

## **Targeting, Monitoring and Implementation Assessment**

### **Thematic Document Crosscutting Perspective No. E**

Prepared by: Gordon Young (Beacon), United Nations World Water Assessment Programme and Daniel Zimmer, World Water Council

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Acknowledgements.....	3
Executive Summary.....	4
1. Introductory remarks.....	8
1.1 The necessity of setting targets and monitoring progress.....	9
1.2 The important water-related issues for which targeting and monitoring processes be undertaken.....	13
1.3 The need for indicators.....	14
1.4 Conceptual framework for monitoring water resources for the MDGs.....	16
1.5 Institutional mechanisms for monitoring water resources and the MDGs..	18
2. Targeting and monitoring for the five Baseline Themes.....	19
2.1 Water for growth and development.....	19
2.2 Integrated Water Resources Management.....	20
2.3 Water Supply and Sanitation for All.....	20
2.4 Water Management for Food and the Environment.....	30
2.5 Risk Management.....	32
Tables.....	34

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## Executive Summary

In order to better manage our water resources we need to understand the nature of the resource itself, the uses to which it is put, the critical problems we face and the ways in which the resource is managed. **Thus the need for objective assessments.** Moreover we must make assessments of the water situation within the much broader contexts of economic, social and cultural realities at the global, regional and national levels. Making these essential assessments within their particular contexts will allow more rational management decisions to be made.

**Monitoring is a critical component of planning and action.** Monitoring change in situations over time is necessary to gauge the effectiveness of interventions and measure the impact of policy reforms and investment at national and sub-national levels. Monitoring is also critical to compare needs and prioritize action among countries at the international level, which implies a need for standardized approaches, data, and methods of information gathering. And at all levels, civil society's most powerful advocacy tool is accurate information, the end product of reliable assessment and monitoring efforts.

**Setting targets is critically important** to focus the attention of the world on significant issues besetting humanity and to provide incentives for essential action. Targets should be set from global to local scales to engage society at all levels. Governments, institutions and individuals must have goals to encourage action. In this respect, it should be stressed that the MDGs, defined at the global level, still need to percolate down and be translated into targets that make sense at the local level.

On the one hand such targets should demand the maximum possible action, yet on the other hand not be so demanding as to demoralize the participants. However, as situations (cultural, political, economic, institutional, legal and financial) are so varied around the world it is also important to recognize the necessity of having national and sub-national targets tailored right down to the community level. This 'dilemma of scale' is unavoidable; indeed it must be accepted as so many crucial decisions must be made at the community and the household level.

**The importance of the need to engage people and institutions at all levels cannot be overemphasized.** If targets are only set for the global or even the national levels ordinary people, who are so important, will not easily become engaged and take responsibility for the process. If, on the other hand, local people become engaged and motivated at the community level, tangible results are much more likely to be achieved.

**Country programmes (road maps) including targets, indicators, monitoring tools and reporting activities should then urgently be prepared.** It is proposed that country modelling tools should be developed to facilitate these road maps. These modelling tools should take into account (i) financial capacities at the national level and financial gaps to be covered and (ii) population evolution and particularly rural exodus.

It is important also to have common goals and targets with commonly accepted definitions within the targets in order to be able to compare situations between countries and regions. One of the mandates of the World Water Assessment Programme is to compare situations between countries in order to better set priorities for international action. However there is a real problem here: countries, sub-national regions and communities should be encouraged to set their own targets in order to involve the populace at all levels, but in doing so there is difficulty in maintaining standard definitions. Retaining standard definitions that are relevant to all circumstances becomes ever more difficult with dissemination of involvement to community levels. However, we should not delude ourselves here – while standardized definitions are desired, it is much more important that there be positive and effective action on the ground – we should not insist on standardization if that would result in hindering poverty alleviation.

Another of the benefits to be derived from a process of setting targets and monitoring progress towards their achievement is to learn from success stories and to avoid, in the cases of lack of success, making the same mistakes again. ***Thus we have to promote the dissemination of experiences***; to learn which combinations of elements make for successful outcomes and to what extent there can be transfer of experience between countries and communities.

**What are the big water-related issues for which targeting and monitoring processes be undertaken?** Here the order of the major issues is in compliance with the major framework themes of WWF4.

1. **Water for Growth and Development.** Some would argue that economic development is a prerequisite for human well-being; that in order for issues of human well-being to be addressed, first attention should be given to economic development based on **energy availability and increase in industrial production**. While we would argue that water for human well-being should be given first priority and, indeed, that human well-being is a prerequisite for economic development, the needs for economic development must be recognized and given strong attention. We would also argue that there is an urgent need to consider issues of social development, such as education at all levels and for everyone. Monitoring programmes for these issues should, therefore, be set up; whether targets need to be set for all these issues is debatable.
2. **Implementing Integrated Water Resource Management.** At the Johannesburg World Summit on Sustainable Development a goal was set that by 2005 all countries would have plans in place for implementation of Integrated Water Resource Management. Surveys have already been started to assess progress towards meeting this goal.
3. **Water supply and sanitation for all.** (However health issues are more than simply drinking water supply and sanitation). The more fortunate people, living in more developed countries, are well nourished and most water-related diseases are under control. However, in the less developed world this is, sadly, not the case. Basic human health, related to food security and sufficiency is a prime dimension of poverty. Lack of safe

drinking water and poor sanitation lead to an unacceptable toll in human life. Cholera, malaria and other water-related diseases take a further toll.

4. **Water management for food and the environment.** Famine and general under-nourishment exacerbate the health problems as resilience to disease is lowered. It is argued that human development and well-being is ultimately dependent on the underlying ecosystems on which we all depend. It is clear that there are enormous changes taking place within ecosystems as a direct or indirect result of human activities. Just how long we can continue in this way is debatable, but, ultimately human well-being will be critically jeopardized by environmental degradation. The extent of the human 'footprint' on the landscape is uneven. Some ecosystems remain relatively unscathed, others are being greatly changed. Coastal ecosystems in general are being far more adversely influenced than many inland ecosystems. Coastal zones contain many very vibrant and diverse ecosystems; however the coastal regions are zones of high concentration of human settlement and activities of all sorts having great impact on the ecosystems. In addition the coastal zones contain the endpoints of rivers and are thus the receivers of effluent from upstream activities. The ecosystems in the coastal margin areas therefore require particular attention and should be monitored assiduously.
5. **Risk Management.** Many disasters are water-related – floods, droughts and pollution spills into rivers, lakes and groundwater systems. With climate change, land-based floods (and some marine based floods, eg those associated with hurricanes) seem to be increasing in frequency and intensity. This, exacerbated by the fact that more and more people are locating in flood-prone areas, is leading to an increase in fatalities and in economic damage from floods. There has been a call for targets to be set for reducing flood impacts and for monitoring progress towards achieving the targets – this call has not yet been answered, but this does not lessen the need for a monitoring programme on this issue.
6. **Challenges of Governance.** This includes the attitudes of people to the resource (affected by culture, religion and political framework), the effectiveness of institutions and of legislation and of financial instruments and the general capabilities of human resources.
7. **Monitoring the resource itself.** There is a fundamental need to monitor the status of the resource itself. This includes monitoring surface and groundwaters in space and through time, in quantity and quality. It also includes monitoring the influence that human activity is having on the resource – changing surface cover, building dams and diversions, abstracting water from aquifers, rivers and lakes have great effect within catchments and for the global hydrological cycle. It is argued here that targets need not be set for this issue, but clearly the availability of the resource itself must be monitored. Two characteristics concerning monitoring of the resource deserve special mention: firstly there is a huge imbalance in intensity of monitoring from the more developed to the less developed countries – monitoring systems in, say, western Europe are far more intense and reliable than in, say, Africa; secondly monitoring systems in many parts of the world have been allowed to deteriorate with the result that our ability to monitor effectively has been reduced.

While the MDGs cover a wide range of issues and while most of them are either directly or indirectly water-related, there are some highly important water-related issues not covered by them. Many industries require water and have detrimental influence on water supplies downstream through waste-water pollution. Many forms of energy production use water or cause pollution that has detrimental effects on the environment. Industry and energy are both fundamental for economic growth and for human well-being and are thus vital for development. Many natural disasters are water-related; floods, droughts and pollution spills being the most notable – the MDGs do not specifically cover any of these. Our concern in targeting and monitoring should, therefore, not be limited to consideration of the MDGs, but should include consideration of industry, energy and disaster issues. Indeed monitoring of the state of the resource itself warrants special attention as the availability of water, both surface and groundwaters, in time and space, in quantity and quality underpins all possible uses and demands.

### **The need for Indicators**

Indicators are used to simplify, quantify, communicate and create order within complex data. They provide information in such a way that both policy-makers and the public can understand and relate to it. They help us to monitor progress and trends in the use and management of water resources over time and space. Similarly, indicators can help us to compare results in different areas or countries and examine potential links between changing conditions, human behaviour and policy choices. Because ‘good’ indicators are easy to understand, they offer a tool for raising awareness about water issues that cuts across every social and political group. The aims of indicators may be summarized as:

- to provide a simple yet meaningful description of the complex water resource phenomena and management issues as a basis for action by decision-makers and the public;
- to offer insight into problems and potentials for integrated water resources management on a global scale;
- to monitor developments regarding the state of the water resources and the effectiveness of the global response in solving problems;
- to assess the impact of water resources development on economic, social, health and environmental conditions; and
- to review progress in meeting the set targets and goals.

## 1. Introductory remarks

We should ask ourselves at the very outset: what are the fundamental principles underlying all our efforts? Surely our answer has to be that our actions must be based on the principles of equity and environmental sustainability. The world is a place of extremes regarding personal material wealth; there is a huge gap between the 'haves' and the 'have-nots'. This gap is unacceptably large. Our answer must, then, be to alleviate poverty and through our actions to address the problems of inequity. Environmental sustainability is, perhaps, almost as important, some would argue more important, than that of equity between human beings. If our natural environment is allowed to continually degrade at the alarming rate that is currently evidenced in many parts of the globe, then humankind is bound, sooner or later, to suffer.

At the United Nations Millennium Summit in September 2000, 189 heads-of-state adopted the Millennium Development Goals (MDGs), which attempted to set clear, numerical targets for making real progress in tackling many of the most pressing issues developing countries face. Many of the goals were time bound and most of these set the date of 2015 by which the targets should be met. Improving water resources development and management is a critical factor for meeting all of these goals, for the broader goal of eradicating extreme poverty and for the more specific goals relating to hunger, achieving universal primary education, promoting gender equality and women's empowerment, reducing child mortality, improving maternal health, combating major diseases, and improving environmental sustainability, including water supply and reducing the number of slum dwellers. At the World Summit on Sustainable Development, 2002, an additional target of including IWRM in national plans by 2005 was added (as was the target on sanitation). Therefore, efforts to achieve the MDGs must involve planning and action in water resources development, management and use to meet the MDGs as a whole and to significantly reduce the huge gap in personal wealth.

While the MDGs cover a wide range of issues and while most of them are either directly or indirectly water-related, there are some highly important water-related issues not covered by them. Many industries require water and have detrimental influence on water supplies downstream through waste-water pollution. Many forms of energy production use water or cause pollution that has detrimental effects on the environment. Industry and energy are both fundamental for economic growth and for human well-being and are thus vital for development. Many natural disasters are water-related; floods, droughts and pollution spills being the most notable – the MDGs do not specifically cover any of these. Our concern in targeting and monitoring should, therefore, not be limited to consideration of the MDGs, but should include consideration of industry, energy and disaster issues. Indeed monitoring of the state of the resource itself warrants special attention as the availability of water, both surface and groundwaters, in time and space, in quantity and quality underpins all possible uses and demands.

By setting clear and time-bound targets, the MDGs have highlighted the need for improved information on the progress made and thus for monitoring and reporting. One of the main questions is however at what time and space scales should monitoring activities be undertaken and what mechanisms should be put in place in order to ensure that monitoring becomes a shared concern of all stakeholders.

The objective of this document and our objective for the Forum is to shed light on this debate and develop proposals to better address the scale issues pertaining to monitoring. Indeed as explained in the following, monitoring and targeting activities are facing a serious “dilemma of scale” since they ideally rely upon top-down and bottom-up approaches. Top-down approaches are induced by the necessity to compare achievements and performances against targets. Using common sets of indicators is obviously important for the comparison and it is also more cost-effective. On the other hand, top-down approaches do not encourage commitment at the local level. Bottom-up initiative implying the definition of targets and thus probably of the related indicators seems in this respect more appropriate since action on the ground is the ultimate objective.

The thesis defended here is that it is possible to find a compromise and a proper combination of top-down and bottom-up approaches and that it is possible to make the different scales complement each other.

### **1.1 The necessity of setting targets and monitoring progress**

Setting targets is critically important to focus the attention of the world on significant issues besetting humanity and to provide incentives for essential action. Targets should be set from global to local scales to engage society at all levels. Governments, institutions and individuals must have goals to encourage action. In this respect, it should be stressed that the MDGs, defined at the global level, still need to percolate down and be translated into targets that make sense at the local level.

On the one hand such targets should demand the maximum possible action, yet on the other hand not be so demanding as to demoralize the participants. However, as situations (cultural, political, economic, institutional, legal and financial) are so varied around the world it is also important to recognize the necessity of having national and sub-national targets tailored right down to the community level. This ‘dilemma of scale’ is unavoidable; indeed it must be accepted as so many crucial decisions must be made at the community and the household level.

The importance of the need to engage people and institutions at all levels cannot be overemphasized. If targets are only set for the global or even the national levels ordinary people, who are so important, will not easily become engaged and take responsibility for the process. If, on the other hand, local people become engaged and motivated at the community level, tangible results are much more likely to be achieved.

Monitoring then becomes a critical component of such planning and action. Monitoring change in situations over time is necessary to gauge the effectiveness of interventions and measure the impact of policy reforms and investment at national and sub-national levels. Monitoring is also critical to compare needs and prioritize action among countries at the international level, which implies a need for standardized approaches, data, and methods of information gathering. And at all levels, civil society's most powerful advocacy tool is accurate information, the end product of reliable assessment and monitoring efforts.

It is important also to have common goals and targets with commonly accepted definitions within the targets in order to be able to compare situations between countries and regions. One of the mandates of the World Water Assessment Programme is to compare situations between countries in order to better set priorities for international action. However there is a real problem here: countries, sub-national regions and communities should be encouraged to set their own targets in order to involve the populace at all levels, but in doing so there is difficulty in maintaining standard definitions. Retaining standard definitions that are relevant to all circumstances becomes ever more difficult with dissemination of involvement to community levels. However, we should not delude ourselves here – while standardized definitions are desired, it is much more important that there be positive and effective action on the ground – we should not insist on standardization if that would result in hindering poverty alleviation.

Another of the benefits to be derived from a process of setting targets and monitoring progress towards their achievement is to learn from success stories and to avoid, in the cases of lack of success, making the same mistakes again. Thus we have to promote the dissemination of experiences; to learn which combinations of elements make for successful outcomes and to what extent there can be transfer of experience between countries and communities.

Monitoring has been advocated as a key instrument since the Millennium Development and Johannesburg goals and targets have been agreed upon by governments. The definition of precise targets has indeed made it obvious that measurement tools are needed to assess the progress toward these targets.

Despite this widely shared interest, remarkably little progress has been achieved so far on the development of appropriate tools to monitoring changes. Monitoring activities are numerous and diverse: many institutions have initiated monitoring programmes, each with its own objective and the overall picture is a profusion of activities lacking coherence and coordination.

One of the main reasons why coordination between monitoring programmes is lacking is that the rationales and the activities carried out by these programmes are different. Without a good understanding of these rationales and the way they complement each other, it is and it will remain difficult to build a more coherent picture.

Monitoring comprises three complementary activities:

- Defining policies and setting achievable targets;
- Establishing a set of indicators to monitor progress toward these targets
- Analysing the results and reporting

These activities must ideally be organised in a sequence as depicted in Figure 1 and a public authority must be in charge of implementing them.

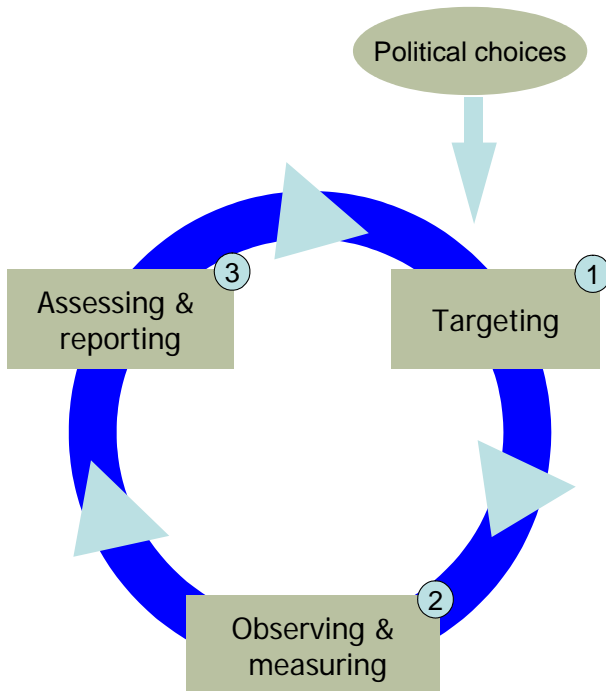


Figure 1. Sequence of activities involved in “monitoring

Three main rationales can be distinguished (Figure 2):

- The international rationale is that of international organisations supported by international donors; this group needs an overview of the situation and a relatively small number of data per country showing what the situation is and what progress is accomplished at a rather short time step ( 1 or 2 years)
- The national rationale is that of institutions that need to define and implement policies at the country level; they typically need to implement the approach depicted in Figure 1. Their rationale is not so much getting information on what is happening than triggering progress on the ground;
- The project rationale is that of all organisations funding of implementing progress on the ground; these organisations are generally interested in knowing how much they contribute to the progress and how successfully the resources they provide are utilised. It should be pointed out that data collected with this rationale will never provide an accurate picture if scaled up. Indeed in a given region or country, several projects are generally implemented so that the sum of their respective contributions

will in general be higher than the actual progress obtained on the ground.

These rationales lead to different approaches to monitoring and explain also why their results are difficult to compare.

Mapping monitoring activities is important in order to understand the relationships between them and possibly improve their linkages; it is proposed to do this along the two lines described above and depicted in Figure 2.

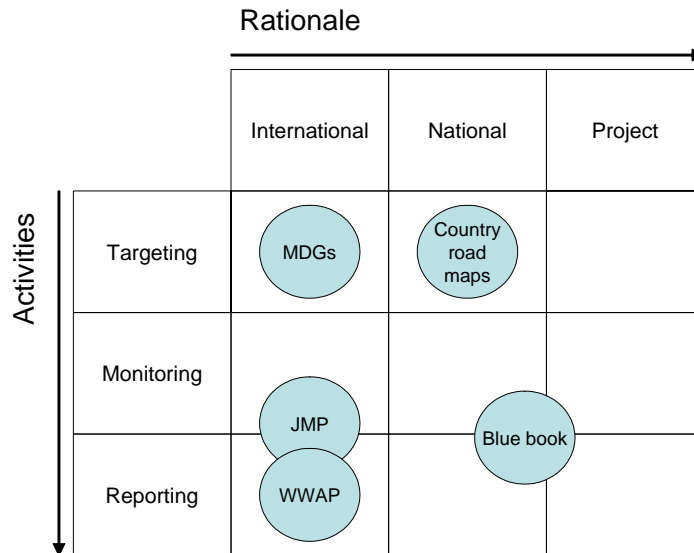


Figure 2. Proposed framework for the classification of monitoring activities with a few programmes classified

One very important and hitherto rather neglected aspect of social and economic assessment is the nature of human distributions over the globe. Settlement patterns are highly diverse ranging from the very dispersed rural settlements through villages and towns to the extreme concentrations within cities and mega-cities. Issues of water availability and use are vastly different from the city to the rural contexts. In many parts of the world the patterns of human distributions are fast changing. There are major movements of people from rural situations to towns and cities, but the precise increase in towns relative to cities and the differences between countries in this regard are insufficiently documented. There are also major migrations between countries and regions – some movements being permanent, some, as in the case of refugees or migrant workers, being semi-permanent or temporary and some, as in the case of tourists, being very transitory. Superimposed on spatial distributions are the very different age structures from country to country; in some countries the proportion of children within the total population is very high, while in other countries the proportion of elderly people relative to the very young is increasing. These very different demographic situations need far greater investigation as an important basis for making water resource management decisions. Monitoring these changing demographics is an essential backdrop to monitoring water issues.

**1.2 The important water-related issues for which targeting and monitoring processes be undertaken** Here the order of the major issues is in compliance with the major framework themes of WWF4.

- 1. Water for Growth and Development.** Some would argue that economic development is a prerequisite for human well-being; that in order for issues of human well-being to be addressed, first attention should be given to economic development based on energy availability and increase in industrial production. While we would argue that water for human well-being should be given first priority and, indeed, that human well-being is a prerequisite for economic development, the needs for economic development must be recognized and given strong attention. We would also argue that there is an urgent need to consider issues of social development, such as education at all levels and for everyone. Monitoring programmes for these issues should, therefore, be set up; whether targets need to be set for all these issues is debatable.
- 2. Implementing Integrated Water Resource Management.** At the Johannesburg World Summit on Sustainable Development a goal was set that by 2005 all countries would have plans in place for implementation of Integrated Water Resource Management. Surveys have already been started to assess progress towards meeting this goal.
- 3. Water supply and sanitation for all.** (However health issues are more than simply drinking water supply and sanitation). The more fortunate people, living in more developed countries, are well nourished and most water-related diseases are under control. However, in the less developed world this is, sadly, not the case. Basic human health, related to food security and sufficiency is a prime dimension of poverty. Lack of safe drinking water and poor sanitation lead to an unacceptable toll in human life. Cholera, malaria and other water-related diseases take a further toll.
- 4. Water management for food and the environment.** Famine and general under-nourishment exacerbate the health problems as resilience to disease is lowered. It is argued that human development and well-being is ultimately dependent on the underlying ecosystems on which we all depend. It is clear that there are enormous changes taking place within ecosystems as a direct or indirect result of human activities. Just how long we can continue in this way is debatable, but, ultimately human well-being will be critically jeopardized by environmental degradation. The extent of the human 'footprint' on the landscape is uneven. Some ecosystems remain relatively unscathed, others are being greatly changed. Coastal ecosystems in general are being far more adversely influenced than many inland ecosystems. Coastal zones contain many very vibrant and diverse ecosystems; however the coastal regions are zones of high concentration of human settlement and activities of all sorts having great impact on the ecosystems. In addition the coastal zones contain the endpoints of rivers and are thus the receivers of effluent from upstream activities. The ecosystems in the coastal margin areas therefore require particular attention and should be monitored assiduously.

5. **Risk Management.** Many disasters are water-related – floods, droughts and pollution spills into rivers, lakes and groundwater systems. With climate change, land-based floods (and some marine based floods, eg those associated with hurricanes) seem to be increasing in frequency and intensity. This, exacerbated by the fact that more and more people are locating in flood-prone areas, is leading to an increase in fatalities and in economic damage from floods. There has been a call for targets to be set for reducing flood impacts and for monitoring progress towards achieving the targets – this call has not yet been answered, but this does not lessen the need for a monitoring programme on this issue.
6. **Challenges of Governance.** This includes the attitudes of people to the resource (affected by culture, religion and political framework), the effectiveness of institutions and of legislation and of financial instruments and the general capabilities of human resources.
7. **Monitoring the resource itself.** Needless to say there is a fundamental need to monitor the status of the resource itself. This includes monitoring surface and groundwaters in space and through time, in quantity and quality. It also includes monitoring the influence that human activity is having on the resource – changing surface cover, building dams and diversions, abstracting water from aquifers, rivers and lakes have great effect within catchments and for the global hydrological cycle. It is argued here that targets need not be set for this issue, but clearly the availability of the resource itself must be monitored.

Based on monitoring activities of several UN agencies at the global level, the World Water Assessment Programme (WWAP) attempts to address all the above issues through its triennial World Water Development Report (WWDR). The links between WWF4 Framework Themes, the major chapters within the second WWDR (2006) and the MDGs are shown in Table 1.

### 1.3 The need for Indicators

As stated in the World Water Development Report (WWDR 2003 edition), indicators are used to simplify, quantify, communicate and create order within complex data. They provide information in such a way that both policy-makers and the public can understand and relate to it. They help us to monitor progress and trends in the use and management of water resources over time and space. Similarly, indicators can help us to compare results in different areas or countries and examine potential links between changing conditions, human behaviour and policy choices. Because ‘good’ indicators are easy to understand, they offer a tool for raising awareness about water issues that cuts across every social and political group. The full reference to the WWDR chapter on Indicators may be found at:

<http://www.unesco.org/water/wwap/wwdr/pdf/chap3.pdf>

There are some fundamental considerations that have to be addressed in the development of indicators.

*Scale of approach.* In conformity with the argument that many issues need to be addressed at the community or very local level, indicators should be

developed at this scale. This might be called a bottom-up approach. The particular characteristics of the local situations would then be addressed and the local community would be motivated to take responsibility for monitoring evolving trends. Using such local scale approaches it would then be possible to set targets and to monitor progress in achieving those targets. However, there would then be a myriad of such locally developed indicators that would likely not be easily translocated to other local situations.

In contrast, if the aim is to compare one country with another, or one region with another, then indicators need to be developed with universally acceptable definitions and to be provisioned with data of relatively uniform consistency and reliability. This may be perceived as a top-down approach. One of the prime aims of the WWDR is to be able to make comparisons between countries and thus develop uniformly acceptable indicators that would be of great usefulness in making policy decisions. At the same time the WWDR has to promote the idea of local scale responsibility for involvement and action and thus be sympathetic to development of local scale indicators.

The important question of which scale is appropriate for what purpose is a fundamental conceptual challenge in the development of indicators.

*Geographical aggregation.* It is argued, most especially by ecologists, that the fundamental unit within which data should be collected is the hydrological unit (usually the river basin, but sometimes the aquifer). Thus we find that indicators on environmental sustainability are often collected within the river basin as the geographical unit.

On the other hand, many data are collected within administrative units, primarily the country, or provinces or smaller scale administrative units. Thus important socio-economic data on, for example, human health or food security are often collected within administrative units.

All too often the 'natural' unit of the river basin and the administrative unit of the country or sub-country unit do not coincide. This is a great challenge when trying to develop complex indicators or indices. This challenge is slowly being overcome with the development of Geographic Information Systems (GIS) technology as more and more data are being collected or depicted within pixels of ever decreasing size – and subsequently aggregated to conform to the desired larger natural or administrative units. However, it will not be for some time that the challenge of merging of data collected under different geographical units will be resolved.

*Data deficiencies.* No matter at which scale data are collected or within which geographical framework, there are normally great problems concerning the nature of the data themselves. It is common that data on the same topic are collected with differing definition of variables in different countries. There is often inconsistency in data reliability and quality and all too often there are gaps, either spatial or temporal, in data sets.

These then are some of the basic challenges in developing consistent and useful indicators. Within this context, the aims of indicators in the WWDR are:

- to provide a simple yet meaningful description of the complex water resource phenomena and management issues as a basis for action by decision-makers and the public;

- to offer insight into problems and potentials for integrated water resources management on a global scale;
- to monitor developments regarding the state of the water resources and the effectiveness of the global response in solving problems;
- to assess the impact of water resources development on economic, social, health and environmental conditions; and
- to review progress in meeting the set targets and goals.

In Table 2 a set of indicators is provided relative to each of the Millennium Development Goal targets. These are the 'official' indicators suggested by UNDP at the time that the MDGs were created. Since that time many other relevant indicators have been proposed and developed. The WWAP has been developing indicators for each of its challenge areas. Below are listed those indicators being developed for the second WWDR for the framework themes within WWF4 on WATSAN, Food and Environment and Risk Management.

#### **1.4 Conceptual Framework for Monitoring Water Resources for the MDGs**

The key way in which monitoring water resources for the MDGs differs from tracking progress in reaching Target 10 is that, whereas target 10 is in itself a measurable goal, water resources development and management is not an end in itself but rather an input to broader efforts to attain the MDGs – to increase food production, reduce poverty and disease, protect ecosystems. Developing a solid conceptual framework for monitoring water resources management and development in relation to the MDGs therefore presents a host of issues that the international community has yet to come to grips with, let alone resolve. As an initial step in this direction four essential foundations on which a conceptual framework for monitoring water for all the MDGs might be built are as follows:

1. A framework for sorting out the multiple ways in which the development, management and use of water resources will impact on the MDGs. Table 1 represents a very preliminary attempt to summarize some of these multiple ways in which the development, management and use of water impacts on the goals, targets and indicators embodied in the MDGs and can be used as a framework to trace what specific parameters need to be monitored to ensure that the development, management and use of water is having the maximum possible positive impact on the achievement of the MDGs. Table 2 elaborates on how MDGs, with their associated indicators are linked to water resource issues. Meeting the poverty target (target #1), for instance, will require not only attaining equity in access to safe drinking water, but also reducing poor people's vulnerability to water-related diseases, disasters like floods and droughts, and water-based conflict; promoting equality for women and girls in access, rights, entitlements and decision-making related to water; and maximizing the social and economic benefits from available water resources, while ensuring that basic human needs are met and the environment is protected for future generations.

2. A set of intermediate targets that relate the development, management and use of water resources to each of the key relevant MDG targets. Following the concepts of “nested systems frameworks”<sup>1</sup>, the relationship between water and any one of the MDGs can be described as a set of nested systems, each with its own particular set of intermediate objectives. The primary link between these systems is that the outputs from one system become part of the inputs into the next system. In this context, three types of intermediate targets could be monitored: process measures, which refer to the processes internal to any given system; output measures, which describe the quality and quantity of outputs at a point where they become inputs to the next higher system; and impact measures, which refer to the impact of these outputs on the MDGs as a whole. Importantly, this requires monitoring not only of the inputs to and outputs from any subsystem, but also the efficiency with which inputs to any subsystem are turned into outputs. In relation to the hunger target, for example, it is important to measure not only the water consumed in irrigated agriculture and the resultant food output, but also the relationship between the two – the “crop per drop” ratio.
3. For each intermediate target, an analytical system to define and measure the target. This will require, for each intermediate target, (a) terminology for defining precisely what we mean by the contribution of water resources management and development for that target; (b) the operational meaning of the agreed terminologies; and (c) survey instruments and indicators for assessing progress in water resources management and development towards the target. In the case of the hunger target, for example, an intermediate target might be the proportion of land area that is effectively irrigated in relation to the proportion of land area that would need to be irrigated if the hunger target is to be met. For both the poverty and the hunger targets, one parameter to monitor might be the degree to which the unequal distribution of water in time and space can be controlled, for example by measuring the proportion of storage infrastructure (both surface and sub-surface) and early warning systems that are effectively in place in relation to the infrastructure and management systems that would be needed to effectively control floods and droughts.
4. A system for monitoring the extent to which each country’s vision of Integrated Water Resources Management is translated into tailored solutions as a base for achieving the MDGs as a whole. Although water management and development will be essential to meeting the MDGs as a whole, efforts to make the MDGs a reality on the ground are going to demand possibly conflicting uses of the same water resources. For this reason, there is increasing acceptance that the management of water resources must be undertaken with an integrated approach, that assessment of the resource is of fundamental importance as the basis for rational decision-making and that national capacities to undertake

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<sup>1</sup> Small, Leslie and Mark Svendsen, 1992. *A framework for assessing irrigation performance*. International Food Policy Research Institute (IFPRI), Working Papers on Irrigation Performance No. 1, Washington, DC: IFPRI.

necessary assessments must be fully supported. Management decisions to alleviate poverty, to allow economic development, to ensure food security and the health of human populations as well as preserve vital ecosystems, must be based on our best possible understanding of all relevant systems. From this point of view, the implementation of one of the Task Force's fundamental propositions – that the vision of Integrated Water Resources Management needs to be translated into tailored solutions to specific countries as a base for achieving the MDGs as a whole – also needs to be carefully monitored. In the short term, this implies monitoring the target set in Johannesburg requiring countries to have formulated IWRM plans by 2005.

Clearly, these four essential foundations only begin to scratch the surface of the needed conceptual framework for monitoring water for all the MDGs let alone all the water issues not covered by the MDGs. In further developing this framework, a wide range of issues will need to be taken into account. Perhaps the most important of these is that, since the relationship between water and the MDGs is enormously site specific, intermediate targets -- as well as intermediate milestones (e.g., for 2005 and 2010) -- will need to be set and monitored at national and sub-national levels. Intermediate targets for water resources will need to give attention to both development and management issues, recognizing the key role of investment in infrastructure and the vast deficiencies in infrastructure endowments in the poorest countries most at risk of failing to achieve the MDGs. Intermediate targets will thus need to include both a physical/infrastructure dimension – for example, access to water for irrigation means the existence of infrastructure in good working order – as well as a concept of use – for example, whether a tube well is working and used effectively.

### **1.5 Institutional Mechanisms for Monitoring Water Resources for the MDGs**

Within the overall MDG reporting process referred to earlier, there is currently no comprehensive global system in place to produce a systematic, continuing, integrated and comprehensive global picture of freshwater and its management in relation to the MDGs. Designed to help close this gap is the World Water Assessment Programme (WWAP), which focuses on assessing the situation of freshwater throughout the world. Its primary output is the triennial World Water Development Report (WWDR) (the most recent report came out in 2003; with subsequent volumes slated for 2006, 2009, 2012, and 2015). The Programme focuses on terrestrial freshwater, but links with the marine near-shore environments and coastal zone regions as principal sinks for land-based sources of pollution and sedimentation and as areas where the threat of flooding and the potential impact of sea level rise on freshwater resources is particularly acute.

The Programme is undertaken by UN agencies working in concert, is hosted by UNESCO, and serves as an "umbrella" for coordination of existing UN initiatives within the freshwater assessment sphere. It also draws on inputs from institutions outside the UN system such as the Global Water Partnership,

the World Water Council and major NGOs. In this regard it links strongly with the data and information systems of the UN agencies, for example GRID, GEMS-Water and the Global International Waters Assessment (GIWA) of UNEP, the Global Runoff Data Center (GRDC) of WMO, AQUASTAT of FAO, the International Groundwater Resources Assessment Centre (IGRAC) of UNESCO and WMO, the water supply and sanitation databases of WHO and UNICEF and the databases of the World Bank system. Currently, data and information compilation and development of indicators is being undertaken in all key areas of water resources and reflected in the WWDR.

The 13<sup>th</sup> session of the Commission on Sustainable Development was very significant for the WWAP and WWDR. The EU, backed by many other countries, recommended that the World Water Assessment Programme become the official mechanism for monitoring on IWRM within the UN system. The triennial World Water Development Report would then become the official reporting mechanism for the system.

Clearly, much needs to be done to help the WWDR system become an effective process to monitor water resources for the MDGs. In addition to the conceptual problems referred to in the previous section, enormous measurement challenges remain to be tackled. Just to take one example, data and information collection is not done in a systematic and consistent fashion at any level, and thus it is difficult to compare data over time or between countries. In addition, there are problems of definition.

## **2. Targeting and monitoring for the five Baseline Themes**

### **2.1 Water for growth and development**

Economic development is one of the prerequisites for human well-being. It is based on the availability of energy and increase in industrial production. There is certainly a need to monitor progress within countries on the extent to which populations are able to receive adequate supplies of energy not only for domestic use but also for all forms of economic activity. Industrial outputs must also be assessed and changes output through time should be monitored on a country basis. At the present the MDGs do not contain targets on these important economic variables. However some countries do have targets for energy and industrial production.

Social development is also needed for human well-being. Thus the effectiveness of institutions such as schools and hospitals should be assessed and progress towards improvements in such institutions should be monitored through time. The MDGs do contain several targets related to social development:

- Target 1 (Poverty): Halve, between 1990 and 2015, the proportion of people whose income is less than one dollar a day
- Target 3: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling

- Target 4: Eliminate gender disparity in primary and secondary education, preferably by 2005, and to all levels of education no later than 2015
- Target 11: By 2020 to have achieved a significant improvement in the lives of at least 100 million slum dwellers

Indicators associated with these targets are suggested in Table 2.

## **2.2 Integrated Water Resources Management**

The World Summit for Sustainable Development, 2002, called for IWRM and water efficiency strategies to be incorporated into national plans by 2005. Monitoring of the extent to which national governments have complied with this target should clearly be undertaken. The Global Water Partnership and the Japan Water Forum have, independently, undertaken studies to ascertain the extent of compliance. These studies will be examined within a session on the IWRM day at the World Water Forum.

It has been suggested that indicators to monitor compliance with this target should be developed along the following lines:

*First order indicators* might include:

- Whether governments and stakeholders are aware of IWRM principles;
- Whether policies based on IWRM principles are being introduced into legislation;
- Whether the legislative framework is capable of incorporating IWRM principles;
- Whether financing mechanisms have been devised;
- Whether any necessary institutional reforms have been introduced and undertaken;

*Second order indicators* might include:

- Assessment of the extent to which necessary reforms in the management systems have been introduced;

*Third order indicators* might include:

- To what extent IWRM principles have become operational and
- To what extent water resources are better managed as a result of introduction of IWRM principles.

## **2.3 Water Supply and Sanitation for All**

### **The Conceptual Framework for Monitoring Target 10**

With respect to Target #10, the international community has a relatively well defined conceptual framework for defining and measuring the target, as well as an institutional mechanism, based on this conceptual framework, for measuring progress towards the targets.

The conceptual framework for monitoring MDG target #10 (“to halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation”) can be said to comprise three things: (a) the terminology for

access to both water and sanitation; (b) the operational meaning of the agreed terminologies; and (c) survey instruments and indicators for assessing progress towards the targets. Before analysing this framework, it is important to highlight four inherent issues – the first relates to monitoring the MDGs as a whole, including MDG Target #10, whereas the other three relate only to target #10.

1. First, the targets can and should be set and monitored at global, national and even sub-national levels. National targets must be owned by each country – some countries, for example, are well on track to achieving one or more of the above targets and can aspire to something much more ambitious than the Millennium Development targets that are being recommended as voluntary minimum targets for all countries. Likewise, intermediate milestones (e.g., for 2005 and 2010) should be set at all levels. Progress at all levels should be monitored and evaluated in terms of these intermediate milestones.
2. Second, the baseline date for target #10, which has not always been made explicit, needs to be clarified. Several other MDG Targets call for specific improvements with respect to some baseline year, but with the exception of the Slum Dwellers Target (#11), they all specify this baseline year as 1990. Taking into account that the UN Statistics Division and UNICEF use 1990 as their baseline year, and that as a result the Secretary-General's report on progress towards achieving the MDGs uses 1990, this year has been adopted in order to ensure maximum consistency.
3. Third, "sustainable access" must be viewed from a social and economic perspective as well as an environmental one. It includes a physical/infrastructure dimension – for example, access to drinking water means the existence of infrastructure in good working order – but also embraces a concept of use. Access to sanitation cannot simply be measured in terms of whether a toilet is installed, but whether that toilet is working and used for safe disposal of excreta with improved hygienic practices, as otherwise the contribution to human health will be negligible or even negative. Sustainable access also includes a time dimension. Can a family that must spend more than two hours queuing up for their turn at the community tap be thought to have sustainable access, even if that tap is just 20 metres from their home?
4. Fourth, target #10 itself has four components, since "people without sustainable access to safe drinking water and basic sanitation" encompasses four fairly distinct groups. This is depicted in greater detail in Figure 3, below. An overall monitoring strategy will therefore need to have distinct sub-strategies to address problems of urban water supply, rural water supply, urban sanitation and rural sanitation.

**Figure 3. Components of MDG Target #10**

<p><b>Urban Water Supply</b></p> <p>Reduce by half, by 2015, the proportion of urban people without sustainable access to safe drinking water</p>	<p><b>Urban Sanitation</b></p> <p>Reduce by half, by 2015, the proportion of urban people without sustainable access to basic sanitation</p>
<p><b>Rural Water Supply</b></p> <p>Reduce by half, by 2015, the proportion of rural people without sustainable access to safe drinking water</p>	<p><b>Rural Sanitation</b></p> <p>Reduce by half, by 2015, the proportion of rural people without sustainable access to basic sanitation</p>

As mentioned earlier, the conceptual framework for the MDG targets for water and sanitation comprises (a) the terminology for access to both water and sanitation; (b) the operational meaning of the agreed terminologies; and (c) survey instruments and indicators for assessing progress towards the targets. Each of these is elaborated on below.

The target for drinking water was defined at the Millennium Summit as part of the MDGs. The baseline global data available on the current status of this target are what is contained in the “Global water supply and sanitation assessment 2000” (GWSSA2000) prepared under the WHO/UNICEF Joint Monitoring Program (JMP). Whereas the MDG target on water uses the terminology of “safe drinking water,” the JMP Report uses the terminology of access to “improved” water technology types. It has been argued that this “change in terminology reflects both the past misrepresentation, and the future uncertainty, in judging and defining services as “safe” in terms of human health.<sup>2</sup>

It is very difficult to measure global coverage of safe water or sanitary excreta disposal routinely, because monitoring aspects of service such as the quality of water at point of consumption or the correct usage of sanitary facilities is not currently within the scope of national surveys or other data sources. Surveys typically register the presence of water and sanitation facilities of different technology types. The GWSSA2000 assumed that those technologies that can be categorized as “improved” are inherently safer or more sanitary than others that are considered “not improved.” Therefore, the coverage estimates from JMP are expressed as the percentage of population with access to improved drinking water sources and improved sanitation as defined in Box 1.

<sup>2</sup> Hunt, C. (2001). How Safe is Safe? A Concise Review of the Health Impacts of Water Supply, Sanitation and Hygiene. London, WELLS (LSHTM/WEDC):22

**Box 1. Improved and Unimproved Water and Sanitation Facilities as defined by the JMP**

<p><b>Improved water supply</b>            Household connection            Public standpipe            Bore hole            Protected dug well            Protected spring            Rainwater collection</p>	<p><b>Improved sanitation</b>            Connection to a public sewer            Connection to septic tank            Pour-flush latrine            Simple pit latrine            Ventilated improved pit latrine</p>
<p><b>Unimproved water supply</b>            Unprotected well            Unprotected spring            Vendor provided water            Bottled water<sup>1</sup>            Tanker truck-provided water</p>	<p><b>Unimproved sanitation</b>            Service or bucket latrine            (where excreta are manually removed)            Public or shared latrines            Latrines with open pit</p>
<p><sup>1</sup> Not considered “improved” because of limitations concerning the potential quantity of supplied water, not its quality</p>	

It appears, however, that the meaning of “improved” is still an issue. One interpretation has been proposed by a task force on monitoring established by the Water Supply and Sanitation Collaborative Council, WSSCC. According to the WSSCC task force, *a person is said to have access to “improved” water supply if the person has access to sufficient drinking water of acceptable quality as well as sufficient quantity of water for hygienic purposes*<sup>3</sup>.

As mentioned earlier, the target for sanitation was established at the 2002 World Summit on Sustainable Development, WSSD. The terminology chosen for this target is “basic sanitation.” In contrast, the terminology used in the JMP report is “improved sanitation.” The term is defined in the JMP report as a sanitation system in which excreta are disposed of in such a way that they reduce the risk of fecal-oral transmission to its users and the environment. It would appear, however, that in choosing “basic sanitation” as the preferred terminology, the Summit had something more in mind. It linked access to sanitation to improved human health and reduced infant and childhood mortality. Basic sanitation was defined more explicitly to include actions on the following:

- Development and implementation of efficient household sanitation systems;
- Improvement of sanitation in public institutions, especially in schools;
- Promotion of safe hygiene practices;
- Promotion of education and outreach focused on children, as agents of behavioural change;
- Promotion of affordable and socially and culturally acceptable technologies and practices;

<sup>3</sup> A survey instrument being prepared by the WSSCC task force gives further elaboration of the meanings of these two aspects of improved water supply.

- Development of innovative financing and partnership mechanisms;
- Integration of sanitation into water resources management strategies in a manner that does not negatively impact on the environment (includes protection of water resources from biological or faecal contamination).

It is apparent that the WSSD definition is broader than what is envisaged in the JMP report and is more impact-oriented, particularly in communities that currently have very low levels of sanitation service. The WSSD is also not focused on the construction of a particular number of toilets as the target goal, but rather on the creation of an overarching process for improved health and hygiene through basic sanitation. The JMP may also be concerned with this broader goal, but has developed a definition and indicators of “improved sanitation” that are simpler to make operational. On the other hand, an emphasis on the presence or absence of particular household technologies ignores health risks associated with poor disposal of sullage or wastewater from domestic sources (e.g., filariasis and schistosomiasis). Moreover, issues of privacy and dignity are also important components of monitoring in sanitation, as they influence willingness to use sanitation facilities regularly.

With these considerations in mind, the following definition and use of the term “basic sanitation” is adopted:

*Access to, and use of, excreta and wastewater facilities and services that provide privacy and dignity while at the same time ensuring a clean and healthful living environment both at home and in the immediate neighbourhood of users.*

With basic sanitation, access at the household level should be sufficient. Yet, one of the goals of such access is public health and environmental pollution prevention. Hence, at the very minimum, the definition of access should reflect a healthful environment at the neighbourhood level. While this may be sufficient in a rural environment or in a dispersed settlement, it would be woefully inadequate in an urban area, especially in urban slum areas or in congested urban areas and mega-cities. For such situations, we would need to go beyond access at the household level to provide proper collection systems like appropriate forms of sewerage, together with facilities for proper treatment and disposal of the collected sewage.

In defining indicators that will be used as the basis for monitoring, it is necessary to strike a balance between “ideal” consistency with conceptual definitions and measurable indicators that provide approximations to the ideal definitions. It is such measurable indicators that should form the basis for developing the main monitoring instruments at the national and international levels. For instance, from a gender perspective, ideally the definition of “improved” water supply would include some measure of the distance between a household and its water source, as the distance women must travel for water has many impacts on their lives, from the amount of time they must spend on water gathering to questions of physical safety. Similarly, having separate sanitation facilities for men and women and, at schools, for girls and boys, as well as the physical location of such facilities, also affects a regularity of use,

women's physical safety, and girls' school attendance. Disaggregating service access data by sex would also yield important information, allowing for assessment of the degree to which both men and women are benefiting from interventions in this area.

However, if the information collected from, for instance, household surveys – among the most reliable methods – does not track access by sex, distance to water sources, or the presence of separate sanitation facilities for men and women, then creating monitoring indicators based on these considerations presents a host of operational difficulties. There is a need to strike a workable balance between what is desirable to measure and what is possible to measure, and cost is an important variable in this exercise.

### **The current institutional mechanism for monitoring Target 10**

As part of the overall United Nations strategy for helping the international community as a whole reach the Millennium Development Goals, there is an overall MDG reporting process, which focuses on the question “where do we stand?” This effort, which monitors progress towards achieving the Millennium Development Goals as a whole and is based on national reporting systems, is spearheaded by UNDP.

Within this overall reporting process, there is an international institutional mechanism for monitoring the water and sanitation targets that dates back to 1990. In that year, at the end of the water decade, the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) combined their efforts in monitoring the water supply and sanitation sector by establishing the Joint Monitoring Programme for Water Supply and Sanitation (JMP). The purpose of the JMP was to:

- Monitor sector progress towards internationally established goals on access to water supply and sanitation;
- Monitor sector trends and programmes;
- Build national sector monitoring capacity; and
- Inform national and global policy-makers on the status of the sector.

Over the past decade, the JMP focused on monitoring access coverage at the global and regional levels. To that end, the JMP compiled coverage rates on water supply and sanitation using information provided primarily by water utilities and government sources. JMP sector assessment reports based on this methodology were issued in 1991, 1993 and 1996.

The latest JMP report, the *Global Water Supply and Sanitation Assessment 2000 Report* (GWSSA2000), which provides a comprehensive review of the water supply and sanitation sector at the end of the millennium, marks a significant shift in the way in which data is derived. The coverage estimates<sup>4</sup>

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<sup>4</sup> If possible, coverage estimates are based on all available national household surveys and censuses. All available surveys and censuses are plotted on a time scale. A linear trend line, based on the least-squares method, is drawn through these data points and determines the estimates for 1990 and 2000. In case

are primarily based on user-based data derived from nationally representative household surveys<sup>5</sup> and census rather than provider-based data. This shift to evidence-based data was made possible after the introduction of the Multiple Cluster Indicator Surveys (MICS) by UNICEF in 64 countries in 1995 and the MICS2 around 2000 in 67 countries. These 120+ MICS results, in addition to the now over 150 Demographic and Health Surveys (funded by USAID and conducted by ORC-Macro) and data from national census efforts, provide a large enough database to calculate coverage estimates on evidence-based data.

Data derived from household surveys is more accurate and reliable than that supplied by governments and water utilities. In many cases, provider-supplied estimates are based on facilities constructed under their programmes multiplied by an estimated number of users per facility. This means that facilities constructed by households themselves, by NGOs, or by the private sector may not have been included. It also means that systems that have broken down or for other reasons are not being used might be counted. In addition, political, institutional, career, and other pressures can sometimes create incentives for suppliers to inflate the numbers of people reported to have access. Therefore, household-level information gathered through household surveys gives a better reflection of the real situation on the ground.

The current JMP-database contains water supply and sanitation coverage data of over 350 national household surveys and census conducted throughout the developing world during the past 15 years. The widely cited figures of 1.1 billion people without access to drinking water and 2.4 billion without access to sanitation are derived from this JMP database.

#### *Limitations of household surveys*

The current major survey instruments only ask a question about the time taken to collect water. No questions are asked about the reliability of the supply, the water quality or affordability, the distance between the household and the facility, or the time taken to collect water. Nor do the surveys assess how hygienic a sanitary facility really is.

Both the DHS and MICS surveys strive to strike a balance between obtaining information and the time needed to conduct a survey interview. Costs are an

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household surveys and censuses are not available, coverage data given through the GWSSA 2000 questionnaire is used.

<sup>5</sup> To be used in the calculation of coverage data for a country, surveys must meet certain criteria. The survey needs to be representative of the entire country. Further, it needs to be well documented, and details about the data should be available. In the JMP approach, coverage data are based on the type of services used, so if a survey only gives one total figure for people with “access,” that survey cannot be used to calculate the coverage estimates because it is not clear whether this access meets the JMP standard of “improved.” However, details of surveys, even those not used, have been included in the country files and are visible in the graphs for purposes of comparison. Examples of valid surveys are the Demographic and Health Survey of Macro International (funded by USAID), UNICEF’s Multiple Indicator Cluster Survey and some of the World Bank’s Living Standard Survey. Many censuses have also been used, but sometimes their data are given with insufficient detail.

issue. A regular MICS or DHS survey interview takes between 45 minutes to one hour. MICS surveys are usually conducted in 4000 – 6000 households, DHS surveys in 6000 – 9000 households. Limiting the number of survey questions to those that have relevance for global level monitoring is therefore of utmost importance.

Although the current five-to-seven questions on water and sanitation in the MICS and DHS may be expanded with a few additional indicators with global relevance, it is likely that the demands of the sector require additional information. Current demands include information on hygiene and hygiene behavior (like hand-washing) and disaggregation of data for peri-urban areas or sub-national level. GIS mapping of the current survey instruments is not enough as the current DHS and MICS survey designs stratify their sampling for an entire country and not for separate regions. Regional stratification as is done in a very large country like India could easily increase the sample size five-to-ten fold to 60,000 households. Such surveys therefore are better done at the individual country level targeting specific regions of interest – the benefits of global monitoring of sub-regional coverage most likely do not outweigh the costs. Rapid appraisal techniques are likely a good and cost-effective alternative to household surveys to assess particular water, sanitation and hygiene problems in specific sub-regions.

### **Directions for the Future**

As part of its work to articulate what it will take to meet the MDGs related to water and sanitation, the Millennium Project Task Force has put forward the following proposition relating to monitoring:

*At the national level, monitoring and evaluation systems should focus on access to services, not simply on existing infrastructure, in order to provide decision makers with a basis for their decision making.*

Monitoring and assessment systems for access to water supply and sanitation services need to be active and adequately resourced from the sub-national to the international level. Equally important, these systems need to employ valid and reliable measures of access to water supply and sanitation services. Historically, monitoring has focused on the presence or absence of particular water and sanitation infrastructure; information about the functioning, use, and reliability of systems was typically not collected. At this time, however, there exists the opportunity to improve and strengthen monitoring such that a more accurate picture of access to water and sanitation services can be obtained. More specifically:

- Access to services, rather than to infrastructure, should be at the center of monitoring efforts. At a minimum, monitoring should assess whether infrastructure is functioning and provides reliable service. The parameters that matter most to users—including the convenience, reliability, sustainability, and adequacy of water supply and sanitation services—should be measured over time. Monitoring of equity of access

- (e.g., by women and the poor) must be undertaken to assess the impacts of investments on different segments of society.
- Monitoring systems should employ a sample survey approach (in lieu of, or in addition to, self-reporting methodologies) such that policy and planning can be based on more objective and accurate information regarding access to water and sanitation services.
  - Collected data should not only be analyzed and reported to national and international institutions, but should also be organized and shared in a user-friendly manner with NGOs, civic groups, and the public at large.
  - Moreover, the flow of information between monitoring bodies and NGOs and other civil society groups should not be one-way; these groups should be involved in the design of surveys and the selection of survey locations. Such groups working on the ground, particularly those that have won community trust, could make valuable contributions to the information-gathering process as well as help validate data reported by others.

Monitoring is imperative if countries are to focus their efforts and resources where needs and challenges are greatest, such as urban slum areas, peri-urban areas and rural areas. In many cities, provinces, and countries, surprisingly little is known about the characteristics of households that lack access to water supply and sanitation services. Such basic assessments should be undertaken such that the obstacles to expanding access are understood and relevant financial, policy, and planning instruments are devised to respond.

Existing resources must be better used. Making the most of such resources is a prerequisite to reaching the goals. Based on improved information, governments at national, regional and local levels must reallocate their scarce existing resources towards achieving the Millennium Development Goals. Subsidies must promote basic services for all rather than luxury services for some. Ensuring the most cost-effective use of resources and their allocation to highest priority investment needs requires a thorough restructuring of local and national public expenditures.

At the global level, there is also a need to enhance monitoring and assessment, given that the achievement of the MDGs is a global commitment.

One issue that requires analysis relates to the Joint Monitoring Programme (JMP), which has largely been funded by its two lead agencies, UNICEF and WHO, and whose mandate appears difficult to achieve given its limited resources. There is a clear need to strengthen the JMP as the key global mechanism for monitoring access to water supply and sanitation, and to provide it with the substantial resources necessary to enable it to do its job effectively and truly monitor progress toward the MDGs on Water Supply and Sanitation. Some important principles here include:

- The focus must change from measuring infrastructure provision to measuring sustainable access to safe and adequate services, and

from collecting provider system data to collecting data on actual service delivery according to agreed norms.

- National strategies and monitoring indicators should be respected; but to promote comparability of data, a few common parameters that can be readily measured at the household level should be identified and tested by the JMP for use in collecting standardized household data on access to safe water supply and basic sanitation.
- Access should be monitored at both national and sub-national levels, using sample survey techniques to complement quantitative national statistics of infrastructure provision.
- The JMP should promote a stakeholder approach, encouraging national governments to cooperate with local as well as international civil society agencies, including representatives of user groups.
- The JMP should play a more active role in promoting capacity building for monitoring purposes at national and sub-national levels.
- The JMP and national governments must adhere to agreed programs for the publication of monitoring data in a consistent format at national and international levels; reports should be publicly available to promote transparency.

#### **Examples of Health Indicators (broader than ‘Water supply and sanitation for all’):**

- **The Disability-Adjusted Life-Year (DALY).** The DALY Index, integrating mortality with morbidity and disability information into a single unit, takes into account the time lived with a disability and the time lost due to premature mortality. DALYs highlight the relative importance of health problems in a society and is the measure of choice to monitor the burden of disease in relation to improvements in water supply and sanitation.
- **Prevalence of underweight children under five years of age.** The prevalence of underweight under-fives is an internationally recognized indicator for monitoring health and nutritional status in populations. A child’s low-weight-per-age condition reflects the effects of acute as well as chronic undernutrition.
- **Prevalence of stunting among children under five years of age.** Stunting, or low height-per-age is considered the best indicator of chronic undernutrition reflecting the cumulative effects of socio-economic, environmental, health, and nutritional conditions. It is an indicator of standard of living; women’s educational level; access to food, water supply and sanitation; and the burden of infectious diseases.
- **Under-five mortality rate.** The under-five mortality rate, one of the most important indicators of development, reflects quality of life, including income and education of parents, efficacy of health services, access to safe drinking water and sanitation. With children especially susceptible to many water-related diseases and the database for child mortality

much better developed than that for adult mortality, this indicator is recommended for monitoring the burden of water-related diseases.

- **Access to safe drinking water.** Contaminated drinking water is a major cause of illness and mortality, as a result of exposure both to infectious agents and to chemical pollutants. This indicator, the proportion of the population with access to safe drinking water, provides a proxy measure both of exposure to unsafe water supplies and the effectiveness of actions to improve access.
- **Access to basic sanitation.** Though not directly a basic need for survival like drinking water, indirectly indiscriminate defecation and improper excreta disposal are principal determinants for both morbidity and mortality. This indicator, the proportion of the population with access to an improved sanitation facility, provides a measure of both the potential exposure of the population to infectious agents associated with poor sanitation, and of the action taken to improve domestic sanitation.

## 2.4 Water Management for Food and the Environment

It is entirely appropriate that there has been, for a number of years, a Dialogue on Water, Food and the Environment. Water is clearly inextricably linked to both food production and sustaining of natural ecosystems. Food production, and the ever increasing extension of food producing lands are intimately linked to the maintenance of natural ecosystems. Both food production and environmental sustainability are, of course, dependent on population increases and population dynamics and reconciliation of these various pressures should be monitored. A suggested suite of indicators to enable such monitoring is given below.

### Examples of Agriculture and Rural Livelihoods Indicators

- **Percentage of undernourished people.** Food security is defined by FAO as physical, social and economic access for all people to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. The percentage of people lacking access to such food resources provides a measure of the dimension of the hunger problem for the region or country considered and therefore a measure for of food insecurity.
- **Percentage of poor people living in rural areas.** To be poor is to be hungry, to lack adequate shelter and clothing, often to be sick and unattended, to be illiterate and unschooled. Poverty encompasses not only material deprivation but also increased vulnerability and exposure to health risk, voicelessness and powerlessness. This indicator, highlighting the proportion of the population of poor who live in rural areas where agriculture and related activities are the primary source of livelihood, provides a measure of the importance of agriculture in the fight against poverty.

- **Relative importance of agriculture in the country's economy.** GDP is defined as the sum of the value added in the agriculture, industry and the services sector. Agricultural GDP is the share of the country's Gross Domestic Product attributable to agriculture production.
- **Irrigated land as percentage of cultivated land.** Mankind has developed a wide variety of ways to bring additional water to agricultural fields for the purpose of enhancing crop production. The area equipped to provide water to crops, including areas equipped for full and partial control irrigation, equipped lowlands, and areas equipped for spate irrigation, expressed as a proportion of total land under agriculture is a measure of the dependence of a country's or region's agriculture on irrigation.
- **Relative importance of agricultural water withdrawal in the water balance.** Water withdrawals from renewable surface and ground water sources serve a variety of agricultural purposes but are mainly used for irrigation and stock rearing. As the proportion of renewable water resources used for agriculture this indicator is a measure of the importance of irrigation in the country's water balance.
- **Extent of land salinized by irrigation.** Increasing soil salinity, a negative result of excessive irrigation in arid climates, reduces the suitability of land for agriculture. To have a measure of the area salinized by irrigation as a percentage of irrigated land gives an indication of the need for management attention and the potential threat to agriculture production.
- **Importance of groundwater for irrigation.** Groundwater withdrawal refers to the gross amount of water, which is extracted from all aquifers for a given use, including conveyance losses, consumptive use and return flow. The percentage of irrigated land relying on groundwater is an indicator of the dependence of a country or region's irrigated agriculture on groundwater resources.

#### **Examples of Ecosystems Indicators:**

- **Fragmentation and Flow Regulation of Rivers and Ecosystem Impact.** Riparian and wetland ecosystems play critical role in maintaining the integrity and proper functioning of coastal as well as freshwater ecosystems. This indicator monitors the degree of environmental impact at the river basin level resulting from flow regulation, channel fragmentation and other stresses associated with the installation of manmade infrastructure, such as dams, canals and water diversions.
- **Dissolved Nitrogen (NO<sub>3</sub> + NO<sub>2</sub>).** Urban wastewater, runoff from heavily fertilized agricultural land, and atmospheric deposition are the principal sources of nitrogen accumulation in water systems. An

increase in the concentration of dissolved inorganic nitrogen is indicative of the potential for the emergence of eutrophic conditions, characterized by prolific growth of algae and macrophytes which in turn inhibits water flow, and renders water unsuitable for drinking among other uses.

- **Trends in freshwater habitat protection.** Inland freshwater ecosystems, which take a variety of forms, provide numerous important environmental goods and services. By comparing the proportional area of freshwater habitats protected currently as compared to a previous point in time, preferably 1990 or before, this indicator monitors the trend in habitat protection, ideally within each freshwater ecosystem, biome or habitat.
- **Trends in freshwater species populations.** With the environment subject to damage by pollution, among other factors, as well as outright destruction, it is important to monitor the quality as well as the extent of freshwater ecosystems. This indicator attempts to assess the health of freshwater ecosystems and biomes through monitoring animal species resident in these ecosystems at a global, regional and other sublevels and is based on the average change in population trends of freshwater species from a 1970 baseline.
- **Biological Oxygen Demand (BOD).** The quantity of oxygen necessary for biological and chemical oxidation, or breakdown, of water-borne organic material, the source of which is often untreated or marginally treated sewage or industrial waste, is known as Biological Oxygen Demand (BOD). Declining oxygen concentrations cause severe ecosystem disruption and thus a high level of BOD is an indicator of ecosystem stress associated with human activities.

## 2.5 Risk Management

As hydrometeorological disasters have been increasing in frequency and intensity. As a result and as more and more people are living in disaster-prone areas the impacts on societies have been greatly increasing. It is incumbent on governments and international agencies to assess and monitor both the disasters themselves and the impacts of disasters on society. Unfortunately, there is good evidence that such monitoring is not being undertaken to nearly the extent needed.

Monitoring should include data and information gathering and analysis on the events themselves as well as monitoring the preparedness or resilience of societies to cope with the disasters. Monitoring of resilience should include information on the preventive measures in place within countries, the awareness of the populations regarding disasters, the effectiveness of early warning systems and emergency operations and the extent to which response mechanisms are in place. This would include the extent to which the various levels of government involved are capable of concerted and collective response to emergency situations.

A target has been proposed, but not, as yet, accepted by the international community that there should be agreement 'to halve by 2015 the number of loss of human lives by water-related disasters'.

**Examples of Risk Indicators might include:**

- **Disaster Risk Index.** In comparing the extent of the population exposed to water-related hazards with average annual deaths caused by such hazards it is possible to assess a nation's or an area's vulnerability to natural disasters. This indicator provides a global ranking of relative risk and vulnerability of nations exposed to water-related and other natural hazards.
  - **Risk and Policy Assessment Indicator.** The objective of this indicator is to assess the efficiency of public policies for flood mitigation in terms of actual impact on physical, social and economic features of floods. By evaluating the sectoral impact of various disasters, this indicator attempts to determine the relevance of public policies aimed at flood mitigation and identify the gaps in public policies.
  - **Climate Vulnerability Index (CVI).** In identifying zones of present and likely future water stress, determining the geographical types likely to be vulnerable, collecting data for sample locations, testing future possible scenarios, it is possible to develop numerical scores for different locations over a range of spatial scales. Termed the Climate Vulnerability Index (CVI) this numeric links water resources modelling with human vulnerability assessments to contribute to a meaningful assessment for generic use.
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**Table 1: Links between WWF4 framework themes, chapters in WWDR II and the MDGs**

WWF4 Framework themes	Sub-themes and additional themes	WWDR II Chapters	Relevant MDG targets
Water for Growth and Development	Sub-theme: Economic development	Ch 8: Water and Industry Ch 9: Water and Energy	No targets and monitoring in place
	Sub-theme: Social development		Target 1 (Poverty): Halve, between 1990 and 2015, the proportion of people whose income is less than one dollar a day Target 3: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling Target 4: Eliminate gender disparity in primary and secondary education, preferably by 2005, and to all levels of education no later than 2015 Target 11: By 2020 to have achieved a significant improvement in the lives of at least 100 million slum dwellers
Implementing IWRM		The whole WWDR II is IWRM-based	GOAL on inclusion of IWRM in the planning processes of all national governments by 2005
Water supply and sanitation for all	Other major health issues	Ch 5: Water and Health	Target 10: Halve by 2015 the proportion of people without sustainable access to safe drinking water and basic sanitation Target 5: Reduce by two thirds, between 1990 and 2015, the under-five mortality rate Target 6: Reduce by three quarters, between 1990 and 2015, the maternal mortality ratio Target 8: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases
Water management for food and the environment		Ch 6: Water and Ecosystems Ch 7: Water and Food	Target 2 (Hunger): Halve, between 1990 and 2015, the proportion of people who suffer from hunger Target 9: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources
Risk Management		Ch 10: Managing risks	No targets and monitoring in place
	Challenges of Governance	Ch 2: The Challenges of Governance Ch 11: Sharing water Ch 12: Valuing water Ch 13: Ensuring the knowledge base	No targets and monitoring in place
	Monitoring the resource itself	Ch 4: The Physical setting: The State of the Resource	Targets need not be set; the WWAP undertakes monitoring

**Table 2. Summary of the way in which water resources development, management and use relate to the realization of each of the MDGs and including the special goal on introduction of IWRM into all national planning processes by 2005.**

A framework of 8 goals, 18 targets and 48 indicators to measure progress towards the Millennium Development goals was adopted by a consensus of experts from the United Nations Secretariat and IMF, OECD and the World Bank. (Road Map towards the Implementation of the United Nations Millennium Declaration, A/56/326). Also included the special Goal on inclusion of IWRM plans within national planning processes by 2005, introduced at the WSSD, Johannesburg, 2002.

Goals and Targets from the Millennium Declaration and WSSD	Indicators for monitoring progress	Contributions of sound water resources management and development	Relevance to Framework Themes							
			1	2	3	4	5			
<b>GOAL 1. ERADICATE EXTREME POVERTY AND HUNGER</b>										
<b>Target 1 (Poverty)</b> Halve, between 1990 and 2015, the proportion of people whose income is less than one dollar a day	<b>Indicators</b> <b>1.</b> Proportion of population below \$1 (PPP) per day (World Bank) <b>2.</b> Poverty gap ratio (incidence x depth of poverty) (World Bank) <b>3.</b> Share of poorest quintile in national consumption (World Bank)	<ul style="list-style-type: none"> <li>Water is a factor of production in agriculture, industry and other economic activities</li> <li>Investments in water infrastructure/services as a catalyst for local/regional development</li> <li>Reduced vulnerability to water-related hazards reduces risks in investments and production</li> <li>Reduced ecosystems degradation makes livelihood systems of the poor more secure</li> <li>Improved health increases productive capacities, reduces burden on those who care for the sick</li> </ul>	X	X	X	X	X			
<b>Target 2 (Hunger)</b> Halve, between 1990 and 2015, the proportion of people who suffer from hunger	<b>Indicators</b> <b>4.</b> Prevalence of underweight children under five years of age (UNICEF - WHO) <b>5.</b> Proportion of population below minimum level of dietary energy consumption (FAO)	<ul style="list-style-type: none"> <li>Water is a direct input to irrigation for expanded grain production</li> <li>Reliable water for subsistence agriculture, home gardens, livestock, tree crops</li> <li>Sustainable production of fish, tree crops and other foods gathered in common property resources (also affects poverty when such goods are sold for income)</li> <li>Reduced urban hunger due to cheaper food prices</li> <li>Healthy people are better able to absorb the nutrients in food than those suffering from water-related diseases, particularly worms</li> </ul>	X	X			X			
<b>GOAL 2. ACHIEVE UNIVERSAL PRIMARY EDUCATION</b>										
<b>Target 3.</b> Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling	<b>Indicators</b> <b>6.</b> Net enrolment ratio in primary education (UNESCO) <b>7.</b> Proportion of pupils starting grade 1 who reach grade 5 (UNESCO) <b>8.</b> Literacy rate of 15-24-year-olds (UNESCO)	<ul style="list-style-type: none"> <li>Domestic water supply can lead to improved school attendance from improved health and reduced water-carrying burdens, especially for girls</li> <li>Having separate sanitation facilities for girls and boys in schools increases girls' school attendance</li> </ul>	X	X						

Framework Themes: 1. Water for Development; 2. Implementing IWRM; 3. Water Supply and Sanitation for All; 4. Water Management for Food and the Environment; 5. Risk Management

Goals and Targets from the Millennium Declaration and WSSD	Indicators for monitoring progress	Contributions of sound water resources management and development	Relevance to Framework Themes				
			1	2	3	4	5
<b>GOAL 3. PROMOTE GENDER EQUALITY AND EMPOWER WOMEN</b>							
<b>Target 4.</b> Eliminate gender disparity in primary and secondary education, preferably by 2005, and to all levels of education no later than 2015	<b>Indicators</b> <b>9.</b> Ratio of girls to boys in primary, secondary and tertiary education (UNESCO) <b>10.</b> Ratio of literate women to men of 15- to 24-year-olds (UNESCO) <b>11.</b> Share of women in wage employment in the non-agricultural sector (ILO) <b>12.</b> Proportion of seats held by women in national parliament (IPU)	<ul style="list-style-type: none"> <li>Community-based organizations for water management improve social capital of women</li> <li>Reduced time, health, and care-giving burdens from improved water services give women more time for productive endeavours, adult education, empowerment activities, leisure</li> <li>Water sources and sanitation facilities closer to home put women and girls at less risk for sexual harassment and assault while gathering water and searching for privacy</li> <li>Higher rates of child survival are a precursor to the demographic transition toward lower fertility rates; having fewer children reduces women's reproductive responsibilities</li> </ul>	X	X	X		
<b>GOAL 4. REDUCE CHILD MORTALITY</b>							
<b>Target 5.</b> Reduce by two thirds, between 1990 and 2015, the under-five mortality rate	<b>Indicators</b> <b>13.</b> Under-five mortality rate (UNICEF - WHO) <b>14.</b> Infant mortality rate (UNICEF - WHO) <b>15.</b> Proportion of 1-year-old children immunized against measles (UNICEF - WHO)	<ul style="list-style-type: none"> <li>Improved quantities and quality of domestic water and sanitation reduce main morbidity and mortality factor for young children</li> <li>Improved nutrition and food security reduces susceptibility to diseases</li> </ul>	X	X	X		
<b>GOAL 5. IMPROVE MATERNAL HEALTH</b>							
<b>Target 6.</b> Reduce by three quarters, between 1990 and 2015, the maternal mortality ratio	<b>Indicators</b> <b>16.</b> Maternal mortality ratio (UNICEF - WHO) <b>17.</b> Proportion of births attended by skilled health personnel (UNICEF - WHO)	<ul style="list-style-type: none"> <li>Improved health and reduced labour burdens from water portage reduce mortality risks</li> <li>Improved health and nutrition reduce susceptibility to anaemia and other conditions that affect maternal mortality</li> <li>Sufficient quantities of clean water for washing pre-and-post birth cut down on life-threatening infections</li> <li>Higher rates of child survival are a precursor to the demographic transition toward lower fertility rates, and fewer pregnancies per woman reduce maternal mortality</li> </ul>	X	X	X		

Framework Themes: 1. Water for Development; 2. Implementing IWRM; 3. Water Supply and Sanitation for All; 4. Water Management for Food and the Environment; 5. Risk Management

Goals and Targets from the Millennium Declaration and WSSD	Indicators for monitoring progress	Contributions of sound water resources management and development	Relevance to Framework Themes							
			1	2	3	4	5			
<b>GOAL 6. COMBAT HIV/AIDS, MALARIA AND OTHER DISEASES</b>										
<b>Target 7</b> Have halted by 2015 and begun to reverse the spread of HIV/AIDS	<b>Indicators</b> <b>18.</b> HIV prevalence among 15-to-24-year-old pregnant women (UNAIDS-WHO-UNICEF) <b>19.</b> Condom use rate of the contraceptive prevalence rate (UNAIDS, UNICEF, UN Population Division, WHO) 19a. Condom use at last high-risk sex 19b. Percentage of population aged 15-24 with comprehensive correct knowledge of HIV/AIDS <b>20.</b> Ratio of school attendance of orphans to school attendance of non-orphans aged 10-14 (UNICEF-UNAIDS)	<ul style="list-style-type: none"> <li>Better water management reduces mosquito habitats</li> <li>Better water management reduces incidence of a range of other water-borne diseases</li> <li>Improved health and nutrition reduce susceptibility to/severity of HIV/AIDS and other major diseases</li> </ul>	X	X						
<b>Target 8.</b> Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases	<b>Indicators</b> <b>21.</b> Prevalence and death rates associated with malaria (WHO) <b>22.</b> Proportion of population in malaria risk areas using effective malaria prevention and treatment measures (UNICEF - WHO) <b>23.</b> Prevalence and death rates associated with tuberculosis (WHO) <b>24.</b> Proportion of tuberculosis cases detected and cured under DOTS (internationally recommended TB control strategy) (WHO)		X	X	X					

Goals and Targets from the Millennium Declaration and WSSD	Indicators for monitoring progress	Contributions of sound water resources management and development	Relevance to Framework Themes						
			1	2	3	4	5		
<b>GOAL 7. ENSURE ENVIRONMENTAL SUSTAINABILITY</b>									
<b>Target 9.</b> Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources	<b>Indicators</b> <b>25.</b> Proportion of land area covered by forest (FAO) <b>26.</b> Ratio of area protected to maintain biological diversity to surface area (UNEP-IUCN) <b>27.</b> Energy use (kg oil equivalent) per \$1 GDP (PPP) (IEA, World Bank) <b>28.</b> Carbon dioxide emissions (per capita) (UNFCCC, UNSD) and consumption of ozone-depleting CFCs (UNEP-Ozone Secretariat) <b>29.</b> Proportion of population using solid fuels (WHO)	<ul style="list-style-type: none"> <li>Improved water management, including pollution control and water conservation, key factor in maintaining ecosystems integrity</li> <li>Development of integrated management within river basins creates situation where sustainable ecosystems management possible and upstream-downstream effects are mitigated</li> <li>Biodiversity conservation, combating desertification furthered by sound water management</li> </ul>	X	X					X
<b>Target 10.</b> Halve by 2015 (ie in the time period 1990 – 2015) the proportion of people without sustainable access to safe drinking water and basic sanitation	<b>Indicators</b> <b>30.</b> Proportion of population with sustainable access to an improved water source, urban and rural (UNICEF - WHO) <b>31.</b> Proportion of population with access to improved sanitation, urban and rural (UNICEF - WHO)		X	X	X				
<b>Target 11.</b> By 2020 to have achieved a significant improvement in the lives of at least 100 million slum dwellers	<b>Indicators</b> <b>32.</b> Proportion of households with access to secure tenure (UN-HABITAT)		X	X	X	X	X	X	X
<b>GOAL on inclusion of IWRM in the planning processes of all national governments by 2005</b>		The principle of considering all issues and their linkages simultaneously is fundamental to current management thinking		X					

Framework Themes: 1. Water for Development; 2. Implementing IWRM; 3. Water Supply and Sanitation for All; 4. Water Management for Food and the Environment; 5. Risk Management