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**ECONOMIC AND SOCIAL COMMISSION FOR WESTERN ASIA**

Workshop on “Training of Trainers on the Application of  
IWRM Guidelines in the Arab Region”  
Kuwait, 14-18 May 2005

**MODULE ONE**

**CONCEPTS IN INTEGRATED WATER  
RESOURCES MANAGEMENT**

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<b>MODULE 1</b> <b>CONCEPTS IN INTEGRATED WATER RESOURCE MANAGEMENT</b>	
<b>RATIONALE</b>	With the fast growing population, urbanization, food security policies and the expansion of development and economic activities exerting pressure on available water resources, integrated management of water resources is becoming an increasingly serious concern throughout the ESCWA countries. The galloping rise in demand associated with the rapidly changing patterns of water use indicate that the availability of water can no longer be taken for granted, and water use in the immediate future will be governed by increasing scarcity in various parts of the ESCWA countries. Pollution further exacerbates water scarcity by reducing water usability downstream. Integrated Water Resources Management (IWRM) can be considered an effective tool in contributing to solving water problems in the ESCWA region since IWRM is a process that 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. There are a number of obstacles in the way of implementing IWRM concepts in the ESCWA countries. Limited technical capacity in water resources management in some ESCWA member countries is compounded by weak institutional and legislative capacity to translate IWRM concepts into policies and enforce them and the lack of political will to fully endorse this process.
<b>OBJECTIVES</b>	<ol style="list-style-type: none"> <li>1. Define IWRM concepts and principles</li> <li>2. Discuss how to implement IWRM</li> <li>3. Discuss Effective Water Governance</li> <li>4. Discuss water related problems in the ESCWA region within the framework of IWRM</li> </ol>
<b>MAIN REFERENCES AND BACKGROUND MATERIALS</b>	<ul style="list-style-type: none"> <li>- ESCWA (2003) <i>Updating the Assessment of Water Resources in ESCWA Member countries.</i></li> <li>- GWP (2001) <i>ToolBox for Integrated Water Resources Management</i>, Stockholm, Sweden</li> <li>- Savenije, H. (1999) <i>Water Resources Management Concepts and Tools</i>. IHE</li> </ul>
<b>SUGGESTED INTERNET LINKS</b>	<a href="http://www.nwp.nl">http://www.nwp.nl</a> <a href="http://www.cap-net.org/home.php">http://www.cap-net.org/home.php</a>
<b>DELIVERY OPTIONS</b>	
<b>DIRECTLY RELATED MODULES</b>	All modules

TOPIC	SESSION TOPIC SYNTHESIS
QUESTIONS FOR DISCUSSION	<ol style="list-style-type: none"> <li>1. What is the terminology used in the water sector with regard to IWRM?</li> <li>2. What are the Principles and key concepts of IWRM?</li> <li>3. Why are coordination and partnership important in IWRM?</li> <li>4. What is Effective Water Governance?</li> <li>5. What could be some water related problems in the ESCWA region constraining the implementation within the framework of IWRM?</li> </ol>
<p><b>Definition of IWRM</b></p> <p>Integrated Water Resources Management is defined 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." (GWP, 2000)</p> <p>There are a number of issues and interests that cut across the decision process in IWRM. They are conditions for sustainable development and desirable socio-economic development (the public interest). The key issues are related to sustainability and to the public interest.</p> <p><b>Guiding principles from The Dublin conference</b></p> <p>The UN Conference on Environment and Development, in Rio de Janeiro, 1992, was attended by 172 national governments, including many ESCWA member countries. The conference endorsed the report of the Conference on Water and the Environment, held in Dublin in January 1992. The "Dublin Principles" have played an important role in stimulating reforms in water management and play a central role in IWRM. The Conference Report sets recommendations for action at local, national, and international levels based on the following four guiding principles with many associated key concepts:</p> <ul style="list-style-type: none"> <li>• Fresh water is a finite and vulnerable resource, essential to sustain life, development, and the environment.</li> <li>• Water development and management should be based on a participatory approach, involving users, planners, and policy makers at all levels.</li> <li>• Women play a central part in the provision, management, and safeguarding of water.</li> <li>• Water has an economic value in all its competing uses and should be recognized as an economic good.</li> </ul> <p><b>How to implement IWRM?</b></p> <p>The GWP has published a definitive paper on the framework for IWRM (2000) and in 2003 it launched its IWRM ToolBox. This is a compendium of over 50 policies, actions and tools for putting IWRM into practice. There is also a growing collection of case studies illustrating practical real-world use of IWRM tools. These can be downloaded from the Internet <a href="http://www.gwp.forum.org">www.gwp.forum.org</a>. The three main components of IWRM revolve around the following categories:</p> <ol style="list-style-type: none"> <li>1. <b>The Enabling Environment:</b> the general framework of national policies, legislation and regulations and information for water resources management stakeholders.</li> <li>2. <b>The Institutional Roles</b> and functions of the various administrative levels and stakeholders.</li> <li>3. <b>The Management Instruments and Tools</b> including operational instruments for effective regulation, monitoring and enforcement that enable the decision-makers to make informed choices between alternative actions.</li> </ol> <p>Underlying the policy instruments presented in the Toolbox are three fundamental and inter-related</p>	

principles, known as the three “E pillars” of IWRM. The three “E Pillars” that support the framework are Social **Equity**, Sustainable **Environment** and Economic **Efficiency**.

1. **Social Equity:** The basic right for all people to have access to water of adequate quantity and quality for the sustenance of human well-being.
2. **Sustainable Environment:** The present use of water resources should be managed in such a way that does not undermine the life support system, thereby compromising use of the same resource by future generations.
3. **Economic Efficiency:** Because of the increasing scarcity of water and financial resources, the finite and vulnerable nature of water as a resource and the demands on it, water must be used with maximum possible efficiency.

### **Raising awareness and water governance**

Raising awareness of the importance of IWRM implications should be seen as an interactive movement in which different parties are engaged, each with their own roles, responsibilities and ways, to make their voices heard, capitalizing on the use of the media in its different forms to maximize the outreach and effectiveness of the campaigns. The campaign planning approaches may include a wide range of broadcasting methods such as public announcements, advocacy, work with specific civil society organizations, brochures and handouts, public displays, slogans, advertising, Internet sites, door-to-door campaigns, newspaper articles and radio/television programs.

The notion of governance for water includes the ability to design public policies and institutional frameworks that are socially accepted and mobilize social resources in support of them. Water policy and the process for its formulation must have as its goal the sustainable development of water resources, and to make its implementation effective, the key actors/stakeholders must be involved in the process. Governance aspects overlap with technical and economic aspects of water, but governance points us to the political and administrative elements of solving a problem or exploiting an opportunity.

### **Water related problems in the ESCWA region within the framework of IWRM**

ESCWA has recognized several reasons for poor implementation of IWRM concepts in the region. These include: lack of awareness and public funds, fragmented water related institutional infrastructure, absence of comprehensive national water policies, outdated legislation, deterioration of water quality, inconsistency in water resources data, the insufficiency of basic data and the demand for water is irrationally high.

Poor implementation of IWRM is the major challenge for the water sector in the water scarce ESCWA region. There is a lack of coordinated development and management of water, land and related resources and as a result, economic and social welfare is not being maximized and the environment is being degraded. Natural water scarcity is combined with unsustainable use, population growth, food security and financial constraints. There is a crisis of water governance in the region, which can only be addressed through IWRM.

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**MODULE 1**  
**CONCEPTS IN INTEGRATED WATER RESOURCE MANAGEMENT**

**A. INTRODUCTION**

Water shortages, quality deterioration, flood and drought impacts are challenging problems, which require greater attention and action at a global scale and for the ESCWA region in particular.

- *Resources under pressure:* The world's freshwater resources are under increasing pressure due to the growth in population, increased economic activity and overall improved standards of living which lead to increased competition for and conflicts over the limited freshwater resource. This is particularly problematic in the ESCWA region where man-made development pressure are compounded by prevailing arid natural environment as indicated in table 1 below:

TABLE 1: WATER STRESS IN SELECTED COUNTRIES (ESCWA, 2003)

LEVEL OF WATER STRESS (M <sup>3</sup> / CAPITA)	STRESS LEVEL / COUNTRY
3,000 – 1,700	Iraq
1,700 - 1,000	<b>Water stress situation</b> Syria
1,000 - 500	<b>Severe water scarcity</b> Lebanon, Egypt, Oman
500 - 200	<b>Critical water scarcity</b> Saudi Arabia, Yemen, Palestine
< 200	<b>Acute scarcity</b> Bahrain, Jordan, UAE, Qatar, Kuwait

- *Populations under water stress:* The world population has increased by a factor of about three during the 20th century whereas water withdrawals have increased by a factor of about seven. It is estimated that currently one third of the world's population live in countries that experience medium to high water stress. This ratio is expected to grow to two thirds by 2025. In the ESCWA region, population, as shown in table 2 below, has experienced a relatively high growth factor, especially in countries that have a critical to acute level of water scarcity.

TABLE 2: FORTY-YEAR POPULATION GROWTH IN MILLIONS

	Bahrain	Egypt	Iraq	Jordan	Kuwait	Lebanon	Oman	Qatar	Saudi Arabia	Syria	U A E	Palestine	Yemen	Total
1980	0.34	43.9	13	2.23	1.4	2.7	1.2	0.23	9.6	8.9	1	1.5	8.1	94.1
	0.68	67.8	23.3	5	2.5	3.5	2.6	0.58	21.1	16.7	2.8	3.2	18	167.76
	0.97	96.9	38	7.56	3.7	4.4	4.4	0.75	36.3	25.1	3.8	6.1	36.5	264.48

Source: UN, 2003

- *The impact of pollution:* Pollution of water is inherently connected with human activities. In addition to serving the basic requirement of biotic life and industrial processes, water also acts as a sink and transport mechanism for domestic, agricultural and industrial waste causing pollution. Deteriorating water quality caused by pollution affects water usability downstream, threatens human health and the functioning of aquatic ecosystems so reducing effective availability and increasing competition for water of adequate quality.
- *Water governance crisis:* The above problems are aggravated by shortcomings in the management of water. Sectoral approaches to water resources management have dominated and are still prevailing; this leads to the fragmented and uncoordinated development and management of the resource. Moreover,

water management institutions are based on a top-down approach, the legitimacy and effectiveness of which have increasingly been questioned. Thus, the overall problem is caused both by inefficient governance and increased competition for the finite resource.

One of the key elements of governance is to create a framework (institutional and administrative) within which strangers or people with different interests can peacefully discuss and agree to co-operate and coordinate their actions. Some form of binding arbitration is needed to reconcile differences; this function would ultimately fall within the jurisdiction of the government and the judicial system or within the UN and multi-lateral agreements at the international level. Integrated Water Resources Management (IWRM) is a process, which can assist countries in their endeavor to deal with water issues in a cost-effective and sustainable way and to meet the following challenges. The concept of IWRM has attracted particular attention following the international conferences on water and environmental issues in Dublin and Rio de Janeiro held during 1992.

- Securing water for people;
- Securing water for food production;
- Developing other job creating activities;
- Protecting vital ecosystems;
- Dealing with variability of water in time and space;
- Managing risks;
- Creating popular awareness and understanding;
- Ensuring collaboration across sectors and boundaries;

## **B. DEFINITION OF IWRM**

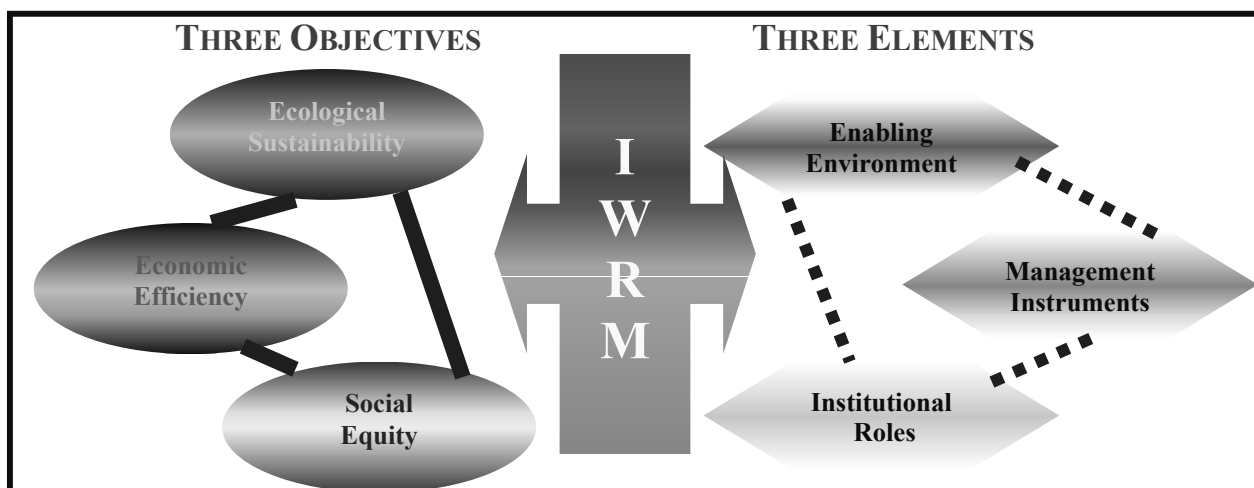
This section deals with the definitions of the terminology used in the water sector with regard to planning and management. Definitions are given of water resources management, integrated water resources management, sustainable use of water resources and water resources capacity building (Savenije 1999).

- Water Resources Development (WRD): actions, mostly physical, that lead to the beneficial use of water resources for single or multiple purposes.
- Water Resources Planning (WRP): planning of the development, conservation and allocation of a scarce resource (sectoral and intersectoral), matching water availability and demand, taking into account the full set of national objectives and constraints and the interests of stakeholders.
- Water Resources Management (WRM): The whole set of technical, institutional, managerial, legal and operational activities required to plan, develop, operate and manage water resources for sustainable use.
- Integrated Water Resources Management (IWRM): Integrated Water Resources Management is a process with many dimensions and concerns not only the different water related public agencies, but also all sectors of the society, including the private water users. It is strongly interdisciplinary and multi-sectoral and assumes a high level of horizontal communication and coordination among water related ministries and public agencies. IWRM addresses a wide range of issues involving the management of the resource, relations with and participation of water users, organization of the service in spatial terms and within the wider context of socio-economic development. Some of these issues include efficient and equitable water allocation, public health and environmental sustainability, institutional arrangements, and international water rights (FAO 1995). Integrated Water Resources Management has been defined by the Global Water Partnership (GWP) Technical Advisory Committee 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."

IWRM means a shift from development focus to management focus. It also means recognizing that there are many competing interests in how water is used and allocated and these various stakeholders should be active participants in water management. The traditional sectoral top down approach whereby water professionals are responsible for and guide decision over water allocation, management and development, yielding the way for a more participatory approach among stakeholders, involving the integration between sectors, between users, and equally important across the different components of the water cycle. Groundwater, surface water, upstream, downstream, green water and blue water are all inextricably linked and management of the water resource must take this into account. 'Traditional' water professional skills and knowledge continue to be essential, and may even be strengthened by the introduction of IWRM, but they are not enough. There is an urgent need for additional skills in management, institutional reform, conflict resolution, social and communication skills in the existing and new water managers (GWP, 2001). Water Resources Management – in contrast to “traditional”, fragmented water resources management – at its most fundamental level is as concerned with the management of water demand as it is with water supply. Thus, integration can be considered under two basic categories:

1. *Natural system integration and this includes:*
  - Integration of freshwater management and coastal zone management;
  - Integration of land and water management;
  - Integration of “Green water” and “blue water”;
  - Integration of surface water and groundwater management;
  - Integration of quantity and quality in water resources management;
  - Integration of upstream and downstream water-related interests.
2. *The human system integration and this includes*
  - Mainstreaming of sustainable water resources management into socio-economic development objectives. ;
  - Cross-sectoral integration in national policy development;
  - Basic principles for integrated policy-making;
  - Integration of all stakeholders in the planning and decision process.

FIGURE 1: FRAMEWORK FOR INTEGRATED WATER RESOURCES MANAGEMENT



Integration has to occur both within and between these categories, taking into account variability in time and space. Historically, water managers have tended to see themselves in a “neutral role”, managing the natural system to augment water supply in order to meet externally determined needs. IWRM approaches brings in a new vision for water managers as “advocate” of sustainable use of the resource and encouraging changes in consumption behavior and modes of water supply that account for social, economic and environmental costs in assessing and planning water development options. The challenge remain defining what is sustainable

management of the water resources and what does IWRM entail in policy options. People from different areas and different professional backgrounds may have different meanings assigned to IWRM, e.g.:

- To the people of arid countries: drought relief, irrigation, food, flash floods
- To the people of humid/wet countries: flood protection, water control structures, navigation
- To the water engineer: dams and reservoirs, flood alleviation, water treatment
- To the environmentalist: loss of biodiversity, deforestation, pollution control
- To the lawyer: legislation and regulation, water rights, international water law
- To the economist: economic growth, poverty alleviation, employment opportunities
- To the simple local user: having a right to take part in decision making

In fact, integrated water resources management includes all these points of view. It is physical, economic, political, sociological, environmental and technical. The relative ease, with either one of these aspects might be quantifiable, as compared to another, does not in any way reflect a correspondingly great importance. Hence Integrated Water Resources Management, in all its components, is multi-disciplinary.

### C. IWRM PRINCIPLES

In the last thirty years many international water conferences have alerted the international community, governments, and politicians of the long-term consequences of poor management of water resources. These meetings have stimulated heated international debates on social and economic value of water, and the legal, financial and technical instruments involved in its governance. A broad consensus has emerged over the years on the importance of adopting and promoting basic principles of sustainable water resources management. However, as implementation of the many recommendations is severely lagging, new initiatives should start building on an evaluation of past failures and exploring options for adapting success stories with proven solutions.

At the *UN conference in Mar del Plata (1977)*, the emphasis was still on water supply and sanitation. *The Brundtland Report of the World Commission on Environment and Development (1987)* only mentioned the word water in relation to pollution and water supply. It was during the preparatory meetings for the *UN Conference on Environment and Development in Rio de Janeiro in 1992*, that the concepts of IWRM were widely discussed and adopted by the international community. Important preparatory meetings were: the informal Consultation in Copenhagen (1991), where the demand driven approach and the subsidiarity principle were launched; the *UNDP Symposium on Water Sector Capacity Building in Delft (1992)*, where the essential role of capacity building was recognized and the concept was worked out; the *International Conference on Water and the Environment in Dublin (1992)*, which led to the *Dublin Principles* and eventually to the *Fresh Water Chapter (18) of Agenda 21*; and the influential *World Bank Policy Paper (1993)* which emphasized IWRM, economic pricing, cost recovery, decentralization, privatization, management of international river basins and incorporation of environmental criteria in planning and management. Since 1994, the *Committee for Sustainable Development (CSD)* has put IWRM high on the international agenda.

The guiding principles from the *Dublin Statement in 1993* on water and sustainable development proposed concerted action to reverse the present trends of over consumption, pollution, and rising threats from drought and floods. *The Dublin Principles* have played an important role in stimulating reforms in water management and play a central position in IWRM. This has not aided the definition of IWRM however and it remains widely debated. The Conference Report sets recommendations for action at local, national, and international levels based on the following four guiding principles with many associated key concepts (UNDDSMS 1996; Savenije 1999):

*C.1. Fresh water is a finite and vulnerable resource, essential to sustain life, development, and the environment.*

This principle recalls the need for a holistic approach to management, recognizing all the characteristics of the hydrological cycle and its interaction with other natural resources and ecosystems. The statement also

recognizes that water is required for many different purposes, functions and services; holistic management, therefore, has to involve consideration of the demands placed on the resource and the threats to it.

The notion that freshwater is a finite resource arises as the hydrological cycle on average yields a fixed quantity of water per time period; this overall quantity cannot be altered significantly by human actions (desalinization of seawater is becoming feasible in some locations but still at a very limited scale). The freshwater resource may be regarded as a natural capital asset, which needs to be maintained to ensure that the desired services it provides are sustained.

Human beings can clearly affect the productivity of the water resource. They can reduce the availability and quality of water by actions, such as mining of groundwater, polluting surface- and groundwater and changing land use, which alter flow regimes within surface water systems. More positive effects can, however, arise from regulation of the natural temporal and spatial variability of flows. The effects of human activities lead to the need for recognition of the linkages between upstream and downstream users of water. Upstream users must recognize the legitimate demands of downstream users to share the available water resources and sustain usability. Holistic management not only involves the management of natural systems; it also necessitates coordination between the range of human activities which create the demands for water, determine land uses and generate water-borne waste products. Creating water sensitive political economy requires coordinated policy-making at all levels (from national ministries to local government or community-based institutions). There is also a need for mechanisms which ensure that economic sector decision makers take water costs and sustainability into account when making production and consumption choices. The development of an institutional framework capable of integrating human systems – economic, social and political – represents a considerable challenge.

*C.2. Water development and management should be based on a participatory approach, involving users, planners, and policy makers at all levels.*

Water is a subject in which everyone is a stakeholder. Real participation only takes place when stakeholders are part of the decision-making process. This can occur directly when local communities come together to make water supply, management and use choices. Participation also occurs if democratically elected or otherwise accountable agencies or spokespersons can represent stakeholder groups. Participation requires that stakeholders at all levels of the social structure have an impact on decisions at different levels of water management. A participatory approach is the only means for achieving long-lasting consensus and common agreement. Governments at national, regional and local levels have the responsibility for making participation possible. Governments also have to help create participatory capacity, particularly among women and other marginalized social groups. This may not only involve awareness raising, confidence building and education, but also the provision of the economic resources needed to facilitate participation and the establishment of good and transparent sources of information. It has to be recognized that simply creating participatory opportunities will do nothing for currently disadvantaged groups unless their capacity to participate is enhanced.

*C.3. Women play a central part in the provision, management, and safeguarding of water.*

It is widely acknowledged that women play a key role in the collection and safeguarding of water for domestic and in many cases agricultural use, but that they have a much less influential role than men in management, problem analysis and in the decision-making process related to water resources. Therefore IWRM requires gender awareness. In developing full and effective participation of women at all levels of decision-making, consideration has to be given to the way different societies assign particular social, economic and cultural roles to men and women. There is a need to ensure that the water sector as a whole is gender aware, a process that should begin by implementing training programs for water professionals, developing focused awareness campaigns and mobilizing community and grassroots organizations to advocate for gender balance in the management of water resources. In the ESCWA region, all countries have traditionally relied on their governments for water collection, treatment, conveyance, distribution and disposal. As a result, the central agencies have been overwhelmed by the size of their administrative and

financial responsibilities. Consequently, the quality of water services has continuously deteriorated in many countries, such as Yemen, Jordan and Egypt. The role of stakeholders in formal municipal water planning and distribution is sometimes weak, or completely missing. However, informal groups of water users in rural and urban communities, often led by women, are mobilizing collectively in order to manage local sources, or negotiate with private vendors. These groups need technical support to maintain water quality standards.

In some countries, such as Egypt, the Syrian Arab Republic, Oman and Yemen, attention has been directed toward involving NGOs, such as Water User Associations (WUA), Farmers Unions, etc. These associations have helped with operation and maintenance (O&M) and assisted in some distributional and financial responsibilities. There is not enough institutional experience on gender issues and gender mainstreaming in formal water resources development, management and planning in the ESCWA region. Gender balance needs to be seen as an integral part of stakeholders' participation. The public and private water sectors can learn from the experiences of NGOs and community organizations.

C.4. Water has an economic value in all its competing uses and should be recognized as an economic good.

Many past failures in water resources management are attributable to the fact that water has been – and is still – viewed as a free good, or at least that the full value of water has not been recognized. In a situation of competition for scarce water resources such a notion may lead to water being allocated to low-value uses and provides no incentives to treat water as a limited asset. In order to extract the maximum benefits from the available water resources there is a need to change perceptions about water values and to recognize the opportunity costs involved in current allocative patterns. The key concepts associated with the *Dublin Principles* are:

- Integrated water resources management: implying an intersectoral approach, representation of all stakeholders, all physical aspects of the water resources and sustainability and environmental considerations
- Sustainable development, sound socio-economic development that safeguards the resource base for future generations
- Emphasis on demand driven and demand oriented approaches
- Decision making at the lowest appropriate level (subsidiarity)

The Dublin and Rio meetings are remembered for having laid the basis for an IWRM approach expressed in the Dublin Principles rather than for making specific calls for national action programs by a specific date. Of course the concept of “integrated approaches to the development, management and use of water resources” needed further development before it could be made operational through national action programs. A lot of work took place in subsequent years in building a stronger understanding of the conceptual foundations of the IWRM approach (see table 3). The second half of the 1990s witnessed concerted efforts to consolidate and strengthen the global attempts of the previous decades in addressing water issues. One pointer in that direction was the establishment of two new institutions to deal with water resources issues: the World Water Council and the Global Water Partnership. Since that time, a series of international conferences, including the three world water forums that were held in Marrakech, The Hague, and Kyoto, have been organized to discuss the existing and emerging water problems. Such conferences and forums have debated the major issues regarding management and development of water resources, and have adopted a number of resolutions, declarations, and action plans.

The year 2000 proved to be a busy one as far as water resources was concerned. It started with The Hague Water Forum in March and witnessed the United Nations Millennium Summit in New York in September, the adoption of the Millennium Development Goals (MDG), and the release of the Report of the World Commission on Dams in London in November. It ended with the adoption in December by the General Assembly of the United Nations of the resolution proclaiming the year 2003 as the “International Year of Freshwater.” The attempts at addressing the challenges faced in the water sector continued in the first years of the millennium.

In December 2001 two major events took place. The first was the United Nations General Assembly resolution on “Status of Preparations for the International Year of Freshwater 2003,” adopted in December 2001. The General Assembly referred to its earlier resolution of December 2000 proclaiming 2003 as the International Year of Freshwater, as well as the millennium development goal of reducing by half, between the years 2000 and 2015, the proportion of people who are unable to reach or afford safe drinking water. Finally, the Declaration urged the World Summit on Sustainable Development to take account of the outcome of the Bonn Conference. Three observations can be offered in connection with the Bonn Conference (2001). The Conference was planned as a preparatory meeting to the World Summit on Sustainable Development that was held in Johannesburg in September 2002. As such, the Bonn Conference was supposed to play the same role for the Johannesburg summit as that of the Dublin meeting for the Rio Summit.

The Bonn Conference declared safe drinking water and sanitation as “basic human needs,” a pronouncement short of declaring them as a “basic human right.” This is an important distinction. The third observation is the use of the term “governance” by the Declaration. This is a term that is difficult to define. Yet, henceforth, the issue of “water governance” occupied a prominent place in the international debate on water. The World Summit on Sustainable Development took place in September 2-4, 2002 in Johannesburg culminating into the “Johannesburg Declaration on Sustainable Development”.

In March 2003 the Third World Water Forum was held in Japan where the World Water Development Report was released. The World Water Development Report dealt with five major areas: governance, funding gap, role of international community, capacity building and technology transfer, and gender. One of the problems of the international community is that there is no UN organization that deals specifically with water resources. The water interest overlaps many different organizations such as UNDP, UN/DPCSD, WMO, FAO, UNESCO, WHO, ESCWA, World Bank and UNICEF. Important steps in the process towards more co-ordination have been the formation of the Global Water Partnership (GWP) and the World Water Council (WWC), which both aim to co-ordinate the implementation of IWRM principles and practices worldwide.

Although there is undoubtedly some overlap between the two organizations, the WWC concentrates on awareness raising at the political level, whereas the GWP aims at implementation of IWRM concepts and practices at the technical and operational levels. Both these organizations and main international players such as the World Bank and UNDP emphasize the need for regional and national capacity building in the water sector.

TABLE 3: A GLOBAL AGENDA FOR IWRM: FROM DUBLIN TO KYOTO

YEAR	EVENT	OUTCOME
1992	International Conference on Water and the Environment, Dublin	<p><b>-Principle No. 1</b> - Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment</p> <p><b>-Principle No. 2</b> - Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels</p> <p><b>-Principle No. 3</b> - Women play a central part in the provision, management and safeguarding of water</p> <p><b>-Principle No. 4</b> - Water has an economic value in all its competing uses and should be recognized as an economic good</p>
1992	UN Conference on Environment and development, Rio de Janeiro	Adoption of Agenda 21 Chapter 18 and other water related chapters: Protection of the quality and supply of freshwater resources: Application of integrated approaches to the development, management and use of water .
1996	Global Water Partnership and World Water Council	<p>-”Water to be managed in a holistic manner”</p> <p>- Introduction of Integrated water resources management (IWRM) as a policy framework for managing water resources“</p>
1997	First World Water Forum, Marrakech	Agreement on conducting a study on global water, including the financial aspect”
1997	World Commission for Water in the 21 <sup>st</sup> century	<p>- Main global water initiatives</p> <p>- Investments of \$100 billions is needed for the water sector</p> <p>- Investments to be mobilized from the international private sector</p> <p>- Development banks and micro-credit mechanisms to be used more efficiently at local level.</p>
2000	2 <sup>nd</sup> World Water Forum, The Hague	<p>- Of the Seven Challenges identified: ”value water in all its uses”</p> <p>- Need to price water to reflect cost of provision, taking into account equity and basic needs of the poor</p>
2000	UN Millennium Declaration	- “Reduce by half the proportion of people without sustainable access to adequate quantities of affordable and safe water by 2015”
2001	International Conference on Freshwater, Bonn	<p>- “ Public –private partnership” where public funding for water can be augmented by private capital.</p> <p>- Making water an attractive sector to invest in, but with good regulation, legal system and transparent contracting procedures to recover cost of water provision.</p>
2002	International Conference of Financing for Development, Monterey	<p>- Change of trend in international aid for development, including water</p> <p>- Governments and agencies committed to increase their aid for development by 25per cent (an extra \$12 billion to be generated per year)</p>
2002	UN World Summit on Sustainable Development, Johannesburg	<p>- “Reduce by half the proportion of people without sustainable access to adequate quantities of affordable and <u>safe water supply and sanitation</u> by 2015”</p> <p>- Business action for Sustainable development stressed the need for an enabling environment, where aid to be used for capacity building and all water stakeholders are involved and users consulted, and promote full cost recovery.</p>
2003	3 <sup>rd</sup> World Water Forum, Kyoto	<p>- “Explore all types of financing arrangements including private sector participation in line with national policies and priorities”.</p> <p>- “Identification and development of new mechanisms of public-private partnerships for the different actors involved, while ensuring the necessary public control and legal frameworks to protect the public interests, especially the interests of the poor.”</p>

Source: Compiled from World Panel on Financing Water Infrastructure, 2003

#### D. HOW TO IMPLEMENT IWRM

Historically, the main objective of water resources management models has been economic efficiency. Gradually other objectives have been added. These, in order of their emergence, are regional income redistribution, environmental quality, and social well-being. Planning and management of water resources are complex because of the many considerations (physical interactions of the ground and surface water systems, environment, politics, economics, sociological requirements) that must be integrated into any

development plan. Thus one should search for efficient, simple planning and operation models. The dimensions of complexities can be realized by the facts that relatively few methodologies exist for quantification of social and community goals.

Even the terminology of water resources management presents difficulties. Words like “comprehensive,” “framework,” “planning,” “integrated,” and “coordinated” mean differently to different water stakeholders. During the last 15 years, considerable progress has been made on the development of physical models for water resources planning and management. Several models exist that consider some economical and demographic parameters, but very few, if any, include sociological and institutional factors. The multi-objective optimization technique, both for quantitative as well as non-quantitative dimensions, is a frequently used tool for long-term management. Technical aspects of optimization are not the only criteria, since socio-economic and environmental considerations are now of equal or higher priority. Environmental optimization is primarily a function of the ecosystems, including the consideration of land, environment and water resources as well as the interactions between them. The Global Water Partnership (2001) has prepared an IWRM ToolBox that can be downloaded from the Internet and offers a compendium of over 50 policies, actions and tools for putting IWRM into practice. Based on this ToolBox a detailed discussion and assessment of relevant IWRM topics to ESCWA countries will be discussed in the different modules of this training manual. The purpose of IWRM ToolBox is to provide water management professionals with clear examples of good and bad practices and lessons learned from real life experiences of implementing IWRM. Tools in the ToolBox are based on three fundamental elements of IWRM:

1. **The Enabling Environment**: the general framework of national policies, legislation and regulations and information for water resources management stakeholders.
2. **The Institutional Roles** and functions of the various administrative levels and stakeholders.
3. **The Management Instruments** including operational instruments for effective regulation, monitoring and enforcement that enable the decision-makers to make informed choices between alternative actions. These choices need to be based on agreed policies, available resources, environmental impacts and the social and economic consequences.

Within these elements, the ToolBox offers a compendium of over 50 policies and actions or tools for putting IWRM into practice. An overview of the topics covered in the ToolBox is given in Table 4.

These policy instruments allow the translation of IWRM principles into operational elements of IWRM national and local strategies, and plans of action and the monitoring of progress through performance indicators. While the proposed policy instruments in the Toolbox can be adopted and customized to local conditions; they are still guided by three fundamental and inter-related principles, known as the three E-pillars of IWRM. (Figure 2)

The three E-pillars of IWRM:

1. **Social Equity** (Social Sustainability): The basic right for all people to have access to water of adequate quantity and quality for the sustenance of human well-being. The social perspective involves the need to meet fundamental human needs in terms of safe household water, water- dependent food production, and - in view of present techniques deficiencies - water-polluting income generation activities. Securing societal acceptance of necessary tradeoffs is essential by effective ways of stakeholder participation in planning and decision-making.
2. **Environmental and Ecological Sustainability**: the present use of water resources should be managed in such a way that does not undermine the life support system, thereby compromising use of the same resource by future generations. The ecological perspective involves attention both to terrestrial ecosystems and their involvement in local runoff generation and to aquatic ecosystems and their dependence on uncommitted environmental flows. Certain highly valued local ecosystems and their particular water determinants may have to be protected. The long-term resilience of the overall system has to be secured for the benefit of coming generations Freshwater management and the management of environment dynamics have to be integrated. This is equivalent to finding ways and means to merge

water management, land use management, and ecosystem management (terrestrial as well as aquatic) within a socio-ecohydrological catchment management - with full awareness of the different ethical and political dilemmas involved.

3. **Economic Efficiency** (Economic Sustainability) of water use: Because of the increasing scarcity of water and financial resources, the finite and vulnerable nature of water as a resource and the demands on it, water must be used with maximum possible efficiency. The economic perspective involves not only economic development in general but also attention to benefit-costs relations, financing challenges, cost coverage to secure operation and maintenance of water in infrastructures, incentives to encourage implementation, and guidance from the values of water in different functions.

The three E's are connected by water flow linkages that influence the potential compatibility of human activities and ecosystem perspectives. Attention has to be paid to blue water accessibility: how much blue water is there that can be mobilized and put to societal use when respecting the need for uncommitted environmental flow that has to remain in the river? The management efforts will have to include preparedness for a policy switch when a basin goes from being open to being closed, i.e., when there remains no blue water surplus available for beneficial consumptive use.

FIGURE 2: THE IWRM GENERAL FRAMEWORK

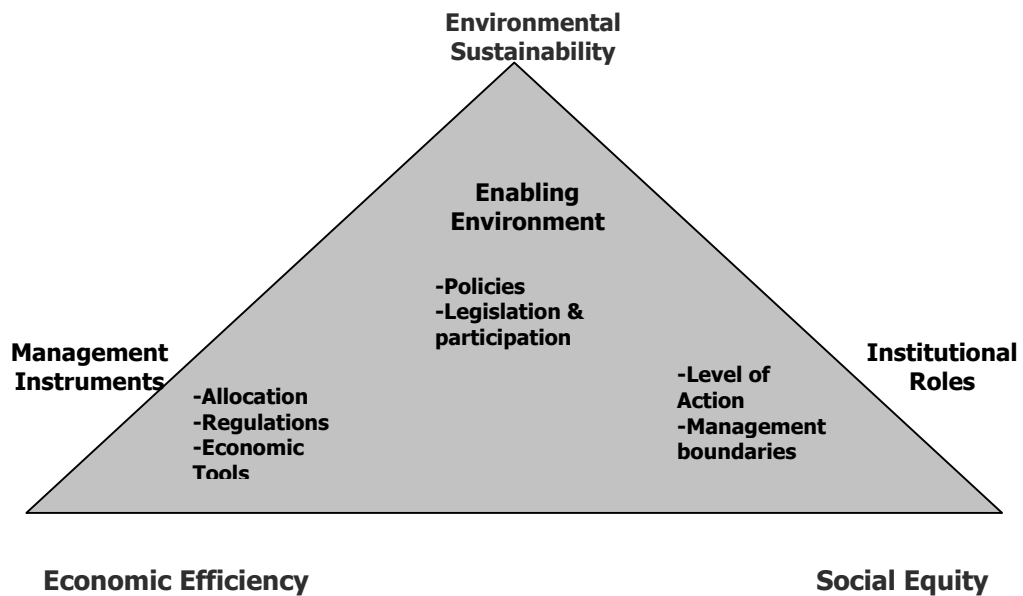


TABLE 4: OVERVIEW OF THE TOPICS COVERED IN THE TOOLBOX (GWP 2001)

<b>THE ENABLING ENVIRONMENT</b>	<p><b>A1. POLICIES – SETTING GOALS FOR WATER USE, PROTECTION AND CONSERVATION</b>  A1.1 Preparation of a national water resources policy  A1.2 Policies with relation to water resources</p> <p><b>A2. LEGISLATIVE FRAMEWORK - WATER POLICY TRANSLATED INTO LAW</b>  A2.1 Water rights  A2.2 Legislation for water quality  A2.3 Reform of existing legislation</p> <p><b>A3. FINANCING AND INCENTIVE STRUCTURES – FINANCIAL RESOURCES TO MEET WATER NEEDS</b>  A3.1 Investment Policies.  A3.2 Financing Options: I Grants and internal sources  A3.3 Financing Options: II. Loans &amp; equity  A3.4 Cost recovery and charging prices  A3.5 Investment Appraisal</p>
<b>INSTITUTIONAL ROLES</b>	<p><b>B1. CREATING AN ORGANISATIONAL FRAMEWORK – FORMS AND FUNCTIONS</b>  B1.1 Reforming institutions for better governance  B1.2 Transboundary organizations for water resource management  B1.3 National apex bodies  B1.4 River basin organizations  B1.5 Regulatory bodies and enforcement agencies  B1.6 Service providers and IWRM  B1.7 Strengthening public sector water utilities  B1.8 Role of the private sector.  B1.9 Civil society institutions and community based organizations  B1.10 Local authorities  B1.11 Building Partnerships</p> <p><b>B2. BUILDING INSTITUTIONAL CAPACITY - DEVELOPING HUMAN RESOURCES</b>  B2.1 Participatory capacity and empowerment of civil society  B2.2 Training to build capacity of water professionals  B2.3 Regulatory capacity  B2.4 Knowledge Sharing</p>

<b>MANAGEMENT INSTRUMENTS</b>	<p><b>C1. WATER RESOURCES ASSESSMENT - UNDERSTANDING RESOURCES AND NEEDS</b></p> <p>C1.1 Water resources knowledge base  C1.2 Water resources assessment  C1.3 Modelling in IWRM  C1.4 Developing water management indicators  C1.5 Ecosystem assessment</p> <p><b>C2. PLANS FOR IWRM – COMBINING DEVELOPMENT OPTIONS, RESOURCE USE AND HUMAN INTERACTION</b></p> <p>C2.1 National Integrated Water Resources Management Plans  C2.2 Basin Management Plans  C2.3 Groundwater management plans  C2.4 Coastal zone management plans  C2.5 Risk assessment and management  C2.6 Environmental Assessment (EA)  C2.7 Social Impact Assessment (SIA)  C2.8 Economic Assessment</p> <p><b>C3. EFFICIENCY IN WATER USE – MANAGING DEMAND AND SUPPLY</b></p> <p>C3.1 Improved efficiency of use  C3.2 Recycling and reuse  C3.3 Improved efficiency of water supply</p> <p><b>C4. SOCIAL CHANGE INSTRUMENTS – ENCOURAGING A WATER-ORIENTED SOCIETY</b></p> <p>C4.1 Education curricula on water management  C4.2 Communication with stakeholders  C4.3 Information and transparency for awareness raising  C4.4 Communication with Stakeholder  C4.5 Water campaigns and awareness raising  C4.6 Broadening participation in water resources management</p> <p><b>C5. CONFLICT RESOLUTION - MANAGING DISPUTES, ENSURING SHARING OF WATER</b></p> <p>C5.1 Conflict management  C5.2 Shared vision planning  C5.3 Consensus building</p> <p><b>C6. REGULATORY INSTRUMENTS - ALLOCATION AND WATER USE LIMITS</b></p> <p>C6.1 Regulations for water quality  C6.2 Regulations for water quantity  C6.3 Regulations for water services  C6.4 Land use planning controls and nature protection</p> <p><b>C7. ECONOMIC INSTRUMENTS - USING VALUE AND PRICES FOR EFFICIENCY AND EQUITY</b></p> <p>C7.1 Pricing of water and water services  C7.2 Pollution and environmental charges  C7.3 Water markets and tradable permits  C7.4 Subsidies and incentives</p> <p><b>C8. INFORMATION EXCHANGE – SHARING KNOWLEDGE FOR BETTER WATER MANAGEMENT</b></p> <p>C8.1 Information management systems  C8.2 Sharing data for IWRM</p>
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Carter (1998) has exposed the magnitude of the obstacles facing developing countries (like some ESCWA countries) as they attempt to introduce the IWRM principles. These principles and obstacles are presented in

table 5. Carter (1998) has also pointed out: “Sustainable water policy needs to be examined carefully within the context of the natural and human environment involved, and against the background of the externalities which affect developing countries. Very real natural, social, cultural, economic, and political obstacles exist to the wholesale adoption of internationally accepted water policy principles”.

Because future conditions are uncertain, management must be sufficiently flexible to allow for possible changes in the political and economic situation in the region. The integrated water resources management framework must:

- Be a “living” entity, with opportunities for periodic corrections to the direction of the water resources development.
- Maximize the use of the available natural resources for purposes that address the water resources needs of society.
- Not preclude the future utilization of any resources within the region.

It is the contrast between this vision of how an ideally managed resource system ‘should’ function, and reality on the ground in most countries (what can be done) that is most striking. In countries such as Mexico for example, which are heavily dependent upon groundwater irrigation, periods of decades are being considered before new reforms begin to realize conservation and reallocation gains. Even in industrialized countries, which have a tradition of a well-established institutional and legal set-up, the challenge of implementing IWRM is still considerable. This is why IWRM is and should be perceived as a “process” than as an “output” or “product”.

TABLE 5: WATER POLICY PRINCIPLES AND CULTURAL OBSTACLES

PRINCIPLE	OBSTACLE
Water as an economic good	Water is perceived as a gift of God; payments inappropriate; even more so when payment is to a government perceived in paternalistic terms
Integrated, holistic approach	Short planning horizon; uncertainty of political-economic climate; difficulties of coordination between line ministries with rigid procedures in which power is not lightly given up and distribution of tasks does not exit.
Desirability of decentralization	Large power distance: centralization of power is accepted as the norm, and has significant personal advantages for those exercising it.
Stakeholder participation (especially women)	Large power distance: those traditionally lacking power do not demand it, nor do they have the time to exercise it.
Private sector participation	Collectivism, not individualism, is the norm; entrepreneurship is not highly developed.
Demand-management rather than supply-augmentation	Paternalistic attitudes encourage attempts to supply perceived demands rather than manage or control them.
Polluter pays	Natural environment perceived as effective repository of waste; no culture of communal waste collection or disposal.

Source: Carter, 1998

The argument made here is not that the IWRM vision is somehow ‘wrong’, or needs to be abandoned. The argument is that IWRM principles describe long-term goals. They tell us little about "how to get from where we are now, to where we want to be". Implementing new policies, and in particular gaining compliance with them, is a much bigger challenge than devising them. This is why it is important to build and share knowledge on initiatives to implement IWRM at national and local levels and draw relevant lessons, which would allow future adjustments and fine-tuning of the conceptual framework.

## **E. RAISING AWARENESS OF IWRM**

Raising awareness of the importance of IWRM implications should be seen as an interactive movement in which different parties are engaged, each with their own roles, responsibilities and ways, to make their voices heard, capitalizing on the use of the media in its different forms to maximize the outreach and effectiveness of the campaigns. The campaign planning approaches may include a wide range of broadcasting methods such as public announcements, advocacy, work with specific civil society organizations, brochures and handouts, public displays, slogans, advertising, Internet sites, door-to-door campaigns, newspaper articles and radio/television programs. The availability of skilled motivators or educators is highly important in most campaigns. Educational settings require teachers with good didactic and facilitative skills and with knowledge of locally important water issues. Training can be done through seminars, workshops or specific on-the-job training. Campaigns should specifically target politicians and other decision-makers to “win” them over as IWRM “champions”. Advocacy can be quite informal, through lobbying and personal contacts. Advocacy can aim to reach not only politicians and officials but also managers in the private sector and NGOs or local community leaders.

## **F. THE GOVERNANCE OF WATER**

### *F.1. What is water governance about?*

Water governance refers to the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society. The notion of governance for water includes the ability to design public policies and institutional frameworks that are socially accepted and mobilize social resources in support of them. Water policy and the process for its formulation must have as its goal the sustainable development of water resources, and to make its implementation effective, the key actors/stakeholders must be involved in the process. Governance aspects overlap with technical and economic aspects of water, but governance points us to the political and administrative elements of solving a problem or exploiting an opportunity. Governance of water is a subset of the more general issue of the creation of a nation’s physical and institutional infrastructure and of the still more general issue of social cooperation (Rogers and Hall, 2002). Given the complexities of water use within society, developing, allocating and managing it equitably and efficiently and ensuring environmental sustainability requires that the disparate voices are heard and respected in decisions over common waters and use of scarce financial and human resources. Water governance is concerned with the functions, balances and structures internal to the water sector (internal governance). It includes the framing of social agreements on property rights and the structure to administer and enforce them, known as the law. Influences also come from civil society and from the “current” government and these are considered parts of the external governance of water. Although issues can arise for water governance from the economic and technical spheres, in most countries the driving force is politics. Effective governance of water resources and water service delivery will require the combined commitment of government and various groups in civil society, particularly at local/community levels, as well as the private sector.

### *F.2. Water governance principles and legal bases*

The Dublin Water Principles bring water resources firmly under the State’s function of clarifying and maintaining a system of property rights, and, through the principle of participatory management, asserts the relevance of meaningful decentralization at the lowest appropriate level. There is increasing pressure to recognize and formalize water rights and this is happening in many countries. Formalizing rights raises complex questions about the plurality of claims and the balancing of the distribution of benefits among the social groups. It also imposes responsibilities including in particular that of pollution prevention and financial sustainability. The process of formalization is often biased in favor of the rich and powerful who may abuse the system and capture rights. Informal ‘rights’, as defined locally with their historical rules and principles, are equally important and improper formalization may lead to conflict between the formal and traditional. The formalization of rights may be unnecessary or insufficient to secure access to water

resources. The capacity to defend rights against competing claimants is essential for the rights to be meaningful, whether they are formal or informal.

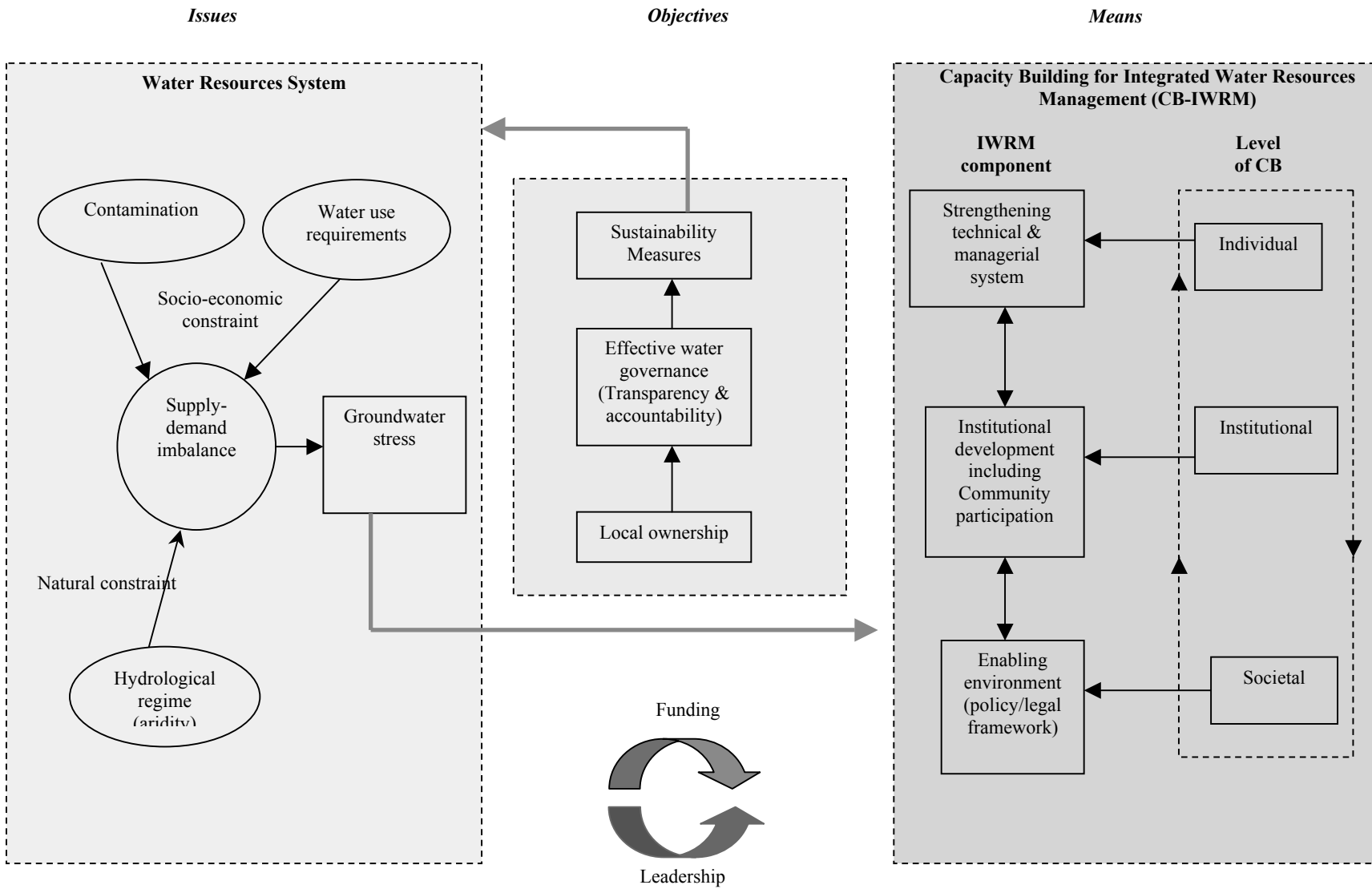
### *F.3. Principles for effective water governance*

- **Open and transparent:** Institutions should work in an open manner. They should use language that is accessible and understandable for the general public to increase confidence in complex institutions. In addition to being open, good governance requires that all policy decisions are transparent so that both insiders and outsiders can easily follow the steps taken in the policy formulation. This is particularly important with regard to financial transactions.
- **Inclusive and communicative:** The quality, relevance and effectiveness of government policies depend on ensuring wide participation throughout the policy chain – from conception to implementation. Improved participation is likely to create more confidence in the end result and in the institutions that deliver policies. Participation crucially depends on all levels of government following an inclusive approach when developing and implementing policies. Broad participation is built on social mobilization and freedom of association and speech, as well as capacities to participate constructively. Transparency and accountability are built on the free flow of information. Governance institutions and systems need to communicate among the actors and stakeholders in very direct ways. Correctly done, this will lead civil society to be socialized into governance over a wide range of issues.
- **Coherent and integrative:** Policies and action must be coherent. The need for harmony and coherence in governance is increasing as the range of tasks has grown and become more diverse. Challenges such as climate and demographic change cross the boundaries of the sectoral policies on which the government has been built. Coherence requires political leadership and a strong responsibility on the part of the institutions at different levels to ensure a consistent approach within a complex system. Water governance should enhance the effectiveness of Integrated Water Resources Management (IWRM). The institutions will have to consider all uses and users within the traditional water sector and also their interconnections with and impacts upon all other potential users and sectors.
- **Equitable and ethical:** All men and women should have opportunities to improve or maintain their well-being. Equity between and among the various interest groups, stakeholders, and consumer-voters needs to be carefully monitored throughout the process of policy development and implementation. It is essential that the penalties for malfeasance are, and are seen to be, equitably applied. Above all, water governance has to be strongly based upon the ethical principles of the society in which it functions and based on the rule of law. This manifests itself most strongly in the issue of justice, property rights for use, access, and ownership of water. Legal and regulatory frameworks should be fair and enforced impartially.

### *F.4. Using Integrated Water Resources Management (IWRM) tools*

The IWRM approach eschews politics and the traditional fragmented and sectoral approach to water and makes a clear distinction between resource management and the water service delivery functions. It should be borne in mind, however, that IWRM is itself a political process, because it deals with reallocating water, the allocation of financial resources, and the implementation of environmental goals. There is a general agreement in the water community that IWRM provides the only viable way forward for sustainable water use and management although there are no universal solutions or blueprints and there is much debate on how to put the process into practice. Moreover, IWRM is not applied in a vacuum and the broader picture, as described by governance, provides the context in which the IWRM approach can be applied. The political context, however, affects political will and also political feasibility. Much more work remains to be done to establish effective water governance regimes that will enable IWRM to be applied. This pertains to both the management of water resources and the delivery of water services (Rogers and Hall, 2002).

FIGURE 3: A CONCEPTUAL FRAMEWORK FOR EFFECTIVE CB IN WATER RESOURCE MANAGEMENT



## **G. WATER RELATED PROBLEMS IN THE ESCWA REGION WITHIN THE FRAMEWORK OF IWRM**

ESCWA countries have recognized the need to conserve and manage their water resources through the formulation of medium and long-term policies for their utilization. At the same time some have made serious efforts to establish or improve meteorological and hydrological networks as well as to improve water administration. Some countries have taken measures to establish unified and centralized institutional arrangements capable of applying modern techniques and methodologies to water management. For example, Jordan and Lebanon have established national water authorities responsible for central management, planning, and administration of water resources.

Integrated Water Resources Management (IWRM) can be considered an effective tool in reducing water problems in the ESCWA region since IWRM is 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.

ESCWA recognized (internal AWARENET proposal, 2002) a number of reasons for the lack of implementation of IWRM concepts in the ESCWA countries. These reasons are:

- Lack of awareness due to a lack of proper education, training and research. The main issue here is the quality of the output rather than the quantity. While the quantity aspects are receiving great attention the quality aspects of education have remained stagnant for many years in most countries.
- Fragmented water-related institutional infrastructure with ill-defined or overlapping mandates;
- The absence of comprehensive national water policies. Present policies turn out to be unrealistic and unachievable since the provision of the various necessary means to implement policies remains unsolved;
- Legislation has become outdated due to the increased scarcity of water and continuous deterioration of water quality. In addition, the enforcement of the same laws is doubtful and incomplete;
- Inconsistency in water resources data due to the extreme variability of annual rates of natural recharges, the insufficiency of basic data and due to the diversity of water evaluation methodologies;
- The demand for water is irrationally high and the introduction of water conservation techniques or improved system efficiency is hampering or lacking;
- Continuous high population growth did not make a change from supply to demand management.

ESCWA acknowledged that the very core of the solution on how to improve implementation of IWRM concepts starts with improving awareness or, more specifically, start with increasing knowledge at the professional level since the knowledge about IWRM concepts is only vaguely present within the professional level of the sector. This is due to the fact that the concept of IWRM is relatively young (10 years or so) and – more important- has hardly been implemented so far in the ESCWA region in a systematic way. There are hardly any case studies available related to the implementation of IWRM or its concepts.

Lack of implementation of IWRM concepts and lack of good governance in most of ESCWA countries are considered to be one of the major problems with regard to the water sector in the ESCWA countries. There is a lack of coordinated development and management of water, land and related resources.

IWRM is a highly dynamic and continuous process, covering a wide spectrum of strategic issues in the fields of assessment, planning and operation. Each relevant strategic issue to ESCWA countries will be discussed in a separate module in this training manual. The strategic issues are highly multidisciplinary, involving engineers and scientists in the area of hydrology, hydrogeology, water supply, sanitation, irrigation, environmentalists, ecologists, lawyers, economists, sociologists, agriculturists, politicians and representatives of interested parties, pressure groups, and water users.

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