

ECONOMIC AND SOCIAL COMMISSION FOR WESTERN ASIA

**THE OPTIMIZATION OF WATER RESOURCE MANAGEMENT
IN THE ESCWA COUNTRIES:**

**A SURVEY OF MEASURES TAKEN BY THE ESCWA COUNTRIES DURING
THE 1990S FOR THE OPTIMIZATION OF WATER RESOURCE
MANAGEMENT AND CAPACITY-BUILDING
IN THE WATER SECTOR**

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Foreword

This study has been prepared by the Working Group on the Optimum Use of Water Resources, pursuant to a recommendation adopted by the Committee on Water Resources at its fourth session, held in Beirut from 14 to 17 November 2000, on the establishment of a working group responsible for preparing a study on the optimum use of water resources in the ESCWA countries. That recommendation was endorsed by the Economic and Social Commission for Western Asia (ESCWA) in its resolution 233 (XXI), dated 11 May 2001, on the strengthening of cooperation between member countries in the field of shared water resources.

The tasks of the Working Group were to review reforms in the water sector in the ESCWA member countries as a means of contributing to the dissemination of expertise and the monitoring of developments relating to water resources in the region, and to develop guidelines and evaluation methods for water resource management with a view to policy upgrading and reform.

In the context of the preparation of this study, a consultative meeting convened for the purpose of establishing a Working Group on the optimal management of water resources was held in Beirut on 12 and 13 November 2001. The participants discussed country reports and available data on institutional, legislative and economic reforms and considered the progress that member countries had made in the area of integrated water resource management (IWRM). The Working Group was mandated to produce a draft report for approval by the participants before it was submitted to the members of the Committee on Water Resources at its fifth session. Nine country reports were presented at the meeting, outlining the institutional, economic and legislative reforms that had been implemented by the countries concerned. An ESCWA document was also presented, in which the general framework for the evaluation process was surveyed and the contents of the country reports were summarized.

The draft study, entitled *The Optimum Management of Water Resources in the ESCWA Countries*, was presented to the Committee on Water Resources at its fifth session, held in Beirut from 30 October to 1 November 2002. The members of the Committee were asked to review its contents and to advise ESCWA of their comments and any new data that they might deem worth considering. The present report is the outcome of those comments and discussions.

We may note at this point that this study is based on contributions and data from the members of the Committee on Water Resources, data from the member countries, previous studies conducted by ESCWA in this area, and country documents. It is merely an attempt to present an inventory of these measures and a survey of the expertise of member countries in water-related sectors, with a view to noting successful initiatives and making them available to all member countries.

CONTENTS

	<i>Page</i>
Foreword	iii
Introduction	1
<i>Chapter</i>	
I. PROGRESS TO DATE IN CREATING AN ENABLING ENVIRONMENT FOR THE STRENGTHENING OF IWRM: POLICIES, LEGISLATION AND FUNDING	5
A. The optimization of strategies and policies for water resource management and development in the ESCWA countries	5
B. Legislative framework: water policy translated into laws and control measures	10
C. Financing and incentive structures: financial resources to meet water needs	14
II. PROGRESS TO DATE IN INSTITUTION-BUILDING	18
A. Creating an institutional framework: forms (institutional arrangements) and functions	18
B. Building institutional capacity: developing human resources	26
III. PROGRESS TO DATE IN THE DEVELOPMENT OF WATER RESOURCE MANAGEMENT TOOLS	29
A. Water resources assessment: understanding resources and needs	29
B. Plans for IWRM	30
C. Efficiency in water use: managing demand	31
D. Social change instruments: encouraging a water-oriented society	31
E. Conflict resolution: conflict management and ensuring partnership	33
F. Regulatory instruments: water allocation and restrictions on water use	34
G. Economic instruments: using value and prices for efficiency and equity	35
H. Information management and exchange: better knowledge for better water management	37
IV. ASSESSING PROGRESS IN THE FIELD OF INTEGRATED WATER RESOURCE MANAGEMENT IN THE ESCWA COUNTRIES	40

LIST OF TABLES

1. The IWRM toolbox	3
2. Main features of the most recent approaches to water sector management in Lebanon	7
3. Some laws and statutes relating to water and the environment that have recently been enacted in ESCWA countries	13
4. Institutional arrangements in the field of water resource management in some ESCWA countries: advantages and disadvantages of different types	20

CONTENTS (continued)

	<i>Page</i>
5. Water resource monitoring agencies and water-related projects and standards in the ESCWA countries	28
6. Assessment of progress to date in the implementation of integrated management in the ESCWA countries	40

LIST OF BOXES

1. Integrated water resource management and water demand management	6
2. Main obstacles to the enforcement of water legislation	23
3. Model enforcement structures in various countries outside the ESCWA region	24
4. Proposed system of incentives for optimization of water consumption in Yemen	38
<i>Figure.</i> General Strategy for Palestinian Water	10
<i>References</i>	43

INTRODUCTION

In the ESCWA countries, water resources are in short supply, while demand for water is growing. Given this situation, the question of the optimal management¹ of water resources is clearly of crucial importance, with implications not only for the future development of those countries, but also for the sustainability of their past economic and social achievements. The dilemma arises from continuing growth in demand, which is the result of galloping population increase and other social factors,² in conjunction with the fact that the region is already exploiting all its annual surface water resources,³ while its aquifers are becoming depleted.

In brief, the ESCWA countries are facing a water crisis that is becoming more critical year by year. It is imperative for them to adopt realistic policies and institutional arrangements⁴ that will enable them to control demand for water, apportion the available quantities along economically efficient lines, and ensure that water is used more efficiently⁵ in various sectors. The essential purpose of this study is to shed light on the measures that the ESCWA member countries have taken to upgrade their water resource management and their water facilities.

A. OBJECTIVES OF THIS STUDY

This study seeks to:

1. Examine the various measures that have been taken by ESCWA countries to upgrade their water resource management and derive therefrom relevant lessons and specialized knowledge that may be of benefit to the other countries.
2. Contribute to the enhancement of the capacity of member countries to analyse and evaluate the effectiveness of their water resource management and identify weaknesses and any measures that should be reformed or strengthened. This study thus presents an analytical framework for an assessment of countries' accomplishments in the area of IWRM.

¹ The term "management", as used in this study, is not synonymous with "administration". The former is the more comprehensive of the two, including as it does all forms of action aimed at attaining specified objectives and, in the case of the water sector, encompassing the technical, institutional, administrative and legal aspects of resource evaluation, planning, development and control and also the operation of structural facilities.

² Population growth is a cause of increased demand for water. In the course of the past 25 years, average population growth in the region has fluctuated between 2.5 per cent and 3.5 per cent annually, while year-over-year increases in demand for water have ranged between 4 and 8 per cent. The populations of most of the ESCWA countries are expected to double within the next 23 years, with resultant huge increases in demand for water that it will not be possible to meet from the available sources, whether conventional or non-conventional. In addition, unplanned urban expansion will require substantial spending for water supply and sanitation facilities.

³ One of the main problems relating to the region's surface water is that there are no agreements on the allocation of water between riparian States sharing most river basins and aquifers.

⁴ The term "institutional arrangements", as used in this study, denotes the full range of official laws, systems, standards, rules and mechanisms, in addition to unofficial or popular rules and mechanisms, including customary practices, that are used by Governments to determine and implement their water-related policies.

⁵ Inadequate supply or increased demand? There are two views or approaches to the search for solutions to the water crisis. According to one school of thought, the cause of the crisis is that the arid lands of the region simply do not have enough water to meet the increasing demand resulting from population growth and agricultural and industrial development. Consequently, solutions must consist in finding new sources for every increase in demand, even though current use may be less than optimal. This is what is known as supply policy. Proponents of the other view (including the World Bank) admit that water has been becoming scarce and that demand for it has increased in recent years, but attribute the current crisis to mismanagement and misuse, asserting that non-domestic consumption, which accounts for a large percentage of all consumption, is not consistent with economic priorities. According to this view, then, the current crisis has more to do with demand than with supply. Solutions will therefore consist in controlling demand, reducing consumption, enhancing efficiency and allocating water for economically efficient uses through market mechanisms, such as pricing, encouraging the commodification of water, and the like.

B. IMPORTANT ISSUES

Where a country does not possess the capacity to manage its water resources efficiently, its society must inevitably bear a growing cost burden as its water deteriorates, quantitatively or qualitatively, as a result of uncoordinated, fragmented, conflicting or overlapping policies, duplication of activities or projects, inadequate oversight of resources, activities, specifications and standards, and structural ineffectiveness on the part of the institutions that are supposed to provide such oversight. Accordingly, integrated resource management in the interests of optimal water use must be top priority for all those who are concerned with the region's water resources.

C. METHODOLOGY

This study relies on an analytical methodology based on evaluation of all aspects of IWRM in the ESCWA countries. To begin with, we had to establish an analytical framework that would enable us to determine, in a systematic and orderly way, the various rationalization and reform measures taken by the ESCWA States in the area of their water resource management and facilities. Those measures could then be assigned to two main categories: measures designed to manage demand for water, and measures designed to manage water supply. Within each of these categories, measures were then distributed into three groups, as follows:

1. Institutional measures relating to policy development and implementation, water sector management, coordination of water sector institutions, and oversight of resources and activities.
2. Legislative measures (laws and regulations) aimed at policy enforcement and the strengthening, protection, conservation, development and management of water resources.
3. Economic measures relating to approaches to funding in the water sector, pricing policy (tariffs) and the role of the private sector.

The concepts of supply management and demand management are closely related, and it is frequently difficult to determine whether a particular measure is designed to enhance the former or the latter. Consequently, we decided that it would not be feasible for our study to be conducted within that analytical framework, and it was therefore discarded in favour of a structural framework known as the "IWRM toolbox", which was introduced by the Global Water Partnership at the International Conference on Freshwater, held in Bonn in December 2001. This toolbox can be used to conduct a comprehensive analysis of a country's progress toward IWRM and identify any weak points. It comprises some 49 tools, distributed along three axes (see table 1) including:

- (a) An enabling environment for the strengthening of integrated management;
- (b) Institutional roles;
- (c) Water management tools.

In addition, contributions from members of the Committee on Water Resources of ESCWA were extensively used in the preparation of this report, as were available data on member countries, previous studies conducted by ESCWA in this area, and country documents presented at various meetings, including the Regional Symposium on Water Use and Conservation (Amman, 28 November – 2 December 1993), the Expert Group Meeting on Water Legislation (Amman, 24-26 November 1996), the Expert Group Meeting on Updating the Assessment of Water Resources in the ESCWA Member Countries (Beirut, 20–23 April 1999) and the Expert Group Meeting on the Harmonization of Environmental Standards in the Water Sector of ESCWA Member States (Beirut, 28 September – 1 October 1999). Also in the context of the preparation of this study, a two-day workshop was held at ESCWA Headquarters in Beirut in October 2001 to consider progress in IWRM achieved by the member countries. The workshop was attended by representatives of seven member countries, and some additional data were obtained, which were added to the Working Group's previous stock.

D. STRUCTURE OF THE STUDY

This study comprises an introduction and four chapters. Chapter I consists of a survey of progress to date in creating an enabling environment for the strengthening of IWRM. Chapter II is a survey of progress to date in the area of institutional roles. Chapter III discusses progress to date in the development of water resource management tools. Lastly, chapter IV contains an evaluation of the status of ESCWA countries as regards their progress toward IWRM.

TABLE 1. THE IWRM TOOLBOX

(a) Enabling environment	(b) Institutional tools	(c) Management tools
<p>1. Policies: setting goals for water use, protection and conservation.</p> <p>(a) Preparation of a national water resources policy;</p> <p>(b) Policies with relation to water resources.</p>	<p>1. Creating an institutional framework: forms (institutional arrangements) and functions.</p> <p>(a) Transboundary organizations for water resource management;</p> <p>(b) National apex bodies;</p> <p>(c) River basin organizations;</p> <p>(d) Regulatory bodies and enforcement agencies;</p> <p>(e) Service providers and IWRM;</p> <p>(f) Civil society institutions and local community organizations;</p> <p>(g) Local authorities.</p>	<p>1. Water resources assessment: understanding resources and needs.</p> <p>(a) Water resources knowledge base;</p> <p>(b) Water resources assessment;</p> <p>(c) Modelling in IWRM;</p> <p>(d) Developing water management indicators.</p>
<p>2. Legislative framework: water policy translated into law.</p> <p>(a) Water rights;</p> <p>(b) Legislation for water quality;</p> <p>(c) Reform of existing legislation.</p>	<p>2. Building institutional capacity: developing human resources.</p> <p>(a) Participatory capacity and empowerment in civil society;</p> <p>(b) Training to build IWRM capacity in water professionals;</p> <p>(c) Regulatory capacity;</p> <p>(d) Participation in knowledge.</p>	<p>2. Plans for IWRM.</p> <p>(a) Basin management plans;</p> <p>(b) Risk assessment and management.</p>
<p>3. Financing and incentive structures: financial resources to meet water needs.</p> <p>(a) Investment policies;</p> <p>(b) Institutional reform in the public sector;</p> <p>(c) The role of the private sector;</p> <p>(d) Cost recovery and tariffication policies;</p> <p>(e) Investment evaluation.</p>		<p>3. Efficiency in water use: managing demand.</p> <p>(a) Improved efficiency of use;</p> <p>(b) Recycling and reuse;</p> <p>(c) Improved efficiency of water supply.</p>

TABLE 1 (continued)

(a) Enabling environment	(b) Institutional tools	(c) Management tools
		<p>4. Social change instruments: encouraging a water-oriented society.</p> <p>(a) Education curricula on water management;</p> <p>(b) Training of water professionals;</p> <p>(c) Training of trainers;</p> <p>(d) Communication with stakeholders;</p> <p>(e) Water campaigns and awareness raising;</p> <p>(f) Broadening of the participation base in water resource management.</p>
		<p>5. Conflict resolution.</p> <p>(a) Conflict management;</p> <p>(b) Shared vision planning;</p> <p>(c) Consensus building.</p>
		<p>6. Regulatory instruments.</p> <p>(a) Regulations for water quality;</p> <p>(b) Regulations for water quantity;</p> <p>(c) Regulations for water services;</p> <p>(d) Land-use planning controls and nature protection.</p>
		<p>7. Economic instruments: using value and prices for efficiency and equity.</p> <p>(a) Pricing of water and water services;</p> <p>(b) Pollution and environmental charges;</p> <p>(c) Water markets and tradable permits;</p> <p>(d) Subsidies and incentives.</p>
		<p>8. Information management and exchange: better knowledge for better water management.</p> <p>(a) Information management systems;</p> <p>(b) Sharing national and international data.</p>

Source: Global Water Partnership, *Integrated water resource management*, TAC background paper No. 4, March 2000.

I. PROGRESS TO DATE IN CREATING AN ENABLING ENVIRONMENT FOR THE STRENGTHENING OF IWRM: POLICIES, LEGISLATION AND FUNDING

The IWRM toolbox contains three sets of tools that will serve to create an enabling environment for the strengthening of IWRM, and each set includes a number of tools. These tools will be considered in this chapter as we look at the progress achieved in this area by the ESCWA countries.

A. THE OPTIMIZATION OF STRATEGIES AND POLICIES FOR WATER RESOURCE MANAGEMENT AND DEVELOPMENT IN THE ESCWA COUNTRIES

This set contains two tools: preparation of a national water resources policy, and policies with relation to water resources. Until the early 1990s, the ESCWA countries paid little attention to aspects relating to the preparation of water resource policies or improved water resource management planning, or the integration of those aspects into their economic plans. For the most part, they concentrated on keeping their people supplied with adequate quantities of water and expanding agricultural production, spending heavily on the building, operation and maintenance of infrastructure facilities.

1. *Preparation of a national water resources policy*

Drinking water, sanitation and environmental protection projects head the list of water policy priorities for all States in the region, and they have made noteworthy progress with those aspects. Different countries have different water resource development and management policies, depending on their respective water resources and their socio-economic situations. Egypt, Iraq and the Syrian Arab Republic have now assigned top priority to the development, efficient use, protection and preservation of their surface water resources, in contrast to their former policies aimed at food self-sufficiency. The Gulf Cooperation Council (GCC) countries, on the other hand, are currently giving priority to increasing their supplies of water through desalination and groundwater pumping, and are simultaneously encouraging food self-sufficiency.

Egypt's water policy has been developed in the context of its National Water Plan, which is to be implemented by stages up to the year 2017. The plan focuses on the development and management of the water of the Nile, a substantial proportion of which is to be allocated to the agricultural sector. The Plan contains investment programmes, production targets, a cost-benefit analysis, rural development plans and surface water and groundwater allocation strategies. It also includes water resource management scenarios, strategies for the apportionment of water to various sectors, and guidelines for water conservation and reuse.

This plan is the successor to a ten-year plan covering the period 1990-2000. That plan was developed in response to several exceptional water-related events which had a direct impact on water planning in Egypt. Those events were as follows: (a) The 1979-88 drought period, during which the Nile flows yielded 99 billion cubic metres less water than expected into Lake Nasser and had reduced the reservoir to a critical minimum of 6.8 billion cubic metres by July 1988; (b) cessation in 1983 of construction work on the Jonglei Canal, a project which would have provided Egypt with an extra 2 billion cubic metres per year; and (c) a revitalization of the land-reclamation programme planned to reclaim approximately 61,000 hectares annually, requiring one million cubic metres of additional water each year.⁶ These three factors point up the need to devote efforts to the optimization of water use as an important approach to the task of coping with natural fluctuations in Nile flows.

In Yemen, water resource development has continued to be characterized by fragmented orientations and strategies that have had no impact on water use efficiency, especially in the agricultural sector, despite the adoption of a new water strategy in 1998.⁷ The aims of that strategy are the protection of water resources from depletion and pollution, the optimization of water use for maximum benefit, and the satisfaction of society's needs for water for all purposes. The strategy sets forth a set of proposed bases and principles for

⁶ Martin Hvidt, "Water resource planning in Egypt", in *The Middle Eastern Environment*, edited by Eric Watkins (Cambridge: St. Malo Press, 1995).

⁷ Republic of Yemen, *National Water Strategy* (Sana'a: National Water Resources Authority, 1998).

attaining those objectives, and discusses the ownership of water, the rights and duties of the State and its citizens, and other matters. It also includes a set of goals and viewpoints on water resource development and management, legislation, institutional arrangements, public awareness, health and environmental standards, public-private partnership, and research and development.

Box 1. IWRM and water demand management

In the course of the past two decades, water resource management has witnessed the development of two important interconnected concepts that have begun to constitute the heart of water resource management efforts in the region. The first of these concepts is integrated management, namely, management of these resources from an integrated, comprehensive standpoint rather than a narrow sectoral standpoint. The second concept is demand management, namely, a shift away from the exploitation of water resources as an unlimited asset (supply management) toward management of those resources as a depletable asset that may be squandered as a result of pollution (transition to demand management). Simply put, IWRM means not making decisions about water resource development and management from a single standpoint, considering only the needs of a specific sector, in isolation from the needs of other sectors. It 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”.* IWRM thus concerns both natural systems and man-made systems.

As regards natural systems, we may mention the integration of land and water, surface water and ground water, water quantity and quality, freshwater management and coastal region management, upstream and downstream States, water and sewerage. As regards man-made systems, we find trans-sectoral integration of water and economic policies extending to all water utilization sectors within a single country, integration of large-scale water projects and economic development, and integration of official agencies and ordinary beneficiaries through the inclusion of the latter in planning, decision-making, resource regulation and so on. Another aim of IWRM is to make optimal use of water at every stage in the hydrological cycle without causing environmental degradation. In the case of the ESCWA countries, this means, *inter alia*, reusing treated wastewater for irrigation purposes, designating different grades of water for different use categories, adopting cooperation among riparian States in the case of shared river basins, creating law enforcement mechanisms, implementing greater institutional decentralization, and strengthening the role of NGOs and other bodies in technical, social and economic issues.

* Global Water Partnership, *Integrated water resource management*, 2000.

In Qatar, the main features of the Government’s water policy, as embodied in development plans, are to put a stop to groundwater degradation by restricting pumping and increasing recharge, to draw on deep aquifers, and to rely more heavily on desalinated water to meet the needs of the domestic and industrial sectors.⁸ Priority is assigned to water for domestic uses, followed by agricultural and industrial uses.

In the Sultanate of Oman, the government’s development plan gives priority to meeting demand for water from the domestic and industrial sectors. To that end, it relies on a variety of strategies, including greater reliance on desalination and water from shallow aquifers, more efficient irrigation, restrictions on agricultural activities, identification of regions with adequate quantities of water, increased aquifer recharge, restrictions on pumping from non-renewable groundwater sources, water conservation, and action to enhance public awareness. The plan also includes programmes aimed at upgrading the country’s hydrological monitoring network and preparing an inventory of recently drilled wells.

In Lebanon, initial steps toward the development of a water policy were taken in 1993. The policy aims at continuous evaluation of the country’s surface and groundwater resources and demand for water, and more effective water allocation and management. The Government is currently focussing on short-term

⁸ United Nations Economic and Social Commission for Western Asia, *Updating the assessment of water resources in the ESCWA member States*, a paper presented at the Expert Group Meeting on Updating the Assessment of Water Resources in ESCWA Member Countries, Beirut, 20-23 April 1999 (E/ESCWA/ENR/1999/WG.1/7).

policies to upgrade water services by overhauling the distribution system, providing adequate sanitary facilities, and strengthening public awareness programmes. Future objectives are expected to include obtaining maximum benefit from Lebanon's surface water resources through the construction of more hydrological facilities, implementing groundwater recharge programmes, recycling treated wastewater, and upgrading and protecting surface and groundwater monitoring systems. Some of the most prominent aspects of recent approaches to water management in Lebanon are summarized in table 2 below. These have come about as a result of new legislation, Law No. 221 of 2000, a law to organize the water sector, which is currently being brought into force.⁹ These approaches are consistent with the draft ten-year plan (2001-2011), which is divided into six sections: the provision of additional water resources (through the construction of dams and mountain reservoirs and the recharging of aquifers), potable water projects, irrigation water projects, wastewater projects, river cleaning and maintenance projects, and hydro-electric power projects.

TABLE 2. MAIN FEATURES OF THE MOST RECENT APPROACHES TO WATER SECTOR MANAGEMENT IN LEBANON

Management policy	Previous situation	New situation resulting from enactment of the recent law
Sectoral institutions	21 Water Authorities + the National Litani River Authority and more than 200 water committees and projects	Consolidation of these Authorities and committees into four WAs + the NLRA
Jurisdiction of Water Authorities	Project management and maintenance	Studies on projects, project funding, execution, management and maintenance
Fields of competence	Drinking water only in some cases, and drinking water and irrigation water in others	Drinking water, irrigation water and wastewater, in accordance with the principle of integrated management
Management structures and powers	Direction: Ministry of Energy and Water Oversight: Civil Service Council, Central Inspection, Accounting Bureau, Ministry of Finance, Board in charge of yearly auditing of public institutions	Same management structures, but with the following changes: Broader powers for decentralized Directorates (WAs) at the expense of the central body (MEW) Reduced oversight of WAs (no longer subject to oversight by the Civil Service Council, yearly audit by the Board) Establishment of a committee to evaluate WAs performance
Private sector participation	Maintenance and operation (18 establishments at the present time)	Maintenance and operation Operation, maintenance, billing and collection (City of Tripoli, initial experiment) BOT (build-operate-transfer) project for increased water supply to the capital, Beirut
Enhanced awareness aimed at influencing demand		More attention to information outreach; use of meters instead of gauges in some WAs, such as Beirut, Tripoli and Saida, to ensure that amounts paid by subscribers are commensurate with consumption

⁹ Lebanese Republic, *Memorandum on the main lines of water sector reform in Lebanon* (Ministry of Energy and Water, General Directorate for Operations, 2001) (unpublished).

TABLE 2 (continued)

Management policy	Previous situation	New situation resulting from enactment of the recent law
Measures to increase supply	To date, recycled wastewater and desalinated seawater have not been used. An effort to use surface and groundwater resources more efficiently is currently under way.	Ten-year plan to build dams and reservoirs in the mountains for rainwater storage, and construction of wastewater treatment stations Bekaa irrigation project (2000 additional hectares) South Lebanon irrigation project at an altitude of 800 metres (funded by Kuwait) BOT project to increase supply to the capital, Beirut

Source: Ministry of Water and Electricity, Lebanon.

In Iraq, the main obstacle to IWRM is the fact that there is as yet no official agreement with other riparian States on the apportionment of water; this has made it impossible to develop a long-term water policy or plan.¹⁰ In recent years, water strategy has focused on offsetting the reduced flow in the Euphrates that has resulted from the construction of dams in upstream States, in an effort to increase water storage within Iraq. This is likely to be a long and costly process in view of the absence of final agreements with riparian States on apportionment, and in view of the Turkish Government's ambitious plans for its GAP project. Under these circumstances, the main priority should doubtless be an effort to reach a fair agreement on water apportionment among the riparian States.

In the Syrian Arab Republic, water strategies and policies contained in the country's five-year development plans have had three objectives: to provide people with clean water that is safe to drink, to achieve food self-sufficiency, and to make the best possible use of every drop of water.¹¹ In pursuit of those objectives, the water policy outlines a set of proposed measures, including surface water and groundwater resource development to meet the needs of the expanding land area under cultivation, which is seen as a means to long-term self-sufficiency, the construction of dams for flood control, action to meet irrigation needs, the upgrading of water quality, and encouragement for the reuse of treated wastewater.

In the Kingdom of Saudi Arabia, water resource planning has been based on policies and strategies embedded in successive five-year development plans. Over the past two decades, the emphasis has been on increasing quantities of desalinated water to meet domestic needs, evaluating deep groundwater reserves, implementing groundwater recharge programmes, flood control, building water supply and wastewater disposal systems, and reusing treated water. However, the most recent five-year plan features a concern to achieve a balance between supply and demand, with emphasis on water conservation through more efficient irrigation, reduced demand from the agricultural sector, groundwater resource monitoring and preservation, and increasing supply by means of seawater desalination.

In Bahrain, water-related strategies of past years were mainly concerned with increasing supplies of desalinated water and upgrading the efficiency of the water distribution system with a view to restoring a balance between demand for groundwater and supply from underground sources. But the country's water resources were steadily declining, and in 1990 Bahrain adopted a water strategy for the period up to 2010. That strategy emphasizes better water management. During the past five years, public awareness campaigns and measures to reduce system losses have been a contributing factor in making substantial quantities of

¹⁰ United Nations Economic and Social Commission for Western Asia, *Updating the assessment of water resources in the ESCWA member States*, a paper presented at the Expert Group Meeting on Updating the Assessment of Water Resources in ESCWA Member Countries, Beirut, 20-23 April 1999 (E/ESCWA/ENR/1999/WG.1/7).

¹¹ Ibid.

water available. The water strategy's objectives for the longer-term future include a comprehensive demand management plan featuring loss reduction, the installation of meters, a tariff schedule featuring progressively higher rates for higher consumption brackets with a view to encouraging water conservation, public awareness campaigns, encouragement for the use of treated wastewater, and the use of desalinated seawater to make up the country's water deficiency.

In Jordan, the Ministry of Water and Irrigation has developed a water strategy that was discussed and adopted by the Jordan Valley Authority and the Water Authority, discussed by the Ministerial Council on Development, and finally approved by the Council of Ministers in April 1997. This strategy is characterized by a strong focus on more effective water resource management and the sustainability of present and future uses, and it devotes particular attention to pollution control, action to prevent depletion, and greater practical efficiency in the transport, distribution and use of water. The strategy takes a twofold approach, addressing both supply and demand. In addition, it seeks to defend and protect Jordan's shared-water rights through communication, discussion and the negotiation of bilateral and multilateral agreements. In the context of the strategy, the Ministry has developed a series of policies for all water facilities (July 1997), irrigation water (February 1998), groundwater management (February 1998) and wastewater management (June 1998). The main obstacles with which water policy in Jordan has to contend are the country's steadily growing water shortage, unlawful well boring, disregard of quantitative restrictions on pumping, reluctance to adopt modern irrigation methods, suboptimal consumption, the use of drinking water for irrigation, and low yields in relation to water inputs.¹²

In Palestine, the Palestinian Authority has adopted a general water strategy aimed at "achieving an optimal approach to the management, protection and conservation of limited water resources".¹³ The strategy identifies seven elements covering the most important issues requiring strategic intervention by the State (see figure), including: the pursuit of Palestinian water rights, the strengthening of water policies and systems, institutional and human capacity building, data system development and resource evaluation, control of investment and operations in the water and sanitation sector, effective pollution control and water resource protection, and public awareness raising and encouragement for popular participation. The Palestinian Authority's water policy, for its part, is based on a set of principles, notably full State ownership of water sources, the right of every citizen to safe drinking water, control of industrial and agricultural development in the light of the quantities of water available, and water as a good having environmental, social and economic value.¹⁴ The National Water Plan published in December 2000, contained a set of detailed investment plans and programmes for the next five years, and also general investment programmes over a twenty-year period.¹⁵

Many countries that do not have water policies have persisted in incorporating water-related issues into their development plans. The unsatisfactory aspect of this approach is that development plans may be neglected in the event of repeated changes of government, or they may lose their coherence and consistency when successive governments try to make alterations to them. Consequently, water policies embedded in development plans are inherently less stable than water policies established by legislation; the former may not be implemented as effectively as could be wished, or may not be implemented at all. This is particularly likely to occur with water plans that are worded in general terms and do not include clearly defined objectives in the areas of integrated management, the role of local communities and the private sector and the like, and are not accompanied by specific projects expressly designed to attain those objectives or indicators to track and monitor progress toward them.

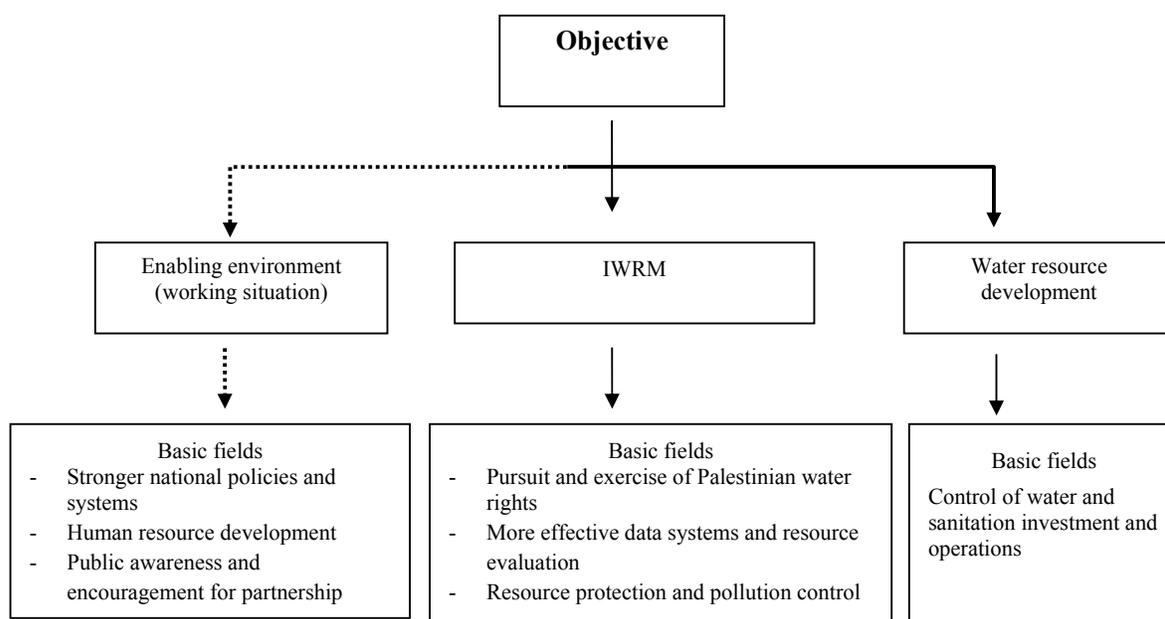
¹² Jordan, *Report on water policy and optimal water resource management* (Ministry of Water and Irrigation, 2001) (unpublished).

¹³ Palestinian National Authority, *Water filter strategic planning study fund report*, Specialist studies, vol. III (April 2000).

¹⁴ Ibid.

¹⁵ J.Y. Al-Dadah, *Water demand management and conservation methods in Palestine*, in the Proceedings of the Joint WHO-UNEP First Regional Conference on Water Demand Management, Conservation and Pollution Control, Amman, 7-10 October 2001.

Figure. General Strategy for Palestinian Water



Source: Palestinian National Authority, *Water filter strategic planning study fund report*.

It is clear from the foregoing discussion that a water policy development mechanism, one that will accommodate both imperatives—the protection and optimal use of water resources on the one hand and economic growth on the other—is sorely needed. Some of the countries of the region have recently begun to realize this, and are fashioning mechanisms that are designed to enable them to include water policies among their economic policies.

2. Policies with relation to water resources

Some countries of the region (Egypt, Iraq, Jordan, the Syrian Arab Republic and Yemen) have developed policies for sectors for which water is a factor (agriculture, energy, industry, land use, intraregional trade and the like), while other countries still have not developed policies for those sectors and coordinated them with water sectors.

In this context, it is essential to realize that policies for these other sectors directly affect water use and management, and to create appropriate mechanisms for coordinating those policies, to ensure that the interests and concerns of all stakeholders are taken into account. These mechanisms can be set up on more than one level: between Ministries, with the national water resource management authority, at the level of individual river basins and at the local level. Obviously, the successful implementation and impact of water policies will depend on the effectiveness of coordination mechanisms.

B. LEGISLATIVE FRAMEWORK: WATER POLICY TRANSLATED INTO LAWS AND CONTROL MEASURES

The importance of legislation with a bearing on water, and also other legislation covering related matters, such as environmental legislation, stems from the fact that it embodies water policy and translates it into regulations and implementation mechanisms. This compartment of the IWRM toolbox contains three tools: water rights, legislation for water quality, and reform of existing legislation.

1. Water rights

Most of the ESCWA countries have adopted laws dealing with:

(a) Water ownership rights, comprising two aspects: (i) the legal status of water. In most ESCWA countries water is owned by the State, which is responsible for conserving it and ensuring that it is used judiciously, in accordance with the Constitution; (ii) conditions relating to the ownership of water;

(b) Water users' rights, including priorities for utilization, quantities that may be used, place of use, and burden sharing in times of scarcity.

2. Legislation for water quality

In the Syrian Arab Republic, Normative Standard 45 of 1973 was the country's first drinking-water standard. It covered a number of aspects: radioactive materials, physical characteristics, chemical characteristics, chemical toxicity, bacterial toxicity, standardized sampling methods and sampling frequencies. The standard was subsequently amended, and a final formulation of draft normative standards for drinking water in the Syrian Arab Republic was adopted and promulgated under the title *Drinking water quality* in 1996. There are normative standards for wastewater as well, which govern effluent from economic activities that is discharged into public sewer systems. These standards, which were adopted in 1996, established permissible pollutant levels with a view to ensuring that wastewater treatment plants could function adequately and that treated wastewater would be suitable for irrigation purposes.

In Yemen, the National Water Resources Authority (NWRA) has developed environmental standards covering the water sector, working jointly with the Environmental Protection Agency, the Ministry of Construction, Housing and Urban Planning, the Ministry of Electricity and Water, the Ministry of Agriculture and Irrigation, the Ministry of Public Health and the Yemen Standards Authority. These standards, which were approved by the Council of Ministers in September 1999, deal with four categories of water: public drinking water, tariffed drinking water, industrial and commercial wastewater, and irrigation water. They were developed having regard to the country's economic and environmental circumstances, international and regional bases for the development of standards, water-related standards in a number of arid and semi-arid Arab countries, the standards in force in some neighbouring countries (Egypt, Jordan and Saudi Arabia), and conditions specific to Yemen, such as the status of the country's aquifers and its nonexistent or rudimentary sewage disposal facilities.¹⁶

In Palestine, a water pollution problem is emerging, especially in the region of the coastal aquifer, with rising nitrate and chloride levels as a result of inadequate recharge and increased pumping. That aquifer is in danger of being infiltrated by wastewater, leachate from garbage tips and agricultural fertilizers. While there is a comprehensive national water source protection and management plan that includes water source protection programmes based on world practices and standards, the Palestinian Authority will not be able to implement those programmes until it achieves control of all the Palestinian territories and the final status negotiations, including in particular the negotiations over water, have been completed and the PA is able to exercise its full water rights.

In Kuwait, there are a number of agencies that are responsible for monitoring water quality and pollution control. These include the Ministry of Electricity and Water, the Ministry of Health and the Environment Public Authority. It is the Authority that monitors drinking water, treated wastewater, brackish water and seawater. The Authority has the power to issue cease-and-desist orders against any entity, domestic or foreign, that is found to be polluting the environment, on the basis of the normative environmental pollution standards issued by the Standards and Practices Commission. Those standards cover drinking water, brackish water, seawater and residual water discharged into the sea.

In Jordan, under the Public Health Law (Law No. 21 of 1971), responsibility for ensuring the safety of drinking water is vested in the Ministry of Health, but responsibility for water quality monitoring is divided among three bodies: the Ministry of Water and Irrigation, the Ministry of Health and the General

¹⁶ United Nations Economic and Social Commission for Western Asia, *Proceedings of the Expert Group Meeting on Harmonization of Environmental Standards in the Water Sector of ESCWA Member States*, Beirut, 28 September - 1 October 1999 (E/ESCWA/ENR/1999/20) (United Nations, New York, 1999).

Corporation for Environment Protection. Each of these has a specific role to play and is in charge of particular aspects: water sources, pumping stations, main reservoirs, distribution systems, withdrawal points and so on, and each of them runs a far-reaching sampling and analysis programme. In 1997, for example, approximately 27,000 samples were taken, and those samples were subjected to approximately 84,000 chemical and biological analyses.¹⁷ Jordan has normative drinking water standards (286/97) that are modelled after those of the World Health Organization (WHO) and the Environmental Protection Agency in the United States, amended to some extent to make them applicable under local conditions. It also has standards governing wastewater that may lawfully be discharged to sewers (893/95).

In Saudi Arabia, responsibility for environmental issues is vested in the Ministerial Committee on Environment and its executive arm, the Environmental Monitoring and Protection Bureau. The Bureau is in charge of water quality issues, applying the environmental protection standards adopted in 1981, as amended in 1989. Those standards are divided into three parts: water guidelines, standards on direct withdrawal, and guidelines for wastewater treatment before disposal to sewers. The Saudi Normative Standards Organization is responsible for the matter of drinking water standards, both tariffed and non-tariffed, while Water and Sanitation Authorities are responsible for drinking water distribution and the monitoring of water in distribution systems to make sure that it is safe for consumers to drink.¹⁸

In Egypt, under Law No. 48 of 1982, responsibility for systematically taking and analysing water samples at drinking water treatment plants is vested in the Ministry of Health, while responsibility for issuing permits to discharge liquid, solid and gaseous residues into the Nile is vested in the Ministry of Water Resources and Irrigation. The Law established standards for post-treatment wastewater that may lawfully be discharged into the Nile. In 1994, a new law on the environment was promulgated (Law No. 4), with emphasis on environmental preservation in all three spheres: air, land and water. Under that law, the Ministry of Water Resources and Irrigation was designated the agency responsible for protecting the Nile and all watercourses in Egypt, while the Environmental Affairs Agency was given responsibility for protecting air and land. Water quality monitoring was assigned to a number of bodies.

3. Reform of existing legislation

All the ESCWA countries understand the importance of overhauling their water-related legislation in two areas in particular:

(a) Organization of the water resource utilization activities pursued by societies. Legislation currently in force is thus being reviewed, and new laws on water and irrigation are being prepared in Egypt, Oman, the Syrian Arab Republic and Yemen;

(b) Organization of the institutional situation in the field of water management. To that end, jurisdictions are being separated to eliminate duplication, fragmentation, and lack of coordination and consistency between water policies and development policies. Accordingly, a number of ESCWA countries (Jordan, Palestine and Yemen) have recently restructured their water sectors, separating water resource planning and management functions from water service provision and project implementation. Planning and management are entrusted to a single national body that coordinates project implementation with the Ministries in charge of the relevant sectors. In addition, a number of ESCWA countries (Lebanon, for one) have promulgated legislation aimed at supporting the decentralization of water resource management, while other countries (including Yemen) have made considerable progress in decentralizing their service facilities.

In general, it may be said that water-related legislation in most countries of the region focuses on the development and protection of water resources, and does not pay enough attention to the management and enforcement aspects; to illustrate, they tend not to include incentives for water conservation and water use optimization, such as measures designed to encourage farmers to adopt state-of-the-art irrigation systems. There is still a mass of uncoordinated legislation, while laws and regulations are inadequately enforced; these

¹⁷ Ibid.

¹⁸ Ibid.

are the main problems affecting water management, even in countries with a long history in that area, such as Egypt.¹⁹ Table 3 summarizes the most important water-related legislation enacted recently by ESCWA countries.

TABLE 3. SOME LAWS AND STATUTES RELATING TO WATER AND THE ENVIRONMENT THAT HAVE RECENTLY BEEN ENACTED IN ESCWA COUNTRIES

Egypt	Environment Law (Law No. 4 of 1994)
Lebanon	Law No. 221 of 2000 on the Organization of the Water Sector
Iraq	Law No. 12 of 1995 on Irrigation, Environment Law (Law No. 3 of 1997)
Yemen	Draft Law on Water and Irrigation (in the adoption process)
United Arab Emirates	Law on Environmental Protection and Development (Law No. 24 of 1999)

Source: United Nations Economic and Social Commission for Western Asia, *Strengthening Institutional Arrangements for the Enforcement of Water-Related Legislation and Upgrading Institutional Capacities in the Water Sector in the ESCWA Countries* (E/ESCWA/ENR/2002/11) (United Nations, New York, 2001) (in Arabic).

A review of water-related legislation, of course, must include more than control and enforcement measures; other relevant issues include standards, lists of prohibited actions, maximum limits, permits and licences, in addition to economic measures aimed at encouraging compliance with laws, water conservation, the creation of an enabling climate for voluntary action, and participation and commitment on the part of all sectors of society. Examples of economic measures include user fees based on consumption volume, the institution of fines for pollution and the like. In the long run, such measures may become self-sustaining, requiring no more than oversight by the supervisory agency concerned and continuing care to ensure that the relevant legislation covers all developments occurring in water-related sectors in the Member States and appropriate responses to water-related challenges in the region. Specifically, it will be essential to ensure that water legislation covers the following issues:²⁰

- (a) Rights and obligations of individuals and Government in the matter of water use, priorities relating to water use and definition of beneficial uses;
- (b) A water rights registration and licensing system;
- (c) Designation of an authority to be responsible for implementing the law and specification of its powers; activation of enforcement mechanisms and mechanisms designed to ensure cooperation and coordination between the various agencies operating in the field of water management; encouragement of public participation;
- (d) Attention to economic and environmental aspects in resource development, with emphasis on water quality and pollution control;
- (e) Attention to the international aspect in the field of water rights, and to the international impacts of local laws and dispute settlement mechanisms;
- (f) The issue of integrated planning and the efficient use of water, especially planning at the river basin level and the regional level, including both quantitative and qualitative aspects;
- (g) Provisions relating to technology and research in the field of water, and development of appropriate data systems and guidelines for water policy-makers, managers, users and service providers and the general public;

¹⁹ S. Myllyla, *Cairo: A Mega-City and Its Water Resources*, a paper presented at the Third Nordic Conference on Middle Eastern Studies: Ethnic Encounter and Culture Change, Joensuu, Finland, 19-22 June 1995.

²⁰ United Nations, Economic and Social Council, Committee on Natural Resources, *Legislative and institutional aspects of water resources management: Institutional and legal issues in integrated water resources management*, Report of the Secretary-General, 18 January 1994. E/C.7/1994/6, 2nd session.

(h) Private-sector participation and local management in water service provision, with establishment of effective systems for close monitoring of the role of the private sector to ensure service quality and control of rates;

(i) Separation of the agency responsible for water planning, allocation and management from the user agency.

It is vital that details should be left to be spelled out in the implementing regulations; the law should simply state the object of the legislation, identify the implementation mechanism, and make it clear that there will be penalties for contravention. The Water Protection Law enacted in Oman in 2000, with its eight brief articles, is a concise model of this approach, while its implementing regulations (Regulations for the Organization of Wells and *Aflaj* [irrigation channels]) are a model of what regulations of this kind should be, with their 46 articles containing a wealth of detail about the organization of the digging of wells and *aflaj*. The regulations also include two annexes, one containing grounds on which licence applications may be denied, and the other containing guidelines on well licensing policy. These two annexes constitute a qualitative advance in the drafting of regulations, as they endow the regulations with transparency and minimize scope for interpretation of their provisions.

C. FINANCING AND INCENTIVE STRUCTURES: FINANCIAL RESOURCES TO MEET WATER NEEDS

Most of the ESCWA countries suffer from a severe lack of financing for water sector projects. Financing structures depend on the general State budget, with the result that the Government's yearly spending on water projects reflects its water sector policy and the level of its concern with that sector. This compartment of the IWRM toolbox contains five tools: investment policies, institutional reform in the public sector, the role of the private sector, cost recovery and tariffification policies, and investment evaluation.

1. *Investment policies*

Some ESCWA countries have national water plans containing investment programmes for the development of sources and facilities and demand management; examples include the national plan of Egypt, which extends to the year 2017, and Lebanon's ten-year plan for the period 2001-2011. Most of those countries, however, do not have investment policies expressly designed for the water sector; at best, they may have a policy for investment in projects with a bearing on that sector (irrigation, drinking water and sanitation). Inevitably, policies aimed at the development of specific sectors (policies aimed at stimulating agricultural production or preferential customs tariff policies, for example) play an important role in determining the volume of investment in the sector concerned. It is noteworthy that the field of water resource management (studies and water quantity and quality monitoring systems) does not enjoy adequate attention or funding, receiving only a small share of Government spending. The same applies to investment for the upgrading and rehabilitation of water distribution systems.

In many countries of the region, donor States and international funding institutions influence the volume of investment in the water sector by providing financing for most projects having to do with water facilities development, service upgrading, and the construction of dams and distribution systems and the like. Through their investment policies, these institutions also influence reforms in that sector: it is fair to say that the institutional developments and new policies that have emerged in many ESCWA countries in the course of the 1990s have frequently reflected the recommendations of donors or funding institutions, especially as regards the separation of water resource management from service or facilities management, the strengthening of the principle of cost recovery, capacity building, participation by stakeholders in decision-making, encouragement for private-sector investment and greater decentralization.

2. *Institutional reform in the public sector*

Since most water services are provided by public facilities, any improvement in the operational efficiency of those facilities will have a positive impact on the availability and effective use of financing sources. In practice, they are frequently inefficient and in need of reform. They are financially and

administratively independent to varying degrees, depending on their institutional status: they may be government administrations (within Ministries or Ministries in their own right), administrative units reporting to the competent Minister or Governor, completely independent, self-financing bodies operating on a commercial basis, or corporations that are entirely or largely publicly owned. In view of this diversity of operating status, the reform of any given facility calls for a set of measures tailored to its situation. However, there are various common factors that are essential to upgrade the working efficiency of water service facilities: greater autonomy and freedom from interference in their day-to-day operations, an obligation to pursue specified objectives, progress toward which is readily measurable (such as numbers of new subscribers, reduced billings, percentage of bills collected and the like), tariff reform for more effective cost recovery, incentives for workers, staff training for better customer service, private sector participation insofar as possible, enhanced efficiency, and restructuring along lines that reflect new objectives and orientations.

3. The role of the private sector

The private sector may play a positive role in providing financing for water and sanitation services and in developing a realistic water policy that takes a more comprehensive view of water resources. However, private-sector participation in decision-making does not of itself ensure that policies will serve the national interest: financial institutions and powerful business enterprises may seek to shape policy along lines that advance their own interests, but may not be consistent with the requirements of optimal water resource management. The ESCWA countries continue to make modest gains in this area, with private-sector representatives holding seats on the Boards of Directors of some institutions involved in water management.

The issue of private-sector investment in water service provision has been extensively debated in the countries of the region. Policies are widely disparate, ranging from partnership to outright privatization. The experience of countries that have gone that route suggests that water services may be upgraded through the privatization of facilities without transferring ownership to private firms. Private management may enable a facility to attain its objectives in a shorter time and at a lower cost than government management. With privatization, the risks and the heavy burden of costs associated with water supply services are transferred to the private sector, reducing the growing financial burden of operating and maintaining facilities, strengthening the capacities of the private sector and contributing to its development and that of the local capital market. However, privatization is not a magical solution to all problems: it may lead to negative results unless it takes place within a clearly defined institutional and legal framework for systematic monitoring of the services provided by private firms, including a reliable supply of good-quality water at affordable cost for all segments of society and sustainable patterns of consumption. Private investment continues to be confronted by a number of issues that must be addressed: ability to pay (tariffication), provision of services to rural areas and resource sustainability. Privatization may turn, disastrously, into support for private firms whose first interest, after all, is profit maximization. Consequently, prerequisites for any transfer of public water facilities into private hands are clear-cut policies and legislative and administrative regulations to ensure that private monopolies are not created and to guarantee service quality.

Many ESCWA member countries have striven to devise economic policies that will help to create an enabling environment aimed at encouraging private-sector investment, either on its own or in partnership with the public sector, and those policies constitute a factor driving the privatization process in the water sector. The United Arab Emirates and Qatar, for example, have allowed private firms to build desalination plants and sell water to large-scale industrial users. In Abu Dhabi, a French firm has recently won a contract to own and expand a combined power generation and desalination plant in a package deal under which it owns 49 per cent of the shares, while the Government and local investors own the remainder. In Oman, a plan for a power generating station/desalination plant/wastewater treatment plant was devised early in 1995. This project involves the establishment of a corporation to build, own and operate the plant under a 30-year concession. In Lebanon, there is a trend in the direction of granting private firms concessions for the operation and management of local water facilities. In April 2002, the Ministry of Electricity and Water signed an agreement with a French bank, Société générale, to conduct a study on privatization in the water sector. Under the agreement, Société générale will carry out a comprehensive study covering all parts of Lebanon with a view to ensuring that the necessary investment can be made through private-sector participation.

Private firms are managing water supply facilities in several ESCWA countries. In Jordan, for example, a contract was concluded in 1999 with a French firm for the management of Greater Amman's water supply and sanitation services for a sum of \$136,000,000, of which the Jordanian Government provided \$17,000,000, while the balance was covered by loans in the amounts of \$55,000,000, \$40,000,000 and \$20,000,000 from the World Bank, the European Investment Bank and the Government of Italy respectively. The aims of this project, which is to be implemented over a period of 51 months, are to improve the efficiency, management, operation and delivery of water and wastewater services to approximately 1.6 million people in all parts of the Amman service area, which accounts for 45 per cent of Jordan's total drinking water consumption. The project seeks to reduce leakage, rehabilitate networks, repair subscribers' meters, reduce unaccounted-for water by not less than 25 per cent, and increase revenue. In addition, water facilities will be developed and the sewer network extended.²¹

In Egypt, under a project that is being funded by the United States Agency for International Development (USAID) in cooperation with a non-governmental organization (NGO), a private firm has been engaged to inspect water and wastewater networks, reduce leakage and install water meters in people's homes and government buildings in the cities of Cairo, Suez and Ismailia. The private sector is playing an important role in the country's water supply and sanitation sector, mainly through operation and maintenance contracts or build-own-operate-transfer (BOOT) contracts, and the Government of Egypt is making them welcome. Private firms are operating some wastewater facilities, such as the treatment plants in Gabal Asfar and Tanta. Egypt is looking for reform plans which will render the sector more autonomous and more efficient. In that connection, it will be essential to enact new laws that will attract the private sector and allow it to play a wider role in the water and sanitation sector by operating facilities and providing optimal service to consumers.²² In Kuwait, a consortium has recently been awarded a \$377,000,000 BOOT contract for a major wastewater treatment plant with a capacity of 375,000 cubic metres. The same consortium had previously won a similar contract for another wastewater treatment plant, the Sulaibiya plant.

There are a number of obstacles to privatization in the ESCWA countries, and the most important of those obstacles is the need to build trust among Governments, the private sector and consumers, their small, poorly performing capital markets, in which it is difficult for private establishments to raise the substantial amounts of capital required to purchase public facilities, the fact that water and wastewater facilities are small in size in most ESCWA countries, so that the separation of production, transport and distribution services is not justifiable, the high level of governmental support for water production and distribution, which is a barrier to privatization, and the fact that tariffs need reviewing. It is essential for Governments, first and foremost, to draft regulations to prevent private monopolies from misusing their influence, to create ongoing performance monitoring mechanisms, and to establish appropriate returns on investment in order to attract the capital they need to extend their service networks.

For these various reasons, then, water policies should be designed to encourage a gradual shift to privatization, provided the options include participation by municipalities or local governing structures in oversight and monitoring. Other arrangements may be adopted, such as management contracts or leases featuring private management combined with public ownership. A private firm, whether it simply provides services or operates under a lease, must handle the issue of rates in such a way as both to enhance efficiency and to make a profit. The whole point of privatization, partial or total, is to achieve more efficient use of water. In a number of the ESCWA countries, private management may be more appropriate than outright privatization for the time being, but it may be an initial step toward full privatization in the future.

4. *Cost recovery and tariffification policies*

There is considerable divergence between the ESCWA countries in their approaches to cost recovery, and hence in their water tariffification policies, which tend to vary depending on the type of water utilization

²¹ "Facts about water resources in Jordan," *Arab Water World* (Beirut, CPH), vol. XXIV, No. 6 (November-December 2000), p. 52.

²² H. Morsi, "Water and wastewater utilities management in Egypt," *Arab Water World* (Beirut, CPH), vol. XXV, No. 1 (January-February 2001), pp. 41-42.

(domestic, agricultural, industrial and so on). As regards domestic water consumption, the ESCWA countries fall into three groups: those that provide water services free of charge, as is the case with some of the Gulf countries, those that charge fixed rates regardless of quantities consumed, and those that charge progressive rates, namely, the greater the consumption the higher the tariff, which is the case with most of the ESCWA countries. Virtually all of them charge special rates for commercial (namely, non-domestic) consumption. Furthermore, there are substantial disparities among countries that depend on rivers or floodwater (spate irrigation systems) as regards the rates they charge for irrigation water. Some countries do not levy any charges at all, others charge fixed rates per dunum or hectare, and still others apply a tariff based on quantities consumed. Countries that rely on groundwater for irrigation purposes, in contrast, charge pumpage fees. Jordan, for example, has set a ceiling of 50,000 cubic metres yearly on the quantity that may be pumped from any well and charges fees on any quantity in excess of that figure (there are 300 licensed wells and approximately 600 unlicensed wells in Jordan).

One of the most important contemporary issues in the area of water tariffication is that revenues are not commensurate with maintenance and rehabilitation requirements for drinking water and irrigation water facilities, with the result that services are deteriorating and are unable to keep pace with urban expansion, among other things. A study conducted in Jordan in 1995 showed that revenues from water services covered no more than 47 per cent of the cost of producing the water for domestic use, and no more than 16 per cent of the cost of irrigation water. When Amman's water and sanitation services were privatized, rates for domestic water went up by 40 per cent and rates for irrigation water by 60 per cent. A number of ESCWA member countries have recently undertaken reviews of their water tariffs.

5. Investment evaluation

The object of investment evaluation is to assess returns on investment in the water sector in order to compare the performance of investment for various purposes within that sector on the one hand, and to compare the gains from investment in other sectors on the other hand. There are a number of analytical tools available for this purpose, including cost-effectiveness analysis, which seeks to select the least costly way of attaining a specified objective, and cost-profit analysis, which seeks to identify the project that will generate the highest rate of return on input capital. Good investment evaluation (such as will support IWRM) requires a thorough understanding of the direct and indirect impacts of proposed projects. Investment analysis is thus an important tool for determining project outcomes and the extent to which a project will serve the ends of social justice and efficiency. But while these methods are useful in the task of selecting desirable water and sanitation projects objectively, they may be misused, as for example to appease funding organizations or to gain preference for particular projects. For effective use, they require problem-solving, and many conditions must be met. Accordingly, it appears that they are not really applicable for purposes of selecting water projects in the ESCWA region.

II. PROGRESS TO DATE IN INSTITUTION-BUILDING

The aim here is to create institutional arrangements comprising elements and procedures that will help decision-makers reach optimal decisions in water resource management. The reason why institutional arrangements are so important is that they provide governments with frameworks (both domestic and regional) within which policies can be formulated, implemented and reviewed. In a word, they enable governments to lay the groundwork for water use and management. The IWRM toolbox contains two sets of institutional tools, one having to do with the organizational framework or structure itself, the other with human capacity building.

A. CREATING AN INSTITUTIONAL FRAMEWORK: FORMS (INSTITUTIONAL ARRANGEMENTS) AND FUNCTIONS

Successful, sustainable water resource management depends on the role played by institutions, their impact on people, people's confidence in them, and their transparency. These considerations are highly important factors with a direct impact on the effectiveness of institutional arrangements and the utility of their role in water resource management. Institutional frameworks in the water sector in the ESCWA countries have undergone many reforms, reflecting the substantial concern that this issue warrants. This compartment of the IWRM toolbox contains seven tools: transboundary organizations for water resource management, national apex bodies, river basin organizations, regulatory bodies and enforcement agencies, service providers and IWRM, civil society institutions and local community organizations, and local authorities.

1. *Transboundary organizations for water resource management*

In the ESCWA region, there have been a limited number of successful experiments in creating organizational frameworks for transboundary water resources. In general, these have consisted of little more than setting up institutional frameworks for some boundary-straddling aquifers, such as the Nubian Sandstone Aquifer, which is shared by Chad, Egypt, the Libyan Arab Jamahiriya and the Sudan, and the basaltic aquifer shared by Jordan and the Syrian Arab Republic. Cooperation in managing the waters of the Euphrates, the Nile and the Orontes are also noteworthy. In many cases that cooperation has been essentially driven by projects funded from external assistance and loans; it has no firm institutional roots, and may well come to an end once the projects in question have been completed. ESCWA is seeking to strengthen such cooperation through its various programmes.

2. *National apex bodies*

In the course of the past few years, the States of the region have introduced major amendments into their institutional arrangements for their water sectors in an effort to make them more effective and accommodate water-related policies within their development plans. In ESCWA countries with water resource management policies, three main types of structures may be distinguished: in some, water resource management is the responsibility of a separate Ministry, in others it is handled by one of a number of departments within a single Ministry, and in others a water authority or ministerial committee is in charge of water planning.²³

Most of the countries of the region have set up drinking water and wastewater management structures that are distinct from their water resource management structures. In the Gulf States, for example, water agencies report to the Ministry of Electricity and Water; in Yemen, the bodies in charge of drinking water and wastewater come under the authority of the Ministry of Electricity and Water, while desalination plants are the responsibility of the Ministry of Agriculture and Irrigation; the same is true of Saudi Arabia. In Egypt, these facilities are managed through a variety of institutional arrangements; however, the Ministry of Housing and Public Utilities is the ultimate authority that evaluates water and sanitation establishments and provides them with technical support, both directly and indirectly through the National Organization for Potable Water and Sanitary Drainage. Major cities, including Cairo and Alexandria, have their own water and wastewater authorities, the facilities of the Canal cities are run by local municipal authorities, Beheira,

²³ Morsi, "Water and wastewater utilities management in Egypt".

Damietta and Kafr El Sheikh have water and wastewater companies, Aswan, Fayoum and a number of other Governorates have economic authorities, while the remaining Governorates have departments to manage their water utilities. These various institutions have many deficiencies in common: inadequate skilled labour, not enough funds to cover their operating and maintenance costs, and legal and legislative problems.

(a) *Water resource management as the responsibility of a separate Ministry:* Some ESCWA countries, including Oman until very recently, and currently Saudi Arabia, have adopted this institutional model, separating water resource management as such from water-using sectors. A separate Ministry is put in charge of water resource planning and management; that Ministry thus serves all user sectors but is independent of them. This arrangement avoids the conflict-of-interest situation that may arise when the task of managing water resources is entrusted to a water-using sector. However, the Ministry may find that it does not enjoy much influence with the public or with other government bodies (compared to executive Ministries such as the Ministry of Agriculture and Irrigation), since it does not implement water utilization projects. This detracts from its authority, especially in rural areas, as people expect the State to launch such projects. A separate Ministry may also find that it has to compete with sectoral Ministries, and this will have an adverse impact on its relations with high-level bodies such as the Council of Ministers or Parliament. The effect may be to weaken its policy coordination, oversight and enforcement role. Consequently, a separate Ministry may prove ineffectual in exercising its official functions of allocating water and bringing water resource management policy under the umbrella of economic development policy. The ESCWA region has experimented with a separate Ministry for water resources only to a limited extent. As noted above, the idea was tried and abandoned in Oman, and has recently been introduced in Saudi Arabia;

(b) *Water resources as one of a number of departments within a single Ministry:*²⁴ This type of institutional arrangement is an outgrowth of the strategic view that water resource policy should be closely coordinated with policy in the sector with the greatest impact on water resources, namely irrigation and agriculture. Despite the theoretical advantage of such a linkage, however, experience in a number of the States of the region has indicated problems with an institutional arrangement of this kind:

- (i) Difficulty in ensuring that within the Ministry, water resource management issues receive as much attention as water utilization issues; there is a natural tendency to focus on water use activities and to neglect the management and planning aspect;
- (ii) The water resource management department tends to lack influence because it does not implement projects and is dominated by the utilization sector. Consequently, in the event of incompatibility between the objectives of water policy and those of the utilization sector, the former tend to be treated as being of secondary importance;
- (iii) There may be difficulty in mustering the necessary resources to execute the various tasks comprising water resource management, as most of the available funding goes for projects.

More than one ESCWA country has assigned responsibility for water resource management and planning to one of a number of departments within a single Ministry, usually the Ministry of Irrigation: Egypt, for example, has a Ministry of Water Resources and Irrigation, Jordan a Ministry of Water and Irrigation, and both Iraq and the Syrian Arab Republic have a Ministry of Irrigation.

(c) *Water resources as the responsibility of a water authority or interministerial committee in charge of water planning:*²⁵ With this type of institutional arrangement, responsibility for water resources is vested in a specialized agency or interministerial committee (Water Council or Planning Council), which deals with all aspects of planning, management and utilization. In the former case, the institutional set-up resembles the

²⁴ Water Resources and Irrigation (Egypt), Irrigation (Syrian Arab Republic), Labour and Agriculture (Bahrain), Water and Irrigation (Jordan), Electricity and Water (Lebanon).

²⁵ Examples of this type of institutional arrangement in the ESCWA countries include the National Water Resources Authority in Yemen, the Palestinian Water Authority in Palestine, the High Council for Water Resources in Bahrain, and the High Committee of Water Planning in Egypt. It appears that some ESCWA countries have established bodies of this kind as an interim measure pending separation of water resource planning issues from utilization projects, subsequently assigning planning and management functions to independent agencies or Ministries.

separate Ministry discussed above in that the agency is an independent national body possessing technical expertise, but it differs from a Ministry in being a management council, made up of representatives from the various relevant bodies, that approves policies and plans for the water sector. This allows more effective coordination among the various bodies concerned with that sector.²⁶ This is an advantage that is also enjoyed by an interministerial committee or water resource planning council. Such a council may be seconded by a specialized body that assists it in water use planning. These two entities are at a higher level than ordinary working Ministries, and may be headed by the Prime Minister or another Minister. In either case, the fact that representatives of the various bodies concerned are part of the process of decision-making, with a voice in approving water-related policies and adopting plans, facilitates the work of policy coordination and the integration of water policy within development policy. However, this advantage may be offset by the inconsistency that arises from too many entities making conflicting policy recommendations, which are then disregarded when the policy is adopted. Other problems include the fact that while these committees may be established at a high level, those who attend meetings and actually participate in their work may not be real decision-makers, with the result that the committees are less important in practice than they should be in theory. There are sometimes problems of a practical nature as well, such as irregular meeting schedules and inadequate technical and financial resources, making it difficult for them to be really effective.

TABLE 4. INSTITUTIONAL ARRANGEMENTS IN THE FIELD OF WATER RESOURCE MANAGEMENT IN SOME ESCWA COUNTRIES: ADVANTAGES AND DISADVANTAGES OF DIFFERENT TYPES

Type of institution	Advantages	Disadvantages
Separate Ministry for water resources, responsible for water resource management and planning	<ul style="list-style-type: none"> - Development of specialization and concentration of expertise on water-related matters within a single institution; - A separate ministry serves in itself to reflect the State's or Government's concern for water issues; - Equal status in dealings with other sectoral ministries 	<ul style="list-style-type: none"> - Water-related issues may be sidelined instead of being integrated into economic development; - The fact that the ministry is separate from other ministries may impede coordination, oversight, enforcement and policy implementation generally; - Water issues will probably be neglected in other ministries because they are the concern of a separate ministry
Water-related matters, including water resource planning and management and water utilization, handled by one of a number of departments within a single ministry (irrigation/ agriculture/energy)	<ul style="list-style-type: none"> - Water issues can readily be taken into account in the development of policies relating to irrigation, agriculture, electricity/energy, and the like 	<ul style="list-style-type: none"> - May lead to limited scope for water-related activities (since they are not comprehensive activities as in the case of a separate ministry); - The interests of water resource planning and management may conflict with those of water utilization handled by other departments. Planning and management may be neglected in favour of utilization projects (irrigation, agriculture, and so on); - May reflect a low level of concern with water-related issues

²⁶ The agency may include an advisory council consisting of experts from universities, representatives from national organizations, the private sector and the general public. This enables it to consider proposed policies from a wider perspective. However, the council, being advisory, has no real power, and its recommendations are not binding.

TABLE 4 (continued)

Type of institution	Advantages	Disadvantages
Ministry of Electricity and Water responsible for drinking water (with specialized bodies for desalination, urban water supply and rural water supply)	This type of institutional arrangement is common in States that rely mainly on desalination (also in Yemen, despite its limited use of desalinated water)	Poor coordination with water resource planning authorities, and inadequate concern with water resource management (tendency to concentrate on utilization and extending water and sanitation services)
Water authority or interministerial committee responsible for integrated water policy development	<ul style="list-style-type: none"> - Same advantages as in the case of a separate ministry (concentration of expertise within a single institution, indication of Government's concern), but does not have equal status in dealings with other ministries; may be of lesser status than a ministry; - Representation of all relevant bodies facilitates policy coordination; - Representation of all relevant bodies means that all aspects can be discussed before policy is settled 	<ul style="list-style-type: none"> - Same disadvantages as in the case of a separate ministry (problems arising from the fact that water issues are isolated from economic development, coordination difficulties, neglect of other water-related bodies, difficulties in policy application and water resource management; - No representation in Council of Ministers, little influence; - Low-level representatives on the authority or committee; - Other practical difficulties (e.g. infrequent meetings) that complicate timely decision-making
Advisory councils that are established expressly to prepare integrated water resource development and water planning policies	<ul style="list-style-type: none"> - Participation by volunteer organizations, the private sector and national organizations is facilitated by the fact that the institution is advisory in nature; - Assorted viewpoints can be taken into account in policy preparation; - Creates channels of communication with the popular sector 	<ul style="list-style-type: none"> - The council is advisory in nature, and consequently its recommendations may not be taken into account in policy development; - Council has no powers/ jurisdiction and consequently may find its role reduced to little more than raising public awareness about water issues

Source: ESCWA. *The Enhancement of Institutional Arrangements for Water Legislation Enforcement and the Improvement of Institutional Functions in Selected ESCWA Member Countries*. 19 October 2001. E/ESCWA/ENR/2001/11 (in Arabic), pp. 41-42.

One attribute that these diverse institutional arrangements for water resource management in the several ESCWA countries is that they all suffer from fragmentation arising from the fact that there are multiple bodies with jurisdiction in the water sector and the fact that coordination tends to be poor, both horizontally, between the various different institutions, and vertically, within the individual institutions themselves, both national and local. This lack of coordination gives rise to two problems in particular, including:

(a) Intersecting jurisdictions or powers, owing to the fact that there are a number of bodies with responsibilities in the areas of water management, development and utilization within any given institution, and this produces overlapping and duplication. This happens, for example, when more than one body

conducts studies on water resources, implements water quality monitoring programmes or establishes a surveillance network in a single region;

(b) Competition or conflict between approaches to water resources, with conservation and protection pitted against expanded utilization in pursuit of specific economic objectives, as may be seen in the case of agricultural policies. Such competition or conflict cannot be addressed through institutional coordination alone, it also requires awareness programmes and solution packages that are appropriately designed from an economic standpoint.²⁷

Both horizontal coordination between different sectoral institutions and vertical coordination within the framework of a single institution, from the local level to the national level, are crucial to integrated management and the avoidance of overlapping and duplication of jurisdictions and powers. Consequently, coordination is essential both at the policy development stage and at the implementation stage.

3. River basin organizations

The ESCWA countries have some accomplishments to their credit in this area, notably the management committees for the Euphrates, the Nile and the Orontes. Many studies on this aspect are now available, and these will be very useful to the ESCWA countries.

4. Regulatory bodies and enforcement agencies

Neither policies, nor institutions, nor monitoring are of much importance in themselves; they require the existence of effective bodies to enforce policies, laws and regulations.²⁸ Enforcement may be bound up with the general notion of compliance with regulations and specific standards in public utilization of water resources at the national level or in the context of particular programmes or activities, or it may apply to individuals who contravene laws and regulations (as by polluting water resources, digging unauthorized wells or committing other acts that are punishable offences under the law).

Enforcement mechanisms comprise three kinds of tools: tools of regulation and control, market tools, which will be considered further on, and management and public awareness tools, which will also be considered at a later stage.

Tools of regulation and control are compulsory systems of measures promulgated by a governing entity to restrain individuals and corporate bodies from engaging in activities that are harmful to water resources and to ensure compliance by individuals and corporate bodies with policies for the use of those resources. These tools may take various forms:

(a) Water-related legislation of various kinds, including laws, regulations and other statutory instruments;

(b) Approved standards and specifications for water-related activities and establishments, permissible maximum and minimum values in such matters as drinking water, wastewater and the like, and lists of prohibited activities that would be harmful to the resource;

(c) Systems and conditions applicable to the issue of permits and licences for operating businesses or engaging in particular activities;

(d) Conditions applicable to the designation of endangered regions, drainage basins and so on as protected.

²⁷ See, for example, the set of conditions incorporated into the package of solutions developed for the problem of water supply for the city of Taiz, in Yeman (Al-Thary 2001).

²⁸ In this study, the concept of enforcement is taken in a broad sense to include the enforcement of policy, rather than the enforcement of laws and regulations exclusively, which is the most common meaning of the term. In our view, laws are only one of a number of tools used for policy enforcement.

One advantage of these tools is that they are legally binding and are backed up by fines or other penalties, perhaps including imprisonment, and thus serve as an effective check on violators, especially where the fine exceeds any possible benefit that the violator might have hoped to gain. Another advantage is that they play an important role in preventing practices that would be harmful to the resource, as for example by providing for the establishment of pollution prevention systems or water resource utilization controls. In general, these tools are a contributing factor in the implementation of IWRM plans and a useful means of directing the relevant agencies toward sectors requiring attention. Even so, they will not, in themselves, suffice to ensure that policy objectives are satisfactorily attained. Where the issue of licences and permits is an important source of revenue for the agency concerned, for example, this is a factor that may affect its decisions and foster corruption among the bureaucrats of its staff. Monitoring and enforcement may be sacrificed because of the high costs associated with those activities, both of which require large, well-developed administrative structures. The problem becomes more complex when disagreements between enforcement bodies arise against a backdrop of conflict over licensing powers and responsibility for enforcing standards. Moreover, these tools lose their importance if the penalties for which provision is made in them are allowed to remain merely theoretical and are not applied in reality. Consequently, these tools are seldom as efficacious as the wording of their provisions would suggest. Most of the ESCWA countries have laws, regulations and other statutory instruments to direct and control their water resources, but the experience of many of those countries with the enforcement of water-related policies and legislation has not been very successful (see box 2).

Box 2. Main obstacles to the enforcement of water legislation

The main obstacles to the enforcement of legislation are as follows:

- (a) Absence of specialized judicial institutions, and the limited expertise of judges and lawyers in technical matters;
- (b) The multiplicity of agencies having enforcement powers (overlapping fields of competence) and the fact that they have conflicting objectives;
- (c) Much of the legislation is obsolete and in need of being replaced by new legislation that takes contemporary challenges and the interests of all relevant parties into account;
- (d) The penalties for which provision is made in the law are inadequate and do not deter violators;
- (e) The financial and human resources available to enforcement agencies are inadequate, and the State is not fully committed to enforcement;
- (f) Bureaucrats do not comply with legislation and disregard violations.

Source: ESCWA. The Enhancement of Institutional Arrangements for Water Legislation Enforcement and the Improvement of Institutional Functions in Selected ESCWA Member Countries. 19 October 2001. E/ESCWA/ENR/2001/11 (in Arabic), p. 59.

Zubari et al., for example, speaking of water-related issues in Bahrain, consider that the problem is not so much the enactment of legislation as its implementation. These authors argue that there will be no point in devising water resource management strategies until that problem is solved. They also emphasize the importance of Government commitment and political will as the two key factors in ensuring that policies are not merely approved but put into practice, raising public awareness, and securing popular participation in programme planning from the earliest stages.

Water legislation enforcement structures are much the same in most countries of the region. In those countries that are characterized by centralized water resource management, the competent ministry or authority is responsible for enforcement. In Egypt, for example, the Ministry of Public Works and Water Resources authorizes the use of water from the Nile, canals, drains and groundwater sources. The Ministry also assesses penalties if its orders are not obeyed.²⁹ In Yemen, the many responsibilities of the National

²⁹ Hvidt 1998.

Water Resources Authority include policy enforcement. Pursuant to that function, NWRA has been working since its inception on a water law. In Kuwait, action has been taken to activate the Environment Public Authority's function of monitoring organizations, corporate entities and individuals in the form of a decree issued by the Emir, establishing and specifying the organization of an environmental court to hear disputes arising from environmental crimes. Within the overall structure of the court, a criminal division has been established, with one presiding magistrate, to rule in environmental criminal cases as defined at law. The court is subject to the provisions of the Kuwait Criminal Code. The membership of the court includes two representatives from the Environment Public Authority, whose function is to examine charges and determine penalties, and two representatives from the Ministry of Communications, as the body with jurisdiction over environmental resources. Magistrates will be required to take a special training course prepared by the Environment Public Authority.

A number of agencies may share responsibility for enforcement, but jurisdictional overlap, inadequate financial and human resources and the unrealistic nature of the relevant statutory instruments themselves have combined to make the enforcement effort no more than moderately successful. At the national level, successful enforcement depends heavily on clearly defined responsibilities and areas of competence for all agencies and organizations involved, performance monitoring agencies, and the body with power to rule on cases of jurisdictional overlap. The absence of clear-cut answers to these questions has undoubtedly been one reason why enforcement has been generally weak. At the local level, Governorate authorities and local authorities apply the same regulation and control measures and market tools, which are basically designed at the national level, while the regional offices of central Government ministries and agencies play an important role in enforcing rules and policies, especially with respect to project activities, and prevent jurisdictional overlap among local authorities by determining their respective areas of responsibility. Generally speaking, local authorities are entrusted with the oversight of small projects. Box 3 summarizes the characteristics of enforcement structures in several countries in various parts of the world.

Box 3. Model enforcement structures in various countries outside the ESCWA region

Canada (Canada Water Act, 1979): This Act provided for the appointment of inspectors and analysts, who could enter places, facilities, premises and vehicles; examine waste, cleaning agents and water conditioners; examine containers; take samples; require information; and require and inspect books and documents. Inspectors are assisted in the performance of their functions. Obstruction of functions and false statements are prohibited (sections 23-25). The Act also provides for fines, continuing offences (each day to be considered a separate offence), issuance of refrain orders and other enforcement tools.

Germany (legislation): German law has provided for supervision of the equipment facilities and processes relevant to water use. Such supervision includes rights of access and a requirement of information (article 21).

United Kingdom (Water Act, 1989): The Act provided a comprehensive definition of the powers of the National Water Authority, including a general power to do everything incidental or conducive to the carrying out of its functions; fixing and recovering charges for services; instituting criminal proceedings; acquiring land; gaining access to premises; and taking samples (section 145). Additional powers include dealing with foul water and pollution, and carrying out works and surveys.

China (Water Law): The Law required the cessation of unlawful activities, the removal of impediments and compensation for losses, within stipulated time-limits (articles 44-45). Certain activities are fined, and functionaries and public officers are personally liable.

United States of America (Clean Water Act, 1972): The Act provided for enforcement, including record-keeping; reporting; installing and using monitoring equipment; and sampling effluents. Records must be available to the public. The Environmental Protection Agency has the authority to enter premises for inspection. It can issue notices of violation and orders for administrative compliance, assess administrative penalties and institute civil suits and criminal action.

Source: United Nations, Economic and Social Council, Committee on Natural Resources. *Legislative and institutional aspects of water resources management; Institutional and legal issues in integrated water resources management*, Report of the Secretary General. 18 January 1994. E/C.7/1994/6: 2nd session, pp. 9-10.

5. Service providers and their role in integrated water resource management

Service providers include governmental and municipal bodies, public institutions, private firms, local community organizations, farmers' associations and other entities that provide rural and urban communities with drinking water, irrigation water, industrial water and the like. Those same entities may also provide sewerage, wastewater treatment and pollution control services. Water-related legislation defines the responsibilities of these entities, outlines IWRM policy and specifies the roles and functions of all concerned at various service provision levels. In recent years, service providers have been paying more attention to efficiency, doing more with less water, terminating support programmes and recovering their operation and maintenance costs.

6. Civil society institutions and local community organizations

It has become axiomatic that any tangible progress in water management can be achieved only with supportive participation and full commitment from persons and organizations with an interest in upgrading and perpetuating water resource management, namely, the general public, NGOs and the private sector. As regards the role of the general public, public opinion can influence water policy, to the point of preventing its implementation if the policy in question is perceived as being undesirable. Conversely, public opinion can undoubtedly play a useful role in facilitating the implementation of a policy that is regarded as acceptable. In general, people are likely to take a more positive view of a government policy if they feel that they have an effective voice in the formulation, implementation and assessment of the policy in question. This greatly facilitates the task of the institutions that manage water resources and justifies the establishment of institutional structures that can accommodate popular participation in policy-making. At the same time, public participation in policy-making is not necessarily a guarantee that the public interest will be served, since pressure groups have been known to try to inflame public opinion in an effort to prevent the implementation of useful projects.

NGOs, such as water and environmental associations, play an important role in the protection of water resources in a number of ESCWA member countries. Those organizations possess a number of advantages: they are less bureaucratic than governmental organizations and can work quickly and efficiently, their members may include experts in various fields who help them with their work, especially in the case of specialized organizations, and they work directly with people at the local level, with the result that they are familiar with local conditions and can distinguish viable or acceptable approaches from unacceptable ones. In many instances, these organizations are funded from non-governmental sources, especially in countries with a strong tradition of volunteer work, and this enables them to programme their work independently, free of government influence. In the ESCWA countries, civil society institutions have participated in water resource management to varying degrees. Many of those countries have enacted laws regulating the work of NGOs, and various associations and unions concerned with water, agriculture and the environment have been established under those laws. These associations and unions have helped popularize numerous concepts in those areas and have contributed to public awareness of the importance of water conservation.

At the same time, however, NGOs in the region have encountered various difficulties. Their work is restricted to a few specific fields, and consequently they are able to play only a limited role in public policy formulation. Furthermore, they have sometimes been regarded as holding extreme views and not much interested in dialogue. While it is true that some States of the region have done a good deal to regulate the formation and work of these organizations, they still are comparatively few in numbers and have played only a very small part in natural resource management. Indeed, they have been able to do little but offer suggestions about raising public awareness about the environment in general and about water-related issues and optimal water use and conservation in particular. Typical organizations of this kind include the Friends of Environment Society in Jordan and the Association of Environmental Friends in Yemen. In the ESCWA countries, these associations continue to be very short of human and financial resources, and consequently they have played only a limited role in water resource management.

7. Local authorities

To put decision-making powers relating to water resource management in the hands of local groups with a real and immediate interest in the resources in question is undoubtedly to take a long stride toward greater effectiveness. Indeed, this is one of the mainstays of IWRM, strengthening as it does a major IWRM tool, namely public participation.

The heart of the matter is that it is essential for local institutions to have a part to play in water policy implementation, inasmuch as their direct and immediate association with the problems involved in their areas of work may give them a sound view of appropriate approaches to water and sanitation issues. At the same time, however, local government institutions may have very little power and may have a narrow outlook, and hence can hardly make an effective contribution to policy formation at the national level. There are various types of local institutions, which may be assigned to two major categories, namely:

(a) Municipalities, water authorities in urban areas, and village councils and committees that are concerned with water and sanitation services;

(b) Water users' associations in irrigated regions.

Municipalities, urban water authorities and village councils and committees in different countries are widely disparate in terms of their powers, depending on each government's policy toward decentralization. Water users' associations may contribute to the well-being of farmers by bringing them into the decision-making process concerning the development of irrigation and sanitation services, and under some conditions may represent a practical alternative to public irrigation facilities management and maintenance and tariffs designed to achieve financial self-reliance. The experience of local users' associations has been satisfactory in many countries, including France, Argentina, Indonesia and others.³⁰ The experience of both developed and other developing countries indicates that associating local communities with the work of monitoring quantities of water used and setting rates, and also with the maintenance of distribution systems, may help make the introduction of charges for water use more acceptable and may encourage those who benefit from water services to take more interest in conservation.

In the Western Asia region, a study by ESCWA has shown that Egypt's experience with farmers' associations, patterned after water users' associations, has led to a general improvement in farmers' management skills.³¹ Irrigation efficiency, for example, has increased by a factor of between 10 and 15 per cent, and productivity has grown by as much as 30 per cent. In some ESCWA countries, traditional rural organizations are playing an important role in organizing water rights and keeping facilities maintained. Jordan's Ministry of Water and Irrigation is seeking to use water source management as a route to the formation of associations of private well owners, especially owners of farm wells, which represent over 70 per cent of all water extracted. The object of this exercise is to activate the role of the private sector in decision-making concerning water management.³²

B. BUILDING INSTITUTIONAL CAPACITY: DEVELOPING HUMAN RESOURCES

The task of activating the various IWRM tools—policy, legislative framework, financing system, appropriate structures and management approaches—necessarily involves ensuring that the various stakeholders are in possession of enough information, expertise and incentives to enable them to play their part efficiently and effectively. This mix of tools, skills and resources makes up the capacity that an

³⁰ United Nations, Economic and Social Council, Committee on Natural Resources. *Legislative and institutional aspects of water resources management; Institutional and legal issues in integrated water resources management*, Report of the Secretary General. 18 January 1994. E/C.7/1994/6: 2nd session.

³¹ United Nations Economic and Social Commission for Western Asia. *Updating the assessment of water resources in the ESCWA Member States*. Paper presented at the Expert Group Meeting on Updating the Assessment of Water Resources in ESCWA Member Countries, Beirut, 20-23 April 1999. E/ESCWA/ENR/1999/WG.1/7.

³² Jordan, *Report on water policy*, 2001.

institution uses to perform its function and meet its needs. The structures, frameworks, systems and tools that are used for specific functions define “institutional capacity”. Human resource development, for example, is a fundamental factor in institutional capacity-building which calls for the nurturing, development and harnessing of the capacities of all stakeholders, including water professionals, farmers and government agencies, for effective implementation of the IWRM process. This compartment of the IWRM toolbox contains four tools, including participatory capacity and empowerment in civil society, training to build IWRM capacity in water professionals, regulatory capacity, and participation in knowledge.

1. Participatory capacity and empowerment in civil society

Needless to say, IWRM depends on the ability of stakeholder individuals and groups to participate in the process, and their ability to play a meaningful role in that connection. Civil society, provided it is well organized, can be pivotal in realizing IWRM and can assume full responsibility for specific aspects. Accordingly, it is essential for government agencies to establish and reinforce public participation, and this task calls for an organized effort targeting specialized groups and associations such as water users’ associations, advisory groups, community committees and the like.

The role of civil society organizations, especially agricultural associations and women’s groups, in IWRM is still limited and in need of strengthening in most of the ESCWA countries. Gender issues also require attention, along with a greater degree of decentralization that will give women and children more responsibilities for local water management, especially in rural areas. The task of developing detailed definitions of these desiderata and determining appropriate measures, in terms of policy, institutions and legislation, that will help strengthen the role played by these groups will require a good deal of field research in the countries of the region.

2. Training to build IWRM capacity in water professionals

The effective use of IWRM tools unquestionably requires specific knowledge and expertise which professionals currently in charge of water resource management may not possess. Consequently, one prerequisite for success in the implementation of IWRM is continuing training for skilled personnel. Many, if not all, ESCWA member countries have instituted skilled human resource training plans and are carrying out extensive training programmes. Most of them, namely Egypt, Iraq, Jordan, Saudi Arabia and Yemen) have established training centres, within ministries or attached to universities, to upgrade professional skills in the field of water resource management.

3. Regulatory capacity

One of the most important IWRM tools is the capacity to regulate the exploitation of water resources, protect them from pollution, and make all activities relating to water use subject to appropriate control measures. Users can be held to the various rules, regulations and standards only if they operate within an efficient regulatory framework comprising two components: skilled personnel and appropriate technical capacities. Water quality monitoring, for example, requires appropriate equipment and the ability to use it, and, equally, inspectors with the necessary skills to ensure that the regulations are being complied with. Regulatory tools and economic tools can be used effectively only given the availability of skilled personnel and adequate data, a well-developed legislative framework, enforcement institutions, mechanisms, structures, systems, data and communications, an education and training system adequate to meet the needs of the situation, and valid indicators to measure performance levels. Planning for regulatory capacity building must be preceded by an evaluation of existing capacities and the strengthening of appropriate regulatory tools, and the evaluation process must proceed hand in hand with an assessment of water resources and the preparation of policies and plans.

Clearly, water quality monitoring requires effective institutional structures, both national and local. Table 5 outlines the main features of an effective institutional structure. Areas of competence overlap in most of the ESCWA countries, and responsibility for monitoring is distributed among a number of agencies at both the national and the local levels. The extent to which those responsibilities are actually discharged and actual monitoring is performed is a matter that varies widely from one country to another, depending on

the nature of the water resources of the country concerned, how active it is in developing those resources, its social and economic development, and the role and importance of water-related normative standards.

TABLE 5. WATER RESOURCE MONITORING AGENCIES AND WATER-RELATED PROJECTS AND STANDARDS IN THE ESCWA COUNTRIES

	Resource monitoring and evaluation	Project monitoring	Monitoring of standards
National level	Ministries and water authorities, sectoral ministries (through projects)	Environmental protection bodies (environmental impact studies), Ministry of Water (compliance with policies), sectoral ministries concerned with investment and development	Ministry of Health, ministries and water authorities (pollution monitoring), water and agriculture research centres, environmental protection bodies
Local level	Branch offices of ministries in regions and Governorates, volunteer associations	Branch offices of ministries and environmental agencies in regions and Governorates	Ministries of Health and Water Facilities

Source: ESCWA. *The Enhancement of Institutional Arrangements for Water Legislation Enforcement and the Improvement of Institutional Functions in Selected ESCWA Member Countries*. 19 October 2001. E/ESCWA/ENR/2001/11 (in Arabic), p. 57.

It is fair to note that the institutional structure that really manages water resources is the one that monitors those resources in terms of quantity and quality and monitors project implementation through environmental agencies and impact studies. Water standards, for their part, are monitored by the water resource managing agency and the Ministry of Health, which is responsible for drinking water standards. There are slight differences in these structures, arising from the different characteristics of different countries. Institutional arrangements for water quality monitoring are characterized by the same structural defects as those for water resource management in general.

4. *Participation in knowledge*

The object here is coordination and cooperation among the various institutions within the water sector and in other sectors that affect water quantity or quality. Participation in knowledge is regarded as the touchstone that determines whether that coordination and cooperation have succeeded and are likely to last. Participation in knowledge strengthens understanding, transparency and mutual trust between institutions. The knowledge in which they should participate includes technical, institutional and financial data and information, as well as research findings. Mechanisms and channels through which the desired participation can take place include training programmes, workshops, seminars and study tours and the like.

III. PROGRESS TO DATE IN THE DEVELOPMENT OF WATER RESOURCE MANAGEMENT TOOLS

The object here is the development of tools and methods that will help decision-makers weigh up the various alternatives available and arrive at viable decisions based on accurate data and information. The art of integrated management depends heavily on awareness that those tools exist and on the choice of the most suitable tool or tools in the light of the attendant circumstances. The IWRM toolbox contains eight sets of water resource management tools, which will be surveyed in the following pages.

A. WATER RESOURCES ASSESSMENT: UNDERSTANDING RESOURCES AND NEEDS

The purpose of water resources assessment is a periodic review of the water resource situation in the country as a whole with a view to determining the total stock, the amounts that are drawn off for various uses, average consumption figures and pollution levels. The outcomes of the assessment process should include determination of the main issues relating to water resources, their social impacts, and potential hazards and threats, such as floods and droughts. The assessment data should not be restricted to supply and demand issues, but should also include other aspects that may be useful in determining the impact of water resource depletion and pollution on the overall economic performance of the country as reflected in its gross domestic product, public health, and other indicators, with a view to ensuring that those impacts are taken into account in the formulation of economic policy.

Despite the importance of data of this kind for the formulation of viable water and development policies, most of the ESCWA countries do not conduct organized water resource assessment operations. Water resource assessment has not yet acquired institutional status as a permanent, continuing task of the agency responsible for water resource management. In practice, assessments seldom cover an entire country; they tend to be limited to a particular region or river basin, or an assessment operation may be conducted as one of a number of studies undertaken for purposes of a specific project. Water resource management authorities are still unskilled at extracting socio-economic significance from raw data, and this situation negatively impacts data availability, both in terms of spatial and temporal coverage and in terms of completeness and consistency.

Organized water source assessment³³ is the first step in converting technical water data to useful socio-economic data that can help decision-makers and policy makers to formulate valid plans and facilitate the integration of water policy into economic policy. Before that step can be taken, however, every country must prepare an inventory of its technical, human, financial, legislative and other capacities in the field of water resource assessment in order to identify its strengths and weaknesses and determine its ability to perform the task. In this connection, we may note that in 1997 the World Meteorological Organization, in cooperation with the United Nations Economic, Social and Cultural Organization (UNESCO), published a handbook on the review of national capabilities in the area of water resource assessment, containing an integrated methodology designed for that purpose.³⁴ This compartment of the IWRM toolbox contains four tools: water resources knowledge base, water resources assessment, modelling in IWRM, and developing water management indicators.

1. *Water resources knowledge base*

The aim here is a process of gathering and compiling quantitative and qualitative data on the various components of the water cycle in the country concerned, and verifying them with other sources of data on economic, social and demographic aspects and on water use from a trans-sectoral standpoint.

³³ There is no single ideal time interval between water resource assessments; the frequency will vary from one country to another, depending on the cost of gathering the necessary data, the country's stock of skilled personnel, its economic development level, and the degree to which its water resources are depleted and polluted. In general, however, the interval may be said to range between a few months to a year.

³⁴ World Meteorological Organization, *Water Resources Assessment, a Handbook for Review of National Capabilities*, June 1997.

Over the past few decades, all the ESCWA countries have constructed sophisticated groundwater observation and monitoring networks and have established electronic databases in which the data are stored. Today, every one of them has a number of such databases in various fields. However, there are some problem aspects: data on water quality are much less abundant than quantitative data, monitoring networks and periodic data-gathering systems have not always been adequately operated and maintained, there are various databases between which there is relatively little communication and data exchange, and the data are treated as sensitive and are not regularly published. Indeed, there is very little detailed information available about water-related data-gathering and compilation systems in the ESCWA countries. We do know, however, that the advances in geographic information systems and remote sensing techniques that have been made worldwide in the course of the past ten years have been turned more effectively to account in some countries than in others, and consequently it would be desirable for the countries of the region to cooperate with a view to disseminating and deriving maximum advantage from progress achieved in other parts of the world.

2. Water resources assessment

Water resources assessment is an important IWRM tool, involving as it does the concept of assessment in an inclusive sense that covers not only supply but also demand, environmental impact, strategic and social impacts, and flood and drought hazards. This assessment process feeds into a database or knowledge base, and it also makes essential data available for water planning purposes.

3. Modelling in IWRM

Models and decision support systems are useful supplementary tools in IWRM that are widely used in the ESCWA countries.

4. Developing water management indicators

This is another important tool that is used to develop water policy and set objectives, and one that is also useful in monitoring water management performance. Water resource assessment data can be turned to good account by being translated into indicators that will serve the purposes of policy development and sound decision-making. An array of selected indicators can reveal how much progress has been made in achieving the objectives of IWRM, and can offer clues to desirable approaches or necessary changes to policies and programmes. The indicators with which we are here concerned may include quantitative and qualitative aspects of water availability, water utilization efficiency, water service level and costs, and changes that may affect water resource status and quality, such as population growth, agricultural and industrial activities and the like. Most of the ESCWA countries do not have indicators of this kind, at any rate not organized, well-documented indicators that are comparable with other indicators nation-wide or with those from other regions within the country.

B. PLANS FOR IWRM

The aim here is to achieve integration among the various options available for water resource development, management and use and human resource development with a view to obtaining flexible, dynamic plans for water resource development and management, as distinguished from central plans or guidelines, which may lack the necessary flexibility³⁵ (see box 4). Plans of the former type strengthen optimal water resource management by identifying objectives, pointing the way to the policies and measures required for the attainment of those objectives, setting priorities and spelling out implementation measures, all of which serve to make integrated planning a reality. It is important to note that the real value of these

³⁵ Another unsatisfactory aspect of central plans is that they may take a long time to prepare, with the result that by the time they are ready they are already in need of updating, and since they tend to be massive and ponderous, they cannot readily be amended to take account of new developments that occur while they are being prepared. More serious still, the mere existence of a plan of this kind tends to act as a deterrent to more realistic planning efforts (smaller-scale planning or partial planning); at best, the big central plan dominates and overshadows the smaller ones.

plans consists in their flexibility, inasmuch as the implementation process is subject to constant monitoring and a plan can be amended as changing circumstances may require.

1. *Basin management plans*

An integrated management plan can be developed for a particular river basin, regardless of administrative boundaries. Such a plan will include all aspects of relevance for the basin: topography, land use, water availability, demand for water, sources of pollution, aquatic ecosystems, flood or drought hazards, and an enumeration of stakeholders. It will identify the basin's short- and long-term development priorities and objectives, funding aspects, and appropriate mechanisms for the implementation, monitoring and updating of the plan.

2. *Risk assessment and management*

IWRM requires an assessment of potential risks and the development of plans for dealing with and managing them. The IWRM toolbox outlines the advantages of hazard assessment and indicates the factors that should be included in management plans.

C. EFFICIENCY IN WATER USE: MANAGING DEMAND

The concept of managing demand for water constitutes a qualitative shift in water resource management, marking as it does a move away from the traditional focus on supply management and the harnessing of new sources toward more efficient utilization, conservation, recycling and reuse of water. This compartment of the IWRM toolbox contains three tools comprising, improved efficiency of use, recycling and reuse, and improved efficiency of water supply.

1. *Improved efficiency of use*

Improved efficiency of use is achieved through the establishment of appropriate mechanisms to change people's attitudes and reorient their behaviour with respect to water use. Those mechanisms include education and communication (schools, local communities and the like), economic incentives (such as tariffs and rates), governmental support for technologies that enhance water use efficiency, regulations, norms and standards for water use that are designed to prevent waste and misuse, and action to promote the use of tools, equipment and facilities that serve to enhance efficiency of use.

2. *Recycling and reuse*

Recycling and reuse constitute a major IWRM tool. Wastewater is treated and returned to rivers or aquifers. Many of the countries in the region have made substantial progress in this area. In the Gulf region, in particular, there are many municipalities that use recycled water to irrigate green spaces within cities, and in most of the countries of that region, tertiary wastewater treatment has become standard practice.

3. *Improved efficiency of water supply*

The aim here is to reduce losses of water, either from natural sources (by harvesting rainwater, for example) or, in the context of a water facility, by upgrading extraction, treatment, transport, distribution, consumption measurement and bill collection operations, and also through improved economic analyses and water management accounting measures.

D. SOCIAL CHANGE INSTRUMENTS: ENCOURAGING A WATER-ORIENTED SOCIETY

Changing people's habits and the ways they use water is a challenge that involves changing deep-rooted attitudes held by individuals, institutions, water professionals and civil society organizations. Social change of this kind can be brought about by the application of appropriate tools. This compartment of the IWRM toolbox contains six tools: education curricula on water management, training of water professionals,

training of trainers, communication with stakeholders, water campaigns and awareness raising, and broadening of the participation base in water management.

ESCWA's Programmes of Work for both the past biennium, 2002-2003, and for the coming biennium, 2004-2005, make provision for various capacity-building activities in this field, including the Arab Integrated Water Resources Management Network (AWARENET) and a number of specialized workshops.

1. Education curricula on water management

The aim here is to take simple, basic concepts relating to water management, water resource sustainability and water conservation, and the fact that individuals can play a meaningful role in water and ecosystem conservation, both quantitatively and qualitatively, and make them part of school curricula, from kindergarten to secondary level. Most of the ESCWA countries have made a good deal of progress along these lines.

2. Training of water professionals

Water professionals need training programmes that will inculcate integrated management concepts, especially the modern concepts that technical education (in such fields as hydrology) has borrowed from the social sciences and economics. These include the concepts of social impact evaluation, institutional aspects and policy analysis as they apply to water management, and they also include participatory methods (bringing society into management), gender issues, and other concepts from the IWRM toolbox that should be incorporated into relevant university programmes.

3. Training of trainers

One important aspect of IWRM is the creation of an environment that will encourage communication and exchanges of data. There are a number of means to that end, including training courses and workshops that bring together professionals and some user groups (such as farmers).

4. Communication with stakeholders

Communication with stakeholders is an instrument that promotes social change and more widespread awareness of water issues in civil society. It relies on the dissemination of information about water use and water resource management among various relevant groups. There are various tools and instruments that can be used to communicate with stakeholders to heighten their awareness of water issues: individual contacts, newsletters and other publications, radio and television and national and regional campaigns promoting exchanges of information between professionals and practitioners (farmers and others).

5. Water campaigns and awareness raising

Campaigns of this kind are designed basically to raise the level of awareness of water-related issues and to muster public support for them. These issues include water conservation, the relationship between water and public health, ecosystem conservation, the formation of popular water use monitoring organizations, and the like. These campaigns use a variety of means of communication: traditional media, NGOs, and so on.

A high level of education and awareness is unquestionably useful in helping people understand the harm that may befall them personally from the quantitative and qualitative degradation of their water. Once they have internalized that understanding, they will refrain from behaving in ways that are damaging to water resources, and this in turn will reduce the need for formal enforcement structures. Despite the great importance of public awareness and education for policy implementation and regulatory compliance, this tool is not yet as widely used as it should be.

Greater public awareness of the importance of protecting water resources, of course, is not in itself sufficient to prevent violations; a violation must also entail some kind of cost to the violator. Accordingly,

the awareness-raising tool should be used in conjunction with other enforcement tools, namely regulations, control measures and market tools.

The ESCWA member countries conduct large-scale programmes designed to enhance awareness of water-related issues and to encourage conservation and protection. In many of the Gulf countries, ministries with responsibility for water organize television and radio publicity campaigns. In Yemen, the NWRA is cooperating with the Ministry of Education to have many water-related and environmental concepts incorporated into public-school curricula at various levels, while NGOs are playing a substantial role in generating public awareness of these issues and the precariousness of Yemen's water resource situation. In Jordan, NGOs are cooperating with the Ministry of Water and Irrigation in conducting field trips to facilities for the purpose of disseminating various domestic water consumption optimization technologies such as the use of special taps, while the Ministry is organizing outreach meetings to make people aware of the water situation and the importance of conserving water and reducing consumption.³⁶

It is also noteworthy that the appearance of various quality certifications (Eco-mark, Eco-labelling and ISO), which are awarded only if the product that bears the certification has been manufactured by environmentally acceptable methods, have proved a useful incentive to manufacturers in the developed countries to apply those methods, particularly as consumers in those countries possess a high level of ecological awareness. These mechanisms might be of some benefit in the countries of the region, especially in the case of producers who export to the outside world, including manufacturers of agricultural products. In order to qualify for the environmental quality logo, a product must also meet a set of environmental conditions at every stage, from production to packaging to shipment out to world markets. In the textile industry, for example, the qualifying conditions for the Eco-mark logo begin with the planting of the cotton and extend through the spinning, weaving and dyeing stages, right up to the final packaging of the manufactured product.

6. Broadening of the participation base in water management

A fundamental objective of IWRM is enlisting the broadest possible participation on the part of the public. To that end, it is essential to conduct analytical studies to identify interest groups and determine how they may most effectively be brought into the IWRM process.

E. CONFLICT RESOLUTION: CONFLICT MANAGEMENT AND ENSURING PARTNERSHIP

Successful implementation of the IWRM process is contingent on the availability of appropriate mechanisms for building consensus around the various aspects, managing conflicts and strengthening a partnership approach to water resources. Conflicts may arise between institutions or groups in society (such as tribes) as a result of competition for scarce water resources, unclear legislation, functional and jurisdictional overlap, differences in the administrative arrangements and influence of different institutions, incompatible objectives and methods, inconsistent data, poor communications, unmet expectations, needs or interests, erroneous concepts and visions, and the like.

Given these various factors, conflict over water management will inevitably arise, but it must not end in a frozen status quo, with all progress toward the attainment of IWRM objectives blocked. Conflict may contain positive aspects: it helps pinpoint the real problems that must be addressed and solved, thus fostering essential change and paving the way for corrective measures without threatening the relations between the parties concerned; it also helps build new relationships and changes in the way contentious issues are viewed, and clarifies the nature of matters that are deemed to be most important. This compartment of the IWRM toolbox contains three tools: conflict management, shared vision planning, and consensus building.

Clearly, these tools are applicable to all IWRM issues, but they are particularly useful in the early planning and design stages of the IWRM process, and least useful in conflicts involving a legal challenge that will result in the upholding or invalidation of some legal precedent. It is important to emphasize that

³⁶ Jordan, *Report on water policy*, 2001.

legislation and statutory measures are the last resort in the resolution of any conflict. The three tools mentioned are above all voluntary means of managing and resolving conflicts.

1. *Conflict management*

There are four tools that are used for intervening in and managing conflicts and disputes, namely: facilitation, mediation, factual investigation, and arbitration. Each of these has its own advantages which make it more suitable than the others for use in particular circumstances or types of conflict. The countries of the region are confronted with various kinds of conflict over water at various levels, from conflicting interests among local authorities, conflicts between urban and rural areas over water rights, jurisdictional overlap and so on to international disputes. Such conflicts are frequently undeclared even as they block the attainment of IWRM. Institutions concerned with water resource management need effective conflict management and resolution mechanisms that will lead to the reinforcement of IWRM practices.

2. *Shared vision planning*

Recent developments in the field of modelling have greatly facilitated the process of preparing a study on the development and management of the water resources of a specific river basin or aquifer. It is now feasible to examine the impacts of every scenario on those resources and its implications for the interests of all stakeholders. In addition, it is now a simple matter for all stakeholders to join together in developing a single river basin resource model and consider various scenarios for arriving at a shared vision for the utilization of the resources in question.

While this can be an important means of reconciling the interests of stakeholders that share a single river basin and strengthening integrated management, shared vision planning is of limited applicability at the national level. At the present time, this management model is being used in the Nile basin, and ESCWA is preparing a model of the same kind for the shared basaltic aquifer that straddles the border between Jordan and the Syrian Arab Republic.

3. *Consensus building*

Consensus building is a strategy or approach that is used for inter-sectoral dialogue on water policy. This tool is used when differences are slight or of moderate intensity only. Its application proceeds by specific steps, beginning by pinpointing the problem and ending with an agreement to which all parties are committed.

F. REGULATORY INSTRUMENTS: WATER ALLOCATION AND RESTRICTIONS ON WATER USE

Regulatory instruments are one means to the end of implementing water-related policies and plans. They are rooted in the legal framework, and their aim is to permit or prohibit specific activities, or to subject them to conditions and restrictions. Regulatory instruments may be used concurrently with economic tools to help improve demand management. This section of the IWRM toolbox contains four tools, including: regulations for water quality, regulations for water quantity, regulations for water services, and land-use planning controls and nature protection.

1. *Regulations for water quality*

Methods and instruments used to regulate water quality include:

- (a) Wastewater disposal monitoring;
- (b) Management of the wastewater receiving environment;
- (c) Regulations aimed at reducing wastewater to a minimum.

In fact, there are many systems and mechanisms that are used to apply each of these methods and instruments, including wastewater standards that serve to determine the terms of a wastewater discharge permit and constitute a basis for the conservation of water of specified quality, optimal technology and the

like. The legislation of most of the ESCWA countries includes provisions covering this aspect of water management.

Water quality monitoring requires a constant high state of preparedness as regards water quality data (water quality indicators), namely data on pollution levels in rivers, lakes, inshore areas, canals, aquifers, supply and disposal systems, water selling points of all kinds, and treated wastewater at the outfall. It also requires commitment on the part of all relevant firms and authorities to the applicable normative standards in all fields. This in turn calls for complex facilities and equipment, a permanent staff of inspectors, and a dynamic working system that allows ongoing or periodic monitoring of standards. The quality of equipment depends on a country's technological level, financial circumstances, and stock of human resources with the necessary skills. The human factor is the most important, not only for purposes of the establishment and operation of a sophisticated data-gathering system, but also for purposes of the analysis of the data and using them to good effect to prepare appropriate policies. In the absence of adequate human resources, sophisticated databases serve no useful purpose.

2. Regulations for water quantity

These are licences to withdraw specified quantities of surface or groundwater. A prerequisite for the task of regulating the withdrawal of water is adequate data on the total quantity available and the quantity currently being used. Furthermore, the institution responsible for such regulation must be able to enforce and monitor user compliance. There are pronounced disparities between ESCWA member countries in terms of their expertise and success to date in enforcing regulations in this area.

3. Regulations for water services

The aim here is to develop standards for water services, including standards for drinking water, regulations for water facility maintenance, sewer connections and the like. These standards may be included in licences, concessions or management contracts awarded to water service providers. Regulations for water services also include economic controls such as prices, and regulations governing service levels and tariffication. In order for these regulations to be applied successfully, it is essential to begin with an objective, realistic assessment of the existing situation. Attainable objectives can then be identified, a time frame for implementing any desirable improvements established, and adequate provision made for institutional monitoring and enforcement capacity. Most of the countries of the region do not devote much attention to this aspect, but it is fundamental, especially where the role of the private sector is expanding.

4. Land-use planning controls and nature protection

Water use and land use are indissolubly linked, and consequently the regulation of land use is a basic part of IWRM. Tools that are used to regulate land use include the establishment of a zoning system that defines permissible land uses within each zone, building codes that specify what types of buildings may be erected, and so on. These regulatory instruments play a major role in determining the boundaries of protection zones around groundwater sources to prevent pollution and pumping, and around groundwater replenishment sources to ensure that any building within that zone will not diminish groundwater replenishment. Another function of land-use planning controls is to reduce flood hazards by specifying what kinds of structures may be located within the various designated zones along watercourses (spate flows). Zoning is a technique that is not yet widely used in the ESCWA countries. By and large, it is restricted to urban areas, and the countries in question have had difficulty enforcing their zoning regulations.

G. ECONOMIC INSTRUMENTS: USING VALUE AND PRICES FOR EFFICIENCY AND EQUITY

Economic instruments serve to supplement regulations, institutional tools, technical tools and so on. They depend on the use of market mechanisms (such as prices) to encourage consumers to adopt specific behaviours and practices in using water. These instruments include optimization and more efficient utilization. Economic instruments yield more satisfactory results when they are applied in conjunction with other supporting tools. This compartment of the IWRM toolbox contains four tools including, pricing of

water and water services, pollution and environmental charges, water markets and tradable permits, and subsidies and incentives.

1. *Pricing of water and water services*

The pricing of water serves three purposes: (1) it promotes environmental protection by encouraging the conservation and efficient use of water, (2) it promotes cost recovery and the generation of revenue to operate the sector, and (3) it makes consumers aware of the true cost of water and the cost of providing services, and thus gives them an incentive to use water efficiently. Water tariffs must conform to a set of conditions, of which the most important is that they are affordable for all, especially the poor, that they are acceptable to the population, and that they are administratively and institutionally feasible. There are wide disparities between the countries of the region with respect to drinking water tariffs.

2. *Pollution and environmental charges*

These charges are levied to counterbalance the financial and economic cost of discharging pollutants into the environment. They encourage polluters to reduce the quantities they discharge by making them pay in proportion to their consumption of part of the environment's ability to accommodate pollutants, exactly as a consumer of water pays for his consumption of part of the total available quantity of water. There are specific, clearly defined rules for determining these charges. Like other forms of regulation, they must be enforceable, and the institutions concerned must be capable of administering them.

3. *Water markets and tradable permits*

These tools allow trading and selling of water allocations among groups. The water in question may be either surface water or groundwater, and the trading or sale may be either seasonal or once and for all. From a theoretical standpoint, these markets are supposed to help ensure that water is directed to uses yielding maximum economic returns, secure alternative sources of water where it is not feasible to purchase ownership rights, provide a cheaper means of obtaining water where the only available alternative would be to develop new sources at greater cost, and make environmental protection possible, as when environmental associations buy water rights with a view to preserving the natural environment. There are many pitfalls associated with an orientation toward and reliance on water markets as an IWRM tool, and because of those pitfalls, a clear-cut legislative framework is essential as a means of defining water rights conveyancing and trading, the impacts of such conveyancing on third parties (such as downstream water users) and compensating them if necessary, the environmental implications, and governmental action to ensure that water does not become a monopoly in the hands of a few. Water markets are a highly sensitive issue, and as yet they have gained a foothold in only a few countries, although buying water and selling it to consumers (for drinking, irrigation and industrial purposes) is widespread in most of the ESCWA countries.

4. *Subsidies and incentives*

Subsidies are an important tool to which governments resort in order to encourage economic activity in specific fields or to protect poor or endangered groups in society. However, it is important to ensure that it is not used for the benefit of groups that are not entitled to the subsidies in question, and that it does not lead to paradoxical results as regards water resources. Agricultural support policies that take the form of low import duties on inputs and machinery, for example, or broadly based fuel and energy support prices may lead to increased consumption of water and disincentives for using it economically.

In general, it may be said that agencies responsible for water resource management in the ESCWA countries have not yet devoted enough attention to the use of economic instruments or incentives to influence the behaviour of individuals and institutions toward water resources, quantitatively and qualitatively. However, there is growing interest in the potential of instruments of this kind for influencing water use, and there have been attempts to apply them in some of those countries, perhaps in part because other methods aimed at correcting the depletion and degradation of water resources have proved relatively unsuccessful. The progressive tariff system, with higher rates for higher water consumption brackets, is one type of economic incentive measure that is widely used in the region. The Government of Jordan, for example, is

conducting a study on rebates for subscribers who can show that they have reduced their water consumption.³⁷

One advantage of this type of enforcement mechanism is that only comparatively light structures are required for its application, making it less costly and less burdensome for monitoring agencies than the structures required to implement direct control measures. Furthermore, it encourages self-regulation, with the result that it involves fewer inspectors and less red tape.

Despite the widely held view that market mechanisms lead to self-enforcement of legislation and policy and consequently need only a minimum of oversight, the fact is that these mechanisms also require effective monitoring and an efficient system of application. There have been instances where inadequate monitoring has led to misuse of financial incentives for unjustifiable gains. Consequently, these tools call for particular attention in order to ensure that such misuse does not occur.

Other difficulties associated with a system of incentives are that it requires the government to sacrifice part of its revenue where the incentives are in the form of tax exemptions for particular goods or products that it would like to see more widely used, or, conversely, to assume additional financial burdens where the incentives are in the form of direct financial grants. Moreover, the task of determining the appropriate or rational amount of a tax exemption is by no means easy. We may note at this point that market tools enjoy a greater measure of success when they are applied in conjunction with regulation and control tools; they are not adequate on their own to enforce policies effectively.

H. INFORMATION MANAGEMENT AND EXCHANGE: BETTER KNOWLEDGE FOR BETTER WATER MANAGEMENT

Information exchange, development and management is an important IWRM tool. The toolbox contains a number of communication and information sharing tools as well as knowledge and capacity building tools, all serving the purpose of managing information and supporting IWRM. Generally speaking, four kinds of information are used in IWRM, including:

- (a) Data on water quantity and quality and on temporal and spatial disparities in hydrological events;
- (b) Data (taken from reports on water resources);
- (c) Knowledge consisting of an understanding of indications of changes in reports over time, and an understanding of water use practices and their effects;
- (d) An understanding of what have by common agreement been found to be the best ways of using water without jeopardizing the sustainability of resources.

Prerequisites for the application of these four kinds of information in the interests of IWRM are information management systems and sharing national and international data.

1. *Information management systems*

These are electronic systems that prepare, store and exchange data and information. In the present context, we are concerned with bibliographic information systems and geographic information systems in particular. Bibliographic information systems comprise three elements:

- (a) Monitoring and evaluation tools;
- (b) Tools for receiving and sending precise information or instructions during data exchanges;
- (c) Tools for ensuring the observance of best data management practices.

³⁷ Jordan, *Report on water policy*, 2001.

A geographic information system, for its part, is nothing more nor less than a comprehensive inventory of natural resources (soil, topography, water and plant cover) for a particular area of the earth and a summary of the available data on them, and as such, it is useful to decision-makers and planners in achieving more effective management of the resources in question. There are several ways of measuring the effectiveness of data management systems in a particular country:

(a) Their role in bringing about developments in water management and water use (changes to farming practices or more satisfactory water management plans) as measured by the range and variety of measures or actions taken following the receipt of specific information;

(b) Their role in stimulating the formation of entities expressly designed for dialogue and data exchange between water management agencies, farm organizations or other relevant groups;

(c) Another set of indicators used to measure the performance of any institution, such as communication with customers.

Most of the ESCWA countries maintain systems for gathering data on compliance with water-related standards, and those systems are shared among a number of agencies in their respective areas of competence, including Ministries of Water/Irrigation, Health and Agriculture, water service institutions, water- and agriculture-related research centres and the like. Some ESCWA member countries have groundwater data systems, as, for example, Bahrain's BGWIS, which contains the coordinates of the country's wells, the quality of their water, permeable strata, how the various wells are designed, pumping, the results of experience with pumping, and the like.³⁸

2. Sharing national and international data

Exchanges of national and international data encourage the adoption of IWRM, on condition that data on the state of water resources and economic and social aspects are available, and on condition that these data and information are widely available and not disputed. It is essential to understand that the formation of a database takes a long time and is feasible only following a protracted period spent building mutual confidence among all parties.

Box 4. Proposed system of incentives for optimization of water consumption in Yemen

Policy tool	Net impact on water supply	Impact on the budget of the government	Impact on urban population	Impact on rural population relying on rain-fed agriculture	Impact on rural population relying on irrigation water delivered by pumping
Support for more effective irrigation technology	+	-			+
Elimination of subsidies for loans for the purpose of purchasing pumps ^{d/}	+	+			-
Discontinuation of Government imports of pumps ^{b/}	+				-
Higher tariffs on pumps and spare parts ^{e/}	+	+			-
Higher prices for diesel fuel and electricity	+	+	-	-	-
Removal of restrictions on importing vegetables/importing <i>qat</i> ^{d/}	+		+		-
Restrictions on well drilling by means of a licensing system ^{e/}	+				-
Higher prices for fertilizers ^{f/}	+	+		-	-
Promotion of market mechanisms in the matter of water rights ^{g/}					+

³⁸ United Nations Department for Development Support and Management, *Bahrain water resource management plan*, mission report by J. Karanjac, 1994 (unpublished).

Box 4 (continued)

Policy tool	Net impact on water supply	Impact on the budget of the government	Impact on urban population	Impact on rural population relying on rain-fed agriculture	Impact on rural population relying on irrigation water delivered by pumping
Buying up water rights and termination of the exercise of those rights ^{b/} /use of wastewater for irrigation	+	-			+
Higher water tariffs ^{d/} /privatization of drinking water supply in urban areas	+	+	-		
Enhancement of efficiency of water distribution networks ^{f/}	+	-			
More investment-friendly climate ^{h/}	+		+	+	+
Professional training ^{k/} /support for industrial investment ^{k/}	+	-	+	+	+
Restrictions on geographic location of various industries	+				
Reduction in the subsidy on wheat ^{l/}		+	-	+	+
Support for cooking gas and gas ovens ^{m/} /encouragement programmes	+	-	+	+	+

Source: ESCWA. *The Enhancement of Institutional Arrangements for Water Legislation Enforcement and the Improvement of Institutional Functions in Selected ESCWA Member Countries*. 19 October 2001. E/ESCWA/ENR/2001/11 (in Arabic), pp. 61-62.

Notes: This table is included by way of an illustrative example. It should be supplemented with quantification of the impacts of the proposed policies, determination of the feasibility of implementing each of them, and a procedure for reconciling conflicting priorities.

^{a/} The Cooperative and Agricultural Loan Bank makes loans for the purchase of pumps available at interest rates below the rate of inflation, and consequently the Government would benefit from the discontinuation of these subsidized loans.

^{b/} The Government imports approximately 75 per cent of all the pumps that enter Yemen every year, most of them under internationally funded projects.

^{c/} It is doubtful whether it would be feasible to levy higher tariffs on drilling equipment given the current institutional situation.

^{d/} *Qat* was formerly imported from Ethiopia, and some observers have suggested that imported *qat* may be of better quality and cheaper (even taking the cost of air freight into account).

^{e/} It is doubtful whether Yemen possesses the institutional capacity to place the necessary restrictions on well drilling and pumping.

^{f/} Higher fertilizer prices would lead indirectly to reduced use of water for irrigation, and since imported fertilizer is subsidized at a rate of approximately 20 per cent, the budget would benefit.

^{g/} Market mechanisms aimed at transferring water between sectors would be an appropriate method of compensating farmers for their water, in contrast to other mechanisms that would compel them to stop using water by raising its cost. The question of transferable water rights, as such, has never been addressed before, but there have been a number of earlier agreements between farmers and the Government under which the former have obtained various benefits in exchange for ceding their water rights to neighbouring cities. This model is expected to be adopted more widely in the future.

^{h/} In addition to the reallocation of water to sectors in which a cubic metre of water would generate greater added value than other sectors, it would be essential to use smaller total quantities of water in order to prevent the depletion of aquifers.

^{i/} In Sana'a, the value of a cubic metre of water from private distribution systems is nine times the value of a cubic metre of water from the public distribution system (100 rials in the case of the former, compared to 11 rials in the case of the latter).

^{j/} Losses of water from Sana'a's distribution system are estimated at 50 per cent of the total quantity of water pumped into it.

^{k/} These measures would create more jobs in industry, thereby giving rural inhabitants an incentive to move into the cities and hence (on balance) enhancing water availability. Benefits for city-dwellers would be more jobs at higher wages.

^{l/} Reducing the subsidy on wheat would impact water in two ways: (i) it would make existing resources available for reallocation to water use optimization programmes and new spending objects, and (ii) it would make rain-fed farming more attractive by increasing returns from it. Over the longer term, groundwater-dependent agriculture would be eliminated and rain-fed agriculture would become more important for rural people. The fact is that so long as workers in the rain-fed agriculture sector do not enjoy higher incomes, rural people from areas of rain-fed agriculture will continue to migrate to the cities, drawn by the prospect of jobs in the new industries there, and as a result the redistribution of labour from the agricultural to the industrial sector will yield only very limited water savings.

^{m/} Encouragement for the use of gas as domestic fuel (which is a policy that has been pursued for some time) would reduce demand for firewood, and consequently would inhibit uncontrolled cutting and preserve trees. This would enhance the water-retention capacity of drainage basins, and would also yield direct benefits for rural families in the form of a cheaper source of energy.

IV. ASSESSING PROGRESS IN THE FIELD OF INTEGRATED WATER RESOURCE MANAGEMENT IN THE ESCWA COUNTRIES

Table 6 presents a summary of the IWRM toolbox which is used to survey the progress that the ESCWA countries have made toward the goal of IWRM in the light of available data. The table may be used to assess any country's progress by assigning one of three ratings for every tool:

- (a) Rating of 1: the country in question has not yet begun to apply the tool;
- (b) Rating of 2: the country has begun to apply the tool, but is not yet applying it in full, or is not applying it satisfactorily;
- (c) Rating of 3: the tool is being applied satisfactorily.

TABLE 6. ASSESSMENT OF PROGRESS TO DATE IN THE IMPLEMENTATION OF INTEGRATED MANAGEMENT IN THE ESCWA COUNTRIES

Tool	Bahrain	Egypt	Iraq	Jordan	Kuwait	Lebanon	Oman	Qatar	Saudi Arabia	Syrian Arab Republic	United Arab Emirates	West Bank and Gaza	Yemen
A. Enabling environment													
1. Policies: setting goals for policy use, protection and conservation													
(a) Preparation of a national water resources policy													
(b) Policies with relation to water resources													
2. Legislative framework: water policy translated into law													
(a) Water rights													
(b) Legislation for water quality													
(c) Reform of existing legislation													
3. Financing and incentive structures: financial resources to meet water needs													
(a) Investment policies													
(b) Institutional reform in the public sector													
(c) The role of the private sector													
(d) Cost recovery and tariffication policies													
(e) Investment evaluation													
B. Institutional tools													
1. Creating an institutional framework: forms (institutional arrangements) and functions													
(a) Transboundary organizations for water resource management													
(b) National apex bodies													
(c) River basin organizations													
(d) Regulatory bodies and enforcement agencies													
(e) Service providers and IWRM													

TABLE 6 (continued)

Tool	Bahrain	Egypt	Iraq	Jordan	Kuwait	Lebanon	Oman	Qatar	Saudi Arabia	Syrian Arab Republic	United Arab Emirates	West Bank and Gaza	Yemen
(f) Civil society institutions and local Community organizations													
(g) Local authorities													
2. Building institutional capacity: developing human resources													
(a) Participatory capacity and empowerment in civil society													
(b) Training to build IWRM capacity in water professionals													
(c) Regulatory capacity													
(d) Participation in knowledge													
C. Management tools													
1. Water resources assessment: understanding resources and needs													
(a) Water resources knowledge base													
(b) Water resources assessment													
(c) Modelling in IWRM													
(d) Developing water management indicators													
2. Plans for IWRM													
(a) Basin management plans													
(b) Risk assessment and management													
3. Efficiency in water use: managing demand													
(a) Improved efficiency of use													
(b) Recycling and reuse													
(c) Improved efficiency of water supply													
4. Social change instruments: encouraging a water-oriented society													
(a) Education curricula on water management													
(b) Training of water professionals													
(c) Training of trainers													
(d) Communication with stakeholders													
(e) Water campaigns and awareness-raising													
(f) Broadening of the participation base in water resource management													
5. Conflict resolution													
(a) Conflict management													

TABLE 6 (continued)

Tool	Bahrain	Egypt	Iraq	Jordan	Kuwait	Lebanon	Oman	Qatar	Saudi Arabia	Syrian Arab Republic	United Arab Emirates	West Bank and Gaza	Yemen
(b) Shared vision planning													
(c) Consensus-building													
6. Regulatory instruments													
(a) Regulations for water quality													
(b) Regulations for water quantity													
(c) Regulations for water services													
(d) Land-use planning controls and nature protection													
7. Economic instruments: using value and prices for efficiency and equity													
(a) Pricing of water and water services													
(b) Pollution and environmental charges													
(c) Water markets and tradable permits													
(d) Subsidies and incentives													
8. Information management and exchange: better knowledge for better water management													
(a) Information management systems													
(b) Sharing national and international data													

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