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# Paradise lost? The difficulties in defining and monitoring Integrated Water Resources Management indicators

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Integrated Water Resources Management (IWRM) has been recognized since the early 1990s as a concept offering an international frame of reference for water resources management. Several attempts to standardise this concept have emerged, notably since the creation of the Global Water Partnership, which has progressively established itself as the main institution in charge of the promotion, development, and monitoring of IWRM policies on the international level. Several crucial observers have nevertheless highlighted the vagueness of this concept and the difficulties regarding its operational implementation. That is why IWRM is often considered, in the field of fresh water, as a 'nirvana' concept, defining ambitious objectives, in an ideal world, but which cannot be met in the real world. Despite these criticisms, numerous policies are being developed today on the basis of this IWRM concept, but they are stumbling over the difficulty of measuring the progress towards IWRM achieved by governments or by basins. This article proposes an overview of the existing initiatives to develop IWRM indicators, in order to understand the difficulties experienced by such initiatives.

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## Introduction

Integrated Water Resources Management (IWRM hereafter) today constitutes a frame of reference for the implementation of water policies at the river basin and aquifer level, in a national and international context. Although this concept experienced a significant boom starting in the late 1990s [1••], many voices have been raised to warn against the idea of a common framework that could be imposed on everyone, without taking into consideration national and local specificities. Several scholars are even very sceptical about the capacity of the countries or river basin organizations to effectively implement an IWRM policy [2,3]. Promoted by both the Global Water Partnership and the United Nations, the frame of reference for IWRM has long struggled with the definition of indicators of progress, which could measure advances in the status of different countries towards the pursuit of an integrated management policy for their resources [4]. The question of IWRM implementation was the subject of a survey in 2008, at the initiative of UN-Water (the Water programme of the United Nations), whose results were unveiled at the occasion of the 16th session of the United Nations Commission on Sustainable Development. 38% of the 77 developing countries in the survey reported that they had implemented IWRM plans (whether finalised or under development), while only 22% of the 27 developed countries surveyed reported that they had implemented such plans [5]. A few years later, in 2011, UN-Water conducted this survey again, at the request of the United Nations Commission on Sustainable Development, but extending it to all 192 countries of the United Nations. Of the 133 countries that answered the questionnaire, only half of them declared that they had implemented an IWRM plan or were at an advanced stage of development [5]. However, such surveys do not necessarily reflect adequately the progress made in the implementation of an IWRM policy, since they rely most of the time on the adoption of new laws and rules or on the existence of institutions, without measuring the effectiveness of these institutional transformations. According to the fourth World Water Development Report released in 2012, "*while important developments have been made around the world, the preparation by governments of national IWRM plans and the actual implementation rates of these plans remain unsatisfactory and well behind targets*" [6: 139]. Thus, the question is to know whether IWRM policies are effectively implemented and which indicators can be used to measure the progress of countries and river basin organizations towards IWRM. According to Anderson *et al.* [7], "*Appropriate indicators, supported by well-managed information monitoring systems should be an integral component of all IWRM initiatives. In order to achieve this, IWRM faces the challenge of supporting and advancing the traditional hydrological monitoring requirements, while at the same time placing greater emphasis on a more holistic, crossdisciplinary approach to the integrated and complex dimensions of the hydrological cycle in particular.*" During

the last 15 years, several initiatives have emerged to define IWRM indicators, but without necessarily leading to a large agreement on the indicators which could be used globally to assess the progress made towards the implementation of IWRM policies.

We can then ask the question whether the difficulties in defining and monitoring IWRM indicators is the main reason for failure of implementation of IWRM. In order to address this issue, we first briefly expose the debates concerning the definition of IWRM and its implementation. Then, we present several initiatives of IWRM indicators, so as to stress the strengths and weaknesses of these indicators. The last section discusses the difficulties in defining a comprehensive set of IWRM indicators.

## Integrated Water Resources Management — debates about a concept with blurred borders and about its implementation

Integrated Water Resources Management has been, since the early 1990s, an international frame of reference for fresh water management. Defined by the Global Water Partnership as ''*a process which promotes the coordinated development and management of water, land and related resources in order to maximise economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems*'' [8], it developed very quickly into a comprehensive solution to remedy recurrent dichotomies in fields impacting water management (such as reconciling the management of surface water and groundwater, taking into account the imperatives of efficiency and equity, short and long term issues, so on). IWRM is meant to be different in practice from water resources planning-as-usual, because it emphasizes the participation of water users and decision makers at all levels, and because it is anchored in a systemic and complex perspective leading to a holistic approach [9] that is compatible with sustainable development issues. Another interesting difference is the rather unprecedented character of the concept's formalisation (at the interface between stakes supported by international institutions and the major corporations in the water and sanitation sectors; also at the interface between science and policy) which has contributed to making discourse ambiguous. For instance, IWRM appears as a normative concept (top-down approach) but supports the participation of all the stakeholders (bottom up approach). Moreover, is it conceivable to define a framework for issue resolution, which could be adapted to a variety of hydro-climatic, cultural, political, and institutional situations? The observers who are the most critical of the concept and its implementation are unequivocal in their answers to this question. As stressed by Medema, McIntosh and Jeffrey [10], ''*The fact that there is ambiguity about the IWRM concept may itself be a barrier to implementation — why should there be an institutional change in water resource management if the form and benefits of integration cannot be unambiguously articulated and compared? Indeed, it remains to be seen whether it is possible for a single water management framework to be universally useful across different physical, economic, social, cultural, and legal conditions* [1••]. *The necessity to adapt the IWRM concept to suit different local contexts makes it very difficult to develop a generic and overall description of strategies and techniques* [11•], *casting further doubt on the adequacy of the causal understanding of the relationships between knowledge production and water resource management outcomes covered by IWRM*''. The specific context of each country should thus be taken into account before incorporating the imperatives of integrated management into national laws and regulations, which would risk going unheeded if this context is not properly understood. Despite everything, the IWRM concept, backed by international funds, has progressively become a prerequisite for obtaining the financing that developing countries are so in need of, now more than ever, even though there is often a significant gap between the adoption of a framework for action and its implementation [12]. This idea is largely covered in the specialised literature on the subject and may be summarized in the following terms: ''*Experience thus far seems to suggest that IWRM can be adopted easily as a principle but is difficult to implement in practice*'' [13: 933]. That is why IWRM is often considered, in the field of freshwater resources, as a 'nirvana' concept, defining ambitious objectives, in an ideal world, but which cannot be met in the real world [14••].

It is in part to respond to these criticisms about the difficult implementation of IWRM that a series of initiatives were developed to define IWRM indicators.

The definition of indicators seems in fact decisive, in what GWP calls the IWRM Planning Cycle, as Figure 1 shows.

However, these initiatives come up against a number of difficulties, as we will see in the following section.

## The unfinished search for IWRM indicators: what lessons can we learn?

The status of indicators in the field of water management has always sparked debate [15–17]. As an example, there is still today a great variety of water scarcity indicators, ranging from the water stress indicators defined by Falkenmark [18] to the works of Sullivan on the Water Poverty Index [19]. However, all these indicators suffer from numerous limitations. For instance, the national scale, which is often used in these indicators, can hide important hydro-climatic contrasts occurring at the local scale. Moreover, according to Rijsberman [20], the Water Poverty Index is too complex and lacks an intuitive understanding. Besides, the political use of these indicators is not neutral, insofar as, for example, they can be used to justify the development of infrastructure (massive transfers, seawater