Strategies to converge local water managing practices and water policy with water science and engineering in Southern and Eastern Mediterranean countries

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STRATEGIES TO CONVERGE LOCAL WATER MANAGING PRACTICES AND WATER POLICY WITH WATER SCIENCE AND ENGINEERING IN SOUTHERN AND EASTERN MEDITERRANEAN COUNTRIES

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SUMMARY - Policy making in developing countries is still ad hoc and does not fully use research-based information. One of the main reasons for this is the weak linkages between researchers, especially the policy research community, and policy makers. Development of local and regional actions to narrow the gap between research community and other social solidarities, especially the policy makers, is desperately needed and of paramount importance. This paper is mainly dependent on the ideas extracted from a critical review done recently by a panel of experts for EU-INCO for evaluating water research projects with relevance to Integrated Water Resources Management (IWRM) approach done in the period 1994-2006 (FP4-FP6).

Key words: Policy research, research communities, ntegrated water resource management.

INTRODUCTION

Water is an essential driver of quality of life, health, food security and it is a pillar for economic development. The water sector involves much more than irrigation, water demand and supply, wastewater treatment, etc. It encompasses, in addition to its engineering and science aspects, political, social, environmental, economic and institutional dimensions. An example of its economic implications is that the production of one kilogram of grains consumes 1,000-4,000 liters of freshwater, food production already accounts for about 80% of freshwater use in developing countries and still these countries face the situation of food insecurity (Allan, 2001). In addition, the political dimension plays an important role in water sector, since the majority of people live in river basin shared by two or more nations. Therefore, much more is needed on the multidisciplinary and integrated nature of water sector and focus should be directed to these dimensions for more effective policy making (Allan, 2001; Gyawali et al., 2006).

Research is financed and undertaken to contribute to the progress of the human kind. Its efficiency is measured by the degree of its impact and mobilisation of its generated knowledge. Huge amount of work conducted by researchers does not have its proper and effective way to policymakers. Also, if the research results reach the policymakers, the impeded knowledge in these results is not properly mobilised. It is evident that there are inadequate and inefficient coordination, collaboration and communication between researchers and policy makers as well as with other social solidarities. In fact, challenges do not end with publishing research results; on the contrary, the real challenges start after this.

WATER SITUATION IN THE SOUTHERN AND EASTERN MEDITERRANEAN COUNTRIES AT A GLANCE

The Southern and Eastern Mediterranean countries (SEM) – figure 1, suffer from the least water availability per capita compared with any other region in the world (Ellysar et al., 2005). It has less than 1% of the world's freshwater resources and 5% of the world population. Water problems are exacerbated by pollution from human activities that negatively affects water quality and can further lower the available water quantities. These challenges will get worse in the future, as population increases, overexploitation of current water resources and pollution continues, and the corresponding demand for more freshwater continues to be on the rise.

Fig. 1 Map of Southern and Eastern Mediterranean Countries involved in the Report

The usually displayed trends have indicated that there is an approaching water crisis in SEM countries. It has been always emphasized that the main constraint to agricultural development of arid and semi-arid land in the Mediterranean will be the availability of water, rather than land. Although the physical availability of water to each country remains constant, the demand for it will increase steadily for the near future. The major challenge facing water planners and managers was and will be to balance demand and supply of water under these difficult conditions.

A summary of SEM countries water situation is shown in Table 1 below. The table shows clearly that six of the nine countries listed already face severe water stress, with levels often well below the redline figure of 1000 m3 per capita per year.

Table 1. Basic water data on SEM countries

Country	Population (million)	Land area (1000 km^2)	GNI per capita ($)	Agriculture % of GDP	Freshwater per capita (m^3/year)	Population with access to improved water services (%)
Morocco	28,238	446.3	1,190	15	1,062	82
Algeria	29,950	2,381.7	1,550	11	477	94
Tunisia	9,457	155.4	2,090	13	434	NA
Egypt	62,655	995.5	1,380	17	930	95
West Bank and Gaza Strip	2,839	NA	1,780	17	NA	NA
Jordan	4,740	88.9	1,630	2	148	96
Syria	15,711	183.8	970	NA	2,845	80
Lebanon	4,271	10.2	3,700	12	1,124	100

* Source: Adapted from Grover (2002) and based on the World Bank Atlas (2001). GNI: Gross National Income; GDP: Gross Domestic Product; NA: not available.

In addition to the obvious physical constraints, there are other factors leading to the exacerbation of the water crisis in SEM countries. The water scarcity is coupled, most of the time, with scarcity in management of this vital natural resource. Despite the tremendous efforts exerted by scientists and engineers in saving water by enhancing irrigation efficiency and increasing other non-conventional water resources, there are still indications that the water availability for nearly all sectors is becoming

lower. The water use in agriculture is becoming much more each year despite all the water use efficiency measures.

In a study related to water demand management research activities in the Middle East and North African Countries (MENA), the results indicate that current research activities are significantly higher than the past activities. The results, as shown in table 2, indicate also that researchers are equally interested in technology development, policy and institutional issues.

In spite of the broad spectrum of research topics covered, there are still topics that receive less attention than others do. The following research gaps would be identified:

- Communication and information systems required to bring the message of proper water management to both end users and policy makers ;
- Assessment of the socioeconomic benefits and costs of different scenarios or systems for water allocation.

It is worth mentioning that the existence of research gaps in some areas does not mean that this should serve as guidelines for future research. Some gaps may indicate that there is no necessity to implement additional work as in the field of irrigation efficiency where we need the capital to mobilise the existing knowledge of research results.

Table 2. Distribution of water demand management research in SEM countries

Types of research	Past	Current	Future
Assessment and development of WDM policy and processes	45.4%	63.6%	45.4%
Development of WDM technologies	27.2%	72.7%	45.4%
Documentation of traditional and modern water management systems	22.7%	50%	45.4%
Improvement of intersectoral water allocation	27.2%	63.6%	54.5%
Development of financial management systems for improved WDM	9%	40.9%	54.5%
Improvement of intersectoral water allocation	27.2%	50%	45.4%
Development of alternative institutional designs for WDM	9%	59%	18.1%
Development of local water supplies to replace central supplies	27.2%	50%	63.6%

*Courtesy of Management of water demand in Africa and the Middle East, Current Practices and Future Needs, *sous la direction de David B. Brooks, Eglal Rached et Maurice Saade, 1997.*

The findings of this survey study[4] indicate that emphasis on appropriate water conservation policies should begin as soon as possible, especially in countries that are not self-sufficient in water.

It is difficult to set one single recipe to solve this exacerbating water scarcity problem due to the complexity and multidisciplinary nature of water sector. However, there are indications that we are facing evident shortcomings in some strongly relevant domains. Of these important domains ***is the translation and utilisation of water research results into practical and fruitful outcomes***. This is clearly manifested in the policy research area that should help in the formulation of water policies and strategies that is an integral part of each country comprehensive policies and strategies.

The following section will exhibit some strategic options necessary to activate the relationship between science and engineering outcomes with policymaking process within an integrated natural resources management vision.

General Background

Modernity Theory

An understanding of water resource management at the global and the local levels would be enhanced by being familiar with the trajectories and paradigms of water management because of the ideas and new technologies associated with modernity era. An important dimension of such analysis is also helpful in explaining why trajectories of investment and development have diverged between

the North and the South at the start of late modernity in the North since the late 1970s (Allan, 2005). Water management has absorbed the driving ideas and new technologies associated with the modernity of the past two centuries. Water scientists and engineers solve problems and were able to be very competent in early modernity. Stakeholders represented in politicians, engineers, farmers and food consumers were all certain that the progressively larger withdrawals of water were good. This is accompanied by industrial modernity and in called the hydraulic mission.

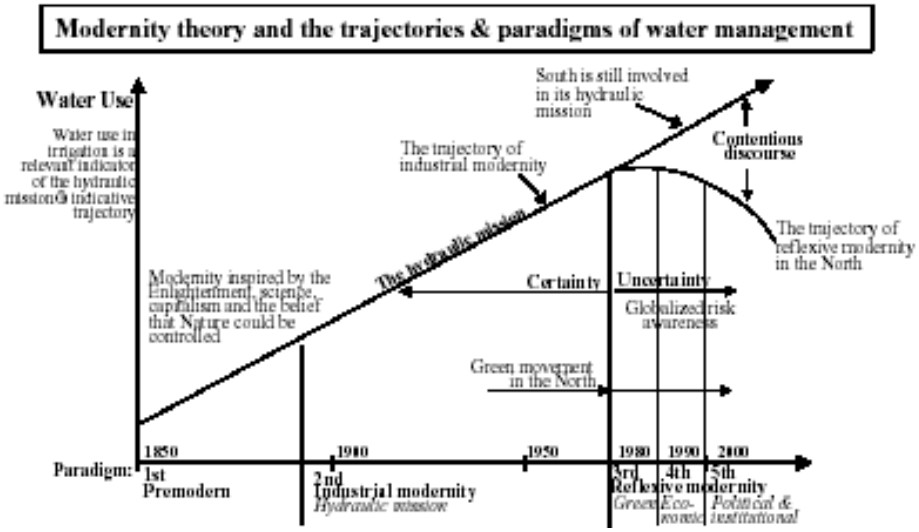

Fig. 2: Trajectories of freshwater use in the Northern and the Southern economies over the past two centuries (courtesy ref 2).

The constantly rising trajectory reflects the process of taking more and more water out of the environment to produce food in the agricultural sector. Before about 1980 ‘certainty’ prevailed that capturing more water for food and fibre production was sound. The messages raised by the green movement in the west and in the United States, shifted the emphasis of the water discourse from ‘certainty’ to ‘uncertainty’. This notion of uncertainty about the soundness of the hydraulic mission had gained such significance by the beginning of late modernity. Uncertainty became the dominant mindset underpinning water resource allocation in the North.

In the South, on the other hand, there remains a commitment to taking more water out of the environment. This is adopted in order to further increase the output of food to meet rising food demands, to avoid dependence on imports, and to increase the wealth of the respective economies as a whole. It is worth mentioning that the Southern economies achieved spectacular increases in production, by four and five times in the major grains, between 1961 and the end of century. This increase in the production resulted mainly from the following:

- increased freshwater use ;
- the expansion of the rain-fed area of crop production ;
- increased efficiencies in the use of land and water and
- the effective use of other inputs such as energy and fertilizers.

This general background about the water management paradigms is aiming at providing a perception about the tools with which it may be possible to address the problem of understanding and predicting water resource allocation and management and related policy-making processes. This background would establish theoretical linkages with culture, society and political economy being included as essential elements of a larger analytical framework. In addition, this linkage has proved to be an attractive intuitive explanation of how communities would react to resource scarcity (Allan, 2001).

Strategies to Converge Water Science and Engineering with Local and Regional Actions and Water Policies

Many strategic options would be implemented or adopted to converge the research dimension relevant to water science and engineering with local and regional actions and water policies. These strategic option are of multidisciplinary nature and not inclusive to the water sector personnel. The following are some important strategic options that would narrow the gap between water research outcomes and policymaking process:

Constructive Engagement – Integrated Water Resources Allocation and Management (CE-IWRM):

This strategic option is presented because IWRM has been criticised despite the fact that it is strongly adopted at the global and national levels. One important aspect of criticism is that IWRM in non-operational[6]. Another aspect of criticism is referred to the fact that IWRM does not help water managers understand the reasons for difficulties of IWRM being operational (Biswass et al., 2005).

For those working in the water sector as scientists, practitioners and educators, IWRM is perceived to be driven mainly by technical and economic fundamentals, enriched by a measure of increased environmental awareness. The problem with this understanding and with the international IWRM discourse, and its regional expressions, is that it has ignored the political dimension, although the notion of governance and related politics has been gaining a place.

A recent EU-Critical Review[2] indicates that IWRM could not be operationalised because it has not been adequately defined, and the definition of IWRM needs to be modified. This modification is required to make IWRM relevant and operational. It was found also necessary to comprehensively define some essential concepts like '*sustainability', 'integrated', and 'management'.*

Sustainability

There is a variety of definitions for sustainability. These definitions are dependent on the degree to which the concept is seen as limited to the environment, or a specific domain, or broadened to include the areas of social justice and other human activities. One of the most broadly accepted definitions was developed in 1987, when the World Commission on Environment and Development, agreed on a definition of sustainable development: *"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."*

The sustainability term is an essential component of any analysis of water policy. However, it can be misleading and have inefficient analysis if it is restricted to the water environment. An operational notion of sustainability is captured in the larger context of the sustainability of society, the economy as well as the maintenance of the environmental services provided by water in the environment. The concept of sustainability is very rich indeed, if this threefold context is adopted (Gyawali et al., 2006). Sustainability is a discursive outcome of the contending articulated concerns of society, those involved in the economy and those anxious about the status of the environment; therefore, its definition is a dynamic one.

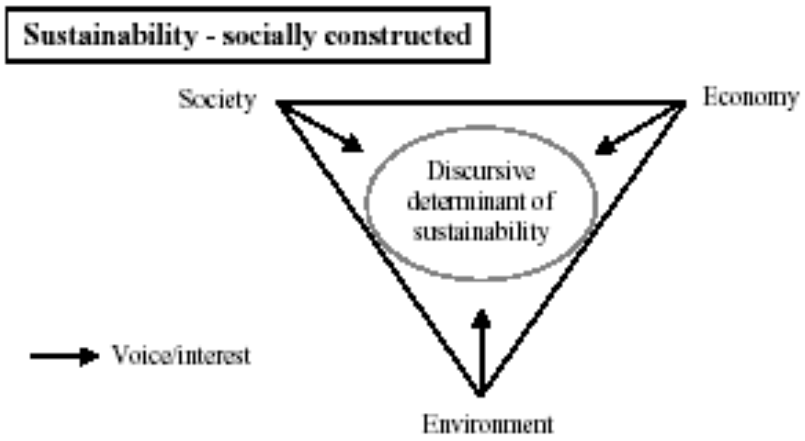

Fig. 3: The three dimensions of water sustainability – social, economic and environmental – and the central mediating role of discursive hydro-politics (Gyawalli et al., 2006).

Figure 4 illustrates how the different definitions of sustainability influence actual trajectories of water use that contrast with the economically and environmentally secure trajectory recommended by water scientists approaches.

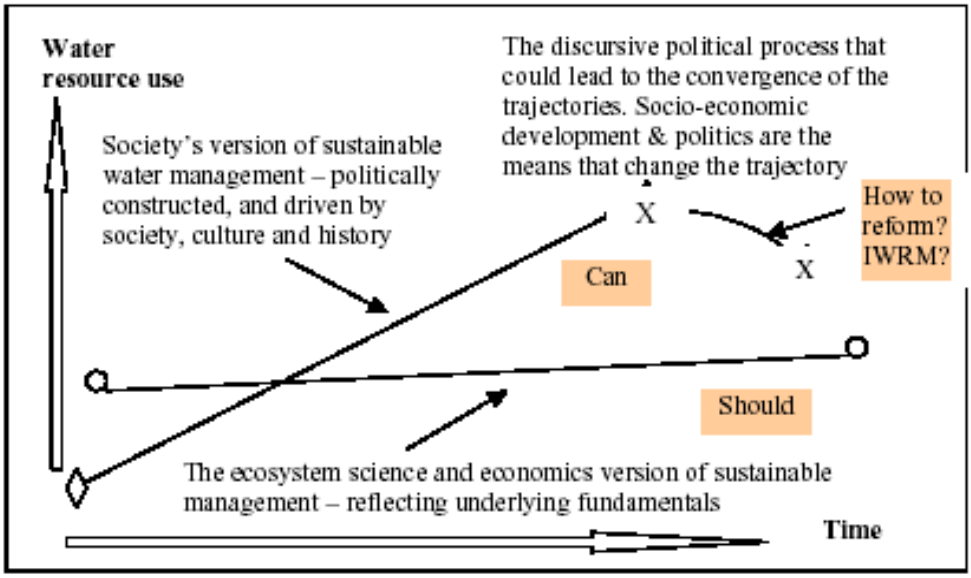

Fig. 4. Conceptualising the trajectory of water management determined by society, ecosystem scientists and economists – the lower trajectory. Convergence - shown as X-X -is achieved by getting the science into the political processes that determine use and policy (Gyawalli et al., 2006).

IWRM is composed of two dimensions: integration and management. *Integration* implies getting scientists and professionals from different fields to work together. Integrating the competing interests of water scientists, water professionals, of water consumers is very political indeed. *Management* is also political in the sense that within the rational implementation of a reform agenda in the water sector, there will be a need to *re-allocate* water between existing users. This is increasingly the case in a world where water scarcity has become the norm. IWRM, then would be a safer term if it is transformed to *IWRAM: «* Integrated Water Resources *Allocation* and Management ».

Water management would be strongly related to the framework of 'four ways of life' identified by Douglas (Douglas and Wildavsky, 1982). Thompson has shown the framework to be particularly relevant to the water sector (Thompson, 1988). He indicated that there are *three social solidarities* that shape the politics of water use and management:

-The institutions in the public sector -*hierarchism*- which are the dominant providers of water services and regulatory regimes ;

-The private sector firms and local *entrepreneurs* that provide some water services and a high proportion of construction capacity ;

-The *civil movement* bodies that advocate water related *environmental and human rights ethics* and play a social audit role.

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It is important to note that the third solidarity can only deploy *voice*. The other two solidarities can deploy a wider range of instruments. Governments can tax, subsidise, legislate, regulate and provide employment and a welfare state. The private sector can provide services via markets and other contractual arrangements. It can also provide employment and promote its interests via various forms of advertising. The purpose of identifying these social solidarities is to establish their relevance to a sound and possibly an operational IWRM approach.

The capability to manage water and, more importantly, to reform the way water is managed reside in two social solidarities with different approaches (Fig. 5). For example, national water ministries and local government bodies provide *public sector finance, management and governance*. The second solidarity is the *private sector,* which uses the tools of the *market* to provide water services. The third

solidarity, which is also of particular importance in the water sector, is *civil movement activists* who provide a voice for the impoverished consumers and the environment. *Civil movements – NGOs* and unions by their mobilisation of civil society bodies – have had a very significant impact - on how the value of water has changed in the past three decades.

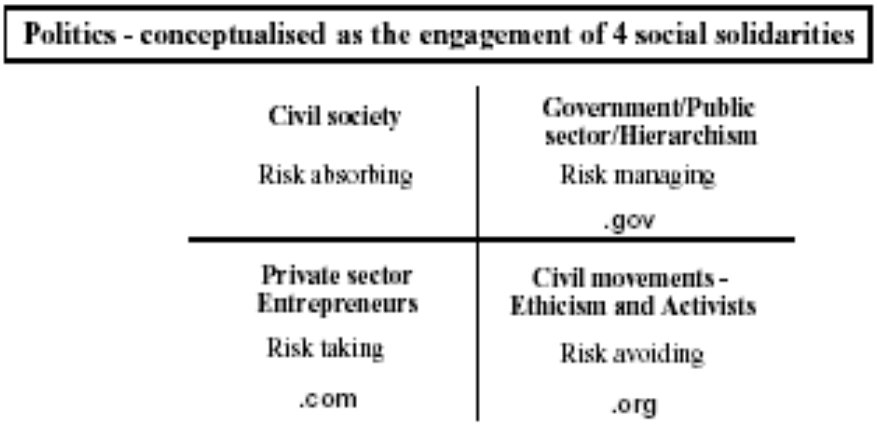

Fig. 5. Four Social Solidarities (Gyawalli et al., 2006).

« The importance of engaging the above perspectives or approaches in developing water allocation and management policies can be illustrated by considering how each social solidarity deals with *risk. Government departments* assume they can *manage risk.* The *private sector* tends to be *risk taking* – at least with respect to the interests of society and the protection of the water services of water. The third solidarity, sometimes identified as *ethicists*, is characterised by its adoption of principled positions. It *advocates risk avoiding* the maintenance of existing livelihoods that use large volumes of water » (Gyawalli et al., 2006).

To be operational and effective IWRM has to be *constructively engaged*. That is, IWRM practice must involve inputs from all social solidarities and must be gender sensitive. This analogy leads to coining the term Constructively Engaged Integrated Water Resources Allocation and Management – CE-IWRAM (Dixit et al., 2004).

« Water management and CE-IWRAM can take place in *humid* or *arid* environments, in economies *well endowed with freshwater and/or soil water* or not. They can also take place in *pre-modern* political economies with *little adaptive capacity* or in *late modern* political economies, which have the *adaptive capacity* to cope with water scarcity and with any other factor endowment deficits ».

The adoption of CE-IWRAM approach represents the extra mile that needs to be travelled to ensure that IWRM is operationalised, enables communication and achieves impact within shortened periods. Such constructive engagement offers the greatest chance of bridging the gap between the fundamentals of society and nature investigated by science and the perceptions of water actors in society, which are politically constructed and driven by culture, societal context and history.

The lack of CE-IWRAM often leads to the following results:

- fragmented institutional structures
- a sector-by-sector management approach and overlapping ;
- conflicting decision-making structures,
- upstream and downstream conflicting interests regarding riparian rights and access to water,
- diversion of public resources for private gain,
- Unpredictability in the application of laws, regulations and licensing practices, which impede markets.

Communication

Constructive engagement would be achieved by establishing an efficient and creative communication among social solidarities. Researchers are distributed among the three effective social solidarities of water management. Research is not a final goal in itself but is implemented to contribute to the prosperity of human being. The issue of communicating water research results is

very critical in policy adoption and knowledge mobilisation « state-of-the-art research needs state-of-the-art communication and knowledge mobilisation strategies to achieve impact ». Research results should be widely and effectively communicated to policy-makers, to the technical community, to local water users and managers, to the education sector and to the private sector. The research should have impacts on capacity building, on the advancement of water management via innovative knowledge generation and its use to support solving problems.

Policymakers always want the right information, in the right form, at the right time. The right form depends on the policymakers' background and perspective. The right time, depends on the stage of the policy making process that can be divided into the following stages (Dixit et al., 2004).

- policy agenda development;
- specific objectives and policy options identification ;
- options evaluation ;
- recommendation advancement ;
- consensus building ;
- legislation set up ;
- policy implementation ;
- policy evaluation and impact assessment.

The following are extremely important aspects that should be taken into consideration to have the best chance for research outputs to find their way into the policy formulation process:

- Research results always written in a language very well appealing to other researchers but indigestible to policymakers. Most policymakers do not read lengthy research reports especially when written in a language with different groups in mind. The translation process for research result has to attract the attention of policy makers in addition to the simplification of displaying these results.
- The value of researches is implied in being inserted into the political process at the right time. To have the best chance for research outputs to find their way into the policy formulation process is to be inserted while this process is between stages one to four. Once research results lead to policy action, then researches have achieved their goals.
- « The 'container theory' of communication usually assumes ideal conditions: a sender packs the information he or she wants to convey into a container and passes it to a receiver who unpacks it and immediately understands the full content . Research results and the fundamental concepts behind them must be explained clearly and reinforced on a face-to-face basis with ample room for discussion.
- The other essential important approach to conveying research results to policy makers is via media. There is a natural interest of people and policy makers in particular, with issues raised by the media. The media makes different issues attaining high public profile that is of paramount importance to policymakers and parties. At the same time, the presentation of water issues in the media should be able to attract attention. This is another issue related to the professionalism of the mass media and the vision of technicians to make it booming.

Developing an effective means of communication entails the precise definition of the target audience and characteristics therein, as well as the change one is hoping to bring about through communication. What is the communication objective? Is it to bring about a change in knowledge, attitude or practice? Effective communication depends not only on what you are communicating, but also on an understanding of with whom you are communicating and for what purpose.

Most scientific and academic research centres are concerned with the number of publications in refereed journals without paying much attention of the impact of their researches even in one single report or study. If scientists have new knowledge, that could enhance the environmental services of water and its economically efficient use, they have to acquire new skills of communication.

Networking

Networking could be an effective approach to productive communication. It can develop an information system on water related matters that can be shared nationally and regionally. The main goals of networking are to achieve cooperation, coordination and collaboration through developing institutional framework to address the water relevant issues.

Networking is an important old tool for improving the flow of ideas and knowledge among researchers and policy makers utilising the development of electronic networking recently. There are many famous existing network dedicated primarily to water research in SEM countries like: Arab

Water Information Network (AWIN), The Centre for Environment and Development of the Arab Region and Europe Water Information Network (CEDARE), Network for Water and Sanitation International (NETWAS), Inter-Islamic Network on Water Resources Development and Management.

International Examples

Some of the developing countries have made a certain effort to develop enabling structures to allow the people's initiative to flourish. One such country is South Africa[2], which has a fairly comprehensive framework in place, at the central, state and local levels. Radical constitutional reform occurred in 1994, followed by a comprehensive, countrywide stakeholder engagement process that culminated in a new water law. These and other social and political changes in turn generated an unprecedented level of focused enquiry in the water sector. They have also spawned an extraordinary number of integrated, water-related, research initiatives on institutions, public participation and decision-making processes. Scientists of all stripes – modellers, ecologists, interpretive social scientists and scientists from the water sector and beyond - have had to respond to and cope with the priorities defined by the urgent needs of society. The option to remain un-involved in a comfortable core of familiar disciplinary science has simply not been possible.

Contributions by partner country scientists have helped to ensure that the current dynamic of South African water science has gained a high profile regionally and internationally. Amongst other local- and national-scale benefits, this co-operation has contributed to parallel processes of water law reform in southern African countries and helped to improve the management of shared (transboundary) river basins across the region.

Applied water management research in South Asia has also played a very important role in advancing our understanding of *constructively engaged IWRM.* The groups of interdisciplinary water research scientists coordinated by SACIwater and ISET [Boulder & South Asia] have made globally significant contributions by demonstrating the importance of the *constructively engaged* version of *integrated water resources management*. They have also researched deeply into the adaptive water managing strategies of communities in flood prone and drought prone regions. Their contributions are especially significant in confirming the role of economic processes beyond the watershed (SACIwaters, 2002).

Korea established an integrated water management system focused on water-utilization and flood control. This project will construct three water management systems:

•There will be a water management centre for the integrated management of water quantity, water quality, and electricity generation.

• A water management system will be set up to collect real-time information on the operations of water systems, and to make possible the linking and operation of dams.

• They will construct an operation system for the remote control operation of electricity generation facilities.

CONCLUDING REMARKS

The following main conclusion would be draw out of the above displayed sections:

1. Technical solutions alone cannot provide the increasing population of the region with safe water supply and proper environmental sanitation. The region needs to integrate the technical, institutional, managerial, social, and economic aspects of water-resources management. The new approach for sustainable water supply and sanitation depends on local involvement, solutions, and knowledge within an overall framework of water and natural resources planning.
2. Water scientists and engineers must recognise that their task should include learning how to communicate their science in order for their methods reveal to other stakeholders in society. Simultaneously, governments, private sector and civil society movements should seek to incorporate scientific results more systematically in their deliberation and decision making process to reach robust solutions.
3. Research should connect local knowledge, gender-aware socioeconomic development, culture and policy institutions and implementing bodies. Research should also focus on the systems beyond the watershed and the conventional concerns of water scientists and managers. It is in these wider systems that the major strategic solutions to water problems will be found
4. International water research should adopt the constructively engaged IWRAM approach and seek links to education, capacity building and innovation.

5. Interdisciplinary research in a constructively engaged mode should pay specific attention to strengthening human capital and implementation capacities and improve the enabling environment within Partner Countries. Bridging the gap between research into the fundamentals and the perceptions of water users and water policy-makers should be a research focus in its own right.

6. Communication and impact are very challenging and sensitive issues in the water management for sustainable development purposes. Effective communication of research must be a prime goal and essential component in the research log frame matrix. Indicators of successful communication and impact need to be identified with special emphasis on links to major societal constituencies, education, training and innovation.

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