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GOVERNANCE

# Integrated Water Resources Management

From concept to implementation

Edited by  
Cecilia Tortajada



# Integrated Water Resources Management

The book includes seventeen excellent researched and documented papers that reflect the diversity of thought, ideas and experiences related to IWRM. They draw from an extensive, inclusive and geographically representative range of theoretical propositions and practical examples. These include the implementation status of the IWRM concept at local, basin, regional and national levels; its appropriateness for the twenty-first century; main implementation gaps from the institutional, legal, policy, governance, management and technical viewpoints; the likelihood that IWRM's entrenchment in laws, regulations and policies has led to smoother implementation and the reasons why that has been the case; reflexions on whether the attention given to IWRM is pushing other alternatives to the policy periphery; and the new conceptual constructions that can be put forward for discussion in the international arena.

For the development and water communities it is imperative to debate and reach towards more illustrative conclusions regarding whether the promotion of the IWRM concept and its actual implementation status have been beneficial for development and how the notion could evolve to achieve this end. In-depth objective and constructive discussions, arguments, proposals and ideas are put forward for analysis by all interested parties. The book has the objective of fostering scholarly exchange, encouraging intellectual debate and promoting the advancement of knowledge and understanding of IWRM as a concept, as a goal per se, and as a strategy towards development goals.

This book was originally published as a special issue of the *International Journal of Water Resources Development*.

**Cecilia Tortajada** is a Senior Research Fellow at the Institute of Water Policy, Lee Kuan Yew School of Public Policy, National University of Singapore and former President of the International Water Resources Association.

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# **Integrated Water Resources Management**

From concept to implementation

*Edited by*  
**Cecilia Tortajada**

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# Preface

Over a decade ago, I wrote a paper assessing the sorry state of application of integrated water resources management (IWRM) in the real world to solve the global water management problems. I wrote the paper because my experience showed that even though the donors and international organisations controlled by them have spent hundreds of millions of dollars in promoting IWRM, neither I nor any objective water professional I had met anywhere in the world could identify even a single macro- or meso-scale project to which IWRM has been successfully applied.

Over the past twenty-five years, it has become increasingly clear to me that the donors and the international organisations were determinedly promoting the *mantra* of IWRM to lead the world to water resources *nirvana* primarily because of their own vested interests. This is in spite of the fact that all the evidence over the past three generations of attempts to implement IWRM has been spectacularly unsuccessful anywhere in the world and has raised more questions than we had answers for. Over the past several decades, IWRM has remained a somewhat seductive concept on which countless papers and books have been written and thousands of meetings and conferences have been held all over the world. Yet, it has been impossible to operationalise this concept anywhere in the world.

Even though donors and development agencies have promoted IWRM consistently and forcefully for use by developing countries, a central question that has never been asked by the water and development professionals in the past, let alone answered, is why if IWRM is such an universal solution, the donors have never even attempted to apply it in their own countries? The likely answer is that the donor countries have never followed the path of IWRM primarily because they are aware that it simply cannot be operationalised. Yet, they have wanted developing countries to adopt this concept universally.

Not surprisingly, in the domain of water management and also in many other development sectors, the traditional Western donors have been increasingly losing their relevance, reliability and credibility from the developing country governments, academics, institutions and media, primarily because they do not practice what they preach. Thus, institutions like the World Bank and all the regional development banks have progressively lost, and are still losing, their prestige and credibility in recent decades in the developing world. Unless they make a conscious effort to reorient their *modus operandi*, they are likely to become increasingly marginalised by the new development-oriented banks managed and controlled by the developing world. Among their new competitors will be the Asian Infrastructure Investment Bank in Beijing and the BRICS Bank in Shanghai. These new development banks are unlikely to have the conflict of interest that exists in the Bretton Woods institutions that are controlled by the Western countries. These conflicts of interest are evident when issues like IWRM are considered.

## PREFACE

The vested interests of most developed countries in actively promoting IWRM over the past twenty-five years lie in the fact that this concept has been very useful to them since it has contributed to the employment opportunities for consultants and institutions in their countries, use their training and capacity-building facilities, and buy whatever instruments and equipment are necessary from them. As a previous President of the Canadian International Development Agency confided during a private meeting, the institution's primary objectives are to create employment in Canada, and ensure Canada's services, goods and products are exported through the official aid budget to developing countries. Canada is not alone. Other bilateral aid agencies follow a very similar philosophy. Thus, from the supply side, IWRM has had many strong suppliers in the past.

On the demand side, with consistent heavy funding from the donors, a thriving industry has grown up in the recipient countries where thousands of highly paid and coveted jobs have been created through various IWRM-related projects which would not have existed without such strong donor support. This intricate dependency between the two groups in donor and recipient countries is now institutionalised around the IWRM aid ecosystems. The interdependencies and mutual symbioses have steadily grown over the past decades. There is no question that this has been beneficial to the donor countries. However, the real losers have been the recipient countries which are now slowly recognising that IWRM has been a lost cause and their current water management practices and processes would have been much further ahead than where they are now, had they not been seduced by the proclaimed all-purpose universal charm of IWRM. Belatedly they are coming to the conclusion that the emperor has no clothes!

As many developing countries like China, India, Brazil, Turkey and South Africa are becoming economically stronger and their people are getting better educated and informed, they have started to ask difficult and pertinent questions to the traditional aid agencies. Countries like South Africa and India have already started to jettison IWRM and are increasingly moving into new ways of managing water. This new paradigm focuses on the management of water resources so that it acts as an engine for economic development, improve the standards of living of its nationals and reduce poverty. In other words, countries are managing water increasingly to enhance their economic growth rates and achieve their stipulated national development goals.

What about the future of IWRM? Throughout history, very few, if any, donors and donor-controlled institutions have ever publicly admitted that the prescriptions they had strongly promoted in the past did not work and will not work in the future. What is most likely to happen is that as developing countries increasingly become self-assertive, confident and realise IWRM does not have the potential of being the path to water *nirvana*, the IWRM terminology and paradigm will be used less and less, until disappearing from the national and international discourses in about a decade or so. This has already started to happen in many developing countries.

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## INTRODUCTION

### IWRM revisited: from concept to implementation

Concepts are the constituents of thoughts. Consequently, they are crucial to such psychological processes as categorization, inference, memory, learning, and decision-making. This much is relatively uncontroversial. But the nature of concepts – the kind of things concepts are – and the constraints that govern a theory of concepts have been the subject of much debate. This is due, at least in part, to the fact that disputes about concepts often reflect deeply opposing approaches to the study of the mind, to language, and even to philosophy itself.

—Stanford Encyclopedia of Philosophy, <http://plato.stanford.edu/entries/concepts/>

In the development field, we have long recognized that there are clear gaps between the current understanding of concepts and paradigms and the one that is necessary to address evolving economic, social and environmental planning and management issues as well as their political, institutional, legal, regulatory and participatory considerations. Some of the best-known paradigms, namely ‘sustainable development’, ‘integrated water resources management’ and ‘governance’, have permeated the development discourse without necessarily having a visible impact on natural resources management, including water resources.

In *Development as Freedom*, Amartya Sen (1999) presents an insightful account of development as a momentous process of engagement with freedom’s possibilities in which freedoms of different kinds strengthen one another. Public policy to foster human capabilities results from the promotion and interlinkages of these freedoms. Sen argues that individuals live and operate in a world of institutions, where opportunities and prospects are crucially determined by the existing institutions and their functioning. Institutions should thus not be considered as mechanical development devices since their establishment, operation and use depend on values, priorities and participation mechanisms. Instead, they could be conceived as constructions that work to promote societal goals and reflect the characteristics of the society to which services are offered. What is needed is to nurture a plurality of institutions that respond to the present and future needs and aspirations of societies.

In the daily world, however, we face constraints which confront theory with reality, where the importance of a more comprehensive view of key issues related to development has still not been fully appreciated, including plurality of institutions, partnerships and even ideologies. In fact, governments face numerous obstacles in incorporating concepts like ‘integrated management’ and ‘sustainable development’ into public policies, translating them into plans and programmes and then successfully implementing them.

In an increasingly globalized world, policy makers have realized that development should go beyond economic growth to encompass social goals and environmental protection. Ultimately, the objective is to improve the quality of life of the populations. Therefore, a major challenge and aim set for current policy making is to reconcile economic, social and environmental goals in various areas of development, including



water resources, so that the overall benefits to the society are maximized, and costs minimized. Since environmental problems cannot be solved by technical or economic means alone, interrelated factors like social activities, perceptions and aspirations must be considered as well.

Many old unresolved issues plague the water sector and impact development: inefficient water institutions, many of them with overlapping or conflicting decision-making structures; outdated or unresponsive legal and regulatory frameworks; increasing and unregulated withdrawals for cities, industry, agriculture and energy; a prevailing focus on water supply rather than on demand management; and water prices and tariff structures that do not consider socially desirable outcomes – to mention just some of them. Conventional wisdom, as it relates to the management of water resources, needs to be challenged and reconsidered so that it is able to address current and future development constraints and opportunities.

An important limitation has been poor information, communication and coordination (not to mention integration) among sectors, partners and actors on goals and objectives. Ideally, in order to take any decision within the public sector for policy development and implementation, and then with the private and non-governmental sectors, some kind of coordination, at least sharing of information, is necessary among institutions, actors and sectors. But it is seldom achieved. This is due to some extent to the increasing number and type of political and social actors involved in and contributing to the development field, who have not always been willing to work towards common development goals. That is, not only has the lack of strong institutions and legal and regulatory frameworks come up short in responding to the changing needs of society, but also the ideological differences among the myriad of actors and partners and self-interests have fostered fragmentation.

The global development landscape is undergoing radical changes and is becoming increasingly more complex. Policies should thus be formulated as part of an overall development agenda whilst striving to link human needs, their fulfilment and their overall impacts on the environment. They should also be dynamic and periodically redefined according to changing trends, requirements, and availability of data and information. Given this panorama, it is pertinent to analyze the role of concepts and paradigms in the different sectors and their importance in terms of development.

In the water sector, one of the most widely known concepts is that of integrated water resources management (IWRM), first promoted by Dr Gilbert White in the 1940s under the term ‘comprehensive water resources management’. The Global Water Partnership later developed its programme based on the Dublin and IWRM principles. During the past two decades, most donors and international organizations have intensively promoted IWRM as a way of solving water-related problems all around the world. Hundreds of millions of dollars have been spent for its implementation. Nonetheless, IWRM practices have been very difficult to achieve anywhere in the world, especially in macro- and meso-scale water policies, programmes and projects.

Given that the concept has become part of policies and also laws in numerous countries, and based on lessons learned from previous decades, an imperative arises to objectively analyze its appropriateness in the twenty-first century. It is equally relevant to identify the main implementation gaps so that the conception and implementation of IWRM-related policies has more consequent development impacts. Therefore, with the objective of fostering scholarly exchange, encouraging intellectual debate and promoting the advancement of knowledge on the topic, the September special issue of the *International Journal of Water Resources Development* focuses on the understanding of IWRM as a concept, as a goal per se and as a strategy towards development goals.

The issue contains 17 excellent researched and documented papers that reflect the diversity of thought, ideas and experiences related to IWRM. They draw from an extensive, inclusive and geographically representative range of theoretical propositions and practical examples. These include the implementation status of the IWRM concept at local, basin, regional and national levels; its appropriateness for the twenty-first century; main implementation gaps from the institutional, legal, policy, governance, management and technical viewpoints; the likelihood that IWRM's entrenchment in laws, regulations and policies has led to smoother implementation and the reasons why that has been the case; reflexions on whether the attention given to IWRM is pushing other alternatives to the policy periphery; and the new conceptual constructions that can be put forward for discussion in the international arena. For the development and water communities it is imperative to debate and reach towards more illustrative conclusions regarding whether the promotion of the IWRM concept and its actual implementation status have been beneficial for development and how the notion could evolve to achieve this end.

Therefore, in-depth objective and constructive discussions, arguments, proposals and ideas based on the authors' experiences are put forward for analysis by all interested parties. The papers are valuable sources of information, ideas and controversy that should open up additional and more extensive and needed dialogue avenues on this overall theme.

In *Ecological Economics*, Soderbaum (2000) argues very eloquently in favour of the co-existence of a plurality of paradigms. For IWRM, its evolution and impacts, it would be very difficult not to agree with such an image: one of plurality and diversity, where a wider pool of partners and argument are considered well beyond the conventional wisdom of its promoters.

As such, I invite the academic, research, policy and water development communities, the authors of the papers published in this special issue, and the reviewers who have greatly added to the high standards of this journal, to continue debating and challenging prevailing wisdom well beyond the fields of development and water resources. Even if controversial, such epistemological, academic and intellectual exercise can only yield positive results as it will ultimately help to promote the advancement of knowledge.

### References

- Sen, A. (1999). *Development as freedom*. New Delhi: Oxford University Press.  
Soderbaum, P. (2000). *Ecological economics: A political economics approach to environment and development*. London: Earthscan.

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# From IWRM back to integrated water resources management

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Integrated water resources management provides a set of ideas to help us manage water more holistically. However, these ideas have been formalized over time in what has now become, in capitals, Integrated Water Resources Management (IWRM), with specific prescriptive principles whose implementation is often supported by donor funding and international advocacy. IWRM has now become an end in itself, in some cases undermining functioning water management systems, in others setting back needed water reform agendas, and in yet others becoming a tool to mask other agendas. Critically, the current monopoly of IWRM in global water management discourse is shutting out alternative thinking on pragmatic solutions to existing water problems. This paper explains these issues and uses examples of transboundary water governance in general, groundwater management in India and rural–urban water transfer in China to show that there are (sometimes antithetical) alternatives to IWRM which are being successfully used to solve major water problems. The main message is that we should simply get on with pragmatic politics and solutions to the world’s many individual water challenges.

## Introduction

The basic ideas of integrated water resources management are nearing 100 years of age (White, 1998). They are a call to consider water holistically, to manage it across sectors, and to ensure wide participation in decision making. In essence, they are a call to stop fragmentary approaches to water management and high-handed development decisions made for the benefit of a single user group or faction.

These ideas are an excellent point of departure for considering improvements in water governance and management, and they have been formalized as what has now become, in capitals, Integrated Water Resources Management (IWRM). IWRM has in turn taken on a life of its own. Following the concept’s inclusion under Agenda 21 (UNCED, 1992) and incorporation of ideas from the 1992 Dublin conference (ICWE, 1992), IWRM is now frequently interpreted as consisting of specific approaches. These include the establishment of an overall water policy and laws which use the basin as the scale of management, establish water rights, use water pricing in allocation, and include participation in decision making (Shah & van Koppen, 2006).

There has already been substantial analysis of the conceptual problems of IWRM. Walther (1987) questioned whether any “integrated” resource management framework, including one related to water, could ever solve real-world problems. While the

application of IWRM is often done on narrow lines, Biswas (2004) highlighted that the discourse of what counts as IWRM has become so broad as to make discussion meaningless. Molle (2008) argued that IWRM precepts such as equity and efficiency are often incompatible. Medema, McIntosh, and Jeffrey (2008) highlighted that IWRM is flawed because it puts water at the centre though it is only one aspect of holistic problem management. Jensen (2013) has shown that IWRM is void of the politics which in fact are at the core of all critical water decisions. Perhaps most damning, Jeffrey and Gearey (2006) have said that there is no evidence that IWRM has actually worked.

This paper has two goals. The first is to push the critique even further and highlight that the use of (capitalized) IWRM has, in some cases, actually taken us away from the goals of better water management. The paper does that by showing that: (1) IWRM has become an end in itself rather than a means to solve specific challenges, thereby diverting resources from practical problems and sometimes undermining alternative, functioning systems; (2) when the goal becomes the implementation of IWRM, rather than the solution of specific water problems, it can set the reform process back; (3) the IWRM brand is being used as a tool to mask other agendas, some of them antithetical to the IWRM ideal; and (4) perhaps worst of all, the focus on IWRM is shutting out alternative thinking on pragmatic solutions to water problems. The second goal is to highlight that there are alternatives to IWRM which have worked and can continue to work in future. A final message, however, is that it is perhaps time to drop discussion for or against IWRM and simply get on with pragmatic politics and solutions to water challenges.

## **From a means to an end**

While many proponents of IWRM argue that it “is not an end in itself but a means”<sup>1</sup> to the end of better water outcomes, it seems that in moving from ideas to implementation, IWRM has become an end. This is perhaps best illustrated by the efforts to monitor IWRM implementation after the 2002 World Summit on Sustainable Development, at which pro-IWRM discourse reached a peak and turned the concept into a global policy goal. In Article 26 of the resulting Plan of Implementation for the final agreement (United Nations, 2002), each of the nearly 200 signatory countries agreed to the very specific target of “develop[ing] integrated water resources management and water efficiency plans by 2005”. In practice, this has meant that many countries, often prompted by donors, began including the language of IWRM in policy documents and creating formal IWRM plans. While the 2002 goals were not met, IWRM proponents are still calling for specific IWRM plans to be put in place.<sup>2</sup>

Hassing, Ipsen, Clausen, Larsen, and Lindgaard-Jørgensen (2009) reported the findings of a survey done for the 4th World Water Forum in Mexico which showed that about three-quarters of the 95 countries for which responses were available used IWRM terminology in at least one policy or law, the vast majority of which were created after 2002. The survey to which they refer focuses not on whether IWRM has worked but rather on whether or not its language formally appears. In fact, similar international surveys on the implementation of IWRM, as defined by the presence of terminology in legal and policy documents, have become somewhat of an industry. The same paper highlights a more detailed 2007 survey done by the United Nations Environment Programme (UNEP). The UNDP and the Arab Water Council conducted a similar survey for the Arab region,<sup>3</sup> and the African Development Bank did one for Africa (UN-Water, 2008). Others have been done by UNWATER (UN-Water, 2008) and the Global Water Partnership (2006). Most recently, a survey of experts was done by UNEP (2012) in preparation for Rio + 20,

though this time also including a limited effort to ask respondents to attribute changes in policy to impact.

These surveys, always financed by proponents of IWRM, justify the focus on language rather than impact in part by the real difficulty of measuring impact. However, they also implicitly or explicitly assume that the creation of formal, national policy related to IWRM not only will improve water outcomes but is required for better water outcomes. IWRM has become a necessary condition. As put by Hassing et al. in a discussion of a survey, “It is indisputable that such documents are essential for helping to create and support an enabling environment for water reforms” (2009, p. 4).

With IWRM now necessary, according to this line of thinking, for any improvement in water management, it is not surprising that the first recommendation of the UN-Water survey was not related to the solution of any particular water problem; it was, rather, that “countries, particularly those that are lagging behind, need to prioritise the development of IWRM and water efficiency measures, with the help of supporting agencies” (UN-Water, 2008, p 32). The means has become the end.

This focus on the use of IWRM language rather than solutions to practical water problems would not necessarily be a significant issue if the impact of the discourse stopped there. However, many of the “supporting agencies” referred to by the UN have made the creation of IWRM core to their water business. For example, the first two pillars of the Asian Development Bank’s Water for All<sup>4</sup> policy are (1) to promote a national focus on water-sector reform and (2) to foster the integrated management of water resources. More specifically, they want to encourage river-basin planning based on IWRM and the creation of river-basin organizations, and support decentralization of decision making, transferable water rights, cost recovery and pricing, and participation of farmers in agricultural water use through participatory irrigation management.

The African Development Bank similarly calls on countries to use the main principles of IWRM to create a national water policy and supporting legal and regulatory framework, adopt the polluter-pays principle, decentralize decision making, and have participation in irrigation decision making through water user associations (it is silent on the basin scale except in transboundary cases, when it calls for full riparian involvement). They highlight that water-sector funding will be contingent on following these ideas and that they “will, in future water projects give financing priority to those projects that comply with national policies that are based on the concept of IWRM”. A search of policy documents of many other bilateral and multilateral donors involved in the water sector will reveal similar provisions.

## **Missing the real priorities and trampling existing successes**

This transformation of an idea into a “sanctioned discourse” (Allan, 2003, p. 21–22), of a means into an end (backed by loan conditionality), can divert attention from actual water problems and national priorities. For example, Tanzania’s 1991 water policy identified water development and provision as key national policy goals and argued for more water-storage creation (Shah & van Koppen, 2006). However, Tanzania’s budgets were heavily donor dependent and creating new storage and infrastructure went against donor practices at the time. Instead, Tanzania implemented what donors would support – IWRM, with state ownership of water resources, water-withdrawal permits, water taxes, river-basin organizations, and water user associations – with no attempt to get what Tanzania had defined as its people’s needs: more and better-managed infrastructure.

Likewise, the focus on IWRM implementation diverts attention from the solution of existing problems. In Ghana, for instance, the Water Resource Commission highlights that its mandate is to “assist and guide the Government to achieve the goals of IWRM and monitor its achievements” (Government of Ghana, 2011, Section 3.1). Rather than focusing on specific problems, the commission must focus on achieving IWRM, whatever that may mean. The government of Ethiopia’s Water Resources Management Policy plans to establish river-basin councils as, in its words, “one of the main instruments to implement integrated water resources management which is actually the pillar of the policy” (Federal Democratic Republic of Ethiopia, 2007, p. 1). Here again IWRM, rather than the solution of pressing problems, is the end.

The negative impact can go beyond diverting attention from key priorities. Efforts to formally implement IWRM in Africa, for example, typically neglect the existing, and functioning, informal rights on which much of African agriculture is based (van Koppen, 2007). The formal implementation of IWRM policies at the cost of plural systems already in use reduces the responsiveness of systems to the uncertainties that necessarily accompany water use (Meinzen-Dick & Pradhan, 2001). Finally, though IWRM is meant to provide integration across sectors, it is typically pushed primarily by water professionals. Thus, actual implementation often neglects the integration of land with water rights. As put by Oorthuizen (2003, p. 9), “Many disasters of resource management during the 20th century have been caused by replacing effective community management with ineffective or corrupt government management.”

### **Setting back the reform agenda?**

It has been argued by IWRM proponents that while the specific concepts such as formal national water laws, basin-scale planning and water pricing are associated with IWRM, IWRM is actually a process without formulas and should be very context specific. At the same time, as highlighted in IWRM guidelines produced by the Global Water Partnership (undated, p. 5), the World Bank Institute (Xie, 2006, p. 5) and others, IWRM does attempt to put the Dublin Principles into practice, emphasizing the ideas of integration, decentralization, participation, and economic and financial sustainability, and with the basin as the unit for decision making.

What has happened when countries have tried to implement this set of practices? The results have not always been as expected, as the case of Sri Lanka shows (Samad, 2005). In 1993, the government began a process of implementing water-policy reform under a technical assistance activity of the Asian Development Bank in association with the US Agency for International Development. Some 115 stakeholder-consultation meetings were held, involving government agencies at the national and provincial levels, policy makers, water managers, the private sector, professional bodies, non-governmental organizations (NGOs) and all major water users. Working groups were set up involving NGOs to discuss and identify the major problems, suggest policy prescriptions and propose appropriate institutional arrangements to implement the policy. The result was a package of reforms mimicking the IWRM ideas described above. A water policy and water law were established. Existing water organizations were to be replaced by river-basin organizations; water-use rights were established through withdrawal permits; permits were made transferable to encourage water trade towards high-valued uses; and all water was priced.

Despite its having followed an apparently open process, the reform programme was heavily criticized. Sections of the press, non-governmental groups, religious bodies and some farmer organizations argued that the process was in fact top-down and closed,



despite the apparent efforts towards inclusion. Other criticisms pointed out the failure to draft the policy document in the local language, insensitivity to the cultural aspects of water, and, importantly, that the whole exercise was undertaken to satisfy donor interest rather than to cater to national needs.

In the wake of intense agitation by the public and the media against the proposed national water policy, the government first distanced itself and then withdrew the proposals. The result was not simply that the process failed, but also that the opportunity for any reform was greatly reduced. Open discussions of even some of the early principles of the reform, in particular cost recovery, had become politically impossible, and outside organizations trying to help with the water sector in any form are still sometimes accused of trying to buy up or privatize Sri Lanka's water. As a result, Sri Lanka still lacks a water policy or coordinated strategy, as evidenced in the efforts to manage recent drought and floods. The IWRM process not only failed to bring about better water management, it set real reform back through the manner in which its implementation was attempted. While there is finally some agreement on a way forward, current efforts by a major donor to further the process still have to be positioned within a larger project focused first on dam safety.

Sri Lanka may be a worst-case scenario, but similar outcomes can be found elsewhere. Externally financed efforts to reform the Pakistani irrigation sector based on key IWRM principles (water rights, pricing and markets, and participation in part through layers of water user associations and federations), though not couched in IWRM terms, were met with criticisms similar to those seen in Sri Lanka (Bandaragoda, 2006; van der Velde & Tirmizi, 2004). Again, the failure also made future discussion of alternative reform models difficult. In the Red River of Vietnam, introduction of IWRM principles may have caused real change, but through institutional confusion rather than design and taking reform in a different direction from what had been expected (Molle & Hoanh, 2011).

Even in those countries at the forefront of the formal IWRM agenda, there is little evidence of positive change. For example, Petit and Baron's (2009) study of Burkina Faso, an early IWRM adopter with substantial international backing, highlighted that multiple assessments of the country have stressed the gap between institutional and legal change based on IWRM and real implementation. Barbara Schreiner, former deputy director-general of the South African Department of Water Affairs and Forestry, has highlighted the problems of implementing the South African National Water Act, which had been "hailed by the international water community . . . as a major step forward in the translation of the concept of integrated water resources management (IWRM) into legislation" (2013, p. 239). As put by Jeffrey and Gearey (2006, p. 4), "Empirical evidence which unambiguously demonstrates the benefits of IWRM is either missing or very poorly reported."

## **Hijacked for other agendas**

Rather than causing policy setbacks as in Sri Lanka and Pakistan, it is probably more often the case that IWRM implementation is used to justify business as usual or mask other agendas. In Ethiopia, the zeal to move forward with IWRM meant that thoughtful water master plans risked being pushed aside because they were not part of a donor's IWRM process. In other cases, though, master plans are simply repackaged as IWRM (Molle, 2005).

This sort of repackaging of existing activities and power structures is probably more the rule than the exception, as has also been documented for the implementation of

irrigation management transfer (IMT), where bureaucratic resistance towards externally financed policy reform manifests itself in the transformation of IMT programmes into the same construction-based project activities that had been done earlier (Bruns & Atmanto, 1992; Khanal, 2003; Nikku, 2006; Oorthuizen, 2003).

In fact, the success stories put forward by IWRM proponents seem to indicate that virtually any water outcome can be claimed by IWRM. Molle (2008) highlighted that on USAID's website of IWRM success, "any story, from villagers gaining access to freshwater in Sudan, to upgrading an Iraqi canal system, to a fish company tapping into global markets in Romania, to purifying water for Haiti's flood victims [seems to qualify] as an 'IWRM achievement'" (p. 135). The IWRM case studies published by the Global Water Partnership and its numerous country and regional partners also seem to confound any water change with IWRM.<sup>5</sup> The most recent UNEP assessment takes a similar approach, with claims of IWRM impact ranging from increased water-use efficiency (reducing system losses from 30% to 17% in Estonia) to the establishment of environmental clubs in Rwanda that enforce adherence to environmental law (2012, see Box 9.1 in particular). IWRM supported by vigilantism is now considered a success. Proponents may wish to include as another success the fee-collection system which resulted from the Tanzanian IWRM implementation discussed earlier. Mugambo, a civil defence force, was empowered to collect water fees from every user regardless of scale and incentivized through commissions.

In essence, any change in water outcomes is now claimed as a success of IWRM. And any change in water policy or management is justified as IWRM. As Biswas (2004, p. 251) noted and as still seems to hold, "Because of the current popularity of the concept, some people have continued to do what they were doing in the past, but under the currently fashionable label of IWRM in order to attract additional funds or to obtain greater national and international acceptance and visibility."

However, IWRM is not used only to justify ongoing activities. It is also used to obscure other agendas. For example, in one Central Asian country, a donor believes irrigation services would be improved if the government separated irrigation management and regulatory responsibilities. To achieve this goal, the approach being used is to include the proposed changes within a programme and project geared at implementing IWRM, negating the participation ideal. In another country in the same region, IWRM has been put forward as a great success, in part because it allows wide participation in water decisions. But in that same country, farmers are generally not allowed to choose the crops they grow and may lose their land if they disobey government planting orders. Participation in water decisions is highlighted; lack of freedom in basic farm decision making is ignored. While such stories are not well documented (for obvious reasons), discussions with practitioners will provide ready examples.

## **What are the alternatives?**

One of the problems with the dominance of the IWRM discourse is that it has caused us to forget that there are many paths to improving water outcomes, many of which are unrelated to IWRM as commonly conceived. To illustrate, this section presents three examples of successful water management that did not involve the standard principles of IWRM. These examples in fact follow a path diametrically opposed to one or more of the standard recommendations: the basin approach; pricing water to control demand; and full participation in decision making.





Figure 1. International cooperation in the Columbia River “basin”. The first agreement applying to the Columbia was the framework Boundary Waters Treaty signed by the US and Great Britain in 1909. The first treaty specifically mentioning the Columbia was signed in 1944 and limited to the “upper portion” of the basin. One additional treaty and four protocols were signed between 1961 and 1968 and focused on dam construction on the main stem within Canada and on the Kootenay tributary. Hydrologic measurements supporting the agreements are made at The Dalles, upstream of other “US” tributaries such as the Willamette and Cowlitz. No agreements apply to the overall basin, but Canada–US cooperation on the Columbia is generally considered some of the strongest in the history of transboundary waters.

*You can ignore the basin*

The basin is consistently put forward as a key pillar of IWRM implementation and the natural management unit for water resources. But is there evidence that the basin approach is needed?

There has been much discussion of the potential for water wars (Barnaby, 2009; Klare, 2001; Starr, 1991) in the world's more than 260 international basins. In fact, though, one would be hard pressed to find evidence of even a single water war having occurred. One factor explaining the relatively peaceful history of international water sharing is the development of institutions, via treaties, to mitigate water-related tensions between countries and turn potential conflict into real cooperation (Wolf, Kramer, Carius, & Dabelko, 2005). There are now literally hundreds of treaties in place, even in areas of high water-conflict potential and outright conflict outside the water sector such as South Asia and the Middle East. In avoiding the threat of water wars in these extreme cases and more generally, do these successful treaties use a basin-scale approach?

The answer is, only in a minority of cases. In the large body of international water law now available, only about a quarter of all treaties cover the entire basin to which they apply (Giordano et al., 2013). Why does water management practice generally not use the basin approach? Because creating agreements and institutions is a costly practice, and so the focus is on real-world problems. And those problems are rarely of basin scale in nature, even for transboundary waters.

Consider the case of the Columbia River, shared between the US and Canada. The specific treaties governing the Columbia are built on a general 1909 agreement signed by Great Britain and the US which deals with all "boundary waters" between Canada and the US. Boundary waters are defined as only those lakes and rivers which are physically cut by the international boundary.<sup>6</sup> The first Columbia-specific agreement, signed in 1944 by Canada and the USA, is focused on the feasibility of dam construction in the "upper" basin. While the scope of that agreement goes beyond simply "boundary waters" to an undefined portion of the basin and does mention a "river system", it never refers to the basin as such. A related set of agreements were signed by Canada and the US between 1961 and 1968 and focused on the construction, operation and financing of the dams. The agreements cover storage within the Canadian portion of the Columbia basin in general but are limited in the US to the Columbia main stem and to a lesser extent the Kootenay tributary. In determining the value of the agreements in producing flood control, hydrologic measurements are to be made at The Dalles, 300 km from the Pacific Ocean and upstream from one of the Columbia's major tributaries, the Willamette (see Figure 1).

Because the primary purpose of the treaties was hydropower and later flood control, the treaties focus primarily on the waters passing through Canadian dams on the Columbia main stem and through none other American dam. Flow measurements to support treaty operations occur downstream of other transboundary tributaries, including the Okanogan and the Kettle as well as major US tributaries including the Pend Oreille and the Snake, but they do not apply to these tributaries themselves. Another set of US tributaries, most importantly the Willamette, enter the Columbia further downstream and in no way are related to the treaties.

Despite more than 100 years of thoughtful treaty making and implementation on the Columbia, which includes the creation of at least 7 separate agreements, the basin scale approach was never used. The current agreements are potentially up for renegotiation in 2024, but there is no discussion of using a basin-scale approach. Analysis of the few hundred other transboundary agreements which do not use the basin-scale approach will likewise show that similar pragmatic concerns were deemed more important than using the theoretically "correct" hydrologic scale.

***Pricing is not the only way to signal scarcity value of water<sup>7</sup>***

The issue of groundwater overdraft in India is well known. In the state of Gujarat, free groundwater and the free electricity to pump it contributed to severe groundwater overdraft, the near-bankruptcy of the State Electricity Board, and poor power supply to farmers and other rural residents. The problem has been well known for decades, and the textbook solution is simple, following IWRM principles (i.e. “economic and financial sustainability”): price groundwater and electricity to reflect their value. However, those who have tried to implement these solutions did not appreciate the political realities of India. Efforts to rationalize pricing were met with great resistance by farmers. Politicians lost their jobs, and external funds for modernizing the system were withdrawn or turned down. The State Electricity Board continued to generate great losses and was unable to meet the needs of the rapidly growing economy. Farmers had to accept the poor quality of the power supply as the cost of their “free” access, while aquifers continued to be overexploited.

An alternative approach, called the Jyotigram Scheme, diverged from IWRM principles and embraced subsidies as part of the strategy. But rather than viewing subsidies as a default component of free electricity supply, the Jyotigram Scheme focused on providing rationally managed subsidies where needed and pricing where possible. Under the programme, rural Gujarat has been completely rewired. Villages are given 24-hour, 3-phase power supply for domestic uses, in schools, hospitals and village industries, all at metered rates. Farmers operating tubewells continue to receive free electricity, but for 8 hours rather than 24 and, importantly for the satisfaction of farmers, on a pre-announced schedule designed to meet their peak demands.

The separation of agricultural energy from other uses and the promise of quality supply were sufficient to gain political and social backing for implementation. The Jyotigram Scheme has now radically improved the quality of village life, spurred non-farm economic enterprises, and halved the power subsidy to agriculture. While groundwater itself is still free, the programme has indirectly raised the price of groundwater supply from tubewell owners in the informal market by 30–50%, thus providing a signal of scarcity and reducing groundwater overdraft. The solution may not be perfect, but it has proved to be implementable in a way that the text book approach was not, and it has brought substantial improvement inside and outside the water sector – two things which did not happen when the “integrated” approaches were tried.

***You do not need participation<sup>8</sup>***

One rationale for IWRM is that we need equitable mechanisms to move water, over time, to the uses with the highest value. The typical IWRM principles for facilitating this shift include the establishment of use rights which are tradable, as well as participation in decision making on changes.

The pressures in many parts of China to move water from agriculture to rapidly growing cities are as large as anywhere in the world. The case of the Zhang He irrigation system provides ideas on how this transfer can occur without reducing agricultural production and without water rights or participation. The Zhang He Reservoir in Hubei Province was designed to irrigate two rice crops per year. In the 1960s and 1970s, the reservoir’s water was used entirely for agriculture. As the Chinese economy started to liberalize in the 1980s, urban uses expanded, and by the 1990s, non-agricultural uses took the majority of the water. Despite the decline in irrigation supplies for the district, agricultural production did not decline (Figure 2).

How did this happen? While Chinese farmers pay for water delivery, it was not the market that provided the incentives for the shift in water use and the large implied increase in agricultural water productivity. Nor was it a participatory process. Rather, operators used a top-down approach and simply allocated an increasing amount to cities and less to farmers. Reduced supplies to farmers forced a response. Part of the response was the construction of thousands of small reservoirs within the irrigated area to capture the runoff generated within the command area and to capture return flows from rice cultivation. In addition, research demonstrated that yields would not suffer if rice fields were not left flooded; alternating wet and dry irrigation could be employed. With the extension of knowledge about alternating wetting and drying irrigation of rice, farmers had a technology to help them cope, and the remarkable trend emerged. Crop production remained steady in spite of less water being delivered from the main reservoir to rice cultivators. The productivity of rice has increased. Water productivity gains in the Zhang He irrigation system have skyrocketed. While less well documented, the authors' experience suggests that similar outcomes are frequent elsewhere. In India, for example, cities increasingly take water from agriculture, and farmers adapt, for example through better use of groundwater (Celio, Scott, & Giordano, 2010).

## Conclusion

We face daunting water management challenges as demand hits the limits of supply, intersectoral competition increases, water quality declines and aquatic ecosystems come under threat. The concept of integrated water resources management provides ideas to help us consider how we can best make social choices about water allocation and access as well as the sustainability of water resources and the infrastructure we use to manage those resources.

But by now we all know how complex water resources management is and that ideally it should be managed holistically, considering efficiency, equity and the environment. But we should also know by now that holistic management is costly and politically difficult, or impossible. Unfortunately, then, integrated water resources management has become (in capitals) Integrated Water Resources Management and associated with specific apolitical,

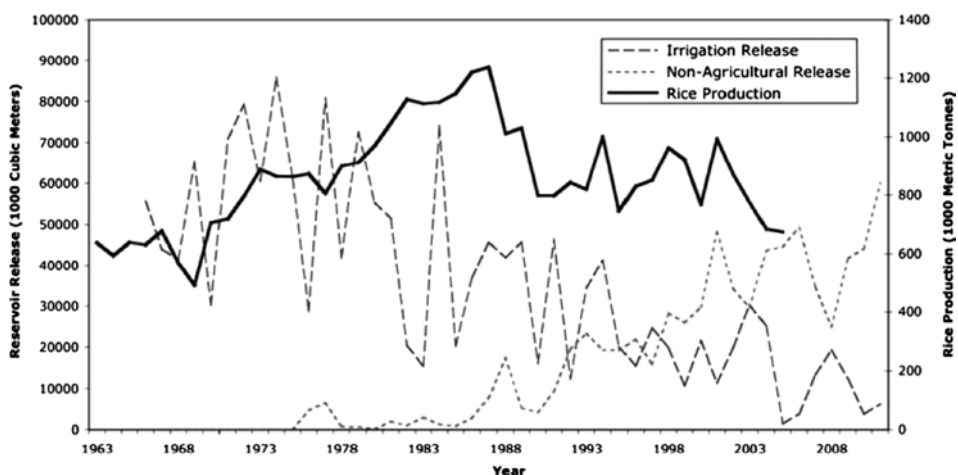


Figure 2. Water allocation and rice production, Zhang He Reservoir, Hubei, China. Source: developed from data in Molden, Dong, Loeve, Barker, & Tuong (2007).

nongeographic approaches. And IWRM has become an end in itself, very often supported by international financial backing. As a result, attention has been diverted from tangible water problems and priorities; well-meaning reform agendas have been set back; and the concept has been hijacked for purposes contrary to those intended by its proponents. As troublesome, IWRM's rise to discourse domination has shut out alternative thinking on water challenges.

There are alternatives. As has long been pointed out for complex environmental problems in general and water problems specifically, implementable solutions can be found by taking a "problem shed" approach (Allan, 1998; Kneese, 1968; Mollinga, Meinzen-Dick, & Merrey, 2007). That is, decision makers can do best by focusing on solutions to specific problems rather than on universal, water-centred approaches. This involves understanding the physical, social and especially political context of the challenge and is in fact what the three examples highlighted in this paper did. But it is something the current IWRM discourse works against with its stock, water-based approaches to all water-related issues. As Elinor Ostrom and her colleagues concluded a decade ago: (1) there is no one best system for governing water resources; and (2) many more viable options exist for resource management than envisioned in much of the policy literature. (Ostrom, Stern, & Dietz, 2003). We need to put the problems first and then work to find pragmatic solutions, whether they use IWRM principles or not.

## Notes

1. This quotation was taken from the foreword to the Global Water Partnership's ToolBox Version 2. Similar quotes can be found in other GWP materials, such as a presentation by GWP-Southern Africa for World Water Week and in other publications authored or co-authored by GWP affiliates such as Foster and Ait-Kadi (2012). GWP ToolBox Version 2 is available at: [http://www.gwp.org/Global/ToolBox/About/ToolBox/ToolBox%20\(English\).pdf](http://www.gwp.org/Global/ToolBox/About/ToolBox/ToolBox%20(English).pdf). The presentation to World Water Week is available at [http://www.worldwaterweek.org/documents/WWW\\_PDF/2010/tuesday/T3/Findings\\_from\\_IWRM\\_Planning\\_from\\_East\\_and\\_Southern\\_Africa\\_final.pdf](http://www.worldwaterweek.org/documents/WWW_PDF/2010/tuesday/T3/Findings_from_IWRM_Planning_from_East_and_Southern_Africa_final.pdf)
2. For example, the Global Water Partnership and the International Network of Basin Organizations call on "each [riparian] country to develop, by 2015, its specific targets and timeframes for preparing and implementing a programme of action and financing strategy to implement integrated water resources management plans" (2012: 1).
3. <http://water.cedare.int/cedare.int/files15%5CFile2298.pdf>
4. <http://www.adb.org/sites/default/files/pub/2003/water-policy.pdf>
5. [http://gwptoolbox.org/index.php?option=com\\_tool&id=3](http://gwptoolbox.org/index.php?option=com_tool&id=3)
6. *Preliminary Article*. For the purpose of this treaty boundary waters are defined as the waters from main shore to main shore of the lakes and rivers and connecting waterways, or the portions thereof, along which the international boundary between the United States and the Dominion of Canada passes, including all bays, arms, and inlets thereof, but not including tributary waters which in their natural channels would flow into such lakes, rivers, and waterways, or waters flowing from such lakes, rivers, and waterways, or the waters of rivers flowing across the boundary (Boundary Waters Treaty, 1909).
7. This section draws on Shah, Bhatt, Shah, and Talati (2008) and Shah and Mehta (2012).
8. This section draws on Molden et al. (2010)

## References

- Allan, T. (1998). Watersheds and problemsheds: Explaining the absence of armed conflict over water in the Middle East. *Middle East*, 2, 50.
- Allan, T. (2003). *IWRM/IWRAM: A new sanctioned discourse?* London: SOAS.
- Bandaragoda, D. J. (2006). Limits to donor-driven water sector reforms: Insight and evidence from Pakistan and Sri Lanka. *Water Policy*, 8, 51–67.
- Barnaby, W. (2009). Do nations go to war over water? *Nature*, 458, 282–283, And responses.