21 of the UNCED and ensuing discussions of the Commission on Sustainable Development (CSD) (Najlis and Kuylenstierna, 1997). Table 1 presents an overview of freshwater targets at the global level.

## 2 Development targets

Development targets, including water-related ones, have been widely adopted by international agencies, governments and policy-makers since the de facto adoption of the MDGs. The MDGs were approved by the UN General Assembly in New York in 2000 as part of the United Nations Millennium Declaration (UNGA, 2000). Similarly, the process to set specific water targets that has been followed by the European Union – the EUWFD of 2000 – has become a landmark comprehensive target framework aiming for water development and sustainability for the countries of the EU. More recently, the preparatory process of the 6th WWF has energized the international water community to discuss more than 100 water targets – these were presented at the Forum in Marseille in March 2012.

These target-setting efforts have a strong logic and bring focus and attention to water issues at the global scale. They are a strong asset for the achievement of specific results, but there are questions about their effectiveness and ultimate development impact because in many cases, water targets are simply wish lists that are generally not well supported analytically and rarely monitored. This report makes the case that a more rigorous analysis of water sustainability targets (WSTs) and of the process of developing and selecting targets – as part of a results framework – could be conducive to improved results in assessing development outcomes and policy impact.

The critical review of targets associated with water resources conducted for this report showed that establishing WSTs

Table 1

Freshwater sustainability targets 1992–2010

| DOCUMENT | TARGET | DELIVERY DATE |
|---|---|---|
| **AGENDA 21 (18.11)**<br>**SECTION 2**<br>**CHAPTER 18**<br>**PROTECTION OF THE QUALITY AND SUPPLY OF FRESHWATER RESOURCES:**<br>**APPLICATION OF INTEGRATED APPROACHES TO THE DEVELOPMENT, MANAGEMENT AND USE OF WATER RESOURCES**<br>**A. INTEGRATED WATER RESOURCES DEVELOPMENT AND MANAGEMENT** | 18.11 All States, according to their capacity and available resources, and through bilateral or multilateral cooperation, including the United Nations and other relevant organizations as appropriate, could set the following targets:<br>(a) By the year 2000:<br>i. To have designed and initiated costed and targeted national action programmes, and to have put in place appropriate institutional structures and legal instruments<br>ii. To have established efficient water-use programmes to attain sustainable resource utilization patterns<br>(b) By the year 2025:<br>i. To have achieved sub-sectoral targets of all freshwater programme areas<br>It is understood that the fulfillment of the targets quantified in i. and ii. above will depend upon new and additional financial resources that will be made available to developing countries in accordance with the relevant provisions of General Assembly resolution 44/228 | 2000<br>2025 |
| **AGENDA 21 (18.26)**<br>**SECTION 2**<br>**CHAPTER 18**<br>**A. WATER RESOURCES ASSESSMENT** | 18.26 All States, according to their capacity and available resources, and through bilateral or multilateral cooperation, including cooperation with the United Nations and other relevant organizations, as appropriate, could set the following targets:<br>(a) By the year 2000, to have studied in detail the feasibility of installing water resources assessment services | 2000 |
| **AGENDA 21 (18.39)**<br>**SECTION 2**<br>**CHAPTER 18**<br>**C. PROTECTION OF WATER RESOURCES, WATER QUALITY AND AQUATIC ECOSYSTEMS** | 18.39 All States, according to their capacity and available resources, through bilateral or multilateral cooperation, including the United Nations and other relevant organizations as appropriate, could set the following targets:<br>(e) To reduce the prevalence of water-associated diseases, starting with the eradication of dracunculiasis (guinea worm disease) and onchocerciasis (river blindness) by the year 2000 | 2000 |
| **AGENDA 21 (18.58)**<br>**SECTION 2**<br>**CHAPTER 18**<br>**E. WATER AND SUSTAINABLE URBAN DEVELOPMENT** | 18.58 All States, according to their capacity and available resources, and through bilateral or multilateral cooperation, including the United Nations and other relevant organizations as appropriate, could set the following targets:<br>(a) By the year 2000, to have ensured that all urban residents have access to at least 40 liters per capita per day of safe water and that 75 per cent of the urban population are provided with on-site or community facilities for sanitation<br>(b) By the year 2000, to have established and applied quantitative and qualitative discharge standards for municipal and industrial effluents<br>(c) By the year 2000, to have ensured that 75 per cent of solid waste generated in urban areas are collected and recycled or disposed of in an environmentally safe way | 2000 |
| **JOHANNESBURG PLAN OF IMPLEMENTATION**<br>**CHAPTER II: POVERTY ERADICATION** | 8. The provision of clean drinking water and adequate sanitation is necessary to protect human health and the environment. In this respect, we agree to halve, by the year 2015, the proportion of people who are unable to reach or to afford safe drinking water (as outlined in the Millennium Declaration) and the proportion of people who do not have access to basic sanitation. | 2015 |
| **JOHANNESBURG PLAN OF IMPLEMENTATION**<br>**CHAPTER IV: PROTECTING AND MANAGING THE NATURAL RESOURCE BASE OF SUSTAINABLE DEVELOPMENT** | 26. Develop integrated water resources management and water efficiency plans by 2005, with support to developing countries | 2005 |
| **MILLENNIUM SUMMIT OUTCOME**<br>**MILLENNIUM DEVELOPMENT GOALS** | 7C. Halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation | 2015 |

*Source*: Global Sustainability Targets 1992–2010 tables in Stoddart (2011).

would be more effective if it were to follow a systematic analytical framework. Otherwise, there is a danger that WSTs will be defined casually through ad hoc processes that would be defective for evaluating long-term development impacts and results, as well as lacking legitimacy and credibility. Therefore, this report assumes that targets are one component of the simplified results framework (Figure 1).

To evaluate WSTs, the methodology proposed in this report is based on two analytical approaches. First, the review is anchored by a comprehensive definition of sustainability targets. Such definition is specified by three intrinsic attributes (objectivity, legitimacy and accountability) and two process-related attributes (realism and applicability). These attributes are further specified in 15 analytical questions and generic responses, as presented in Table 2. Such an analytical matrix could be a useful approach to policy-makers and water practitioners for assessing current water targets, and ultimately improve the formulation of future WSTs. Second, the review considers the perspective of the simplified results framework described in this report (Figure 1).

The assessment of the attributes of WSTs proposed in this report is qualitative by nature and ultimately relies on value judgements. It is considered that a core set of questions, 1 to 8 in Table 2, should receive a reasonably positive response to consider a target robust by definition. The assessment of such questions could be made through participatory processes such as Delphi, which are widely used to capture expert opinions. In addition, a graphical representation of the 15 questions responding to value judgements in a Likert Scale (e.g. from 0, 'nil' to 4, 'strong') corresponding to the level of responsiveness could indicate how a given target responds to the analytical questions. The responsiveness of a given target can also be estimated by simple calculation of the area as a percentage of the hypothetical situation of full compliance.

## 2.1 The Millennium Development Goals

The UN promoted an internationally agreed framework – approved at the Millennium Summit in September 2000, when the largest gathering of world leaders in history adopted the UN Millennium Declaration, committing their nations to a new global partnership to reduce extreme poverty and setting out a series of time-bound targets, with a deadline of 2015 – that has become known as the MDGs. The MDGs are considered a landmark of a results-based approach, which emphasizes the need to measure results. The MDGs comprise 8 goals and 18 targets and are complemented by 48 technical indicators to measure progress towards the goals. These indicators have been adopted by experts from the UN, International Monetary Fund (IMF), the Organisation for Economic Co-operation and Development (OECD) and The World Bank.

The UN has long been concerned by the global crisis caused by growing demands on the world's water resources to meet human, industrial and agricultural needs, as well as the need for basic sanitation. The United Nations Mar del Plata Conference (1977), the International Drinking Water Supply and Sanitation Decade (1981–1990), the International Conference on Water and the Environment (1992) and the UNCED (1992) all focused on this vital resource.

The MDG 7, *Ensure Environmental Sustainability*, has three targets related to water resources:

- **Target 7A:** Integrate the principles of sustainable development into country policies and programmes by proposing a reverse in the loss of environmental resources
- **Target 7B:** Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss

  Both targets 7A and 7B have one indicator related to water: Indicator 7.5: Proportion of total water resources used
- **Target 7C:** Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation, with two indicators, disaggregated by sex and for urban and rural areas when it corresponds.
- Target 7C has two indicators:

  Indicator 7.8: Proportion of population using an improved drinking water source

  Indicator 7.9: Proportion of population using an improved sanitation facility

Application of the analytical matrix shows that MDG Target 7C fulfils 11 of the 15 questions and responds reasonably well to 7 of the first 8 questions; therefore, it is considered robust. The main weakness of this target is related to realism, as it does not include an estimate of the cost associated with achieving it. MDG Target 7A responds well to 7 of the 15 questions, but fulfils only 4 of the first 8; therefore, it cannot be considered a robust target. In addition, Target 7A is not responsive to questions 2, 3, 4 and 6 – it is not quantitatively and/or qualitatively defined, it is not bounded by a timeframe, there are no indicators to monitor and verify it, and the resources to achieve it are not defined. MDG Target 7B fulfils 7 of the 15 analytical questions, but it responds to only 5 of the first 8 questions; therefore, it is not robust. The level of compliance for each of the three targets is presented in Figure 5, which shows that Target 7C, access to safe water and sanitation, has the highest compliance level (44%). See Appendix 1.1 and 2.1 for the data presented in Figure 5.

## 2.2 The European Union Water Framework Directive

The EUWFD (Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for community action in the field of water policy) is an overarching piece of legislation aimed at harmonizing European water policy and

Table 2

Attributes of water targets

| ATTRIBUTE | | ANALYTICAL QUESTION | GENERIC RESPONSE |
|---|---|---|---|
| 1 | OBJECTIVITY | Is the relationship between the goal and the target clearly established? | Goal or objective is an ideal result that is desired in the long run; target is a step in the path towards achieving that goal/objective. |
| 2 | REALISM | Is the target quantitatively and/or qualitatively defined? | A numerical value or order assigned to the target, preferentially in the form of performance indicator benchmark. A qualitative property could be indicated with the idea of standing out the target quality. |
| 3 | REALISM | Is the target bounded by a time frame? | A calendar of execution or a date of term to achieve the target is established. |
| 4 | REALISM | Are the indicators to monitor and verify compliance clearly established? | When a target is established, the indicators that permit to measure its evolution must be defined. |
| 5 | REALISM | Is there a baseline with clear and credible data to which the indicators can be compared? | A diagnosis at the start of period of analysis exists, allowing comparison with the situation and the desired future. |
| 6 | REALISM | Are the resources to achieve the targets defined? | An estimate of financial and non-financial resources to achieve the target has been made, including monitoring. |
| 7 | LEGITIMACY | Is the target the result of a participatory process of all stakeholders? | The target is associated with a system of rules and agreements that are openly examined among the interested parties. |
| 8 | ACCOUNTABILITY | Is there any accountability framework related to compliance with the target? | An accountability framework exists with clear responsibilities for decisions and results associated with the target, including transparent reporting. |
| 9 | ACCOUNTABILITY | Is there a framework of commitment that was adopted? | Was the agreement or compromise for achieving the targets supported by some kind of legal documents? |
| 10 | REALISM | For what and for whom is the target useful? | The quality of to be useful and especially practical worth or applicable for policy decisions, allocation of resources, development planning mobilization or awareness rising of stakeholders, etc. |
| 11 | REALISM | Is the target easy to calculate? | The target has the property to be practical or feasible to estimate or calculate. Is it based on information/data that is collected regularly? |
| 12 | APPLICABILITY | Is the target applicable in any part of the world? | The universality as an attribute requires that the target defined could be applicable in any country. |
| 13 | APPLICABILITY | Scalability: Is the target applicable at different scales: global, regional, country, local, basin? | The ability of the target to maintain usefulness or usability regardless of scale of different geographic spaces. |
| 14 | APPLICABILITY | Is the target linked to an objective that is clear and intuitive? | The objective and the target must be easy to understand or explain to a widespread public. Can it be easily understood by all stakeholders? |
| 15 | APPLICABILITY | Are the targets and indicators disaggregated by sex and for urban and rural areas when it corresponds? | The target and indicators differentiate gender and present statistics of behaviour in the city and in rural areas when it corresponds. |

improving water quality in all of Europe's aquatic environments. The Directive is valid for the 27 countries that at present constitute the EU. The Directive is based on the Treaty establishing the European Community, and in particular Article 175, which was a product of years of work and consultation with the Member States and took into account the available scientific and technical data about water quality and quantity.

The general purpose of the EUWFD is to establish a framework in which to protect inland surface waters, transitional waters, coastal waters and groundwater, with the specific objectives to:

- Prevent further deterioration and protect and enhance the status of aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands directly depending on the aquatic ecosystems.
- Promote sustainable water use based on a long-term protection of available water resources.
- Enhance protection and improve the aquatic environment, inter alia, through specific measures for the progressive reduction of discharges, emissions and losses of priority substances and the cessation or phasing-out of discharges, emissions and losses of the priority hazardous substances.
- Ensure the progressive reduction of pollution of groundwater and prevent its further pollution.
- Contribute to mitigating the effects of floods and droughts and thereby contribute to the provision of the sufficient supply of good quality surface water and groundwater as needed for sustainable, balanced and equitable water use; a significant reduction in pollution of groundwater; protection of territorial and marine waters; and, achieving the objectives of relevant international agreements, including those which aim to prevent and eliminate pollution of the marine environment, to cease or phase out discharges, emissions and losses of priority hazardous substances, with the ultimate aim of achieving concentrations in the marine environment near background values for naturally occurring substances and close to zero for man-made synthetic substances.

The Directive establishes the date when specific targets should be achieved by Member States, as well as measures that have to be taken and tools and indicators that can be used. It defines general targets for three overarching categories – surface water, groundwater and protected areas – as follows:

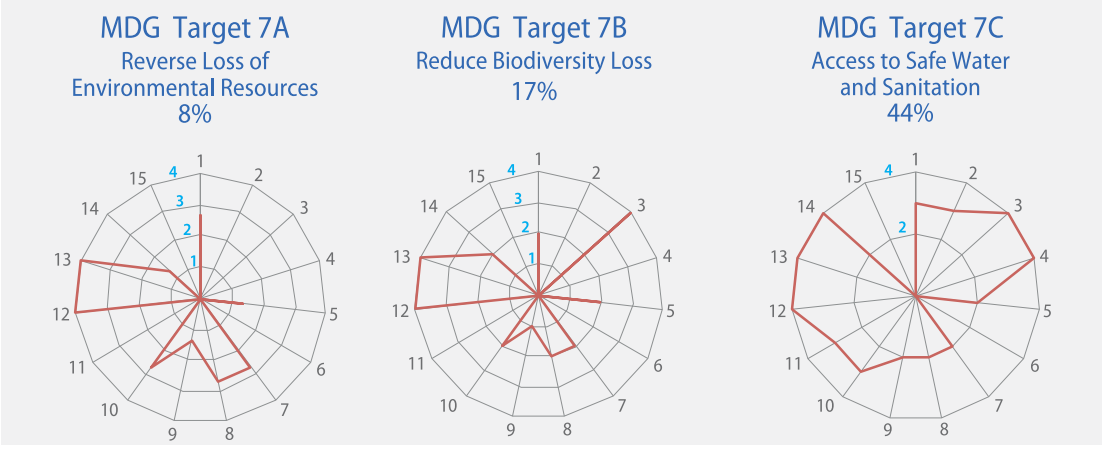
- **Surface Water:** Protect, enhance and restore all bodies of surface water. For artificial and heavily modified bodies of water, aim to achieve good surface water status at the latest 15 years after the date of entry into force of the Directive.
- **Groundwater:** Protect, enhance and restore all bodies of groundwater, ensure a balance between abstraction and recharge of groundwater, with the aim of achieving good groundwater status at the latest 15 years after the date of entry into force of the Directive.
- **Protected Areas:** Achieve compliance with any standards and objectives at the latest 15 years after the date of entry into force of the Directive, unless otherwise specified in the Community legislation under which the individual protected areas have been established.

The Directive also sets targets for a number of key principles and instruments (tools and activities) to be implemented. These are further specified with a timeline by which they must be applied (or be effective):

- The Basin Management Plan: Establishes the date by which Member States shall ensure that a river basin management plan is produced for each river basin district lying entirely within their territory.

Figure 5

Application of the analytical matrix to MDG Targets 7A, 7B and 7C



- Monitoring: Refers to the establishment of programmes for monitoring surface water status, groundwater status and protected areas in order to establish a coherent and comprehensive overview of water status within each river basin district.
- Costs recovery: Refers to the application of the principle of recovery of the costs of water services, including environmental and resource costs, having regard for the economic analysis conducted according to the polluter pays principle. It proposes that Member States ensure that the principle has been applied by specific policy instruments by 2010, considering social, environmental and economic effects of the cost recovery policy as well as the geographic and climatic conditions of the region(s) affected.
- Stakeholder participation: Refers to the principle of subsidiarity by encouraging the active involvement of all interested parties in the implementation of the Directive, in particular in the production, review and updating of the river basin management plans. To that end it clarifies that Member States ensure that, for each river basin district, they publish and make available for comments to the public, including users, information that includes draft copies of the Basin Management Plan.
- Analysis of the characteristics of the river basin district: This includes reviewing the environmental impact of human activity and the economic analysis of water use. This would be also an information baseline for the basin, which should be updated periodically.
- Registry of protected areas: Establishes that Member States ensure the establishment of a register or registers of all areas lying within each river basin district which have been designated as requiring special protection under specific Community legislation for the protection of their surface water and groundwater or for the conservation of habitats and species directly depending on water.
- Control of point and diffuse sources of pollution: Refers to ensuring that discharges into surface waters are controlled according to a combined approach that includes emission controls based on best available techniques, relevant emission limit values, and in the case of diffuse impacts the controls including, as appropriate, best environmental practices set out in some specific directives mentioned.
- Programme of measures: Establishes that Member States ensure the establishment for each river basin district, or for the part of an international river basin district within their territory, a programme of measures.

The EUWFD also provides guidance about the indicators to be used. It introduces three concepts of water status that are used to define WSTs: for surface water, it includes rivers, lakes, transitional and coastal waters; and groundwater status is defined as high, good and moderate. Each category has a normative definition; each status is also specified by considering diverse elements. For example, for rivers, the classification of each status considers biological quality elements (phytoplankton, macrophytes and phytobenthos, benthic invertebrate fauna, fish fauna); hydromorphological quality elements (hydrological regime, river continuity, morphological conditions); and physicochemical quality elements (general conditions, specific synthetic pollutants, specific non-synthetic pollutants). Some of these elements have quantitative parameters and others are only qualitative. In the case of protected areas, there are no precise indicators because the Directive only establishes a commitment to achieve compliance with *any* standards and objectives, which are not specified.

In 2000, the EUWFD provided an implicit strategy for managing the future of Europe's water. This strategy is now under the spotlight as a revised comprehensive blueprint is expected by 2012. As part of the preparation for the updated Directive, a commission is undertaking a 'fitness check' to assess the effectiveness of existing laws and identify possible gaps or inconsistencies that need to be dealt with. The first phase of this assessment has just been completed by the Institute for European Environmental Policy (IEEP, 2011).

Application of the analytical matrix shows that targets for Surface Water and Groundwater satisfy 12 of the 15 questions, and 7 of the first 8; therefore, these targets can be considered robust. The targets fail, however, to estimate the resources needed to achieve them. The target for Protected Areas is not regarded as robust within this approach as it responds to only 9 of the 15 analytical questions, and to only 4 of the first 8. This target also fails to satisfy the questions regarding the quantitative/qualitative definition; it does not have indicators to monitor and verify; there is no baseline to compare indicators; and the resources to achieve the target are not defined. As shown in Figure 6, targets for Surface Water and Groundwater have the highest levels of compliance (56%). See Appendix 1.2 and 2.2 for the data presented in Figure 6.

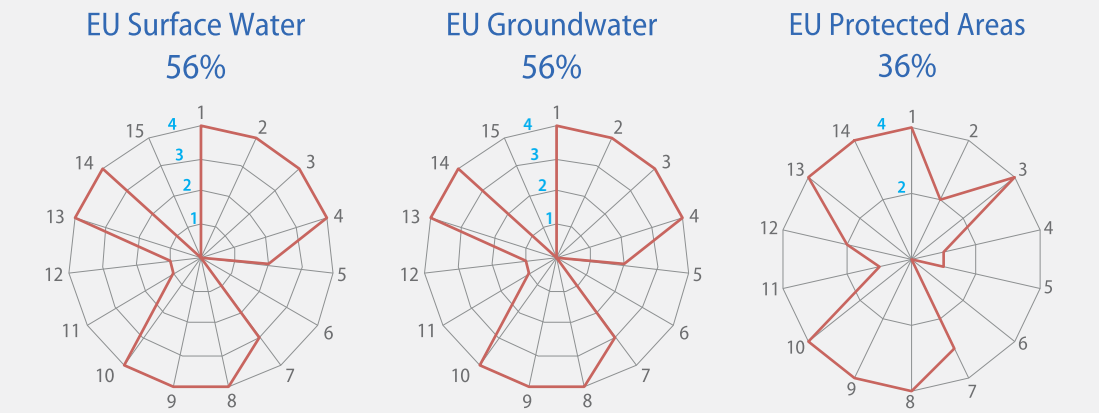
## 2.3 The World Water Council

In response to increasing concern from the global community about worldwide water issues, the WWC was created by a number of key water institutions in 1996 as a membership organization representing and federating the great diversity of water stakeholders. The WWC currently unites more than 300 active members (intergovernmental organizations, governments and governmental authorities, enterprises and facilities, civil society organizations and water user associations, and professional associations and academic institutions) from over 60 countries, and it functions through four regional committees (Africa, Asia, Europe and America).

Since 1997, every three years the WWC has organized a World Water Forum (WWF). To date these have been held in Marrakech (1997), The Hague (2000), Kyoto (2003), Mexico City (2006), Istanbul (2009) and Marseille (March, 2012). The forums afford an opportunity to

Figure 6

Application of the analytical matrix to selected European Union Water Framework Directive targets




discuss the status and main challenges of the global water sector – issues such as the state and ownership of water resources, development potential, governance, management, financing, and the impact of water development on poverty and on the environment.

For the 6th WWF, three strategic directions, twelve priorities for action and three conditions for success were proposed (Figure 7) (FAO, 2011; WWF, 2011). Working groups (Thematic Process, Figure 7) outlined 103 water targets, which are expected to be achieved through an action plan and within a defined timeframe. According to the WWC, targets are identified through a Wide Involvement Stakeholder Exchange (WISE) approach.

The WWC has established a group – constituted by the International Forum Committee (IFC), which is in turn constituted by an ad hoc consortium of organizations – vested with the tasks of identifying existing successful or innovative targets and solutions; coordinating the work of Target and Solutions Groups; liaising with other Core Groups and other WWF processes; and reporting on solution delivery and commitments.

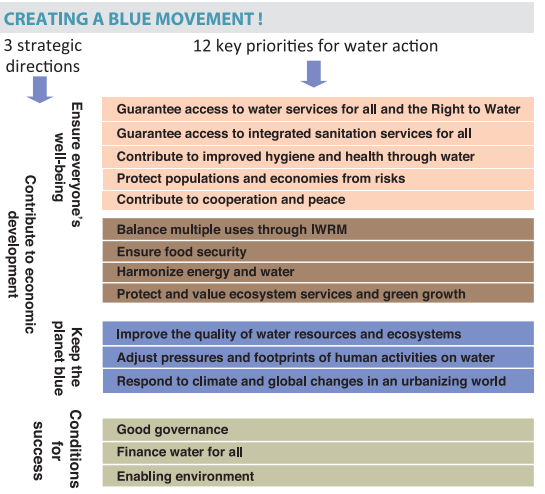
A Target and Solutions Group is a multi-stakeholder group dedicated to a specific target tasked with developing a detailed target action plan; identifying and reporting on solutions that can contribute to reaching the given target; and encouraging stakeholders to commit to the target and/or solutions. The groups follow a conceptual framework that relates themes, issues, priorities, targets and solutions (Figure 8). It seems, however, that this framework is not directly related to performance or results, and apparently there is no formal process of defining the concept of water targets and its relationship with sustainable development.

The broad definition of targets was set by the IFC, and regional groups discussed the values and timeframe for specific targets that were assigned and adopted by regional and thematic processes. The IFC follows an elaborated process to set water targets. One strategic priority of the WWF – Guarantee access to water for all and the Right to Water – was selected to evaluate with the methodology proposed in this report to illustrate its applicability to future water target-setting exercises. This strategic priority is broken down into six targets, as follows:

- **Target 1:** For 2012, highlight the practical implications of the Right to Water for practitioners by collecting and disseminating at least one example per category in each region of national policies targeting and delivering effectively better water quality, availability, accessibility and affordability at country level – all major components of the human right to drinking water.

Figure 7

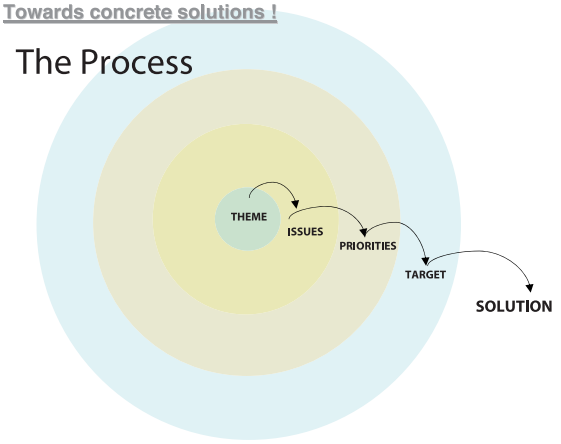
6th World Water Forum Thematic Process




*Source:* World Water Council, 6th World Water Forum Preparatory Meetings, 'Towards World Water Solutions', Preparatory Meeting of the Americas, São Paulo, 27 June 2011 (http://www.ambiente.sp.gov.br/wp/pactodasaguas/files/2011/07/anexo_2_B_Braga.pdf).

Figure 8

6th World Water Forum conceptual framework



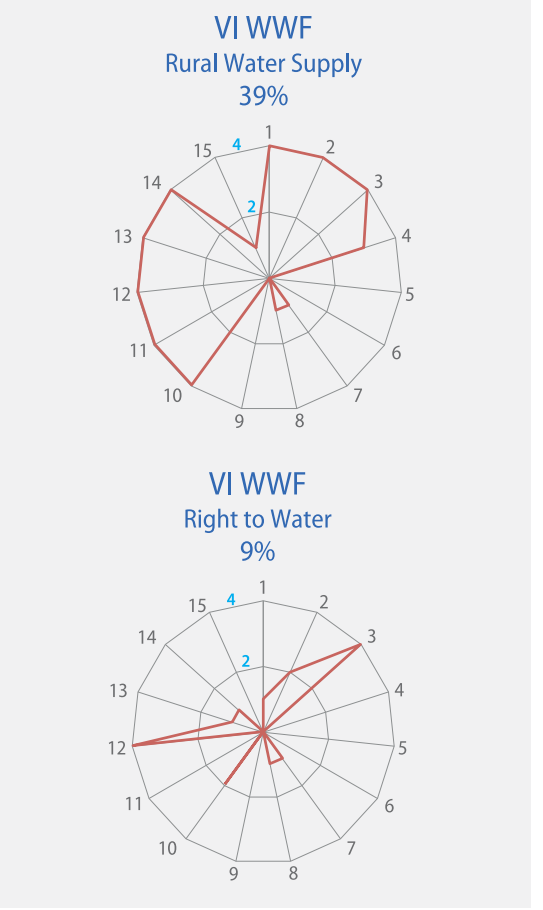

*Source:* World Water Council, 6th World Water Forum Preparatory Meetings, 'Towards World Water Solutions', Preparatory Meeting of the Americas, São Paulo, 27 June 2011 (http://www.ambiente.sp.gov.br/wp/pactodasaguas/files/2011/07/anexo_2_B_Braga.pdf).

- **Target 2:** By 20xx, ensure that the global rural population without access to safe water decreases by x%, with special attention to the poor.
- **Target 3:** By 20xx, ensure that the global urban population without access to safe water decreases by x%, with special attention to the poor.
- **Target 4:** By 2015 more than half of the countries in each continent should have set up financial mechanisms that suit the needs of local authorities and local operators.
- **Target 5:** By 2020 more than half of the countries in each continent should have organized a simple, inclusive and reliable reporting mechanism for water supply that includes every local water service provider in rural and urban areas.
- **Target 6:** By 2015, elaborate key global indicators regarding water quality, accessibility, availability, affordability and non-discrimination – all major components of the human right to drinking water.

The analytical matrix is applied here only to Targets 1 and 2. Application of the analytical matrix shows that Target 1 (Right to Water) responds to 4 of the 15 analytical questions and only 2 of the first 8; therefore, it is not robust. The target does not have a clear relationship with a goal, it does not have indicators or a baseline, and the resources are not estimated. It also seems that participation of stakeholders has been limited, and it lacks an accountability framework. Target 2 (Rural Water Supply) responds to 9 of 15 analytical questions and to 4 of the first 8; therefore, it is also not robust. It has similar weaknesses as Target 1. As shown in Figure 9, the target for Rural Water Supply has the highest level of compliance (39%). See Appendix 1.3 and 2.3 for the data presented in Figure 9.

Figure 9

Application of the analytical matrix to selected targets proposed for the 6th World Water Forum



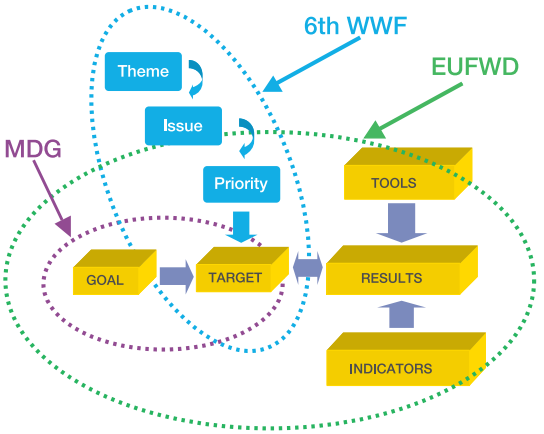

# 3 Summary

A preliminary observation from the review of the three WST systems shows that the EUWFD fits well with the simplified results framework proposed in this study. The MDGs are more focused on goals and targets, but less on actual performance and results. The 6th WWF follows a different logic that starts by identifying themes of global significance, main issues and priorities, and then targets. A graphical representation of how these three systems of WSTs are related to the results outlined in this report is provided in Figure 10.

It is noteworthy to highlight the apparently limited attention given to gender issues and the overall lack of realism by the inadequate attention to estimate the cost and the policy and institutional effort needed to achieve the proposed targets in the three systems that have been

Figure 10

Water sustainability targets and results




assessed. It also seems that targets proposed for the 6th WWF exhibit a lack of attention to baseline indicators and to the costs associated with achieving the target, as well as a lack of clarity regarding commitments. However, in spite of these limitations, these efforts are all commendable, because they bring focus to policy discussions and have a significant impact on advocacy worldwide through various political, parliamentary and local processes.

The lack of a results-oriented focus in setting targets might jeopardize the entire effort by diluting the targets' potential impact and weakening their credibility. Based on the analysis done in this report, two approaches to set future targets are discussed in the next section.

# 4 Moving forward

Meaningful water targets related to sustainable development ideally should be linked more systematically to performance and outcomes within a results framework. Otherwise, they run the risk that their impact and usefulness will be weak and largely limited to advocacy efforts.

The establishment of future WSTs should follow a rigorous process of strategic planning. Strategic thinking and action is an increasingly important ingredient in improving the effectiveness of development agencies, governments and non-profit organizations. A strategic planning process can be established through the following generic steps (Schilder, 1997; Bryson, 1988).

- *Evaluate the current situation*, comprising the assessment of recent history and changing contexts to achieve a development goal, including organizational arrangements, costs, and desired outcome indicators, which involves stakeholder participation. Frequently, such processes are identified by a SWOT analysis framework that identifies strengths, weaknesses, opportunities and threats.
- *Define goals and targets*, which for water sustainability is usually done through expert processes (e.g. Delphi surveys, Cost of Doing Business [IFC and World Bank, 2011]) or broader consultation processes (e.g. that in *Voices of the Poor: Can Anyone Hear Us?* [Narayan, 2000]). Expert consultation is useful to collect and systematize information about the current situation, evaluate performance, and even make rough estimates of possible goals and targets that could be achieved in a timeframe. The estimates are generally consulted and validated with key decision-makers at the level required and with other stakeholders. In general, a similar process has been followed to define targets in the three examples that were analysed in this report (MDGs, EUWFD and WWC).
- *Define the resources* that are needed and the tools as means to reach the targets.
- *Define the indicators* to monitor the process towards reaching those targets – a reliable baseline indicator is critical to the usefulness of the entire process.
- *Evaluate process performance* to introduce correctives to targets or tools if needed.

Strategic planning for water resources is by definition for the long term (20 years or more), and difficult because uncertainty levels are high. Uncertainty is a key consideration in defining future targets and generally is associated with:

- Projected pressures on the water system, which are fundamentally outside the control of water managers and can greatly affect the balance between water demand and supply and thus create new risks for water managers and users. These increasing uncertainties and growing risks require a different approach to water management strategies (WWAP, 2012).
- Forecasting techniques to estimate future water use and water resources: although forecasts may be reliable over the short term, they 'become untrustworthy as the time horizon expands from months and years to decades and generations' (Gallopín, 2012, p. 3).

Within a strategic planning context, two approaches are proposed in this report to establish future WSTs. One is top-down; it is about defining WSTs based on the utilization of water scenarios, which are understood as plausible narratives of the future that provide a useful reference frame (APEC Center for Technology Foresight, 1998). The other approach is bottom-up; it is based on well-known issues of the water sustainability agenda, on the availability of information and indicators (including baseline data), and on the actual cost of implementation.

The two approaches could be quite complementary, allowing for a target-setting process that can be realistically assessed with indicators that are regularly collected and validated by international and national agencies, without lengthy and costly scenario exercises.

## 4.1 Scenario-based targets

The term 'scenario' has been introduced into the planning literature to mean a hypothetical sequence of events constructed for the purpose of focusing attention on causal processes and decision points (Gallopín, 2012).

While it is obviously impossible to predict the future, strategic planning should be informed by a range of possible futures that is based on understanding key socio-economic and climatic drivers and it should consult aspects of future national and international development (UNESCAP, 2004). Within this context, scenarios are stories about the future that are designed to test the mental maps that managers hold. Scenarios differ from forecasts in that they always come in sets – two, three or more equally plausible, relevant and challenging versions of a possible future.

A forecast is based on an interpretation of the best information we have about the present as it is extrapolated into the future. A forecast fundamentally assumes that the future is fairly similar to the past or that we understand with a fair degree of certainty what is likely to happen. Scenarios, in contrast, offer multiple versions of an unknowable future. They also sometimes combine forecasts for variables thus bringing about new insights about correlative or synergistic effects. To engage with scenarios is to hold two or more stories in the mind at the same time and therefore to hold the future not as a belief, but as a fiction. Such stories help us deal with uncertainty without turning that uncertainty into a false sense of certainty. In addition, they help us handle the multi-dimensionality of our future (WBCSD, 2006).

Scenarios are helpful to move strategic thinking from what is known to what is not known. In addition to changing mental maps, engaging with scenarios can reveal blind spots and expose areas where strategies may not be robust. Rather than offering answers, scenarios create a common language and a shared context so that we can begin a strategic conversation. To change the way we act, we must first change the way we think – and scenarios are a platform for effecting this change (WBCSD, 2006). To develop long-term water scenarios, the UN recently initiated an ambitious study to explore alternative futures of the world's water for 2050 (personal communication with W. J. Cosgrove on draft proposal for 'Exploring Alternative Futures of the World's Water 2050', 2010).

A first and coarse approximation of global water futures for 2050 has been defined (Gallopín, 2012), intending to open a discussion about qualitative global water futures using five scenarios: Conventional World, Conflict-world, Techno-world, Global Consciousness, and Conventional World Gone Sour. These exercises can be seen as a natural progression of the four scenarios to compare alternative futures of ecosystems services and human well-being proposed by the Millennium Ecosystems Assessment: Global Orchestration, Techno-garden, Order from Strength, and Adapting Mosaic (MEA, 2005).

## 4.2 Results-based targets

The second approach to build WSTs is based on expert assessments of key results and expected performance of specific elements of the water development agenda. This approach might identify WSTs that are neutral to water scenarios except on defining the timeframe for implementation.

A few of the highest priority issues of the water development agenda, which are tracked regularly and consistently, are reduction of unaccounted for water (UFW) in the water supply and sanitation sector; ecological flows; overexploitation of aquifers; treatment of domestic and industrial wastewater; reutilization of residual water; water productivity in agriculture; access to improved water sources; access to improved sanitation; and investment in water infrastructure as a percentage of Gross Domestic Product (GDP).

For instance, defining a target, say, to achieve 20% of UFW for the major utilities worldwide could be extremely meaningful. The target responds to the overarching goal of using water efficiently and expanding service to the unserved population by (possibly) taking advantage of the cheapest source of treated water supply in cities. The target can be defined clearly, and there is information for many cities of the world that has been collected by systems such as the International Benchmarking Network (IBNET). In addition, there are multiple policy and technical tools that are available, and the costs can be reasonably estimated to propose realistic timeframes for implementation. A similar exercise could be done for other commonsense WSTs which would be present in any scenario-based target setting exercise.

Setting targets for 10 or more years into the future is a daunting task considering the inherent uncertainties involved and the amount of resources and other inputs that are needed. Therefore, it is advisable to set interim targets over shorter periods of time – say three to four years – that can be more realistically estimated and perhaps can be reasonably accomplished. These targets could be sequenced; for example, Target 1 for years one to three, Target 2 for years four to seven, and so on (Kusek and Rist, 2004).

# Part B Tools

## 1 Scope and classification

In the context of this study, tools are instruments for improving and evaluating the performance oriented towards achieving targets. The relationship between tools and WSTs has been examined from different perspectives in a brief overview of a few well-known tools, approaches and strategies that support water sector performance and sustainable development.

Considering that there are myriad tools applicable to both water development and water management, the selection in this report had the following scope. It (i) summarized a holistic approach to water resources management; (ii) identified the key elements of selected tools used in specific water-using sectors, specifically agriculture, water supply, sanitation and hygiene, and hydropower; (iii) examined the cross-sectoral dimension of water development from the perspective of tools that are applied to urban areas, the environment and adaptation to climate change; (iv) highlighted water development tools at a country level (the USA); and (v) extracted tools from the project experience of The World Bank at Project Level. Table 3 summarizes the tools that were in this way selected for this overview.

Considering the ample variety of available water development tools, this report attempts to classify them by focus and priority. To that purpose, a generic classification proposed for the water supply, sanitation and hygiene sector included in a study sponsored by the Pacific Institute (2006) is applied. The classification could be useful for evaluating the applicability of tools but more importantly for identifying important conceptual and operational voids.

The classification is based on the review of 120 support resources that led to a framework of generic characteristics that could be applied to classify decision-making support tools for the water sector. According to the proposed classification, water sector tools fall into one of five typologies:

1 Evaluation tools: Documents, websites or computer programs that help users choose among multiple options for a particular problem.

2 Process guides: Documents that describe a suggested set of steps decision-makers should take to assess and improve water and sanitation conditions in a community.

3 Technical briefs: Provide succinct descriptions of a technology, method or process.

4 Technical references: Provide practitioners with guidance on how to carry out specific tasks. They come in the form of construction manuals, operation and maintenance manuals, water quality testing procedures, and descriptions of financing methods.

5 Policy papers: Present situational analyses and make recommendations on needed policies or approaches in the field.

Table 3

Tools selected for the overview in this report

| SCOPE | SOURCE | APPLICABILITY | REFERENCE |
|---|---|---|---|
| Holistic and comprehensive approach | Global Water Partnership (GWP) Toolkit, UNESCO-WWAP and UNESCO-IHP | The most comprehensive approach to sustainability of water resources to date | GWP (2000); UNESCO-IHP and NARBO (2009) |
| Sectoral | International Water Management Institute (IWMI) and The World Bank | Water management in agriculture | Comprehensive Assessment of Water Management in Agriculture (2007); World Bank (2005) |
| | Hydropower Sustainability Assessment Protocol of the International Hydropower Association (IHA) | Hydropower development and operation | IHA (2010) |
| | International Benchmarking Network for Water and Sanitation Utilities (IBNET) | Supports and promotes good benchmarking practice among water and sanitation services | IBNET (see http://www.ib-net.org) |
| Cross-sectoral | International Council for Local Environmental Initiatives (ICLEI) Climate Change Adaptation Toolkit | Supports sustainable development at the local level and climate action plans as a tool to incorporate climate change considerations | ICLEI (2008) |
| | City Water Balance (CWB) as a modelling tool for the Sustainability of Urban Water Systems and European Commission | Allows city planners to assess options for the future management of urban water systems under a variety of changing conditions | Last (2010) |
| | Agenda 21 from the environmental point of view | Presents an integrated way to see water resources sustainability | Agenda 21, UNDESA (n.d.) |
| Country level | United States Army Corps of Engineers Dam Safety Action Classification | Manages dam safety risk | US Government (2011*a*) |
| | National Oceanic and Atmospheric Administration (NOAA) Roadmap for Adapting to Coastal Risk | Participatory process for assessing a community's vulnerability to hazards | US Government (2011*a*) |
| | Vulnerability Assessment Guide and Training by the US Department of the Interior (DOI), NOAA and the National Wildlife Federation (NWF) | Helps natural resources professionals understand how the changing climate is likely to affect fish and wildlife and the habitats on which they depend | US Government (2011*a*) |
| | Environmental Protection Agency (EPA) Climate Resilience Evaluation and Awareness Tool | Helps a drinking water or wastewater (water sector) utility to conduct a climate impacts risk | US Government (2011*a*) |
| Project level | World Bank Safeguards | For sustainable project design and implementation | The World Bank (n.d.) |
| | World Bank Output Based Aid (OBA) | To deliver and target public services in ways that promote efficiency and innovation | The World Bank (2011) |

Moreover, the review suggests that for effectively addressing decision-makers' needs, technologies and approaches should be economically, ecologically and socially appropriate and sustainable.

The typologies of water sector tools can be subdivided into ten substantive issue areas:

- Technological comparison: Descriptions, figures, tables, lists and other mechanisms that compare the benefits and disadvantages of technologies in a side-by-side manner.
- Construction: Information on how to build or implement water and sanitation infrastructure and technologies.
- Operation and maintenance (O&M): Information on specific O&M requirements for a technology, or a general discussion of O&M within a framework or methodology.
- Community involvement: Information on the role of a community or community members in water and sanitation projects, specifically their role in planning, implementation, evaluation, and O&M; and information on a specific technology, method or approach that relies on community involvement.
- Institutional aspects: Information on the role that government bodies, community groups, banks, businesses and others play in the planning, implementation, promotion, construction, evaluation and maintenance of a water- or sanitation-related method or technology.
- Cost of technologies: Information on water and sanitation infrastructure construction and O&M costs, the price consumers and providers pay for water and sanitation services using specific technologies or systems, and any other incurred costs.
- Financing: Discussion of approaches to financing specific water and sanitation technologies or general projects.
- Evaluation and monitoring: Information on the evaluation and monitoring of water and sanitation improvement projects in general, or with respect to projects that use specific technologies or systems.
- Scalability and replicability: Information on or discussion of how well particular technologies or approaches are suited to replication in other regions, or how easy it is to scale up a particular approach to larger geographic areas.
- Case studies: Descriptions of actual water and sanitation projects and their use of systems, technologies and approaches in communities.

The tools reviewed for this report were classified using the typology framework (Table 4).

## 1.1 A holistic and comprehensive approach to water resources management

The GWP has developed a comprehensive set of tools to support countries and water practitioners in applying the concept of IWRM as a strategy to address fragmented responsibilities about water and to foster the integration of water resources management across all sectors – finance, planning, agriculture, energy, tourism, industry, education and health. There is a strong belief among water practitioners that IWRM is a basic necessity to achieve water resources sustainability because it takes into account the potentialities, problems and demands of each sector and their inter-relations.

However, the global economy and society are dynamic and the natural environment is also subject to change; therefore, IWRM needs to be responsive to change and capable of adapting to new economic, social (including changing human values) and environmental conditions. IWRM is a sustainability tool that if well used could have a cross-sectoral focus illustrated by the well-known GWP 'water comb' concept introduced in Figure 3. To reiterate the concept, the comb shows the cross-sectoral integration of water use subsectors (people, food, nature, industry and other uses) and the role of IWRM in their linkage through the three areas developed in the toolbox: the enabling environment, institutional roles, and management instruments. In summary, the GWP defines IWRM as a means to achieve three objectives that are closely related to the Dublin Principles: efficiency, equity and environmental sustainability.

Considering the importance of IWRM in water sustainability, the GWP Toolbox as well as tools developed by UNESCO-WWAP and UNESCO-IHP are at the core of the review in this report. The Toolbox is the result of the participation and the experiences of many water stakeholders around the world, who concluded that addressing water issues usually requires a combination of approaches, including policies, laws, planning, institutional and regulatory mechanisms – all based on sound information. For these reasons, the GWP Toolbox provides a wide range of the options available, but it recognizes that the list is incomplete and that application varies from place to place – and it is certainly not prescriptive. The Toolbox is divided into three inter-related sets of tools that relate to (i) the enabling environment; (ii) to institutional roles; and (iii) management instruments. These are described below.

## Enabling environment tools

- *Policy tool*s lead to the development of laws, rules and regulations designed to achieve overall development goals.
- *Legislative framework tools* address issues such as water rights, allocation of responsibilities and accountabilities across water users and the government, and externalities.

Table 4

The classification of tools in different issue areas by the typology framework prepared for this report

| ISSUE AREA | TYPOLOGY | | | | | |
|---|---|---|---|---|---|---|
| | | EVALUATION TOOLS | PROCESS GUIDES | TECHNICAL BRIEFS | TECHNICAL REFERENCES | POLICY PAPERS |
| | TECHNOLOGICAL COMPARISON | EPA, WB-SA | IHA, CWB | | AG21 | IWMI, AG21 |
| | CONSTRUCTION | USACE | IHA, NOAA | | | |
| | O&M | EPA, USACE | IHA, CWB | | | |
| | COMMUNITY INVOLVEMENT | WB-SA, WB-OBA, UNESCO-WWAP, UNESCO-IHP | GWP, ICLEI, WB-AG, IWMI, NOAA, DOI, UNESCO-WWAP, UNESCO-IHP | GWP, DOI | GWP, IBNET | GWP, IWMI, AG21 |
| | INSTITUTIONAL ASPECTS | WB-SA, WB-OBA, UNESCO-IWWAP, UNESCO-IHP | GWP, IWMI, ICLEI, NOAA, DOI, UNESCO-WWAP, UNESCO-IHP | GWP, DOI | GWP, UNESCO-WWAP, UNESCO-IHP | GWP, IWMI, AG21 |
| | COST OF TECHNOLOGIES | EPA | IHA, CWB, UNESCO-WWAP, UNESCO-IHP | | IBNET | IWMI, AG21 |
| | FINANCING | WB-OBA, GWP, GW-SA | GWP, WB-OBA | GWP | GWP, IBNET | GWP, IWMI, AG21 |
| | EVALUATION AND MONITORING | GWP, EPA, WB-SA, WB-OBA | IHA, CWB, ICLEI | | IBNET | |
| | SCALABILITY AND REPLICABILITY | USACE, EPA, WB-OBA, WB-SA, GWP | WB-AG, IHA, NOAA, CWB, ICLEI, IWMI, DOI | | IBNET | |
| | CASE STUDIES | | GWP | GWP | GWP, IBNET | GWP |

AG21, Agenda 21; CWB, Central Weather Bureau; DOI, US Department of the Interior; EPA, US Environmental Protection Agency; GWP, Global Water Partnership; IBNET, International Benchmarking Network; ICLEI, International Council for Local Environmental Initiatives; IHA, International Hydropower Association; IWMI, International Water Management Institute; NOAA, National Oceanic and Atmospheric Administration; UNESCO-IHP, International Hydrological Programme of the United Nations Educational, Scientific and Cultural Organization; UNESCO-WWAP, World Water Assessment Programme of the United Nations Educational, Scientific and Cultural Organization; USACE, United States Army Corps of Engineers.

- *Financing and incentive tools* assist sustainable financing of water operations and investments to implement cost recovery and subsidy policies and to optimize the allocation of fiscal resources.

## Institutional tools

- *Governance tools* include a range of political, social, economic and administrative systems to develop and manage water resources and the delivery of water services.
- *Transboundary organizational tools* enable transboundary water resource management and collaboration, such as accepting common datasets and knowledge that allows for shared visions about the future of the resource.
- *Private sector tools* assist in the implementation of public–private partnerships in water service provision such as contracting; leasing; concessions; and BOOT (Build, Own, Operate and Transfer), BOT (Build, Operate and Transfer) and joint ventures in operating companies.
- *Civil society institutions (CSIs), community-based organizations (CBOs) and non-governmental organizations (NGOs)* play an important role in developing, communicating and implementing IWRM policies. This group includes tools to facilitate 'peer' exchanges to stimulate learning and competition, creation of apex units, and access to financing and technical support for local organizations.
- *Institutional and human capacity-building programmes* include assessment of existing capacity and management tools to resolve conflicts and build consensus.

### Box 2: Why gender in water resources?

It is widely acknowledged that women traditionally play a central role in the collection and safeguarding of water for domestic and – in many cases – agricultural use, but they often have a much less influential role than men in management, problem analysis and the decision-making process related to water resources. There is a global consensus about the importance of gender equality issues to development practice and it is at the heart of economic and social progress.

Gender refers to the different roles, rights and responsibilities of men and women and the relations between them. Gender does not simply refer to women or men, but to the way their qualities, behaviours and identities are determined through the process of socialization. Gender is generally associated with unequal power and access to choices and resources. The different positions of men and women are influenced by historical, religious, economic and cultural realities. These relations and responsibilities can and do change over time.

Development results cannot be maximized and sustained without explicit recognition that every policy, programme and project affects women and men differently. Addressing gender as a cross-cutting goal requires that women's views, interests and needs shape the development agenda as much as men's, and that the development agenda support progress towards more equal relations between men and women. The ability to do this can be strengthened through community organizations and institutions, and building participatory capacity.

Involving both women and men in integrated water resources initiatives can increase project effectiveness and efficiency. Participation by both men and women improves project performance and improves the likelihood of sustainability. In other words, a project is more likely to achieve what planners hope it will achieve if women and men (both rich and poor) are active participants and decision-makers.

- *Gender* is a key principle for sustainable development; it constitutes one of the Dublin Principles and is implicit in the MDG targets (see Box 2).

## Management tools

- *Water resources assessment tools* look at both the quantity and the quality of surface water and groundwater. They identify the pertinent parameters of the hydrological cycle, and evaluate the water requirement of development alternatives. The assessment pinpoints the major water resources issues and potential conflicts, their severity and social implications, as well as risks and hazards such as flood and drought. Understanding of terrestrial and aquatic ecosystems is an essential element of resource assessment.
- *Planning process for IWRM* must take into account not only development options within the water sector itself but also scenarios for development and relations between other sectors that may have an impact on water resources (e.g. water demand or water quality). Likewise, the consequences of water management decisions in other economic sectors (e.g. tourism or health) should be an integral part of the analyses made during the planning process. It is important that the planning process includes analysis of risks (e.g. climatic variations, economic and political risks) and addresses the necessary and adequate measures to reduce or manage risks.
- *Supply and demand management* looks at changing demand and the way people use water in order to achieve more efficient and cost-effective water use and to reduce waste. These tools are linked to social change instruments, regulatory and economic instruments, and communication and knowledge. They can apply to river basins as well as to large users of water such as utilities, industry and agriculture.
- *Social change instruments* are a strong tool for encouraging new civil orientation as changing water practices require broad stakeholder participation in water planning and operating decisions. Education and awareness raising are important tools for social change, involving the incorporation of locally relevant sustainable water management at all levels of education.
- *Conflict resolution and consensus-building procedures* are central to successful governance and management of water resources, as well as for peace as a wider goal. These tools are used to anticipate, prevent and react to conflict. Which tool to select depends on the root causes of the conflict, as well as its type and location. Conflict management tools can be classified into (i) interventions for conflict management; (ii) decision support/modelling tools; and (iii) tools for consensus-building. A conflict management strategy will involve a combination of these three types.
- *Regulatory instruments* that have a role to play in IWRM comprise (i) direct regulation to establish laws, rules or standards that water and land users and water service providers are required to follow; (ii) economic regulation such as pricing, subsidies and tradable, marketable rights; (iii) self-regulation through establishment of own rules of conduct and mechanisms to ensure compliance; and (iv) social regulation persuasion, information and education.

## Coordination of IWRM and flood management tools (UNESCO-IHP and NARBO, 2009)

### *The Pentagram*

The pentagram is a useful tool for comparing alternative plans (Figure 11). The five axes represent the indices to be compared and the evaluation results are plotted on the axes. The plotted points are then connected to create a pentagram. The number of indices can be set as appropriate for the application; so, for example, if there are six indices, a hexagram results. The better balanced and larger the created diagram, the better the proposed plan. A pentagram for each plan can be created as follows:

1 Create a regular polygonal shape within vertices

2 Connect each of the vertices with the centre point of the polygon (hereafter, axes)

3 Label each axis with an evaluation index

4 Plot on the axes the evaluation results for each index – the vertices' point is the perfect score while the worst score is located in the centre of the polygon

5 Connect the plotted points on the axes by straight lines and create a polygon within vertices

6 Complete the pentagram by colouring the inside of the polygon

### *Visualization*

It is useful for managers to visualize using graphics – that help them as well as stakeholders involved in the decision-making process – certain situations:

- When the water resources and the water-use status in a basin are to be assessed under the 'Recognizing and identifying' phase of the 'IWRM spiral' model (Figure 4), visualization of the basin situation can be useful in determining high stress areas or important locations to be addressed in the allocation and coordination of water resources.
- One of the important conditions for sectors to consider when participating in a project is their financial condition. If the managers in charge of coordinating an IWRM project are aware of the financial conditions of the sectors involved when preparing the project implementation plan, this can greatly facilitate the coordination process.
- In water resources development, a master plan is generally developed before individual projects are planned and implemented. It is useful to visualize such planning frameworks and processes to better understand the overall framework and structure of water resources development, which includes the legal requirements that need to be met and the institutional level at which decisions will be taken.

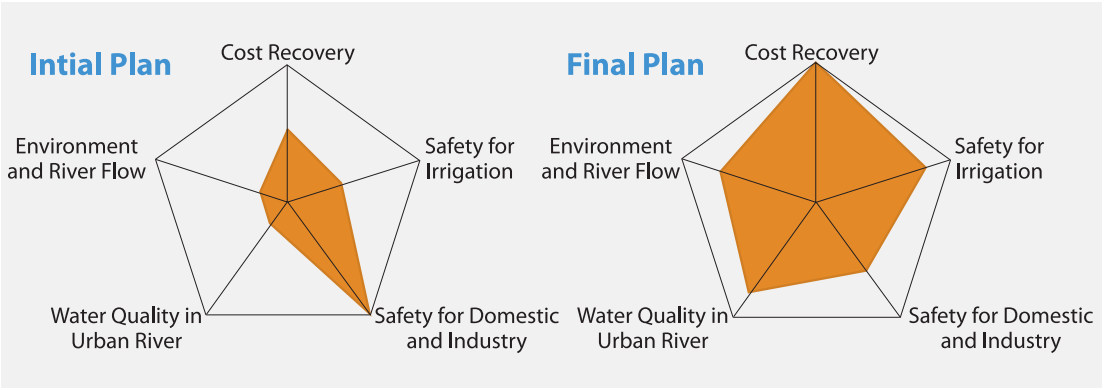
### *Cost allocation*

When a multi-purpose infrastructure development is jointly implemented, the cost allocation among sectors must be agreed upon from the outset. Sectors are generally divided into groups of stakeholders who share the same purpose, and a cost is allocated to each. If a sector has multiple purposes, that sector is included in each of the relevant purpose groups. The remaining (non-separable) cost is allocated among the purpose groups in the following manner:

1 Determine for each purpose group the cost of implementing the project individually (estimated cost) and the justifiable investment amount, and select the lesser of the two.

Figure 11

The Pentagram coordination tool




*Source:* UNESCO-IHP and NARBO (2009, fig. 7, p. 33).

2 Deduct the separable cost from the cost above for each purpose group.

3 Allocate the remaining cost among purpose groups in proportion to the amount determined above.

*Grasping the positioning of stakeholders and their relationships*

Identifying all stakeholders and understanding the positioning and relationships that connect them is useful in laying out strategies for stakeholder involvement effectively and efficiently. Such efficiency is improved further if a key person in each stakeholder group is identified and involved.

## Flood management tools

*Flood hazard map*

A flood hazard map provides information such as anticipated inundation areas, severity/depth of inundation, and location of evacuation shelters and other facilities. It aims to promote the quick and safe evacuation of residents and minimize damages in the event of flooding. Posting hazard maps in communities facilitates public awareness of floods by residents and travellers.

*Global Flood Alert System*

The Global Flood Alert System (GFAS) automatically forecasts flooding worldwide by computing real-time basin rainfall for world rivers based on earth observation satellite data. This system assists the flood forecasting and distribution of flood alerts of developing countries that lack access to the telemeter rainfall observation network.

*Integrated Flood Analysis System*

The Integrated Flood Analysis System (IFAS) has interfaces to input ground-based and satellite-based rainfall data as well as Geographic Information System (GIS) functions to create river channel networks, and it estimates the parameters of a default runoff analysis engine and interfaces to display output results. IFAS is used as a flood forecasting and warning system in ungauged or poorly gauged basins, and was developed by the International Centre for Water Hazard and Risk Management (ICHARM) under the auspices of UNESCO (ICHARM, 2009).

*Training in disaster management*

Practical training programmes in a role-playing style are effective for enhancing the management capacities of disaster managers while raising disaster awareness among floodplain residents. These programmes thereby minimize the damage caused by disasters.

*Flood-fighting drills*

Flood-fighting drills can involve local residents, private companies, local disaster managers and NGOs. Drills can be for information dissemination, river inspection, and flood-fighting construction and technologies. Conducting such drills annually (perhaps specifying a 'flood prevention month/week') before the flood season may be effective.

*Workshops for preparing appropriate hazard maps*

By conducting workshops on how to prepare or use hazard maps, disaster managers can promote flood preparation in a basin. Organizations such as ICHARM organize such workshops for managers from developing countries, and they in turn can provide the workshops in their local areas.

*Integrated flood management*

Integrated flood management (IFM) is a concept that aims to make a shift from 'controlling' floods (conventional flood management) to achieving sustainable development of the basin while maximizing the net benefit from floodplains by appropriately 'managing' floods. The Associated Programme on Flood Management (APFM) promotes IFM, which integrates land and water resources development in a river basin, within the context of IWRM, with a view to maximizing the net benefit from floodplains and minimizing loss of life due to extreme hydrological events (APFM, n.d.).

## 1.2 Sectoral scope: Water for food

The International Water Management Institute (IWMI) and The World Bank understand that agricultural water management includes (i) irrigation for large and small schemes and farms; (ii) drainage of irrigated and rainfed areas; (iii) watershed restoration; (iv) recycled water use; (v) rainwater harvesting; and (vi) all in-field water management practices (Comprehensive Assessment of Water Management in Agriculture, 2007; World Bank, 2005). The challenges facing agricultural water management include (i) policy and institutional challenges; (ii) economic and financial challenges; (iii) declining investment; (iv) the challenge of technology and water resources to supply growing demand; (v) the poverty and rural incomes challenge; and (vi) environmental dimensions and the sustainability imperative (World Bank, 2005).

The question is: How can we meet food and fibre demand with our land and water resources? The world's available land and water resources can satisfy future demands in several ways using strategic tools; for example:

*Investing to increase production in rainfed (or green water) agriculture*

- Increasing productivity in rainfed areas through enhanced management of soil moisture and supplemental irrigation where small water storage is feasible

- Improving soil fertility management, including the reversal of land degradation
- Expanding cropped areas

*Investing in irrigation (blue water)*

- Increasing annual irrigation water supplies by innovations in system management, developing new surface water storage facilities, and increasing groundwater withdrawals and the use of wastewater
- Increasing water productivity in irrigated areas and value per unit of water by integrating multiple uses – including livestock, fisheries and domestic – in irrigated systems
- Establishing governance of irrigation. With the general decline in construction of new systems and the shift of management responsibilities to users, the role of public irrigation agencies is rapidly changing. Activities in planning and designing systems, contracting for and supervising civil works, and delivering water to farms will be less important. New responsibilities will include resource allocation, bulk water delivery, basin-level management, sector regulation, and the achievement of global social and environmental goals such as the MDGs.

*Conducting agricultural trade within and between countries*

- By trading agricultural commodities, a nation is also trading the amount of water required to produce those commodities domestically. Trading can result in net gains (imports) or losses (export) in virtual water – a strategic increase in international food trade could thus mitigate water scarcity and reduce environmental degradation in some countries. However, despite emerging water problems, many countries view the development of water resources as a more secure option to achieving food supply goals and promoting income growth, particularly in poor rural communities.

*Reducing gross food demand*

- Influencing diets
- Reducing post-harvest losses, including industrial and household waste

Each of the above strategies and tools will affect water use, the environment and poor communities but in very different ways, depending on the local setting. In addition, all of the strategies and tools must have investment to improve management, build effective institutions to meet changing demands, and increase knowledge and human capacity.

A combination of investment, policy shifts and research approaches will clearly be needed, and each strategic tool will have its risks and trade-offs. While the global policy and economic environment will provide the overall framework, local conditions will dictate the choices for future water investments in agriculture.

## 1.3 Sectoral scope: Water for people

The IBNET Toolkit for Water and Sanitation Utilities supports and promotes good benchmarking practice by providing guidance on indicators and definitions; facilitating the establishment of national or regional benchmarking schemes; and undertaking peer group performance comparisons.

The purpose of benchmarking is to search for and identify best practices in a sector with the objective of implementing those practices and thus improving performance. Collection of data is not benchmarking, but it is an integral step in the benchmarking path to improved performance. The provision of comparative information and its use in benchmarking has become an important management tool for managers and professionals in water and sanitation utilities. If data definitions are shared and used by a sufficient number of participants, at least for a core set of indicators, this network will add value to all its users and contributors by providing them with useful international comparative information.

The IBNET Toolkit has been developed to support the above concept and to provide initial support to newly establishing benchmarking schemes. The IBNET Toolkit includes:

- A set of core indicators on which stakeholders can build their own customized measurement and monitoring system
- A data list complete with robust data definitions
- A data capture system that also calculates the complete indicator set
- A method to share information and get the most out of benchmarking

IBNET has a database of more than 2,000 utilities in 85 countries, and it is presented in English, French, Russian and Spanish. The database for each utility has information on contacts, service coverage, staffing, water service, sewage service, financial performance, tariff information, customer relations, consumption, production, no revenue water, metering practices, network performance, costs, quality of services, billing and collection, assets, affordability of services and process indicators.

## 1.4 Sectoral scope: Water for energy

The Hydropower Sustainability Assessment Protocol (IHA, 2010) is a sustainability assessment framework for

hydropower development and operation developed by the International Hydropower Association (IHA) to promote sustainability in the sector. The Protocol enables the generation of a sustainability profile by project sponsors through the assessment of performance within important sustainability topics.

The tool is applied through four successive protocols depending on the stage of the development cycle of a project: Early Stage, Preparation, Implementation and Operation. Within each protocol assessment tool there is a set of topics important to the overall sustainability of that project at that point in its life cycle. Topics, when taken together, provide the list of issues that must be considered to confidently form a view on the overall sustainability of a hydropower project. These protocol assessment tools are as follows.

- *The Early Stage assessment tool* is a preliminary screening tool to assess the strategic environment from which proposals for hydropower projects emerge. It identifies project risks and opportunities at an early stage in order to identify the challenges and management responses to proceed with a more detailed project investigation.
- *The Preparation assessment tool* assesses the stage of a hydropower project during which investigations, planning and design are undertaken for all aspects of the project.
- *The Implementation assessment tool* assesses the stage of a hydropower project during which construction, resettlement, environmental and other management plans and commitments are implemented.
- *The Operation assessment tool* assesses the operation of a hydropower facility to inform about the view that the facility is operating on a sustainable basis with active measures in place towards monitoring, compliance and continuous improvement.

## 1.5 Cross-sectoral scope: Water and adaptation to climate change

As the climate is changing so too are the challenges facing local governments, which need to enhance their capacity to anticipate and respond, by harnessing opportunities and managing risks, while helping their communities adapt to the impacts of climate change.

There are multiple tools and methodologies developed by the International Council for Local Environmental Initiatives (ICLEI) to assist local governments in adapting to climate change (ICLEI, 2008). The Australian Government and ICLEI have developed a useful tool to manage risks at the local level by helping local governments navigate the complexity and uncertainty inherent in making decisions based on climate change impact scenarios so that they can plan for and manage the local impacts of climate change. This tool provides information about climate change scenarios to assess a wide variety of risks and opportunities, and it includes these guiding principles integral to effective implementation of climate adaptation strategies at the local level:

- *Balance immediate and long-term needs.* While some of the impacts of climate change are felt today, a balance between immediate and long-term needs is required.
- *Interaction must be supplemented with action.* Adaptation approaches go beyond territorial jurisdiction of local governments and so these governments should interact with institutional stakeholders at a wider geographic level.
- *Make a commitment to act in the face of uncertainty.* Local governments must commit to approaches and decision-making under uncertainty.

This toolkit for local decision-makers and other local stakeholders is organized according to the adaptive management process. It follows a logical sequence which is generally assisted by experienced facilitators to guide a participatory and stepwise process, including questionnaires, workshops, identification of suitable tools, identification of stakeholders, and drafting of consensus documents. The process includes assessment of several climate scenarios and their potential impacts. It is action-oriented, providing detailed guidance on risks and barriers for implementation, as well as producing issues based on assumptions and also proposing actions.

## 1.6 Cross-sectoral scope: Water and urban areas

One of the most recent and innovative tools for urban water management has been developed under the EU-funded SWITCH project (Last, 2010; UNESCO-IHE, n.d.). Multiple instruments and approaches from this project are being tested; the City Water Balance (CWB) is particularly interesting as a modelling tool that forms part of the City Water decision support system. CWB allows city planners to assess options for the future management of urban water systems under a variety of changing conditions. For example, planners can explore the impact of alternative technical options to cope with pressures on water and wastewater caused by climate change or population change.

Features of the CWB tool include integration of the natural environment into the urban water cycle; inclusion of regulatory aspects and historical data; analysis of urban development; and a wide range of time and space horizons under which planning can be assessed. CWB allows planners to model the balances of water, energy and pollution associated with urban water systems at the city level. The model provides indicators of the proportion of water demand to supply; wastewater production; water quality; life-cycle energy; and life-cycle costs. CWB is based on simplified assumptions about water storage

and use and transmission of water in unit blocks of land use in a city (e.g. apartment blocks, hospitals and golf courses). Neighbourhoods can be characterized by similar types of land use units and can be grouped together to map the water flow in the city.

CWB also enables water; runoff; natural water systems such as rivers, lakes and ponds; water pollution; and the life-cycle energy and costs associated with each water management option to be assessed. Strategic planning for sustainable water systems include green roof provision, wastewater recycling, porous pavements and retention ponds. The CWB model can map city waterscapes relatively quickly and can be used by planners with both advanced and less advanced mapping and monitoring capabilities, allowing valid comparisons to be made.

## 1.7 Cross-sectoral scope: Water and the environment

Agenda 21 (UNDESA, n.d.) is a comprehensive plan of action to be taken globally, nationally and locally by organizations of the UN System, governments, and major groups in every area in which humans have impact on the environment. Agenda 21 was adopted jointly with the Rio Declaration on Environment and Development and the Statement of Principles for the Sustainable Management of Forests by more than 178 governments at UNCED in Rio in 1992. Agenda 21 is a framework generated from the environmental point of view, and it proposes an integrated way to see water resources development sustainability. The following programme areas for the freshwater sector were proposed in Agenda 21:

- Integrated water resources development and management
- Water resources assessment
- Protection of water resources, water quality and aquatic ecosystems
- Drinking water supply and sanitation
- Water and sustainable urban development
- Water for sustainable food production and rural development
- Impacts of climate change on water resources

Each programme area has a basis for action, objectives, targets and activities that could be implemented as well as means (or tools) of implementation. The means or tools proposed for all areas are of four types: (i) financing and cost evaluation; (ii) scientific and technological; (iii) human resources development; and (iv) capacity-building.

For each programme, detailed recommendations to be used or adopted are presented for each type of tool, with the exception of financing and cost evaluation, for which an estimated cost is always proposed by order-of-magnitude estimates until the programme is reviewed by

### Box 3: Water, the Green Economy, and Green Societies

Water plays a vital role in all aspects of human life, but a chronic lack of interest in and political support for water resources management has led to poor governance of and underinvestment in it. Bold leadership – from both public and private spheres – and new approaches to business, investment and policy are required to confront the world crises in water, and these must be founded on a green society approach to sustainable development.

The 'Green Economy' concept shines a new perspective on the role of sustainable water management. It centres on the interdependency of the water, agriculture and energy sectors and therefore seeks common solutions. After all, development objectives in the spheres of energy security, food security and access to drinking water critically depend on whether water is available in sufficient quantity and quality.

The United Nations Environment Programme (UNEP) defines a green economy as one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. In its simplest expression, a green economy can be thought of as one which is low carbon, resource efficient and socially inclusive.

UNEP's Towards a Green Economy report (UNEP, 2011) indicates that while economic growth under a green scenario may be less in the short term than under a business-as-usual scenario, in the longer term (2020 and beyond), green would outperform business-as-usual by both traditional measures and more holistic ones. The report also finds that in a number of important sectors, such as agriculture, building, forestry and transport, a green economy delivers more jobs throughout the short, medium, and long terms than does a business-as-usual economy.

Some enabling conditions are needed to foster the application of green economy concept, and these are related to implementing IWRM, long-term planning for sustainable water resources, a regulatory framework, establishing more effective communication with decision-makers and the public, emphasizing the demand-side approach, providing effective price signals and moral and financial motivation for change, and providing finance for better institutional management of water resources.

a government – actual costs and financial arrangements are then included depending on the specific strategies the government decides on for implementation.

## 1.8 Country-level scope

At the country level, the risk assessment tools developed by US federal agencies provide interesting frameworks that are widely used worldwide (US Government, 2011*b*, appendix I [Examples of Risk Assessment Tools]):

- United States Army Corps of Engineers (USACE) Dam Safety Action Classification (DSAC): This method is used by USACE to manage dam safety risk by ensuring that all dams and appurtenant structures are designed, constructed and operated safely and effectively under all conditions, based on the dam safety programme purposes as adopted by the Interagency Committee on Dam Safety.
- National Oceanic and Atmospheric Administration (NOAA) Roadmap for Adapting to Coastal Risk: This is a participatory process for assessing a community's vulnerability to hazards and for incorporating relevant data and information about hazards and climate into ongoing local planning and decision-making. It assists decisions about impact on operations and budgets of hazards related to land use, government services, community character and natural resource protection. Hazards are connected to all these areas and impact operations and budgets.
- Vulnerability Assessment Guide and Training: These guidelines, developed jointly by the US DOI, NOAA and the National Wildlife Federation (NWF), are designed to help natural resources professionals understand how the changing climate is likely to affect fish and wildlife and the habitats on which they depend.
- Environmental Protection Agency (EPA) Climate Resilience Evaluation and Awareness Tool: This has been developed in response to actionable signals indicating localized climate impacts hold the potential to affect operational conditions. A drinking water or wastewater (water sector) utility would conduct a climate impacts risk assessment (vulnerabilities, threats and consequences) looking at a broad range of potential systems implications. This focused engagement would include assessing the risk of a range of water sector system component responses to climate change-related watershed variation. In response to risk assessment outputs, a water sector utility would develop strategies to address the identified risk, including expanded operating flexibility, expanded capacity, and development of alternative supply and treatment options. The EPA has developed a PC-based Climate Resilience Evaluation and Awareness Tool (CREAT) for drinking water and wastewater utility owners and operators under its Climate Ready Water Utilities Program.

## 1.9 Project-level scope

### The World Bank Safeguards Policies

Ensuring compliance with sustainability principles at the project level is a major concern of development agencies. To meet the overarching goals of sustainable development, The World Bank has developed environmental and social safeguards policies that are used for investment lending in projects; they have the following objectives:

- Ensure that environmental and social issues are evaluated in decision-making
- Reduce and manage the risk of the project/programme
- Provide a mechanism for consultation and disclosure of information

All of the environmental and social safeguards policies that The World Bank applies to its projects have a direct or indirect connection to water and sustainability issues.

#### *Environmental assessment*

Environmental Assessment (EA) is a process used to evaluate a project's potential environmental risks and impacts in its area of influence; examine project alternatives; and identify ways of improving project selection, sitting or location, planning, design and implementation by preventing, minimizing, mitigating or compensating for adverse environmental impacts and enhancing positive impacts. It includes the process of mitigating and managing adverse environmental impacts throughout project implementation.

#### *Natural habitats*

This policy seeks to ensure that Bank-supported infrastructure and other development projects take into account the conservation of biodiversity, as well as the numerous environmental services and products which natural habitats provide to human society.

#### *Pest management*

Rural development projects must avoid using harmful pesticides. A preferred solution is to use integrated pest management (IPM) techniques and encourage their use in all of the sectors concerned. If pesticides have to be used in crop protection, the Bank-funded project should include a Pest Management Plan (PMP).

#### *Indigenous people*

The development process should fully respect the dignity, human rights, economies and cultures of indigenous people. The Bank provides project financing only where free, prior and informed consultation results in broad community support to the project by the affected indigenous people.

### *Involuntary resettlement*

This policy is triggered in situations involving involuntary taking of land and involuntary restriction of access to legally designated parks and protected areas. The policy aims to avoid involuntary resettlement to the extent feasible, or to minimize and mitigate its adverse social and economic impacts. This policy promotes participation of displaced people in resettlement planning and implementation; its key economic objective is to assist displaced persons in their efforts to improve or at least restore their incomes and standards of living after displacement.

### *Physical cultural resources*

This policy addresses physical cultural resources, which are defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic or other cultural significance. Their cultural interest may be at the local, provincial or national level, or within the international community.

### *Forests*

This policy aims to reduce deforestation, enhance the environmental contribution of forested areas, promote afforestation, reduce poverty, and encourage economic development. The Bank recognizes that forests play an increasingly important role in poverty alleviation, economic development, and providing local as well as global environmental services.

### *Dam safety*

Because there are serious consequences (social, economic and environmental) if a dam does not function properly or fails, the Bank is concerned about the safety of new dams it finances and existing dams on which a Bank-financed project is directly dependent.

### *International waterways*

Projects on international waterways may affect the relations between the Bank and its borrowers and between riparian states. Therefore, the Bank attaches great importance to the riparian countries making appropriate agreements or arrangements for the entire waterway, or parts thereof, and stands ready to assist in this regard.

### *Disputed areas*

Projects in disputed areas may affect the relations between the Bank and its borrowers, and between the claimants to the disputed area. Therefore, the Bank will only finance projects in disputed areas when either there is no objection from the other claimant to the disputed area, or the special circumstances of the case support Bank financing, notwithstanding the objection. The policy details those special circumstances.

## The World Bank Output Based Aid

The Output Based Aid (OBA) tool has been developed by The World Bank (World Bank, 2011; Mumssen et al., 2010) to complement traditional approaches to aid and public spending that have often failed to yield sustained improvements in services, particularly for the poorest people and communities. Thus an important question for developing countries and for the international development community is how to deliver and target public services in ways that promote efficiency and innovation, increase accountability for performance, and – in a world of limited budgets – leverage public resources with private financing. This is the question to which OBA schemes seek to provide an answer to. OBA contrasts to aid projects focusing on financing facilities (e.g. building a water treatment and distribution system).

Individuals who lack the financial means to pay for basic services are targeted by OBA; the service provider will receive subsidies to replace costs associated with providing the service to these people. Independent agents verify that the service is being delivered and payment of subsidies is based on the performance of the service provider.

# Part C Regional cases

A brief outline of five water resources systems is presented in this part of the report to illustrate some of the water and sustainability concepts that have been discussed. For each regional case, a major sustainability issue is identified together with strategic tools to address economic and environmental trade-offs in achieving long-term sustainable commitments. All cases are important transboundary systems with multiple riparian countries with widely different, and even potentially conflicting, interests.

In the case of the Mekong River system, upstream countries have a strong interest in hydropower development that would change the flow regime of the river, affecting downstream irrigation, navigation, fish production and multiple environmental services. A major sustainability issue of the Danube River system is to ensure water and environmental quality in the lower part of the river. While there are not major sustainability issues in the Guarani Aquifer System, recharge areas are under threat by large changes in land use. Allocation of the Nile's water has large geopolitical implications and at the same offers unique opportunities to foster economic development and poverty reduction through cooperation based on principles of benefits sharing across the basin. Finally, regulating the Zambezi River to optimize hydropower generation has implications for flood control and for delivering key environmental services downstream, including land–sea interactions in the delta.

In all of these cases, key strategic tools are centred on building a legal and an institutional framework and making agreements to facilitate a common understanding of key sustainability issues, the trade-offs involved, and mechanisms to resolve conflicts. Importantly, the tools are centred on building a shared agenda and strategy – the basis of long-term sustainable commitments.

livelihoods depend heavily on agriculture, fisheries and forestry. Forty-three per cent of the lower Mekong basin is forest, and inland fisheries of the Mekong basin are among the most productive in the world.

Map 1

The Mekong River

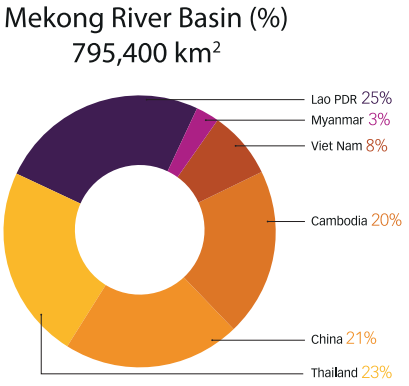

*Source:* Greater Mekong Subregion, Map No. 4112 Rev. 2, January 2004. United Nations Department of Peacekeeping Operations Cartographic Section.

# 1 The Mekong River

## 1.1 Introduction

The Mekong is the largest river in South-East Asia and is shared by six countries. It has a mean flow of 15,200 $m^3/s$. The population in the watershed is about 74 million and comprises several distinct ethnic groups, with many languages, and rich cultures that have been closely associated with the river for millennia. About 75% of the population in the basin is poor and the people's

| CHARACTERISTIC | VALUE |
|---|---|
| Length | 4,800 km |
| Watershed area | 795,400 $km^2$ |
| Mean rainfall | 1,000–5,000 mm/year |
| Annual flow | 475,000 x $10^6$ $m^3$ |
| Population | 74 million |
| GDP per capita | US$252–876 |
| Poverty rate | 75% |




Water infrastructure development is incipient; in particular, hydropower potential is estimated at 30,000 MW, but only 10% has been tapped. Ecosystems are still largely healthy, and biodiversity remains among the richest in the world. In general, water quality is good, but deteriorates near densely populated areas and as a consequence of intensive agriculture and aquaculture.

## 1.2 Issues

One, if not the main, water sustainability issue of the Mekong River basin is the potential change in the flow regime of the river caused by dams in the upper basin. There are large trade-offs between the potential use of the river by upstream riparian countries, mainly for hydropower generation, and irrigation, fisheries and river navigation in the lower reach of the river – uses that have fed a large population and a vast cultural heritage for thousands of years. The construction of dams, particularly in the main stem of the river, will have multiple negative impacts such as fish migration, changes in sediment flow, and coastal erosion.

Water resources management in the lower Mekong River basin (LMB) is adapted to the annual regime of floods and droughts. Seasonal high flows fertilize the flood plain, irrigate rice fields and support fish production. At the same time, extreme floods produce substantial human casualties and damages to crops and infrastructure. The dry season often leads to shortages of water supply for domestic use and agriculture, and limits river navigation.

In the Mekong Delta, low flow results in 2.1 million ha being affected by sea water intrusion. Recent studies show that climate change poses a new challenge to the LMB countries, principally Viet Nam, by increasing their vulnerability and risk to natural hazards. There is a widespread perception that damming the river could worsen these impacts.

## 1.3 Tools

The strategic tool for water sustainability in the Mekong River is to achieve a status of mutual understanding and cooperation among riparian countries that maximize the benefits of the river for present and future generations. Therefore, for the past 50 years, the Mekong River has been an emblematic symbol of transboundary cooperation.

The Mekong River Commission (MRC) and its predecessors (since 1957) is one of only very few regional institutions to have survived the difficult period of the Cold War and ideological confrontation. Since the signing of the Mekong Agreement in 1995, the MRC's achievements have demonstrated the extent to which a river-based organization can impact a region through the strengthening of cooperative governance and the building of national capacity. Cooperation is being built on a shared vision and common goals, as well as on mutual understanding and trust. However, a daunting task is to ensure that the two upstream countries, China and Myanmar, become more actively involved in the cooperative processes.

Since 2001 the MRC has embarked on a process of basinwide development planning, taking into consideration the national programmes of development using the resources from the Mekong. Three five-year strategic plans have been approved: 2001–2005, 2006–2010 and 2011–2015. These plans follow the principles of IWRM to encourage balanced and coordinated development and investment.

The MRC has significant financial constraints. To date, it has been largely supported by the Member States and donor funding through various technical programmes. Financial sustainability is a major issue for the MRC. It is expected that core administration costs will be fully covered by the four member countries by 2015, and that country ownership and financial sustainability of the MRC will be achieved by 2030.

The Strategic Plan 2006–2010 set forth an overarching Strategic Goal and four Specific Strategic Goals. The overarching Strategic Goal is to support the riparian countries to reach a more effective use of the Mekong's water and related resources to alleviate poverty while protecting the environment. This overarching goal is broken down into these Specific Strategic Goals: (i) promote and support coordinated, sustainable and pro-poor development; (ii) enhance effective regional cooperation; (iii) strengthen basinwide environmental monitoring and impact assessment; and (iv) strengthen IWRM capacity and knowledge base of the MRC partners and stakeholders.

For more than 50 years, many tools proposed by the GWP for IWRM have been implemented, including specific tools to establish a sound legal and policy framework; mobilize financing; and create the institutional organization to generate data and knowledge, support decision-making, coordinate government agencies, and foster participation of stakeholders.

While there has been much progress at the institutional level, the challenges ahead to achieve long-term sustainable commitments across the diverse (and conflicting)

interests of riparian countries are enormous. Hopefully, the way forward will be lighted by the same persistence of the past 50 years – within an environment of trust and cooperation across governments and with relentless political will to compromise and achieve sustainable commitments.

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# 2 The Danube River

## 2.1 Introduction

The Danube River basin (DRB) is in the heartland of Central Europe, covering all of Hungary; most of Romania, Austria, Slovenia, Croatia and Slovakia; and significant parts of Bulgaria, Germany, the Czech Republic, the Republic of Moldova and the Ukraine. Territories of Serbia, Montenegro, Bosnia and Herzegovina, and small parts of Italy, Switzerland, Albania and Poland are also part of the basin.

Map 2

The Danube River

*Source:* Wikipedia (http://en.wikipedia.org/wiki/Danube).

| CHARACTERISTIC | VALUE |
|---|---|
| Length | 2,857 km |
| Watershed area | 801,463 $km^2$ |
| Mean rainfall | 400–3,000 mm/year |
| Annual flow | 206,000 x $10^6$ $m^3$ |
| Population | 83 million |
| GDP per capita | US$350–29,000 |

The DRB provides a vital resource in water supply for more than 20 million people, also sustaining biodiversity, agriculture, industry, fishing, recreation, tourism, power generation and navigation. The river is an aquatic ecosystem with high economic, social and environmental value. The Danube River discharges into the Black Sea through a delta, the second largest natural wetland in Europe. Different hydraulic structures and intensive water use in the basin influence the natural flow regime.

## 2.2 Issues

The main issue in the DRB is related to water and environmental quality. The DRB is under great pressure from economic activities and land use changes, its numerous urban centres, and a wide range of industrial, agricultural, forestry and mining activities. A large number of dams and reservoirs, dykes, navigation locks and other hydraulic structures have been constructed in the basin to facilitate important water uses; these include more than 40 major structures on the main stream of the river. These hydraulic structures have resulted in significant economic benefits but they have also caused, in some cases, significant negative impacts downstream.

In addition to biological pollutants, pollution from other hazardous substances is also significant in the DRB. The major cause is wastewater treatment that is either missing or inadequate in the middle and lower DRB. The countries within the upper basin have already taken significant measures related to wastewater treatment during recent decades and have succeeded in reducing negative impacts due to organic pollution on surface water status.

## 2.3 Tools

The DRB countries and the EU signed in June 1994 the Convention on Cooperation for the Protection and Sustainable Use of the River Danube – the Danube River Protection Convention (DRPC). The Convention is aimed at achieving sustainable and equitable water management. With its entry into force in 1998, the DRPC became the overall legal instrument for cooperation and transboundary water management in the DRB among the Contracting Parties.

The EUWFD that was approved in December 2000 provides an innovative approach for water management based on river basins (natural geographical and hydrological units) and sets specific deadlines for EU Member States. All countries of the EU have been using a river basin approach for water management since the adoption of the Directive.

The International Commission for the Protection of the Danube River (ICPDR) provides the institutional and legal framework for development and implementation of policies and measures defined in the EUWFD. The ICPDR has technical and management tools for transboundary cooperation and a high level of commitment from the participating governments (13 Contracting States) as well as the European Community.

What makes the implementation process in the DRB challenging is the fact that currently, not all countries are EU Members and therefore obliged to fulfil the EUWFD. Several Danube countries are in accession and are preparing to fulfil the complete body of EU legislation to become EU Members. Others have not stated their intent to join the EU. Nonetheless, a number of the non-EU countries are implementing the Directive.

In the DRB, many tools proposed by the EUWFD using an IWRM approach have been used, such as legal tools, policies, financial tools, institutional organization to coordinate and permit the participation of diverse stakeholders, building institutional capacity, and developing human resources and management instruments. Tools also include water resources assessment – the Danube River Basin Management Plan – working for water efficiency (principally transboundary surface and groundwater quality), conflict resolution, regulatory instruments for establishing allocation and water use limits through ICPDR regulations, and information gathering and dissemination to stakeholders.

The Danube River Basin Management Plan has to be updated every six years according to EU legislation. Within the Plan there are four significant water management issues for surface waters: pollution by (i) organic substances, (ii) nutrients and (iii) hazardous substances, and alterations to (iv) hydromorphology (i.e. the structural characteristics – shape, boundaries and content – of rivers, lakes, and transitional and coastal waters). There are two transboundary groundwater issues: alterations to (i) quality and (ii) quantity.

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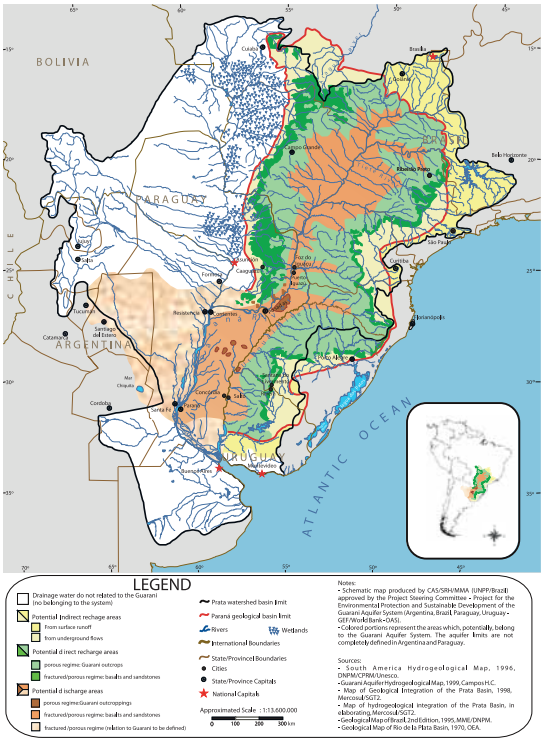
# 3 The Guarani Aquifer

## 3.1 Introduction

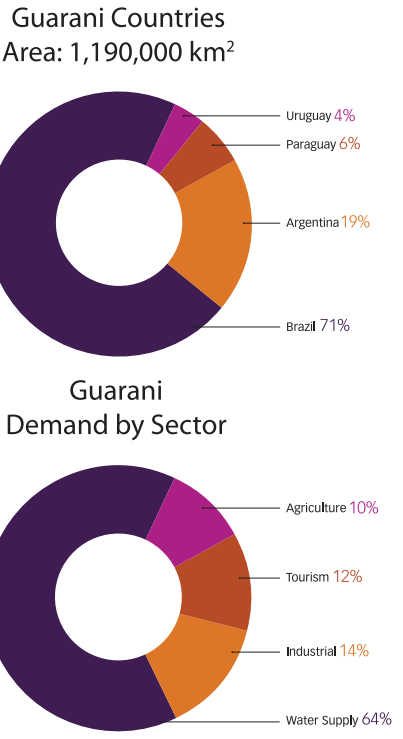
The Guarani Aquifer System (GAS), one of the world's largest, underlies an area of 1,190,000 km$^2$, mainly in the Parana River basin of Brazil, Argentina, Paraguay and Uruguay. The total volume of freshwater is estimated at 30,000 km$^3$ – equivalent to 100 years of cumulative flow in the Parana River. The GAS comprises water-saturated sandstone formations underlying basalt rocks with an estimated yield of 5 km$^3$/year. Water in sandstone formations is found between 50 and 1,500 m depth, with an average thickness of 250 m. Temperature ranges from 30°C to 70°C, offering possibilities for diverse geothermic applications. Except for a few localized areas, the aquifer is free of contamination or overexploitation. Population in the GAS region is 15 million, but when including large cities in its proximity, this figure reaches about 92 million.

Map 3

The Guarani Aquifer




*Source:* Organization of American States (OAS) (http://www.oas.org/dsd/guarani/PDF/guarani_acquif_sys.pdf). Property of the General Secretariat of the Organization of American States. Reproduced with permission. All rights reserved.




## 3.2 Issues

The GAS constitutes a strategic reserve for water supply in the face of increasing scarcity and pollution of surface water sources in southern Brazil and parts of Uruguay, Paraguay and Argentina. There are about 1,000 deep production wells in operation (mostly in Brazil), although the number may reach 3,000 or more if wells in the overlying basalts that may just reach the sandstone are included. Land use has changed considerably over the past 30 years, affecting recharge areas. These areas are the only ones with significant vulnerability to groundwater pollution from human activities – land which comprises the aquifer outcrop and adjacent areas where the basalts are highly fractured and openings through the basalt exist. Land under agriculture in the GAS has increased from 22% to 47% since 1980, and to 23% of silvopasture. At the same time, natural forest coverage has decreased from 9% to 2% and other not cultivated land from 23% to 18%.

The GAS is expected to remain predominantly for domestic and industrial/commercial use through either public water supply systems or private wells. This conclusion is based on the fact that the groundwater resource was found to be economical as a source of public water supply, but generally not economical for irrigation given other alternative water sources. In addition, the great majority of the GAS is confined, and existing technologies are generally not economical for its exploitation.

## 3.3 Tools

To address long-term sustainability issues, the main strategic tool is to improve knowledge and cooperation to manage the GAS through the Environmental Protection and Sustainable Management of the Guarani Aquifer System Project (PGAS). This project, implemented in 2003–2009 at the request of the four countries, received financial support from the Global Environmental Facility, with the participation of The World Bank and the Organization of American States.

The project aimed to outline a common institutional and technical framework for managing and preserving the GAS for current and future generations. The project was preventive, not only from the standpoint of forestalling overexploitation, pollution and contamination, but also before disagreement among the countries became a reality and made a turn for the worse. The project generated much information on GAS groundwater, its users and uses, and promoted data compilation and dissemination.

Following the project, in 2010 the four countries signed a landmark agreement to expand their levels of cooperation for a greater scientific understanding of the GAS and the responsible management of its water resources. This

agreement is expected to enhance the dialogue on other water bodies within the region, and it may contribute to improved water management at a transboundary level. It has been the first international treaty regarding management of a transboundary aquifer that adopted Draft Articles on the Law of Transboundary Aquifers, which have been annexed to UN General Assembly Resolution 63/124.

One important outcome of the PGAS was the Strategic Action Plan (SAP), whose main objective was to use the capacities generated during the process of the elaboration of the PGAS and to exploit the experience acquired, while placing the need for sustainable development of groundwater resources of the GAS on public agendas and raising public awareness. The SAP proposed specific actions to protect and ensure sustainable use of the GAS.

The SAP summarizes the execution and joint proposals of the countries that participated in the PGAS, following a detailed Transboundary Diagnostic Analysis which was based upon a comprehensive process of consultation. Perhaps no other transboundary aquifer in the world has such harmonization of standards and joint technical cooperation. This success results directly from cooperation between the countries, which have overcome difficulties posed by differences in their technical and institutional arrangements. To achieve this, institutional mechanisms for fostering participation in decision-making were created at the regional, national and Pilot Project levels. Establishment of these spaces for discussion and exchange led to a gradual enhancement of technical and institutional capacities, strengthening ties of trust, and dissemination of lessons learned at all levels.

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# 4 The Nile River

## 4.1 Introduction

The Nile is a north-flowing river in North Africa, generally regarded as the longest river in the world – at 6,650 km – with a drainage basin of 3,349,000 km$^2$ (about 10% of the area of Africa) and an average annual discharge of 2,830 m$^3$/s. The Nile River flows through ten countries: Burundi, Rwanda, the Democratic Republic of the Congo, Tanzania, Kenya, Uganda, Ethiopia, Eritrea, Sudan and Egypt. The Nile River basin is home to about 160 million people, while almost 300 million live in the ten countries that share the basin. Most countries in the basin share a history of poverty, high population growth, environmental degradation, unstable economies and political insecurity.

The Nile has two major tributaries: the White Nile and the Blue Nile. The latter is the source of most of the water and fertile soil, while the former is the longer river. The Nile ends in a large delta that empties into the Mediterranean Sea. The Blue Nile contributes between 80% and 90% of the Nile River discharge; however, during the dry season (January to June), the White Nile contributes between 70% and 90% of the total discharge. Economic and social development of the Nile basin is heavily constrained by lack of infrastructure: only 10% of hydropower potential has been developed, while only 15% of the population has electricity and only 10% of the land with potential for irrigation is actually irrigated.

Compared to many other large transboundary river basins, the Nile basin is a water scarce region. Most of the water is generated from less than one-third of the total geographic area. Of 180 countries ranked according to water scarcity, Kenya places at 154, Ethiopia at 137 and Uganda at 115. While water is already scarce, climate change may increase the variability of supply and possibly even reduce it.

More than 70% of the Nile basin population is involved in the agricultural sector. The dependence on agriculture by this large part of the population in spite of its limited share in the GDP may be the most important

Map 4

The Nile River


*Source:* World Bank (http://siteresources.worldbank.org/INTAFRNILEBASINI/About%20Us/21082459/Nile_River_Basin.htm). The World Bank authorizes the use of this material subject to the terms and conditions on its website, http://www.worldbank.org/terms

single factor regarding poverty prevalence in the basin. Over the next 25 years, population within the basin is expected to double, adding to the increased demand for water generated by growth in industry and agriculture. The Nile's waters are becoming unsafe for use and this deteriorating quality is resulting in increased prevalence of waterborne disease.

## 4.2 Issues

The allocation of the Nile's water has affected the politics of East Africa and the Horn of Africa for many decades. Two agreements were signed during the colonial era: the 1929 Nile Water Agreement and the 1959 Agreement for the Full Utilization of the Nile – these gave Egypt and Sudan extensive rights over the river's use. Uganda, Kenya, Tanzania and Ethiopia made the complaint that these colonial agreements didn't involve all the riparian countries and therefore do not deal equitably with the interests of the upstream countries. Conflict in the Nile basin emanates mainly from the fact that Egypt is more than 95% dependent on water that stems from upstream countries; 85% of this water stems from the Ethiopian highlands.

Real progress to engage the riparian countries had been very slow until the creation of the Nile Basin Initiative (NBI) in 1999. The NBI now constitutes the most important basin-level approach to cooperative development of the Nile waters ever undertaken. However, continued unilateral development is seen as very risky for the basin sustainability. The lack of common policy frameworks and the lack of even transboundary water policies impact Nile countries' ability to effectively cooperate on development programmes. Furthermore, some basin countries have limited technical capacity and financial resources to adequately address the technical challenges.

## 4.3 Tools

The NBI is an intergovernmental organization dedicated to equitable and sustainable management and development of the shared water resources of the Nile basin. It includes all the riparian countries, with the exception of Eritrea, an observer. Its future role is seen as a river basin organization under a Cooperative Framework Agreement; however, to date, only six of the ten riparian countries have signed the Agreement. The riparian countries agreed upon a Strategic Action Program (SAP) comprising two complementary programmes: the Shared Vision Program (SVP) and the Subsidiary Action Program (SAP). These programmes are the main strategic tools to guide Nile cooperation. The SVP consists of eight basinwide projects, with a major focus on building trust, confidence and capacity in member countries as well as creating an enabling environment for transboundary investments. The SAP (subsidiary) is the investment arm of the NBI and it focuses on preparation of investment projects that are transboundary in nature. The over-riding goal of the investment agenda is to contribute to poverty alleviation, reverse environmental degradation and promote socio-economic growth in the riparian countries.

One important outcome of this process is the utilization of the SAP as a planning tool involving all riparian countries, and capacity to formulate development projects. However, one of the major challenges to ensuring the sustainability of the NBI is the creation of a process of institutional support at all levels, including civil society at local, regional and national levels. For that, the capacity to communicate adequately to the different levels is a very important tool that must be applied.

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# 5 The Zambezi River

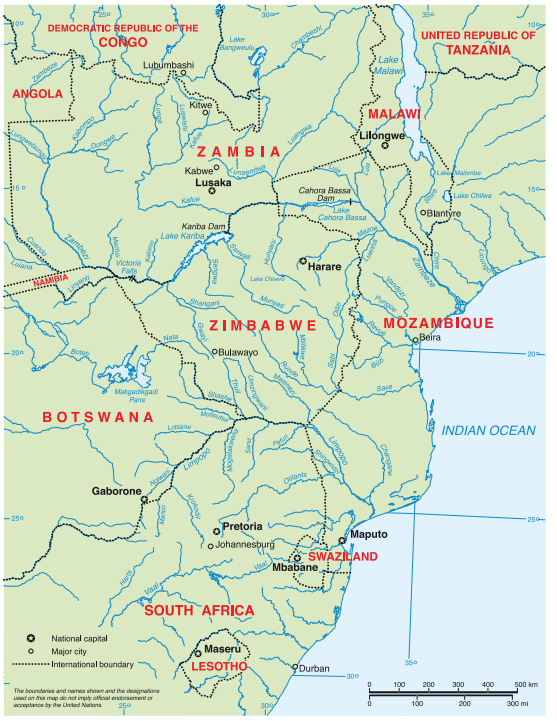
## 5.1 Introduction

The Zambezi is the fourth longest and the largest African river flowing into the Indian Ocean. The Zambezi River basin (ZRB), with its territory that includes eight countries and 1.39 million km$^2$, is one of the most diverse and valuable natural resources in Africa. Managing this large transboundary basin is critical to sustainable economic growth and poverty reduction in the region.

About 80% of the population relies on agriculture, fishing and tourism – Victoria Falls, Mana Pools and Lake Kariba attract more than 1.5 million visitors every year. The ZRB is rich in minerals and fossil fuels. Coal mining is already important, and 5,000 MW are installed in about 30 large dams that have been built with a storage capacity of 221,000 million m$^3$ – equivalent to 169% of annual runoff. Two large dams and hydroelectric stations, Kariba (Zambia) and Cahora Bassa (Mozambique), were built in the 1960s and 1970s for electricity supply for Mozambique and South Africa. While water resources are plentiful for meeting current demand, it is likely that demand will increase considerably to supply large-scale irrigation projects.

Map 5

The Zambezi River




*Source:* South East Africa Drainage Map, Map No. 4070 Rev. 2, January 2004. United Nations Department of Peacekeeping Operations Cartographic Section.

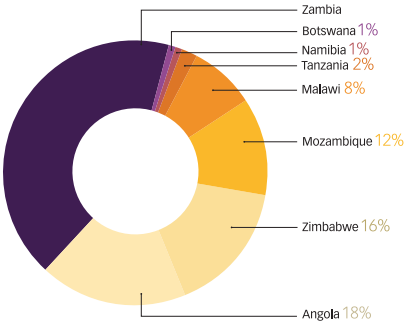
| CHARACTERISTIC | VALUE |
|---|---|
| Length | 3,540 km |
| Watershed area | 1,390,000 km$^2$ |
| Mean rainfall | 956 mm/year |
| Evaporation | >1,600 mm/year |
| Annual flow | 130,370 x 10$^6$ m$^3$ |
| Population | 30 million |
| GDP per capita | US$122–7,000 |
| Poverty rate | 80% |

## 5.2 Issues

Despite the regional importance of the ZRB, there has been limited progress on its institutional and policy framework. Up to now, water resources management has been largely approached unilaterally given the broad differences in post-independence development strategies, the complex political economy within riparian countries, and the diverse physical characteristics of the basin.

The lack of a coordinated effort to approach water resources management is particularly worrisome as the ZRB is characterized by extreme climatic variability. The Zambezi and its tributaries are subject to a cycle of floods and droughts that have devastating effects on the people and economies of the region, especially on the poorest segments of the population. This is in spite of the large storage capacity in place in the basin, which is optimized to prioritize revenues from electricity generation and not flood control.

Zambezi River Basin




The construction of dams has brought important economic benefits and significant impacts on ecosystems. For instance, the Zambezi delta is about half the size it was before the construction of the Kariba and Cahora Bassa dams, which have regulated the seasonal variations in the flow of the river. Modifying seasonal flooding has affected land and marine interaction in the Indian Ocean related to the nutrient cycle and in coastal wetlands.

Untreated discharges of sewage effluent are rapidly becoming a major issue around urban areas. This has resulted in eutrophication of reservoirs and has, in combination with poor hygiene, facilitated the spread and outbreaks of waterborne diseases such as cholera, typhus and dysentery.

To address these emerging issues, in 1987, five riparian states formulated and adopted the Zambezi River Basin Action Plan (ZACPLAN) to establish mechanisms for common management of the river. Unfortunately, the plan lacked financing and implementation capacity to establish a competent basin institution tasked with the coordination and implementation of the ZACPLAN.

## 5.3 Tools

Application of IWRM approaches has been attempted in the past with little success given that it requires institutional and policy frameworks to manage transboundary issues, such as optimizing the selection of water investment opportunities that expand the economic, social and environmental benefits across the entire basin.

ZACPLAN was proposed as the main strategic tool to promote sustainable development and to implement environmentally sound water resources management across the entire basin. It included the creation of a Trust Fund (principally with the support of donor institutions) for the execution of 8 of the 19 projects that was defined by ZACPLAN. Once the resources of the Trust Fund extinguished they were not replenished, and ZACPLAN came to an end. This situation highlights the failures of water resource management programmes in the ZRB.

Cooperative river basin development and management is urgently needed – it would provide not only a tool for increasing the productivity and sustainability of the river system, but also a potential platform for accelerated regional economic growth, cooperation and stability within the wider Southern Africa Development Community (SADC).

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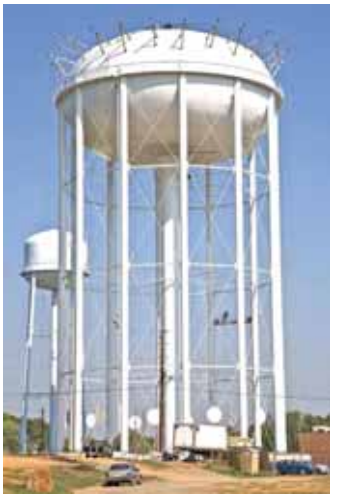

# Conclusion

Efforts of the international community and development practitioners regarding water targets are well justified. In spite of insufficient data and indicators for monitoring, the absence of baseline data to evaluate progress, and limited information about financial and other resources required to achieve them, water targets are important to gain the attention and focus of policy-makers on water sustainability issues. This report argues that there is much room to enhance water targets if more rigorous definitions are used as part of a results and performance monitoring framework.

There is a growing conviction that to increase the sustainable management of freshwater and other natural resources, a hydrographic basin and an IWRM approach are essential to deal with the complexity of the water cycle and the delivery of water services.

The review of a few transboundary water systems (case studies) concludes that long-term sustainability of water resources management requires involving all riparian countries, incremental steps towards establishing legal agreements, and a dedicated institutional framework to facilitate cooperation and coordination at the basin level.

Achieving sustainable development requires cooperation among government institutions and a vast range of other stakeholders. To achieve this goal, many organizations are producing analyses, facilitating dialogue, conducting consultations and building multi-stakeholder coalitions.

Setting specific water targets based on gender could be considered to address the disproportionately large impact of lack of water on women, who often spend a significant amount of time carrying water from wells and collective facilities. Inadequate sanitation facilities also reduce their well-being and even compromise personal safety.

The report concludes that problems in water resources management and water services stem not from a lack of tools, but from the selection and application of appropriate tools to support decision-making on policies and investments. Tools are useful to facilitate dialogue between sector specialists and decision-makers to address the so-called 'water box' dilemma. Leaders in the water sector – for example in water supply and sanitation, hydropower, irrigation and flood control – have long been aware that water is essential to sustainable development, but they generally do not have the mandate to make decisions on development objectives or the human and financial resources to meet them. These decisions are made or influenced by leaders in government, the private sector and civil society, who must learn to recognize water's role in obtaining their objectives. Therefore, leaders and specialists in the water resources sector should work very closely with the 'out of the box' decision-makers to make better decisions.

**Box 4: SIDS and water resources**

Currently, UNDESA lists 52 Small Island Developing States (SIDS), which are broken down into three geographic regions: the Caribbean; the Pacific; and Africa, Indian Ocean, Mediterranean and South China Sea (AIMS). SIDS are considered among the countries worldwide that are structurally weak, vulnerable and have small economies (SWVSEs). SIDS are low lying coastal countries that tend to share similar development challenges, including small but growing populations, limited resources, remoteness, susceptibility to natural disasters, vulnerability to external shocks, excessive dependence on international trade and fragile environments. These challenges can be tackled through appropriate strategies that are based on the basic principles of sustainable development and with support from the international community.

SIDS have limited landmass that do not have extensive surface water bodies or large underground sources of water. The restricted water resources are extremely vulnerable to both long-term climate change and shorter term climate variability, such as the cycle of droughts and wet years induced in some countries by El Niño and La Niña. SIDS must establish more efficient water resources management if they are to sustain and improve the living standards of their populations.

Another growing concern in SIDS is the pressure on water resulting from increasing levels of pollution, increasing demands for water from competing sectors, and decline in water resources. Increases in population and urbanization have increased both solid and liquid waste. Industrial waste and agrochemicals are a source of pollution in surface and groundwater systems. Tourism promotion has placed further pressures on the water supply. The increased demand for water contributes to overextraction from aquifers and increased saltwater intrusion.

Nutrition-related health problems and food import dependency are a growing concern in many SIDS. To face the challenges of agricultural production being competitive in a global economy and vulnerability/self-reliance, SIDS are seeking opportunities to diversify their agricultural systems. The Food and Agriculture Organization of the United Nations (FAO, n.d.) is responding by helping SIDS build on and enhance traditional production systems, revive interest in traditional food crops, and develop integrated approaches to pest control, production land and water management.

# Appendixes

## 1 Assessment matrixes

Note: Green cells indicate compliance with attribute; yellow cells indicate partial compliance; and red cells indicate no compliance.

### 1.1 The Millennium Development Goals water resources-related targets

| ATTRIBUTES TO BE EVALUATED | GOAL 7: Ensure Environmental Sustainability | | |
|---|---|---|---|
| | TARGET 7C | TARGET 7A | TARGET 7B |
| | Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation | Integrate the principles of sustainable development into country policies and programmes; reverse loss of environmental resources | Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss |
| Is the relationship between the goal and the target clearly established? | Yes, basic human needs, but not necessarily in a sustainable way | Yes | Yes |

| | | | |
|---|---|---|---|
| Is the target quantitatively and/or qualitatively defined? | Yes | No, lacks defined values or range to be achieved | No, mentions only significant reduction but not the scale |
| Is the target bounded by a time frame? | Yes | No | Yes |
| Are the indicators to monitor and verify compliance clearly established? | Yes, refers to a broad indicator, but undefined quality of service | Indicator 7.5. Proportion of total water resources used (but this does not represent the loss of environmental resources and reduced biodiversity) | |
| Is there a baseline with clear and credible data to which the indicators can be compared? | Yes, but lack credibility | Yes, but lack credibility | |
| Are the resources to achieve the targets defined? | No, generally linked to aid | No | No, not defined |
| Is the target the result of a participatory process of all stakeholders? | Broad participation, but key stakeholders missing | Expert participation | Expert participation |
| Is there any accountability framework related to compliance with the target? | Yes, but not mandatory | Yes, but not mandatory | Yes, but not mandatory |
| Is there a framework of commitment that was adopted? | No, when established; linked to aid | No | No |
| For what and for whom is the target useful? | Yes, for awareness raising, policy decisions, mobilization/ allocation of resources | Raise the issue of environmental resources loss | Proposed target reduce biodiversity loss |
| Is the target easy to calculate? | Yes | No, targets too wide, multiple components | |
| Is the target applicable in any part of the world? | Yes | Yes | Yes |
| Is the target applicable at different scales: global, regional, country, local, basin? | Yes | Yes | Yes |
| Is the target linked to an objective that is clear and intuitive? | Yes | No, target definition is ambiguous | |
| Are the targets and indicators disaggregated by sex and for urban and rural areas when it corresponds? | No, but indicators are disaggregated | No | No |

## 1.2 The European Union Water Framework Directive 2000/60/EC targets

**GOAL: Prevents further deterioration of aquatic ecosystems, promotes sustainable water use, progressive reduction of discharges and pollution of groundwater, mitigating the effects of floods and droughts**

| ATTRIBUTES TO BE EVALUATED | TARGET: SURFACE WATER | TARGET: GROUNDWATER | TARGET: PROTECTED AREAS |
|---|---|---|---|
| | Enhance and restore all bodies of surface water with the aim of achieving good surface water status at the latest 15 years after the date of entry of this Directive | Enhance and restore all bodies of groundwater, with the aim of achieving good groundwater status at the latest 15 years after the date of entry of this Directive | Achieve compliance in all protected areas with any standards and objectives at the latest 15 years after the date of entry of this Directive |

| | | | |
|---|---|---|---|
| Is the relationship between the goal and the target clearly established? | Yes | Yes | Yes |
| Is the target quantitatively and/or qualitatively defined? | There is a qualitative definition of the condition of 'good surface water status' in the Annexes of the Directive | There is a qualitative definition of the condition of 'good groundwater status' in the Annexes of the Directive | No, the 'Standards and objectives' are not explained in the document |
| Is the target bounded by a time frame? | Yes, it is well defined | Yes, it is well defined | Yes, it is well defined |
| Are the indicators to monitor and verify compliance clearly established? | Yes | Yes | No, there are not well defined |
| Is there a baseline with clear and credible data to which the indicators can be compared? | Yes, perhaps in most of them | Yes, perhaps in most of them | No, because the indicators are not well defined |
| Are the resources to achieve the targets defined? | No | No | No |
| Is the target the result of a participatory process of all stakeholders? | Yes, it is legitimate, there was broad participation, but not by all the key stakeholders | Yes, it is legitimate, there was broad participation, but not by all the key stakeholders | Yes, it is legitimate, there was broad participation, but not by all the key stakeholders |
| Is there any accountability framework related to compliance with the target? | Yes, each government is responsible for achieving the target for their country, and establishing measures to penalize in case of non-fulfillment | Yes, each government is responsible for achieving the target for their country, and establishing measures to penalize in case of non-fulfillment | Yes, each government is responsible for achieving the target for their country, and establishing measures to penalize in case of non-fulfillment |
| Is there a framework of commitment that was adopted? | Yes, there is an agreement for achieving the target | Yes, there is an agreement for achieving the target | Yes, there is an agreement for achieving the target |
| For what and for whom is the target useful? | Yes, it's useful for policy decisions and allocation of resources | Yes, it's useful for policy decisions and allocation of resources | Yes, it's useful for policy decisions and allocation of resources |
| Is the target easy to calculate? | No, not easy, depends on many variables and has to be done by an inter-institutional and multidisciplinary team | No, not easy, depends on many variables and has to be done by an inter-institutional and multidisciplinary team | No, not easy, depends on many variables and has to be done by an inter-institutional and multidisciplinary team |
| Is the target applicable in any part of the world? | Yes, but a multidisciplinary and inter-institutional team is needed | Yes, but a multidisciplinary and inter-institutional team is needed | Yes, but a multidisciplinary and inter-institutional team is needed |
| Is the target applicable at different scales: global, regional, country, local, basin? | Yes | Yes | Yes |
| Is the target linked to an objective that is clear and intuitive? | Yes | Yes | Yes |
| Are the targets and indicators disaggregated by sex and for urban and rural areas when it corresponds? | No | No | No |

## 1.3 The World Water Council targets proposed for the 6th World Water Forum

**GOAL (OR PRIORITY FOR ACTION 1.1): Guarantee access to water for all and the Right to Water**

| ATTRIBUTES TO BE EVALUATED | TARGET 1<br>For 2012, highlight the practical implications of the Right to Water for practitioners by collecting and disseminating at least one example per category in each region of national policies targeting and delivering effectively better water quality, availability, accessibility, affordability at country level, all major components of the human right to drinking water | TARGET 2<br>By 20xx, ensure that the global rural population without access to safe water decreases by x%, with special attention to the poor |
|---|---|---|
| Is the relationship between the goal and the target clearly established? | No, does not guarantee access of water for all | Yes, step towards access of water for all |
| Is the target quantitatively and/or qualitatively defined? | Yes, at least one example per category | Yes, decrease number of rural people without access to safe water |
| Is the target bounded by a time frame? | Yes | Yes |
| Are the indicators to monitor and verify compliance clearly established? | No, lack indicator to monitor compliance | Yes, has indicator to monitor compliance |
| Is there a baseline with clear and credible data to which the indicators can be compared? | No, no baseline data | No, no baseline data |
| Are the resources to achieve the targets defined? | No, lack estimation of resources to achieve target | No, lack estimation of resources to achieve target |
| Is the target the result of a participatory process of all stakeholders? | No, reflect views of a few stakeholders | No, reflect views of a few stakeholders |
| Is there any accountability framework related to compliance with the target? | No, lack accountability framework to assess compliance | No, lack accountability framework to assess compliance |
| Is there a framework of commitment that was adopted? | No, lack explicit commitment to reach targets | No, lack explicit commitment to reach targets. |
| For what and for whom is the target useful? | Yes, useful to policy focus and debate at all levels | Yes, useful to policy focus and debate at all levels |
| Is the target easy to calculate? | No, complex to calculate and measure | Yes |
| Is the target applicable in any part of the world? | Yes, also allows country comparisons | Yes, also allows country comparisons |
| Is the target applicable at different scales: global, regional, country, local, basin? | No, applicable at country level | Yes |
| Is the target linked to an objective that is clear and intuitive? | No, difficult to understand and explain to general public | Yes, the target is easy to understand and explain to a widespread public |
| Are the targets and indicators disaggregated by sex and for urban and rural areas when it corresponds? | No, but it might highlight women's rights | No, but it might highlight women's rights |

# 2 Rating of water sector targets

## 2.1 Scores for the Millennium Development Goals targets

| ATTRIBUTES TO BE EVALUATED | GOAL 7: Ensure Environmental Sustainability | | |
|---|---|---|---|
| | TARGET 7C | TARGET 7A | TARGET 7B |
| | Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation | Integrate the principles of sustainable development into country policies and programmes; reverse loss of environmental resources | Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss |
| | ATTRIBUTES SCORE | | |
| Is the relationship between the goal and the target clearly established? | 3 | 2 | 2 |
| Is the target quantitatively and/or qualitatively defined? | 3 | 0 | 0 |
| Is the target bounded by a time frame? | 4 | 0 | 4 |
| Are the indicators to monitor and verify compliance clearly established? | 4 | 0 | 0 |
| Is there a baseline with clear and credible data to which the indicators can be compared? | 2 | 1 | 2 |
| Are the resources to achieve the targets defined? | 0 | 0 | 0 |
| Is the target the result of a participatory process of all stakeholders? | 2 | 2 | 2 |
| Is there any accountability framework related to compliance with the target? | 2 | 2 | 2 |
| Is there a framework of commitment that was adopted? | 2 | 1 | 1 |
| For what and for whom is the target useful? | 3 | 2 | 2 |
| Is the target easy to calculate? | 4 | 0 | 0 |
| Is the target applicable in any part of the world? | 4 | 3 | 4 |
| Is the target applicable at different scales: global, regional, country, local, basin? | 4 | 3 | 4 |
| Is the target linked to an objective that is clear and intuitive? | 4 | 1 | 2 |
| Are the targets and indicators disaggregated by sex and for urban and rural areas when it corresponds? | 0 | 0 | 0 |
| Average radius | 2.66 | 1.13 | 1.66 |
| Area (%) | 44 | 8 | 17 |

## 2.2 Scores for the European Union Water Framework Directive targets

**GOAL: Prevents further deterioration of aquatic ecosystems, promotes sustainable water use, progressive reduction of discharges and pollution of groundwater, mitigating the effects of floods and droughts**

| ATTRIBUTES TO BE EVALUATED | TARGET: SURFACE WATER | TARGET: GROUNDWATER | TARGET: PROTECTED AREAS |
|---|---|---|---|
| | Enhance and restore all bodies of surface water with the aim of achieving good surface water status at the latest 15 years after the date of entry of this Directive | Enhance and restore all bodies of groundwater, with the aim of achieving good groundwater status at the latest 15 years after the date of entry of this Directive | Achieve compliance in all protected areas with any standards and objectives at the latest 15 years after the date of entry of this Directive |
| | ATTRIBUTES SCORE | | |
| Is the relationship between the goal and the target clearly established? | 4 | 4 | 4 |
| Is the target quantitatively and/or qualitatively defined? | 4 | 4 | 1 |
| Is the target bounded by a time frame? | 4 | 4 | 4 |
| Are the indicators to monitor and verify compliance clearly established? | 4 | 4 | 1 |
| Is there a baseline with clear and credible data to which the indicators can be compared? | 2 | 2 | 1 |
| Are the resources to achieve the targets defined? | 0 | 0 | 0 |
| Is the target the result of a participatory process of all stakeholders? | 3 | 3 | 3 |
| Is there any accountability framework related to compliance with the target? | 4 | 4 | 4 |
| Is there a framework of commitment that was adopted? | 4 | 4 | 4 |
| For what and for whom is the target useful? | 4 | 4 | 4 |
| Is the target easy to calculate? | 2 | 2 | 1 |
| Is the target applicable in any part of the world? | 2 | 2 | 2 |
| Is the target applicable at different scales: global, regional, country, local, basin? | 4 | 4 | 4 |
| Is the target linked to an objective that is clear and intuitive? | 4 | 4 | 4 |
| Are the targets and indicators disaggregated by sex and for urban and rural areas when it corresponds? | 0 | 0 | 0 |
| Average radius | 3 | 3 | 2.4 |
| Area (%) | 56 | 56 | 36 |

## 2.3 Scores for the attributes of the World Water Council targets proposed for the 6th World Water Forum

**GOAL (OR PRIORITY FOR ACTION 1.1): Guarantee access to water for all and the Right to Water**

| ATTRIBUTES TO BE EVALUATED | TARGET 1 | TARGET 2 |
|---|---|---|
| | For 2012, highlight the practical implications of the Right to Water for practitioners by collecting and disseminating at least one example per category in each region of national policies targeting and delivering effectively better water quality, availability, accessibility, affordability at country level, all major components of the human right to drinking water | By 20xx, ensure that the global rural population without access to safe water decreases by x%, with special attention to the poor |
| | ATTRIBUTES SCORE | |
| Is the relationship between the goal and the target clearly established? | 1 | 4 |
| Is the target quantitatively and/or qualitatively defined? | 2 | 4 |
| Is the target bounded by a time frame? | 4 | 4 |
| Are the indicators to monitor and verify compliance clearly established? | 0 | 3 |
| Is there a baseline with clear and credible data to which the indicators can be compared? | 0 | 0 |
| Are the resources to achieve the targets defined? | 0 | 0 |
| Is the target the result of a participatory process of all stakeholders? | 1 | 1 |
| Is there any accountability framework related to compliance with the target? | 1 | 1 |
| Is there a framework of commitment that was adopted? | 0 | 0 |
| For what and for whom is the target useful? | 2 | 4 |
| Is the target easy to calculate? | 0 | 4 |
| Is the target applicable in any part of the world? | 4 | 4 |
| Is the target applicable at different scales: global, regional, country, local, basin? | 2 | 4 |
| Is the target linked to an objective that is clear and intuitive? | 1 | 4 |
| Are the targets and indicators disaggregated by sex and for urban and rural areas when it corresponds? | 0 | 1 |
| Average radius | 1.2 | 2.5 |
| Area (%) | 9 | 39 |

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SIDE PUBLICATIONS SERIES :03

# Water and Sustainability

## A Review of Targets, Tools and Regional Cases

There is emerging interest by governments, international agencies, development practitioners and society-at-large in engaging in various initiatives of target setting to measure the impact of policy actions, assess development outcomes and evaluate aid effectiveness. In this light, *Water and Sustainability* provides an overview of water sustainability targets and selected tools and approaches to assist decision-makers improve performance and achieve results, with a view to ultimately meeting development targets.

*Water and Sustainability* focuses on three widely known systems of water sustainability targets: those set under the umbrella of the Millennium Development Goals; those established as part of the European Union Water Framework Directive; and the target-setting process for the 6th World Water Forum. The report also presents five cases to highlight some of the current practices being followed to set water sustainability targets.

The report aims to show that formulation and evaluation of water targets would be more effective if it were to follow a systematic analytical framework for results and performance monitoring – and it proposes one such framework for the purpose, a comprehensive definition of water targets specified by five attributes and fifteen analytical questions.

Attention then turns to tools, the report arguing that problems in water resources management and water services stem not from a lack of tools, but from the selection and application of appropriate ones to support decision-making on policies and investments. Diverse tools are reviewed – covering water resources management, water services and cross-sectoral approaches, as well as tools that are applied at country and project levels.

*Water and Sustainability* hopes to gain the attention and focus of policy-makers on water sustainability issues. It contends that leaders and specialists in water resources should work very closely with the 'out of the box' decision-makers, who must learn to recognize water's role in achieving their objectives to make better decisions.

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