

# Monitoring and evaluation indicators for IWRM strategies and plans

A good monitoring and evaluation (M&E) system can make the difference between an IWRM strategy or plan<sup>1</sup> that has an impact on the ground and one that remains merely an expression of good intentions. It is a crucial part of laying the foundation for better decision-making on an on-going basis and creating a strategy that can adapt to changing needs and conditions.

The following brief focuses on defining indicators as a part of a coherent M&E system. It builds directly on the discussion of M&E in *Catalyzing Change: A Handbook for Developing Integrated Water Resources Management (IWRM) and Water Efficiency Strategies* (pp. 31–33), and on the basic information about indicators provided in *GWP Technical Brief 2: Tools for keeping IWRM strategic planning on track*.<sup>2</sup> The information and recommendations presented here are based on experiences in monitoring sustainable development initiatives<sup>3</sup> as well as IWRM plans and strategies.

A strong monitoring and evaluation system helps ensure that an IWRM strategy meets its main objective of fostering positive change, and also that the strategy can adapt to evolving needs and conditions. Although a vital component in the success of any strategy, development and implementation of a M&E system is often allocated insufficient time, thought, and human and financial resources.

Monitoring and evaluation involves:

- Monitoring the process of implementation—to ensure that the *actions* outlined in the strategy are being taken and that resources are being allocated and used effectively.
- Monitoring the *outcomes* of those actions—in terms of investments in infrastructure and changes in policies, institutional frameworks, and management instruments.
- Evaluating the progress towards the achievement of *goals and objectives* in relation to actions.
- Using the information gained to refine the strategy and to inform decision-making at different levels—from national planning to water user behavior.

<sup>1</sup> We use the word "strategy" as shorthand for all IWRM strategies and plans.

<sup>2</sup> *GWP Technical Brief 1: Checklists for change: defining areas for action in an IWRM strategy or plan* is also useful background reading for this brief.

<sup>3</sup> Including national sustainable development plans, poverty reduction strategy papers (PRSPs), Millennium Development Goals (MDGs), and Agenda 21 initiatives. See "Resources and further reading" section (p. 8) for a list of sources consulted

## Box 1: Common pitfalls in developing an M&E system

- **Not having a system:** Defining a loose collection of disparate indicators with little or no relationship to each other, instead of a *system* in which indicators relate to each other and to the strategy goals, objectives and targets in a meaningful way.
- **Bad fit between targets and indicators:** Defining indicators with a weak relationship to the targets set for strategy activities, objectives and goals. In most cases, the problem is with the indicator; in others, the root of the problem is a poorly formulated target.
- **Building a system based on bad baseline data and/or unreliable indicators:** Indicators need to provide a consistent measure of progress. This means that the starting point (the baseline data) is accurate and that the indicator provides an objectively verifiable result, i.e. two people applying the same indicator should get the same result.
- **Not taking into account that impacts may differ according to location and to the gender and socio-economic status of intended beneficiaries.**
- **Poor feedback mechanisms:** Developing a system in which indicator results do not feed back into the strategy process and into decision-making and planning processes. M&E systems are worthless if the information they provide is not acted upon.

### An overview of the roles indicators play in the strategy process

Indicators are the basic building blocks of monitoring and evaluation systems. They are also a part of assessment, which plays a crucial role at the beginning of the strategy formulation process and provides the baseline needed for M&E during implementation.

As a part of assessment and M&E systems, indicators help to answer key questions at various stages in the strategy, such as where are we now, where do we want to go, are we taking the right path to get there, and, finally, are we there yet?

**Where are we now?** As part of a baseline assessment at the beginning of the strategy process, indicators help to determine what the problems are, where they are, and their level of severity. Depending on the resources available and the strategy approach chosen, this may be through a comprehensive assessment of water resource requirements and availabilities, or through a more targeted assessment focused on specific problem areas that have already been identified. Some of these indicators will feed into the monitoring and evaluation system—providing a baseline against which to measure progress during implementation. These might include indicators of water availability, water quality, irrigation performance, aquatic ecosystem health, incidence of water-borne disease, incidence and impacts of flood or drought, and access to water supply and sanitation. They may also include sustainable development indicators that are not as clearly water-related such as child mortality, percentage of boys and girls in rural areas attending school, and changes in the contribution of certain sectors to the GNP.

**Where do we want to go?** Information provided by the baseline assessment indicators can help decide on priorities and can serve as a useful input into stakeholder dialogues during the strategy formulation process. Indicators may also be used in identifying the necessary actions by helping to assess the effectiveness of existing institutions, policies, regulations, etc. (See Technical Brief 1). Once priorities and basic goals, objectives, and actions have been agreed upon, the process of defining indicators for monitoring and evaluation can help to set and refine specific targets.

“ Indicators can help to answer the questions where are we now, where do we want to go, are we taking the right path to get there, and are we there yet?

**Are we taking the right path to get there?** As part of an M&E system, indicators can signal when a strategy is off track—when actions are not being taken or are not resulting in the desired outcomes and impacts. At the day-to-day project management level, indicators can be used to track inputs—are the human and financial resources allocated to different activities adequate and are those resources being disbursed and used efficiently? (See Technical Brief 2 for more information on the role of indicators in project management.)

**Are we there yet?** Evaluating progress towards goals and objectives is important not just from the standpoint of identifying when and where adjustments are needed but also for the purpose of accountability and building and maintaining support for the strategy.

## Box 2: Definitions

The terminology used in M&E is still far from standardized, resulting in a confused tangle of competing definitions. Below we've defined the terms used in this brief. These are in accord with the framework employed in monitoring the Millennium Development Goals and with the most common logical framework definitions.

- *Goals* are broad, qualitative statements about what is to be achieved or what problem is to be solved. For example, Millennium Development Goal 1 is to eradicate extreme poverty and hunger. In the case of an IWRM strategy or plan, using already accepted national and international goals is one way of linking into larger sustainable development and poverty initiatives, such as efforts to meet MDGs, national sustainable development plans, etc.
- *Objectives* are the means identified to achieve goals, or the major water and development challenges that need to be overcome to achieve the goals. For example, reducing farmers' vulnerability to drought in rain-fed areas might be an objective associated with the goal of eradicating extreme poverty and hunger. (The Millennium Declaration does not define objectives, since they will differ from country to country.) Often the terms "goals" and "objectives" are used interchangeably. Here we chose to make the distinction between "goals", as overarching aims, often defined by larger national (and international) priorities, and "objectives", as specific aims to be achieved that are determined by the goals.
- *Actions* are the specific activities identified to accomplish objectives. These encompass infrastructural development and changes in policies, institutions, and management instruments.

All the above goals, objectives and actions have corresponding targets and indicators:

- *Targets* make goals, objectives and actions specific with defined and measurable criteria for achievement and timetables. For MDG 1, one of the targets is to halve, between 1990 and 2015, the proportion of people who suffer from hunger.
- *Indicators* are measures selected to assess progress towards the targets associated with goals and objectives and the accomplishment of actions. For example, the prevalence of underweight children under five years of age and the proportion of population below the minimum level of dietary energy consumption are used as indicators for the Millennium Development target on hunger.

Indicators can be further subdivided into:

- *Process indicators*, which monitor the basic progress of implementing the actions outlined in the strategy. This includes monitoring implementation processes and also the tracking of inputs—the people, money, equipment needed to achieve actions.
- *Outcome indicators*, which monitor the direct results of actions. (Sometimes used interchangeably with impact indicators.)
- *Impact indicators*, which monitor progress towards achieving goals and objectives.

“ A good monitoring and evaluation system will also take into account possible tradeoffs and unintended consequences involved in any course of action.

## The challenge of linking actions, outcomes and impacts

As suggested in the preceding section, decisions on what and even how to monitor cannot be made independently from the definition of goals, objectives, actions and targets, all of which should relate to each other in a logical way. Establishing these logical relationships is a large part of developing an effective M&E system, as well as an effective strategy.

In particular, establishing cause-effect relationships between the outcomes of actions—the direct results of the strategy’s activities—and impacts, in terms of the strategy’s larger goals and objectives, can be difficult. This is partially because impacts take time to emerge, but also because progress on the ground can rarely be attributed to a single cause. Usually it is the product of multiple forces—not all of which lie within the strategy’s scope of action—which are often too numerous and/or complex to feasibly monitor. That said, there are ways around this dilemma: (1) making initial assumptions regarding causal links explicit and regarding these as hypotheses that the M&E system will test; (2) identifying factors outside the strategy that could influence impacts and choosing which ones to monitor based on the likelihood and potential degree of influence; (3) setting and monitoring short-, medium-, and long-term targets; and, most importantly, (4) developing an M&E system that is geared towards learning and adaptation.

**Defining the links in the chain:** In monitoring and evaluation it is important to develop indicators to monitor all the key links in a chain of results or logical hierarchy. To take a relatively simple example at a sub-national level, let us say that the goal is to improve the livelihoods of fishers in a coastal ecosystem. One of the objectives that has been identified under this goal is to reduce the high levels of pesticides in the river feeding the ecosystem, based on the assumption that high pesticide levels are having a negative impact on the catches of the area fishers. The primary action identified to address this problem is to introduce an integrated pest management program in the upstream agricultural area. There would need to be indicators to track (1) if the action was resulting in a reduction in pesticide use by farmers, (2) if the changes in farmer behavior were resulting in a significant reduction in the pesticide levels in the river, and (3) if this improved water quality was resulting in improved catches and increased income for the fishers. Without developing and analyzing indicators together in the context of a logical chain of results, it is difficult to identify the problem when goals and objectives aren’t reached.

A good monitoring and evaluation system will also take into account possible tradeoffs and unintended consequences involved in any course of action. To continue with the above example, this would also mean monitoring agricultural productivity in the upstream area where integrated pest management was introduced to make sure that there was not a resulting decline in crop yields. It might also mean monitoring the market price of fish, to make sure that increasing the fishers’ catches doesn’t result in a glut in the market and a corresponding drop in prices.

The way in which indicators at different levels interconnect is depicted in Box 3. The key point here is that indicators cannot be identified in isolation—they must emerge from agreed goals and objectives, and the actions needed to achieve them.

## Basic steps in developing indicators as part of an a M&E system

There are various approaches to defining indicators. The model below is one example:

*Step 1: Make sure that targets associated with strategy goals, objectives and actions are clearly defined and agreed upon; and that the inputs necessary carry out actions are identified.*

## Box 3: The relationships between goals, objectives, actions, targets and indicators

The following example defines a hypothetical set of objectives and actions, with targets and indicators, to contribute to Millennium Development Goal (MDG) 1. The example is intended to illustrate the relationships between these different elements of an IWRM strategy, and, in particular, to offer insight into the process of defining targets and indicators. It is not intended to be comprehensive nor to serve as a recommendation of any particular objectives or actions.

The IWRM strategy or plan may take as its overarching goal one or more of the development goals that the country is committed to achieving and that are impacted, directly or indirectly, by water resources development, management and use.

In the case of national and international development goals, often targets and indicators will already have been defined.

Targets and indicators defined for the objective should relate clearly to the targets and indicators defined for the goal. For example, accomplishment of this target, as measured by the indicator, would theoretically contribute directly to meeting MDG target 1, according to indicator 1—proportion of population below \$1 per day.

Additional targets would be needed to address the household water supply and sustainability components of the objective.

The IWRM strategy or plan needs to define a set of actions to achieve each objective—i.e. infrastructural development investments and changes in policies, institutions and management instruments. This might be one of the actions under the above objective.

Targets, process indicators, and outcome indicators need to be defined for each action. Notice that this example includes short-, medium-, and long-term targets.

Process indicators, used to measure the process of implementing the action, can be quantitative or qualitative; in some case a checklist item may be more appropriate.<sup>2</sup> This example contains a mix of quantitative indicators and checklist items

The outcome indicators relate directly to targets set for this action. The assumption behind these targets are that if the program reaches the farmers, their incomes will improve. Testing this involves correlating the results of the outcome indicators with results from the impact indicator defined for the objective.

### GOALS

*Example goal:*

- Millennium Development Goal #1: Eradicate extreme poverty and hunger

*Target:*

- Target #1: halve, between 1990 and 2015, the proportion of people whose income is less than one dollar a day
- Target#2: halve, between 1990 and 2015, the proportion of people who suffer from hunger

*(Impact) Indicators for Target #1:*

- MDG Indicator #1: Proportion of population below \$1 (PPP) per day
- MDG Indicator #2: Poverty gap ratio (incidence x depth of poverty)
- MDG Indicator #3: Share of poorest quintile in national consumption

### OBJECTIVES

*Example objective:*

- Fully and sustainably harness rainwater and groundwater resources in the country's arid and semi arid areas to improve the income-generating potential of small-scale agriculture in those areas and provide improved access to safe water for household use

*Example of a target:*

- Between 2005 and 2015, increase average annual income of farmers with plots of less than 1 hectare by at least \$2 per day

*Example of an impact indicator:*

- Average annual income, by district, of farmers with less than 1 hectare of land

### ACTIONS

*Example action:*

- Create integrated program targeted at farmers with plots less than 1 hectare to promote sustainable groundwater development and rainwater harvesting in combination with supplemental irrigation

*Example targets:*

- By 2009, 50% of farmers identified by baseline study are reached by program
- By 2010, *at least* 80% of farmers identified by baseline study are reached by program
- By 2015, 100% of farmers identified by baseline study are reached by program
- By 2015, total groundwater withdrawal reaches 90% of safe yield<sup>1</sup>

*Some examples of process indicators*

*(unless otherwise noted, these indicators are to be applied by district, annually):*

- Financial resources allocated to the development and implementation of program
- Feasibility/baseline study completed; target districts identified by 2007
- Groundwater assessment and monitoring system in place in target districts by 2007
- System for regulating and licensing groundwater withdrawal put into place by 2007
- Number of check dams sited and constructed with community participation
- Percentage of low-interest loans to farmers that are defaulted on
- Number of agricultural extension officers trained in supplemental irrigation and water harvesting

*Some examples of outcome indicators:*

- Number of low-interest loans granted for investing in supplemental irrigation technologies, water harvesting, and groundwater development (monthly)
- Number of farmers served by extension officers trained in supplemental irrigation and water harvesting
- Number of groundwater licenses granted
- Total groundwater withdrawal expressed as a percentage of safe yield

Objectives can be thought of as the major water and development challenges that need to be addressed to achieve the defined goals. For a country with many poor people dependant on marginal rainfed agriculture, this might be a possible objective under MDG 1.

Objectives and actions will often contribute to more than one target, and even more than one goal. The example used here contributes to MDG 1, targets 1 and 2, and also to MDG 7, target 9 on integrating sustainable development principles into policies and programs and target 10 on sustainable access to safe drinking water and sanitation.

<sup>1</sup> Rate of groundwater extraction from a basin for consumptive use over an indefinite period of time that can be maintained without producing negative effects.

<sup>2</sup> See Technical Brief 2 of this series for information on deciding between quantitative indicators, qualitative indicators or checklist items.

“ Stakeholders to involve include those who cause or are affected by the problem or issue to be addressed; those with relevant information or expertise; and those who will be responsible for implementing indicators.

Step 2: *Define indicators for each target* based on stakeholder consultations and on criteria, such as relevance, reliability, and cost-effectiveness. Involve stakeholders who cause or are affected by the problem or issue addressed in the target; who have relevant information or expertise; and who will be responsible for implementing indicators.

Step 3: *Select indicators to track human and financial resources and ensure that they are being disbursed and used efficiently.*

Step 4: *Check to make sure that indicators relate clearly to targets, and that these in turn support the achievement of actions, objectives and goals.* Identify and fill gaps. Refine indicators and/or targets as necessary. This step may involve taking an inventory of indicators that are already in use in the country to eliminate redundancies, and also considering the relationship of national M&E efforts to international monitoring programs—such as the World Water Assessment Programme.

Step 5: *Calculate human and financial resources needed* to apply the indicator package. Evaluate whether the package is a good investment, i.e. the human and financial resources required are commensurate with the value of the various indicators employed.

Step 6: *Agree on the agencies/institutions that will be responsible for applying the different indicators, how, and how often.*

Step 7: *Determine how the information resulting from the different indicators will be managed:* how it fits into decision-making processes, both specifically related to the strategy but also ongoing policy and planning processes; how information will be amalgamated to get a more comprehensive picture of progress; and how it will be communicated to stakeholders.

Step 8: *Include requirements for M&E package in capacity building plan, budget, and staff allocation.*

## Some nuts and bolts of establishing an M&E system

**Determining frequency of monitoring and reporting:** Should be based on how rapidly conditions are changing and the significance of change. In general, processes need to be monitored frequently and need to be part of regular management activities. Action monitoring is generally tied to specific milestones. Objectives have a longer time horizon—depending on the specific objective, this may mean monthly, quarterly, biannual, or annual monitoring. Progress on goals may take many years to emerge, this may mean annual monitoring, but reporting every three years or even every five years—again depending on the targets defined.

**Coordinating monitoring efforts across agencies** (see also *Catalyzing Change*, pp. 29–31, on building a knowledge base): Creating the kind of M&E system needed for an IWRM strategy often involves linking the data collection activities of multiple agencies. This can be a challenge, especially if agencies are not used to working together, much less sharing information. One possible solution is to create a monitoring and evaluation unit or task force, with representation from organizations and agencies carrying out relevant monitoring activities. Also make sure that agencies understand how the data they provide is being used and that the flow of information is not solely one way.

**Managing data:** Investment in designing a good data management system is money well spent. When considering the design of such a system, consider current needs as well as future ones. Solicit input from a range of end users of the system.

**Communicating with stakeholders:** An often neglected aspect of monitoring and evaluation is communicating results to stakeholders—this includes those directly involved in implementing the strategy as well as the general public. Regular stakeholder communication can help to mobilize support for the strategy and to increase accountability. Effective communication means packaging information in a way that is readily understandable to the target group and that addresses their needs or concerns.

**Linking to decision-making and planning processes:** Part of the on-going work of the strategy process is to support better decision-making. M&E is a valuable tool in this effort—but only if M&E results are provided to decision-makers at all levels in a readily accessible form that meets the end users' needs.

## **Building a system that encourages improvement and adaptation**

A good monitoring and evaluation system should support improvement and adaptation at several different levels. At the project management level, a monitoring and evaluation system should provide information needed to improve the efficiency of the implementation process and the performance of those involved. At a strategic level, it should also support regular reviews of the strategy itself—to reevaluate chosen courses of action and take into account changing contexts. The monitoring and evaluation system itself should also be subject to regular reviews.

## **Key lessons**

- Indicators should clearly relate to the targets defined for the strategy's actions, objectives and goals.
- Indicators need to be defined and analyzed as part of a logical framework of relationships between goals, objectives, actions and the intended outcomes and impacts. In some cases these relationships may only be hypothesized, in which case part of the work of the M&E system is to test hypothesized links.
- Stakeholders should be involved in defining indicators and should clearly see how the information provided by the indicator relates to their concerns and activities.
- It should be clear who is responsible for applying each indicator and how the resulting information will be utilized in the process—who needs it when.
- M&E needs to take into account that impacts may differ according to location and gender and socio-economic status of beneficiaries.
- The human and financial resources required for M&E need to be considered and factored into budgets and capacity-building needs.
- The results of M&E activities should be communicated regularly to stakeholders—to help mobilize support for the strategy and to increase accountability.

## Resources and further reading

Booth, D. and Lucas, H. (2002). ODI Working Paper 172: Good Practice in the Development of PRSP Indicators and Monitoring Systems. [http://www.odi.org.uk/publications/working\\_papers/wp172.pdf](http://www.odi.org.uk/publications/working_papers/wp172.pdf)

CSD (2001). *Indicators of Sustainable Development: Guidelines and Methodologies*. <http://www.un.org/esa/sustdev/publications/indisd-mg2001.pdf>

Dalal-Clayton and Bass (2002). *Sustainable Development Strategies – A Resource Book*. Chapters 5 and 10. [http://www.nssd.net/res\\_book.html](http://www.nssd.net/res_book.html)

Joint Monitoring Programme (JMP) for water supply and sanitation [www.wssinfo.org/](http://www.wssinfo.org/)

IISD, Measurement and assessment for sustainable development website <http://www.iisd.org/measure/>

IRC (2004) *Monitoring Millennium Development Goals for Water and Sanitation: A Review of Experiences and Challenges*. <http://www.irc.nl/page/12932>

IWRM Toolbox: Tool C1.4 Developing water management indicators [www.gwpforum.org](http://www.gwpforum.org)

OECD (2001) *The DAC Guidelines: Strategies for Sustainable Development*. <http://www.oecd.org/dataoecd/34/10/2669958.pdf>

Parris, T. and Kates, R. (2003) Characterizing and Managing Sustainable Development. *Annual Review of Environment and Resources* vol. 28, pp. 559–86. <http://arjournals.annualreviews.org>

Swanson, Pintér, et al. (2002) *National Strategies for Sustainable Development Challenges, Approaches and Innovations in Strategic and Co-ordinated Action Based on a 19-country Analysis*. Pages 22 – 28. <http://www.iisd.org/publications/pub.aspx?id=640>

UN DESA (2002). *Guidance in preparing a national sustainable development strategy: Managing sustainable development in the new millennium*. Pages 32 – 34. <http://www.un.org/esa/sustdev/natlinfo/nsds/nsds.htm>

Walmsley, D., et al. (2004). IWMI Working Paper 90: An Evaluation of Proposed World Water Programme Indicators for Use in South Africa. <http://www.iwmi.cgiar.org/pubs/working/WOR90.pdf>

Water Monitoring Alliance <http://www.watermonitoringalliance.net/>

Winograd, Manuel, et al. (1999) *A Conceptual Framework to Develop and Use Water Indicators* [http://lnweb18.worldbank.org/ESSD/envext.nsf/44ByDocName/ConceptualFrameworktoDevelopandUseWaterIndicators199987KPDF/\\$FILE/ConceptualFrameworktoDevelopandUseWaterIndicators1999.pdf](http://lnweb18.worldbank.org/ESSD/envext.nsf/44ByDocName/ConceptualFrameworktoDevelopandUseWaterIndicators199987KPDF/$FILE/ConceptualFrameworktoDevelopandUseWaterIndicators1999.pdf)

World Bank, World Development Indicators <http://devdata.worldbank.org/wdi2005/index2.htm>

World Water Assessment Program <http://www.unesco.org/water/wwap/>

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### About the Catalyzing Change Series

The brief is part of a series of policy and technical briefs designed to help countries accelerate their efforts to achieve the action target for the preparation of IWRM and water efficiency strategies and plans set by the 2002 World Summit on Sustainable Development (WSSD) and reinforced by the 2005 World Summit. The series tackles key issues and potential stumbling blocks and attempts to give countries at the beginning of the process the benefit of lessons learned from those further down the path.

The series complements *Catalyzing Change: A Handbook for Developing Integrated Water Resources Management (IWRM) and Water Efficiency Strategies*. The handbook and all associated briefs can be downloaded from [www.gwpforum.org](http://www.gwpforum.org) or hard copies can be requested from [gwp@gwpforum.org](mailto:gwp@gwpforum.org).

The briefs in this series are intended to be dynamic rather than static documents. We will continue to update and improve them based on your input. Please send comments and questions to Christie Walkuski at [walkuski@iri.columbia.edu](mailto:walkuski@iri.columbia.edu).