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Asit K. Biswas

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# Integrated Water Resources Management: Is It Working?

ASIT K. BISWAS

Third World Centre for Water Management, Atizapán, Mexico

**ABSTRACT** *Integrated water resources management is not a new concept: it has been around for some two generations. In the early 1990s it was 'rediscovered' by some water professionals, and then subsequently heavily promoted by several donors and international institutions. In spite of the fact that its promoters have spent hundreds of millions of dollars in recent years, the facts remain that the definition of this concept remains amorphous, and the results of its application in a real world to improve water policy, programme and projects at macro- and meso-scales have left much to be desired. At a scale of 1 to 100 (1 being no integrated water resources management and 100 being full integration), any objective analyst will be hard-pressed to give a score of 30 to any one activity anywhere in the world in terms of its application. The paper reviews the reasons for its recent popularity, why the concept has not been a universal solution in the past, as claimed by its promoters, and also discusses why it is highly unlikely to work in the future.*

## Introduction

According to the Greek philosopher Pindar, the best of all things is water. This view is not surprising since the need for water, throughout human history, has always been appreciated. It is present everywhere, and without water, life, as it is known, will simply cease to exist. Water is constantly in motion, passing from one state to another and from one location to another. Whether the water is in motion, or stationary as it is in lakes, it invariably contains extraneous materials, some due to natural causes but others because of human activities. All these, plus natural variations in water availability, makes its rational planning and management a very complex and difficult task under the best of circumstances. Water may be everywhere, but its use has always been dictated by its availability in terms of quantity and quality.

Water problems of the world are neither homogenous, nor constant or consistent over time. They often vary very significantly from one region to another, sometimes even within a single country, from one season to another, and also from one year to another. Solutions to water problems depend not only on water availability, but also on many other factors, among which are the processes through which water is managed; competence and capacities of the institutions that manage them; prevailing socio-political conditions and

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*Correspondence Address:* Asit K. Biswas, Third World Centre for Water Management, Avenida Manantial Oriente No. 27, Los Clubes, Atizapán 52958, Estado de México, México. Email: akbiswas@thirdworldcentre.org

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expectations which affect water planning, development and management processes and practices; appropriateness and implementation statuses of the legal and regulatory frameworks; availability of investment funds as and when needed; climatic, social and environmental conditions of the countries concerned; levels of available and usable technology; national, regional and international attitudes and perceptions; modes of governance including issues like political interference, transparency, corruption, etc.; educational and development conditions; and quality, effectiveness and relevance of research that are being conducted to solve the national, sub-national and local water problems.

Water is a resource that is of direct interest to the society as a whole, as well as to most development-related public institutions at central, state and municipal levels, academia, private sector and non-governmental organizations (NGOs). Such widespread interest in water is not a unique situation, as many water professionals have often claimed: it is equally applicable to other important sectors like food, energy, the environment, health, communication or transportation. All these issues command high levels of social and political attention in all modern societies, although their relative importance may vary from one country to another, and also over time. In an increasingly interrelated and complex world, many issues are of pervasive interest for assuring good quality of life of the people. Water is one of these important intersectoral issues, but it is certainly *not* the only issue, or often the *most* important socio-political issue, irrespective of the views of many in the water profession. In recent years, it has become increasingly evident that the water problems of a country can no longer be resolved exclusively by the water professionals, and/or the water ministries, alone. The water problems are becoming increasingly more and more interconnected and intertwined with other development-related issues, and also with social, economic, environmental, legal and political considerations, at local and national levels, and sometimes even at regional and international levels. Many of the water problems have already become far too complex, interconnected and large to be handled by any one single institution, irrespective of the authority and resources given to it, technical expertise and management capacity available, level of political and public support, and all the good intentions (Biswas, 2001).

The current and the foreseeable trends indicate that water problems of the future will continue to become increasingly complex, and will become more and more interlinked with other development sectors such as agriculture, energy, industry, transportation and communication, and with social sectors such as education, the environment, health and rural or regional development (Asian Development Bank, 2007). The time is fast approaching when water can no longer be viewed in isolation by primarily one single institution, or any one group of professionals, without explicit and simultaneous consideration of other related sectors and issues that affect water management, and vice versa. In fact, it can be successfully argued that the time has already come when water policies and major water-related issues should be assessed, analysed, reviewed and resolved within an overall societal and development context, otherwise the main objectives of water management, such as improved standard and quality of life of the people, poverty alleviation, regional and equitable income distribution and environmental conservation, cannot be achieved. One of the main questions facing the water profession is how this challenge can be successfully answered in a socially acceptable and economically efficient manner.

During the past 15 years or so, and heavily promoted by the donors, the mantra has often been that integrated water resources management will solve the water problems

everywhere in the world, in spite of the different physical, economic, social and environmental conditions of a very heterogeneous world, and irrespective of the rapidly increasing complexities of water management practices and processes. The present paper analyzes how realistic this widely promoted universal solution is to the water management problems of the world.

### **Integrated Water Resources Management: Background and Definition**

During the early 1980s, a few members of the water profession started to realize that the overall global water situation was not as good as it appeared. This feeling intensified during the 1990s, when many more in the profession began to appreciate that the water problems had become multi-dimensional, multi-sectoral and multi-regional, and were enmeshed with multi-interests, multi-agendas and multi-causes, which could be resolved only through an appropriate multi-disciplinary, multi-institutional and multi-stakeholders coordination. However, at present the main question is not whether such a process is desirable, but rather can this be achieved in the real world in a timely, cost-effective and socially acceptable manner?

Faced with such unprecedented management complexities, many in the water profession started to look for a new paradigm for management, which would solve the existing and the foreseeable problems in different parts of the world. However, the solution that was selected and which became increasingly popular was not new. It was the rediscovery of a basically more than 60-year old concept, which could not be successfully implemented previously: integrated water resources management. Many who 'discovered' this concept were not even aware that the 'new' concept was in fact not at all new, but had been around for several decades, with a dubious implementation record, which had never been objectively, comprehensively and critically assessed.

Before the status of application of integrated water resources management can be discussed, an important and fundamental issue that needs to be first considered is what precisely is meant by this concept. A comprehensive and objective assessment of the recent writings of the individuals and the institutions that have vigorously championed integrated water resources management indicates that not only no one has a clear idea as to what exactly this concept means in operational terms, but also their views of it in terms of what it actually means and involves, vary very widely. It can even be argued that this very vagueness has contributed to the high popularity of the integrated water resources management concept since people could continue to do what they had done before, or are doing at present, but put these activities under an increasingly popular bandwagon for which considerable resources have been made available by the donors and international institutions.

The definition that is most often quoted at present is the one that was formulated by the Global Water Partnership (GWP, 2000), which started to champion integrated water resources management as a major component of its technical programme shortly after its inception. GWP defined it as:

a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.

This definition, on a first reading, appears broad, all-encompassing and, perhaps even impressive, at least linguistically. However, such lofty phrases, when scrutinized carefully and objectively, have little practical resonance on the present, or on future water management practices. A serious and critical look at this amorphous definition may remind one of the immortal writings of William Shakespeare:

Polonius: What do you read, my lord?

Hamlet: Words, words, words.

Unfortunately, for a variety of reasons, a fundamental question that has never been asked, let alone answered, either by the GWP or the promoters of this paradigm who have uncritically accepted the GWP definition as the gospel, is that whether this well-intentioned and good-sounding definition has any practical value in terms of its application and implementation to improve existing water management, or is it just an aggregation of trendy words which collectively provides an amorphous definition which does not help water planners and managers very much in terms of the application of the concept to solve the real water-related problems that are being faced in different parts of the world.

Let us consider only some of the fundamental questions that the above definition raises in terms of its possible application in the real world, which have not been addressed to in any significant way thus far, either by GWP or by the proponents of IWRM. Among these questions are the following:

- ‘Promotes’: Who promotes this concept? Why should it be promoted, and through what processes? Can the promotion of an amorphous concept be enough to improve water management? What about its implementation?
- ‘Land and related resources’: What is meant by ‘related resources’? Does it include agriculture, energy, minerals, fish, other aquatic resources, forests, the environment, etc.? Even if only land and agricultural resources are considered, the institutions responsible for water management have seldom any say, or authority, over them. Considering the intense inter-ministerial and intra-ministerial rivalries that have always been present in all countries, how can the use, development and management of land and agricultural resources be integrated with water, even if this was technically, administratively, knowledge-wise and managerially possible? Is this realistically feasible? If the boundaries of integration are further expanded, and issues such as the environment and ecosystems are considered, how can the water professionals and the relevant ministries handle such integration, which is often beyond their knowledge, expertise and/or legal and institutional control?

Interestingly, but not surprisingly, the people who formulated this definition for the Global Water Partnership were all from the water profession: experts from ‘land and related resources’ were singularly conspicuous by their absence, as were from other resource-related professions. This raises one fundamental question, that is, what makes the water profession believe that they can superimpose their views on the other professions, who were not even consulted and on which they have only limited knowledge and expertise? Equally, why should the professionals from other professions accept the view of some people

from the water profession? A cynic might even be excused for claiming that the water profession prefers to remain in water-tight compartments, but preach integration with other sectors without any consultations or discussions with the professionals of appropriate disciplines, sectors and institutions.

- ‘Maximize’: What specific parameters should be maximized? What process should be used to select these parameters adequately and reliably? Who will select these parameters: only water experts, as was the case for the formulation of the GWP definition, or should professionals from other sectors be involved? What criteria should be used to select the necessary parameters? What reliable methodology is available at present to maximize the selected parameters? Do such methodologies even exist at present? If not, can they be developed within a reasonable timeframe so that these can be used?
- ‘Economic and social welfare’: What exactly meant by economic and social welfare? Even the economists and the sociologists cannot agree as to what actually constitutes economic and social welfare, except in somewhat general and broad terms. How can the issues related to social and economic welfare be quantified? Can these be even quantified? Are water professionals capable of maximizing economic and social welfare in operational terms, a fact that has mostly eluded even the social scientists thus far? Is it possible that even the cause-and-effect relationships between water development and management and economic and social welfare can be established, let alone be maximized? Such functional relationships are mostly unknown at present. Even if they were known, which they are not, they are likely to be a site- or region-specific, and thus generalization simply will not be possible on a global scale, as is implied by the definition.
- ‘Equitable’: What is precisely meant by equitable? How will this be determined operationally? Who will decide what is equitable, for whom, and from what perspectives and under what conditions?
- ‘Sustainability’: What is meant by sustainability, which itself is as a vague word, and perhaps also as fashionable and trendy, as integrated? How can sustainability be defined and measured in operational terms?
- ‘Vital ecosystems’: What exactly constitutes vital ecosystems? How can ‘vital’ and ‘non-vital’ ecosystems be differentiated? Can such a differentiation even be made in conceptual terms, let alone in operational and implementation terms? What are the minimum boundary conditions that will ensure the ‘sustainability’ of the ‘vital ecosystems’, at least in terms of its linkage to water, irrespective of how sustainability itself is defined, or the issue of what constitutes vital ecosystems is resolved?

When all these uncertainties and unknowns are aggregated, the only objective and realistic conclusion that can be drawn is that even though on a first reading the definition formulated by the Global Water Partnership appears impressive, it has to be admitted by any objective person that it is simply unusable, or unimplementable, in operational terms. Not surprisingly, even though the rhetoric of integrated water resources management has been very strong at many international and national fora during the past decade, its actual use (irrespective of what it means) has been minimal, even indiscernible in the field (for an analysis of its actual use in south and southeast Asia, see Biswas *et al.*, 2004, and for Latin

America see Biswas *et al.*, 2008). In fact, it can even be successfully argued that it would not have made any perceptible difference in enhancing the efficiencies of macro- and meso-scale water policies, programmes and projects of the recent years, even if the concept of integrated water resources management had not been resurrected, reinvented and promoted vigorously by the various donors and international institutions in recent years.

No objective person will question that for all practical purposes, the definition that has been formulated by the Global Water Partnership is unusable and unimplementable. In addition, it is internally inconsistent. Furthermore, while the definition has effectively collated many of the recent trendy, fashionable and politically correct words, it does not provide any real guidance to the water professionals and policy makers as to how the concept can be operationalized to make the existing water planning, management and decision-making processes increasingly more and more rational and efficient so that the actual objectives of water management can be achieved.

### **What Issues Should Be Integrated?**

Analyses of existing literature indicate that the authors concerned have considered different issues that need to be integrated under this concept. This is not surprising, since as noted earlier, there is simply no agreement in the profession as to what integrated water resources management means, and what it really entails.

The word 'integration' often has had very different connotations and interpretations depending on the author(s) and institutions concerned, and their interests. Depending upon the author(s) and/or institutions, integrated water resources management requires integration of:

- objectives which are not mutually exclusive (economic efficiency, regional income redistribution, environmental quality and social welfare);
- water supply and water demand;
- surface water and groundwater;
- water quantity and water quality;
- water and land-related issues;
- different types of water uses: domestic, industrial, agricultural, navigational, recreational, environmental and hydropower generation;
- rivers, aquifers, estuaries and coastal waters;
- water, the environment and ecosystems;
- water supply and wastewater collection, treatment and disposal;
- urban and rural water issues;
- irrigation and drainage;
- water and health;
- macro, meso and micro water projects and programmes;
- water-related institutions at national, regional, municipal and local levels;
- public and private sectors;
- government and NGOs;
- timing of water release from the reservoirs to meet domestic, industrial, agricultural, navigational, environmental and hydropower generation needs;
- all legal and regulatory frameworks relating to water, not only from the water

sector, but also from other sectors that have direct implications on the water sector;

- all economic instruments that can be used for water management;
- upstream and downstream issues and interests;
- interests of all different stakeholders;
- national, regional and international issues;
- water projects, programmes and policies;
- policies of all different sectors that have water-related implications, both in terms of quantity and quality, and also direct and indirect (sectors include agriculture, industry, energy, transportation, health, the environment, education, gender, etc.);
- intra-state, interstate and international rivers;
- bottom-up and top-down approaches;
- centralization and decentralization;
- national, state and municipal water activities;
- national and international water policies;
- timings of water release for municipal, hydropower, agricultural, navigational, recreational and environmental water uses;
- climatic, physical, biological, human and environmental impacts;
- all social groups, rich and poor;
- beneficiaries of the projects and those who pay the costs;
- service providers and beneficiaries;
- present and future generations;
- national needs and interests of donors;
- activities and interests of donors
- water pollution, air pollution and solid wastes disposal, especially in terms of their water linkages;
- various gender-related issues;
- present and future technologies;
- water development and regional development; and
- any number of formulations and combinations of the above.

The above list, which is by no means exhaustive, identifies at least 41 sets of issues which different authors and/or institutions consider to be the issues that should be integrated under the aegis of integrated water resources management. Even at a conceptual level, all, or even many of these 41 sets of issues that the proponents would like to be integrated, simply cannot be achieved. At our present state of knowledge, this simply cannot be done. Nor is it likely to be achieved in the foreseeable future.

These types of fundamental issues and constraints need to be discussed and resolved successfully before the concept of integrated water resources management can be considered to be an universal approach to improve water management, as has been promoted in recent years. It is highly unlikely that these issues and constraints can be resolved, or one solution can be found which can be implemented all over the world. These are totally unrealistic expectations.

Unfortunately, while much lip-service has been given to this concept in recent years, most of the published works on the subject are somewhat general, or a continuation of earlier 'business as usual' approaches, but with a trendier label of integrated water resources management. If integrated water resources management is ever to become successful approach to water management, national and international organizations will



have to address many real and complex questions, which they have not done so far in any meaningful fashion, nor is there any indication whatsoever that they are likely to do so in the foreseeable future. Under these circumstances, and unless the current rhetoric can be translated effectively into operational reality, integrated water resources management will remain a fashionable and trendy concept for another few years, and then gradually fade away like many other similarly popular concepts of the earlier times. There are already some signs that this is already happening, since a few of its ardent past promoters have stopped promoting this concept.

### **Implementational Constraints**

The definition of integrated water resources management is an important consideration. When the definitional problem can be successfully resolved in an operational manner, it may be possible to translate it into measurable criteria, which can then be used to appraise the degree to which the concept of integration has been implemented in a specific case, and also the overall relevance, usefulness and effectiveness of the concept in terms of improving practices and processes used for water management.

In addition, a fundamental question that has never been asked, let alone answered, or for which there is no clear-cut answer at the present state of knowledge, is what are the parameters that need to be monitored to indicate that a water resources system is functioning in an integrated manner, or a transition is about to occur from an integrated to an 'unintegrated' stage, or vice versa, or indeed even such a transition is occurring? In the absence of both an operational definition and measurable criteria, it is not possible to identify what actually constitutes an integrated water resources management system at present, or how water should be managed so that the system remains inherently integrated on a long-term basis.

Nor have the proponents of the concept given any serious thought to the data requirements for the application of this concept. Irrespective of all the intensive promotion of this paradigm, what type and extent of data are needed to implement this concept in the real world, assuming that somehow it can ever be implemented? Are such levels of data available even in developed countries, let alone in developing countries? This is an important topic that is considered in further detail in this issue of the journal by Rachael McDonnell (2008). In addition, the Asian Development Bank (2007) has raised the serious issue of paucity and reliability of data on all aspects of water-related issues in the Asian developing countries. The proponents of integrated water resources management concept have been conspicuous by their neglect of the data availability, reliability and accessibility issues.

There is no question that in the water area, integrated water resources management has become a powerful and all-embracing slogan during the past 15 years. This is in spite of the fact that operationally it has not been possible to identify a water management process at a macro- or meso-scale which can be planned and implemented in such a way that it becomes inherently integrated, however this may be defined, right from its initial planning stage and then to implementation and operational phases. For all practical purposes, most international institutions have endorsed this concept, either explicitly or implicitly, without seriously analysis of its usability and implementability. This is in spite of the facts that there is no agreement at present among the various international institutions that endorse it as to what exactly is meant by integrated water resources management, or

whether this concept has improved water management practices anywhere in the world, which would not have occurred otherwise without the explicit use of this concept. Furthermore, in which countries, if any, this concept has been successfully implemented, and, if so, under what conditions, over what periods, and what have been its impacts (positive, negative and neutral) on human lives, the environment and other appropriate development indicators. Even the donors who have been promoting this concept vigorously will be hard-pressed to identify even one good case at successful implementation of integrated water resources management in their own countries. Not surprisingly, increasingly more and more national and international institutions and water professionals have started to question the relevance and the appropriateness of the implementation potential of integrated water resources management.

As noted earlier, this type of almost universal popularity of a vague, undefinable and unimplementable concept is not a new phenomenon in the area of natural resources management. It has happened many times earlier. For example, during the 20th century many popular concepts have come and gone, without leaving much of a footprint on how natural resources can be managed efficiently on a long-term basis. Such concepts generally became politically correct during the time of their popularity, and are widely embraced since they are vague enough for everyone to jump on the bandwagon and claim that they are following the latest development. In fact, it appears that the vagueness of a concept, to a significant extent, increases its popularity, since people can then continue to do the same old stuff (SOS) they were doing before, but can concurrently claim that they are au courant with the latest global thinking. This jumping on the bandwagon also increases, often very significantly, the potential of receiving funding support from the donors, and also other personal benefits.

The current popularity of the concept reminds one of another similar concept which received wide popular support in the United States during the early 20th century: conservation. Even President Roosevelt of the United States said at that time that: "Everyone is for conservation: no matter what it means!" (Biswas, 2001). The situation has been somewhat similar in recent years with integrated water resources management. To paraphrase, and perhaps update President Roosevelt, it can be said that "Everyone is for integrated water resources management: no matter what it means, no matter whether it can be implemented, or no matter whether it would actually improve water management processes". However, there is an important difference between the Conservation Movement witnessed during President Roosevelt's time and the current push by the donors for integrated water resources management. This is because information and communication revolution and globalization processes have ensured that the gospel of integrated water resources management could be spread quickly all over the world, and not mostly confined to one country, as was the case for the Conservation Movement earlier. Strong funding support and political push from the donors have further contributed to the increased global spread of integrated water resources management. These were not important factors for the Conservations Movement.

### **Is Integrated Water Management a New Concept?**

Shortly after the Dublin Conference in 1992, and following the embracement by GWP of integrated water resources management as a main component of their programme, the concept gained traction from several international institutions during the 1990s, many of

whom were not even aware that the concept had been around for more than half a century! Accordingly, and not surprisingly, the authors of *Toolbox for IWRM for the Global Water Partnership* claimed, totally erroneously, in 2003, that “IWRM draws its inspiration from the Dublin principles”, being blissfully unaware of the longevity of this concept, or the fact that international institutions such as the United Nations were promoting this concept extensively during the 1950s, or that the United Nations Water Conference, held in Mar del Plata, Argentina, in March 1977 had more relevant statements on integrated water resources management (Biswas, 1978) than the Dublin Conference. In addition, the Mar del Plata Conference was an intergovernmental meeting, and its Action Plan (which included references to integrated water resources management and other appropriate means for water management) was endorsed by all the governments that were members of the United Nations in 1977. In contrast, the Dublin Conference of 1992 was a meeting of experts. Accordingly, its recommendations, whatever may be their values or relevance, were never approved by the global community of the governments, irrespective of the claims to the contrary of the individuals and institutions that were responsible for the organization of the Dublin Conference, many of whom subsequently became the major promoters of IWRM. Thus, to a significant extent, many of the post-Dublin proponents of integrated water resources management not only rediscovered the wheel, but also the wood with which the wheel was made of!

It should be noted that the Global Water Partnership spent very considerable resources in developing and promoting the so-called *Toolbox* for integrated water resources management. The examples provided in the *Toolbox* have never received objective scrutiny or serious peer-review, and no objective and independent evaluation was ever made to determine if the so-called ‘tools’ were actually used and resulted in improving water management measurably which would not have happened otherwise. Nor was the replicability potential of the various ‘tools’ ever seriously considered or objectively assessed. Under these conditions, and, not surprisingly, the global interest in the *Toolbox*, for all practical purposes, has basically disappeared, irrespective of the fact that immense amount of resources and efforts were expended to develop and promote the *Toolbox*.

### **Other Considerations**

Extensive and intensive analyses of integrated water resources management literature published during the past decade indicate three unwelcome developments. First, there is no clear understanding of what exactly integrated water resources management means. Accordingly, different people have interpreted this concept very differently, but under a very general catch-all concept of integrated water resources management. The absence of any usable and implementable definition has only compounded the vagueness of the concept, and has reduced its implementation potential to a minimum. Second, because of the recent popularity of the concept, many people and institutions have continued to do what they were doing in the past, but under the guise of integrated water resources management in order to attract additional funds, or to obtain greater national and international acceptance and visibility. Third, considerable efforts have been expended by the various donors to promote the concept extensively, but irrespective of their oft-repeated rhetoric, the results have been meagre.

An analysis of the recently published literature on only one of the definitional aspects of the concept, that is, what are the issues that should be integrated, under the IWRM level,

indicates a very wide divergence of opinions. It should be noted that this refers only to what should be integrated, and *not* to other equally important fundamental issues such as how can these issues be integrated (even if they can actually be integrated since many of the issues are mutually exclusive), who will do the integration and why, what processes will be used for integration (do such processes currently exist?), or will the integration, if at all it can be done, produce the benefits that proponents have claimed. Regrettably, none of these questions have ever been asked seriously in the past and are not being asked now. Not surprisingly, at present there are no objective and definitive answers to such fundamental questions. Consequently, acceptance of the concept has been primarily a leap of faith, and not based on its scientific merit or technical strength.

Another very unwelcome development has been that the current high priests of integrated water resources management, for the most part, have refused to argue in public on the validity and applicability of the concept with those who have questioned it. Instead, a deliberate attempt has often been made to ostracise and denigrate the opponents of the concept, and, sometimes, attempts have even been made to cut off their funding sources through backdoor channels. Sadly, the proponents have made no attempt to win the intellectual and technical arguments behind integrated water resources management. Unfortunately, they have either forgotten or have found it convenient to forget, a fundamental principle of science and knowledge generation. Knowledge does not advance by consensus: if it did, we would still be living in the Dark Ages! (Biswas, 2006)

### **Popularity of the Concept**

An important issue that needs to be asked is why an old concept suddenly became so popular in the 1990s, to the extent that some people and institutions even considered it to be the 'holy grail' of water management? There are many reasons for its sudden leap of popularity, and only some of the main reasons will be discussed herein.

Probably one of the two most important reasons for its current popularity is the simplicity of the concept: it is easy to understand at a conceptual level, at least at a first glance. In a world that operates on the principle of reductionism, integrated water resources management often gives a false feeling of using a comprehensive and holistic approach, which many people a priori assume will produce the best results, irrespective of its inherent shortcomings and numerous fundamental inconsistencies embedded in the concept. These constraints and complexities need to be objectively and comprehensively assessed.

The second reason for its popularity is because of the amount of funds the donors have pumped in promoting this concept. This enormous level of funding has been primarily responsible for the creation of a new and thriving industry on integrated water resources management. This development is, of course, not new. For example, as Hall (2003) has perceptibly noted:

One needs to be realistic about how humans, universities and research institutions work. They are driven by egos and money. For example, when research on any issue starts getting hot, soon by land, sea and air, the field is invaded by researchers scrambling for a piece of action, pursuing their intellectual curiosity with all the decorum and dignity of the 19th century gentlemen geologists who pursued their curiosity about rumours of gold in California.

As long as the donors continue to pump money in promoting the concept, the bandwagon will keep rolling, until the countries whose water management were supposed to have improved by this old-wine-in-a-new-bottle concept realize that they are making no visible progress. Fortunately, there are now increasing signs that some donors are now carefully evaluating the validity and applicability of integrated water resources management as a universal solution, and some developing countries are assessing whether this concept, which they have made national policies at the urging of donors and international institutions, has produced the expected benefits. All these objective reassessments should be considered to be necessary developments.

### **Need for Reductionism**

Historically, it was possible for a brilliant person to know nearly all there was to know until about the end of the 16th century. Versatile geniuses such as Aristotle, Theophrastus, Vitruvius, Isidore of Seville and Leonardo da Vinci could discuss most subjects authoritatively. Human knowledge, in terms of natural and social sciences, was at a stage where it was possible for a truly gifted person to master all the knowledge that was available during their lifetimes.

The situation started to change around the 17th century. By the early 18th century, tremendous advances in knowledge had made it impossible for anyone to be a universal encyclopaedist, and keep up with the constant generation of new knowledge. This realization was gradually reflected in the development of a new branch of knowledge, which initially became known as natural philosophy, and began to be distinguished increasingly from traditional philosophy, which was earlier considered to be the exclusive discipline for knowledge. The 19th century witnessed exponential advances in human knowledge and, with it, technological developments. It was no longer possible for anyone individual to master even natural philosophy completely. Thus, new disciplines began to emerge, which further fragmented the knowledge-base to manageable levels. Natural philosophy was subsequently subdivided, initially into physics and chemistry, and later to other additional disciplines such as life sciences and biological sciences.

The knowledge and information explosion of the 20th century further accelerated this reductionism trend. Disciplines became more and more fragmented. It became humanly impossible for anyone to know everything there is to know even in a much more restricted subject area such as water. Knowledge, communication and information revolution and increasing globalization witnessed towards the end of the 20th century further constrained the mastering of a person's disciplinary knowledge-base. With the frontiers of knowledge expanding continuously, it has become increasingly difficult for professionals to keep up with the advances even in their limited areas of interest, such as water.

As the world became increasingly complex and interrelated, the disciplinary knowledge-base of individuals started to reduce as well. People started to specialize in narrower and narrower subject areas. Concomitantly, managing human societies became increasingly complex, as a result of which new institutional machineries had to be created with increasingly narrower focuses. New institutions had to be created in areas that were part of broader groups earlier. For example, in 1972, when the United Nations Conference on the Human Environment was held in Stockholm, only 11 countries had environmental machineries. Two decades later, nearly all countries of the world had similar institutions.

For a variety of reasons, including efficient management, smaller institutions have generally been preferred, compared to humongous ones.

During the past century, a progressively reductionism approach has been applied to both knowledge and institutions. In one sense, integrated water resources management can be viewed as a nostalgic approach to a broader and more holistic way to manage water, as may have been possible in the past, perhaps half a century ago. However, since the world has moved on, water management needs to move with it.

In a fundamental sense, integrated water resources management, irrespective of the general impression prevalent in the water profession, is not holistic. This is not surprising, since most water professionals consider, explicitly or implicitly, water to be a very important, if not the most important, resource for human and ecosystems survival. Other issues such as energy, agriculture, industry or the environment do not generally receive appropriate emphasis or consideration from the water profession compared to water, although some of these issues may receive comparatively more attention than the others.

### **Increasing Complexities of Natural Resource Management**

If integrated water resources management is considered essential by the water profession, other disciplines can justifiably promote very similar concepts such as integrated energy management, or integrated agricultural management, or integrated environmental management or integrated rural development. Such terminologies already exist at present, even though promotion of integration in these areas has received significantly less attention or emphasis compared to water. Unfortunately, in a complex and increasingly interdependent world, issues such as water, energy, agriculture, the environment or rural development are becoming increasingly interrelated and interdependent. Accordingly, integrated management of any one of these resources is not technically possible and institutionally and managerial feasible, because of accelerating overlaps and interlinkages with the other resource and development sectors. Developments in the water area invariably affect management of resources such as energy, agriculture or ecosystems, and the developments in these resource areas, in turn, affect water, both directly and indirectly.

As an example, let us consider the issue of water and energy interrelationships. The water profession has mostly ignored energy, even though in many ways water and energy are closely interlinked. For example, water not only produces energy (hydropower), but also the water sector is a prodigious user of energy. Accordingly, in a country such as India, hydropower accounts for slightly over 20% of electricity generated, but the water sector in turn 'consumes' a similar amount of India's electricity. In Mexico, the water sector uses an even larger percentage of national electricity generation. Furthermore, no large-scale electricity production, be it thermal, nuclear or hydro, is possible without water. In some countries such as France, the biggest user of water is not agriculture, but the energy industry. Thus, it simply is not possible to consider water resources management in an integrative manner without reference to energy, or integrated energy resources management without considering water. In other words, conceptually, technically and managerially, it is not possible to consider parallel efforts which will focus exclusively on integrated management of water or energy as a single resource, because of their inherently extensive and intensive overlaps and interlinkages.

Since water and energy are closely interrelated, integrated water resources management per se would contribute to 'unintegrated' energy management, since these two resources

have many common factors in terms of planning, operation and management, which are sometimes mutually exclusive. Both of these two resources cannot be separately planned in an 'integrative' manner, irrespective of how integration is defined. Optimizing the benefits of integrated water resources management, even if this can be operationally achieved by a miracle, will not result in the maximization of the benefits of integrated energy management or vice versa. There will be substantial trade-offs, both positive and negative, for any such management approaches for these two resources in an independently integrated manner.

It can be conceivably argued that if water and energy cannot be managed in an integrative manner independently, perhaps these two resources can be managed together as integrated water and energy resources management. This is also not a practical solution because while there are significant interlinkages between water and energy, the processes available at present for their overall management are very different, and the expertise required to manage these two resources efficiently is also very different. Furthermore, institutionally, if these two resources are combined under one umbrella, for most countries it will result in a large and unmanageable institution, which is likely to be both undesirable and counterproductive. In a few countries, at least institutionally, water and energy are managed by the same governmental ministry. These countries are comparatively small, and thus the management of these two resources by one single institution may still be feasible. However, this is not possible for large- to medium-sized countries such as Brazil, China, India, Mexico, Nigeria or South Africa.

If the current global institutional arrangements for the management of water and energy resources are analyzed, they are often somewhat arbitrary. For example, hydropower in some countries such as Brazil, India, Mexico or Turkey is placed within the mandate of a separate ministry, and/or institutions, which means that the Ministry of Water has somewhat limited responsibility as to how hydropower projects are planned, operated and managed. In some other countries, the Water Ministry is responsible for hydropower, even though hydropower contributes to a very significant percentage of national electricity generation. Thus, there is no simple, elegant and universal solution in terms of integration, a fact that has been consistently ignored by the proponents of integrated water resources management. It is also interesting to note that in a country such as Canada, the word 'hydro' is synonymous with electricity, even though water and electricity are managed very differently, both technically and institutionally, at national and provincial levels.

Irrespective of whether hydropower is located institutionally within the Ministry of Energy or Water, it ensures that neither water nor energy can be managed on an integrated basis. Integration requirements, if all these can be achieved, for each of these resources are likely to be different. What is thus needed is not integration in terms of management of these two resources, but close collaboration, cooperation and coordination between the two institutions, as well as other public and private sector institutions associated with their development and management. In a real world, such collaborations are unfortunately limited, and often somewhat ad hoc. They also vary with time, even for the same country. One is reminded of Voltaire's assertion that "best is the enemy of good". The 'best' approaches for integrated water management and integrated energy management may not be compatible. What we can strive for is a 'good' solution which could result in acceptable management practices for both water and energy in a coordinated manner.

The problem becomes even more complex since it is not only the energy sector that is closely linked to water, but also other economically important sectors such as agriculture,

the environment, industry or tourism. Globally, the agricultural sector is the largest user of water. Therefore, neither agriculture nor water can be managed in an 'integrated' way without considering the other. The issue becomes even more unmanageable if parallel efforts are made to manage water, energy, agriculture, industry, and/or environmental sectors in an integrated manner however the word integrated is defined. Thus, integrated water resources management, from an initial and somewhat superficial view, may appear to be a holistic approach, but on deeper consideration, it still ends up as a reductionist approach, but perhaps at a somewhat higher level.

Accordingly, integrated management of a specific resource such as water cannot simply be considered to be a holistic approach. It can be argued that it may be possible to manage two or more natural resources by combining their management processes through one common institution. Past experiences indicate that this is generally neither a practical nor efficient solution. A good example is what happened in Egypt during the 1970s, when the two separate Ministries of Irrigation and Agriculture were combined to form one single institution. The expectation was that this combined entity would manage these two sectors more rationally and efficiently than what had happened in the past. The Minister of Irrigation, who was probably one of the most dynamic and competent Ministers of Irrigation that Egypt had ever had since President Nasser's Revolution in 1952, became the minister of this new enlarged institution. In spite of his determined and strenuous efforts, it was simply not possible to manage the combined Ministry efficiently or integratively. After a very short period, the management experimentation was reversed: irrigation and agriculture became two separate ministries again. This practice has continued ever since, even though the names of the Irrigation Ministry of Egypt were changed twice subsequently. In spite of the name changes, this ministry has basically remained a water management institution, just as in the vast majority of the other countries of the world.

### **Additional Constraints to Implementation**

In a real world, integrated water resources management, even in a limited sense, becomes difficult to achieve because of extensive inter- and intra-ministerial turf wars and bureaucratic infighting. In addition, the legal regimes (for example, national constitutions in countries such as Canada, India and Pakistan) make integrated management of any single resource very difficult. Integrated management of two or more resources by institutions that have been historic rivals is an almost impossible task.

It should also be noted that water has linkages to all development sectors and social issues such as poverty alleviation and regional income redistribution. It is simply unthinkable and totally impractical to bring them under one roof in the guise of integration, irrespective of how integration is defined. Such integrations are most likely to increase the complexities of managing the resources, instead of solving them.

Some have argued that integrated water resources management is a journey and not a destination, and the concept provides only a road map for the journey. However, the problem with such a simplistic reasoning is that in the area of water management, we are long on road maps, but very short on actual directions or competent drivers! Equally, road maps may be useful, but in order to use them we need a starting point and a destination. Without knowing the starting point and the destination, road maps are of very limited use since one is mostly likely to be all over the place. Another problem of using a road map analogy for integrated water resources management is that we do not even know where we



wish to go, except in a very vague manner, and since we have no idea as to how to identify the final destination, we would have no idea when we have reached that destination, even if we reach the destination by some miracle. Not knowing the destination, it is not possible to decide if we are travelling in the right direction or the probability of reaching the right end. In the final analysis, it is not very helpful to be long on vague and unimplementable concepts but short on their implementation potential, as has been the case thus far for integrated water resources management.

There are also some negative implications of integrated water resources management, which, for the most part, are not being seriously considered.

Already, in a few countries, there are indications that the main national water institution is trying to take over other water-related institutions in the name of more effective integration. The implicit assumption is that such integration of water-related institutions will contribute to integrated water resources management. However, even if this was possible, it is unlikely to be an efficient and socially desirable approach since different institutions have different stakeholders and interests, and this diversity is a component of any democratic process. The consolidation of institutions, in the name of integration, is likely to produce more centralization, and reduced responsiveness of such institutions to the needs of the different stakeholders, which is not an objective that the present societies and international institutions prefer. Water management must be responsive to the needs and demands of a growing diversity of central, state and municipal institutions, user groups, the private sector, NGOs and other appropriate bodies. Concentration of authorities into one, or fewer, water institutions could increase bias, reduce transparency and proper scrutiny of their activities.

In addition, objectives such as increased stakeholders' participation, decentralization and decision making at the lowest possible level are unlikely to promote integration at a higher macro level, however the integration process is defined. Under most conditions, especially for macro- and meso-scale water policies, development objectives such as stakeholders' participation and a bottom-up approach at the micro-level are often unlikely to contribute to 'integration' at higher levels. This has been repeatedly observed in many developing countries such as India and Bangladesh. A variety of trade-offs between these development objectives will be necessary, since these objectives often are not mutually exclusive.

Integrated water resources management, like other similar concepts (e.g. integrated rural development, or integrated area development), has historically run into very serious difficulties in terms of their implementation. Conceptually these integrated concepts may be easy to understand, at least initially, but the world is complex, and many concepts, irrespective of their initial attractiveness and simplicity, cannot be applied to solve increasingly complex and interdependent issues and activities (Biswas & Tortajada, 2004). Even after more than half a century of existence, it has not been possible to find a practical framework that could be used for the integration of the various issues associated with water management. There is absolutely no evidence at present, irrespective of the widespread international rhetoric of the past 15 years, that this situation is likely to change in the foreseeable future.

## Conclusions

It is argued that integrated water resources management has become a popular concept in recent years, but its track record in terms of application to more efficiently manage

macro- and meso-scale water policies, programmes and projects has been dismal. Conceptual attraction by itself is not enough.

It should be noted that extensive analyses and research carried out at the Third World Centre for Water Management indicate that on a scale of 1 to 100 (1 being no integrated water resources management and 100 being full integration), one is hard pressed to find even a single macro- or meso-level water policy, programme or project anywhere in the world that can be given a score of 30, based on medium- to long-term performance. Indeed, it is a very dismal implementation record for a concept that has been around for nearly two generations.

Concepts and paradigms, if they are to have any validity and usefulness, must be implementable so that better and more efficient solutions can be obtained. Not only is this not happening at present for integrated water resources management, but also there are no visible signs that the situation is likely to change in the foreseeable future.

It is also necessary to ask a very fundamental question: why it has not been possible to properly implement a concept that has been around for some two generations in the real world for macro- and meso-level water policies, projects and programmes? Another important question that needs to be answered is that is the concept of integrated water resources management an universal solution, as its numerous proponents have consistently claimed, or is it a concept that has limited implementation potential, irrespective of its initial conceptual attractiveness and current popularity? Unless the concept on integrated water resources management can actually be applied in the real world to demonstrably improve the existing water management practices, its current popularity and extensive endorsements by donor institutions will unquestionably be a limited-term phenomenon, which will become irrelevant on a medium- to long-term basis.

In addition, the world is heterogeneous, with different cultures, social norms, physical attributes, skewed availability of renewable and non-renewable resources, investment funds, management capacities and institutional arrangements. The systems of governance, legal frameworks, decision-making processes and types and effectiveness of institutions mostly differ from one country to another, and often in very significant ways. Accordingly, and under such diverse conditions, one fundamental question that needs to be asked is that is it possible that a single paradigm of integrated water resources management can encompass all countries, or even regions, with diverse physical, economic, social, cultural and legal conditions? Can a single paradigm of integrated water resources management be equally valid for an economic giant like the United States, technological powerhouse like Japan, and for countries with very diverse conditions such as Brazil, Bhutan or Burkino Fasso? Can a single concept be equally applicable for Asian values, African traditions, Japanese culture, Western civilization, Islamic customs and the emerging economies of Eastern Europe? Can any general water management paradigm be equally valid for monsoon and non-monsoon countries, deserts and very wet regions, and countries in tropical, sub-tropical and temperate regions, with very different climates, institutional, legal and environmental regimes? The answer is most probably to be an emphatic 'no'.

What is now needed is an objective, impartial and undogmatic assessment of the applicability of integrated water resources management. Unfortunately, most of its current promoters have a priori assumed that this concept will automatically make the water management processes and practices ideal. Equally, the proponents of this concept have already spent so much time, energy and resources that they are mostly very reluctant to consider, let alone admit, at least in public, that the emperor may not have any clothes.

What is most likely happen in the coming years is that both the donors and the developing countries will finally appreciate the non-implementability of this concept. Based on past experience, its promoters are unlikely to admit that the concept has not worked in the past, is not working at present, and is highly unlikely to work in the future for a rapidly changing world. Accordingly, the most likely scenario of the future will be that its past and present promoters will gradually start downplaying the strong rhetoric of integrated water resources management, and start focusing on the 'ends' of water management rather than exclusive emphasis on only one of its 'means', as has been the case in recent years. A careful analysis indicates that a few international and national institutions, which have actively promoted this concept earlier, have already started to downplay it. This trend is likely to accelerate in the future.

The current evidence indicates that irrespective of the current popularity of the concept, its impact to improve water management has been, at best, marginal. It may work for micro-scale projects, but there is absolutely no evidence from anywhere in the world that it will work for macro- or meso-scale policies, programmes and projects on a long-term basis. A cynic might even say that many in the water profession mostly sit in watertight compartments, but preach integrated approaches to water management. Perhaps, the salutary caution of Harold Macmillan, the former Prime Minister of the UK, is appropriate in the current context: "After a long life I have come to the conclusion that when all the establishment is united, it is always wrong!" Is it possible that integrated water resources management falls squarely within this cautionary statement of this remarkable statesman?

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