ECONOMIC AND SOCIAL COMMISSION FOR WESTERN ASIA

WATER LEGISLATION

IN SELECTED ESCWA MEMBER COUNTRIES

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INTRODUCTION

A. BACKGROUND

The securing of water resources in adequate quantity and quality is one of the main requirements for the enhancement of economic and social development in the Middle East. This need is particularly crucial for the members of the Economic and Social Commission for Western Asia (ESCWA),[1] and it affects the quality of life on both a local and a regional level. However, the ESCWA member countries, situated in arid and semi-arid zones, are characterized by large spatial and temporal variations in rainfall and by limited amounts of surface water. These countries face a common problem: widespread scarcity of water resources.

The ESCWA member countries have been experiencing rapid population growth, socio-economic development and increased urbanization, and have been carrying out industrial and agricultural activities that have placed great strains on their water resources, particularly in the countries of the Arabian Peninsula. A number of the ESCWA member countries are now faced with the challenge of meeting increasing water demands in all sectors. While some countries have adequate water supplies to fulfil short-term requirements, others have limited resources with few real possibilities for developing additional supplies without relying heavily on groundwater mining and the use of non-conventional desalination and treatment facilities, which require substantial financial and technological investment. The water situation is further complicated by ineffective management practices, as well as the fact that substantial volumes of available surface and groundwater are being withdrawn from rivers and aquifers, some of which are shared between countries within and outside the ESCWA region. Fragmented institutional arrangements and a lack of comprehensive and effective water legislation further contribute to a delay in the urgently needed implementation of an integrated development and management approach to water resources.

Rising water demand to satisfy basic needs has contributed to intensive use of both surface and groundwater resources, leading to further exploitation of water resources in excess of natural renewability, as well as the deterioration of water quality in some countries. This has compelled some of the ESCWA member States to focus attention on the need to implement measures to improve management of water resources, and invest in the construction of hydraulic structures to store and regulate water flow, water conveyar ce, and reuse systems. The member countries of the Gulf Cooperation Council (GCC) were forced to construct desalination plants to meet rising water demands in the domestic sector. Expected competition between different water-use sectors over utilization of available water sources in some of the ESCWA member countries may create water shortages in the near future. In order to overcome future water shortages, there is a need to formulate and achieve integrated water resource development and management, supported by effective institutional arrangements and legal instruments, as well as the promotion of capacity-building.

B. PERSPECTIVES ON REGIONAL WATER RESOURCES

Despite serious efforts made to develop their water resources, many member States in the ESCWA region are still far from achieving efficient development and management of their water resources. A survey of the availability of natural water resources indicates large variations from country to country within the ESCWA region, depending on the physiographical and hydrogeological setting. Egypt, Iraq, Lebanon and the Syrian Arab Republic have relatively dependable surface water sources in the form of major rivers and springs. River flow in these countries originates both within and outside of national boundaries. They also possess renewable groundwater reserves sufficient to meet part of their current water requirements. Jordan, the West Bank and the Gaza Strip have limited surface water and renewable groundwater sources that partially meet their minimum requirements. In Egypt, Iraq and the Syrian Arab Republic, a number of large

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[1] ESCWA members are: Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Oman, Palestine, Qatar, Saudi Arabia, the Syrian Arab Republic, the United Arab Emirates and Yemen.

dams have been constructed on major rivers to regulate the flow of water supplies, hydroelectric power production and flooding, as well as provide recreational opportunities. In Egypt, Iraq and the Syrian Arab Republic, and to a limited extent in Lebanon and Jordan, river flow represents the main source for irrigation, and domestic and industrial needs.

In contrast, the Arabian Peninsula countries of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, the United Arab Emirates and Yemen are characterized by a severe desert environment and are devoid of rivers and lakes. Conventional water resources consist of limited quantities of run-off resulting from intermittent and undependable flash floods, groundwater in the alluvial aquifers, and extensive fossil groundwater reserves in deep sedimentary formations. In the countries of the Arabian Peninsula, the use of surface run-off is very limited. It is primarily utilized for traditional flood irrigation, especially in the south-western region of Saudi Arabia, most of Yemen, and southern Oman. Regulated flow from small dams and unregulated flood flow are the main sources of groundwater recharge of shallow alluvial aquifers.

In many of the ESCWA member countries, non-conventional water sources are being utilized to supplement natural sources in order to satisfy water requirements. Brackish and sea water desalination has also become a viable alternative to meet rising demand. The Gulf States rely largely on desalination to augment excessive domestic water demand. During the last 20 years these countries, with the exception of Yemen, have become increasingly dependent on desalination to meet their water supply requirements. A limited amount of treated wastewater is being reused in most of the ESCWA member countries.

C. JUSTIFICATION: THE STATUS OF WATER LEGISLATION

The most fundamental element in the organization of the water sector is the current legislation in force, which establishes and regulates the ownership and use of water resources. In recent years some ESCWA member countries have adopted legislation to regulate water resource development, use, control and protection. These measures are taken to ensure rational development, utilization and protection of water resources, taking into consideration prevailing social and economic conditions. However, in some ESCWA member countries there is either only minimal legislation dealing specifically with water, or laws that are out of date and do not satisfy the current requirements. Therefore, the preparation and proclamation of rational and up-to-date water legislation are among the most important measures to be taken by the decision makers of each country.

A review of the evolution of institutional arrangements and water legislation in the ESCWA region reveals that countries that depend largely on surface water have enacted laws designed to provide water quality standards, pollution control, and to some extent, water allocation. Countries that rely mostly on groundwater have issued directives aimed at regulating groundwater extraction through well drilling permits, and the formulation of standards for drinking water and treated wastewater. The oldest current water legislation was enacted in 1925 in Lebanon and the Syrian Arab Republic, governing public ownership of water and licensing, while more recently enacted legislation includes a directive issued in Egypt in 1994 concerning the protection of the environment, including water resources. In addition decrees in Yemen and Oman, issued in 1995, deal with the establishment of a national water resource authority in Yemen and groundwater regulation in Oman (ESCWA, 1995b and 1995c).

Most water legislation was enacted between 1967 and 1985. During the last 10 years the ESCWA member States of Egypt, Jordan, Oman, Qatar, the United Arab Emirates and Yemen have made some efforts to revise, modernize, or introduce new water laws and strengthen institutional arrangements. Egypt enacted environmental law No. 40 in 1990, covering protection of water resources (ESCWA, 1995b). Royal Decree No. 31 was issued in Oman in 1993 to merge the Ministry of Environment with the Ministry of Municipalities, creating a single ministry with the authority to provide protection of water resources and issue

groundwater regulations. In Qatar, Decree No. 13 was issued in 1994 amending Law No. 4, which transferred the Environmental Protection Committee to the Ministry of Municipal Affairs and Agriculture, in order to better protect water resources (ESCWA, 1995e). Law No. 7 issued in 1993 in the United Arab Emirates provided the foundation for the Federal Environment Agency with mandates for the protection of water resources and the establishment of standards. In Yemen, a law was enacted in April of 1995, calling for the establishment of the National Water Resources Authority, with the power to establish water policy, strategies and plans, and provide the enforcement needed for further development and management.

D. PURPOSE OF THE STUDY

The present technical study on the water legislation in selected ESCWA member countries was prepared as a background document for the Expert Group Meeting on Water Legislation in the ESCWA Region, held in Amman from 24 to 26 November 1996, which is part of the work of the ESCWA 1996-1997 natural resources work programme. This study is a direct response to the recommendations on water management and sustainable development put forth at the International Conference on Water and the Environment (Dublin, 26-31 January 1992) and the United Nations Conference on Environment and Development (Rio de Janeiro, Brazil, 3-14 June 1992). It seeks to provide a review and analysis of existing and/or planned efforts to update water legislation in some of the ESCWA member countries. In this context, the different chapters of the study address the following issues: historical evolution of laws and regulations for water institutions; the legal framework governing utilization of surface and groundwater resources; and planned water legislation relevant to water institutions. The study also contains a detailed examination of the status of water legislation in selected ESCWA member countries which may clarify what has been achieved in these countries as well as underscore the need to update, formulate, implement and enforce the effective legal systems needed for efficient development and management of water resources. In addition, the study reports on institutional reform, legislative enforcement mechanisms and the foundations of modern and effective water law.

The study is divided into 10 chapters. Chapters I-VII provide a historical perspective on water laws and customary practices as well as a review of the current status and practices related to water legislation in selected ESCWA member countries: Jordan, Lebanon, Oman, Saudi Arabia, the Syrian Arab Republic, the United Arab Emirates and Yemen. Chapters IX and X contain some suggestions for possible legal frameworks to assist in achieving optimal development and management of water services in the ESCWA region.

I. WATER LEGISLATION IN THE ESCWA REGION: GENERAL

A. DEFINITION OF TERMS

The two distinct concepts of water law and water legislation and their legal and administrative ramifications have often been misunderstood by water resource specialists. This lack of understanding may hinder the implementation and enforcement of water regulations. In this context, it is appropriate to clarify the meanings of water law and water legislation.

1. *Law*

Water law comprises as the comprehensive legal means used to govern the administration, development and management of water; it includes administrative, civil, criminal, commercial, industrial, and communications laws. The terms water law, act, code and ordinance designate any legal tool or enactment that can be used to regulate different aspects of water resource development and management. These terms will be used interchangeably in the text to denote the same meaning. Water law covers a diverse range of water-related subjects including surface water, groundwater, wastewater, water resource policies, inventory, water rights and ownership, prioritization of uses, and zoning and planning at the basin level with regard to servitude and passage, regulation of sectoral use and allocation, hydroelectric production, management of natural disasters such as flood and drought, protection of water sources, conservation, recreation, monetary aspects such as fines and taxes, control of pollution, and the environmental integrity of water and its relation to other natural resources.

Water law represents a complex legal instrument, owing to its interconnection with numerous other branches of the legal system, and other related areas. Water law usually reflects the economic and social conditions within each country. Water jurisdictions set forth in water law may be comprehensive for the entire resource, or may be local, regional, national or international, and sometimes may result in conflict of jurisdiction. Therefore, water law lends itself to the possibility of conflict in a number of areas and has provisions for the resolution of such conflicts. International water law has also recently become of interest in areas such as the ESCWA region, where water sources, both surface and subsurface, are shared among a number of countries. The need to share water resources, as well as the requirement to achieve an integrated approach to water resource management, makes the resolution of water problems even more complex.

2. *Legislation*

Water legislation is the body of written, legal regulations governing all aspects of water. Therefore, water law may encompass a great deal of water legislation. Water legislation originates from the fundamental laws of a country and may include traditional, customary, and socio-economic factors. There are two general types of water legislation: basic acts or laws, and subsidiary or enforcing legislation. A basic act may require the approval of the citizens of a country, through their official representatives, and may involve lengthy legal procedures before becoming official. Subsidiary or enforcement legislation is the means by which the original act is implemented and enforced, or maintained. This may be carried out through orders given by a minister or other water authority, as mandated by the act, or through the delegation of power to other water authorities. Water legislation constitutes the legal means by which a country's water management policy is carried out. Water legislation is basically concerned with water rights, rights to divert or abstract and use water, or to use it *in situ*. It is affected by physical, economic and social factors and by the desire of the Governments to maintain a reasonably efficient balance between conflicting water development and management goals such as equity of distribution, pricing with regard to the general public's ability to pay, and capital recovery from water development projects.

B. HISTORICAL PERSPECTIVES ON WATER LEGISLATION

Historically, the legal framework for water development and utilization in the Middle East, including all ESCWA member countries, has always been responsive to water scarcity. This phenomenon is reflected in a number of principles that characterize Shariah water law and customary practices. The customary legal frameworks prevailing in the region before the twentieth century were the Ottoman Majalla code, the Shariah principles and traditional practices (Mallat, 1995).

1. *Customary laws*

The population of the ESCWA region is predominantly of the Moslem faith, where both Sunni and Shiite doctrines emphasize Shariah principles and incorporate some customary laws as the basis for their water legislation. Before the Islamic period as well as after the advent of Islam, in many parts of the Middle East, including most of the ESCWA member countries, administration of water rights was often based on customary water practices. This practice was common prior to the introduction of written legislation, and has governed resource development and utilization in past civilizations. Customary water law, also referred to as traditional water practices, originated with the local historical water use of a specific community and with religious beliefs, mainly Islam. Customary water laws addressed rights in regard to water ownership, use, and allocation. Customary practices usually emphasized religious beliefs and local customs. Traditional water rights were established as a result of the repetition of certain actions, as well as the acceptance of binding rules set by indigenous peoples over many generations. In the past, customary water laws generally were not written or registered, and were transmitted orally from one generation to the next. The duration of water rights generally varied according to the availability of water and customary water use practices. During times when water was relatively abundant, traditional practices were adequate; however, as water gradually became more scarce, water use regulations became more complicated.

Traditionally, there were different types of water ownership rights which could be acquired in one of several different ways. An individual could hold water rights, as well as a community or tribe. Water rights held by a community were not transferable; however, those held by an individual or a group could be sold, inherited or given as a gift. Water rights were determined either by land ownership or by contribution to the actual construction of the facility involved in acquiring the water, including the construction of surface water facilities, or exploration and production of groundwater resources from wells. In general, the greater the contribution, the larger the share of water ownership rights. Rarely were water rights registered in writing. Water rights were recorded only in cases of dispute or when it was specifically requested by the parties involved. In later years, water ownership rights were recorded at the time they were acquired.

Traditional practices also included irrigation water rights, with reference to the right to irrigate lands with orchards or crops. In cases where water from small streams required diversion or storage, upstream lands were to be irrigated first, to a depth not above the ankle. The remainder would then be released for irrigation downstream. In the case of private irrigation canals, all individuals who contributed to the construction of the canal had exclusive water rights, shared equally among all members. For public irrigation canals, water was diverted from the canals using a variety of methods, usually on a time-share hourly or daily basis. Fluctuations in canal flow resulting from drought, floods or seasonal variations would be considered in the process of equitable allocation of water from the canal.

Customary water laws still play an important role in water allocation, especially at the user level. In many parts of the ESCWA region, particularly in Oman, Saudi Arabia and Yemen, customary water use patterns still prevail in determining water rights and administration of regulations.

2. *Shariah principles*

Islamic water law is based on Shariah principles, representing the predominant legal water system in most of the ESCWA member countries. The Shariah principles originate from the Holy Koran and the Hadith. Shariah principles address all aspects of water resources such as development, allocation, utilization, ownership, rights, and conservation. The basic elements of Islamic water law consist of the belief that water belongs in principle to the community; it is a gift from God. The right to ownership of water may be established through value added to water by labour, by retaining the water in a container and/or through distribution work (Mallat, 1995). It also includes provision for water-sharing principles according to traditional practices with acknowledgment of prior appropriation rights. The Islamic principles also include liability elements addressing the withholding or misuse of water, particularly wastage and degradation of clean water. These basic elements of the Shariah principles were consolidated in the Ottoman Majalla code and the land laws of 1858 (Mallat, 1995).

According to the Shariah principles, different aspects of water rights were, and are still, addressed according to priority: the right to satisfy thirst; water ownership; private water rights; transfer of rights; protection zones; and operation and maintenance. One of the basic principles is the assurance of water availability to all members of the Islamic community, which considers water to be the property of the State or in the public domain. Islamic water law is predominant, especially in countries where the State constitution is based on Islamic Shariah principles. Islamic water laws honour customary practices, within certain limits, as a subsidiary source of law, provided they are not contrary to the Shariah principles.

The Shariah principles address various forms of legal water ownership, and recognize two important water rights: the right to quench human and animal thirst, and the right to irrigation. In addition to recognizing the right to quench thirst, the Shariah principles also state that water for the purpose of quenching a person's or an animal's thirst, including water from wells or water sources on public property, cannot be refused to anyone. These principles also apply to large bodies of water such as lakes or rivers, or to water appropriated to a community. Individuals are also entitled to rights of servitude, which require owners of private property to allow them to pass through. However, some restrictions apply, particularly if there is a possibility that passage across private land may damage a watercourse. Restrictions also apply for hand-dug wells constructed by nomads; nomads have exclusive rights to these wells during their stay. Afterwards, the wells become public property. Land ownership is tied to ownership of wells. Thus, anyone who digs a well by hand, on either his own private land or unoccupied land, becomes the owner of the well and the water rights for irrigation of the land (Caponera, 1992).

Ownership of water is also governed by Islamic law. Water in its natural state is not considered to be owned by anyone, and therefore cannot be sold. Islamic belief considers water to be a gift from God to be used for the benefit of all people. Some Islamic doctrines allow ownership of water when it is appropriated. In the case of land ownership, the owner of the land has first priority to any water found there. Rainwater belongs to the owner of the land on which it falls. In the case of unowned land, the water may be used by anyone; however, the owner of the nearest cultivated plot has first priority.

Water rights cannot be sold except in predetermined circumstances. The Hanifa doctrine allows the sale of water that is either stored or carried in receptacles. It also permits the sale of a well or a spring, and the purchaser obtains priority to use the water from this source. The sale of irrigation rights is not allowed, nor is the direct transfer of rights. Irrigation rights can be inherited and applied to new parcels of land annexed by the same landowner, and when such parcels are sold, irrigation rights are transferred along with the sale of the land.

The question of land and underground-water rights is indirectly addressed by various customary and religious rulings concerning infiltration galleries, or *quanats*. These underground galleries are sometimes constructed to transfer water from underground formations to the ground surface. The groundwater rights cannot be attached to any particular land parcel; however, a group, such as the townspeople or the group of individuals who constructed the galleries, have the right to sell, rent or distribute water from this source as they please. There are no historical limitations on water use from this source. Likewise, for other groundwater sources such as springs, there are no limitations on the use of water on unowned public property, or unappropriated water from a public source such as a river or lake that crosses private property.

Shariah principles, as elaborated by various Islamic theologians, also regulate water distribution. Allocation of water is based on the classification of water sources as rivers, wells, or springs. River flow is further subdivided into large, small and artificial rivers. Water in large rivers is considered to be community property; anyone may withdraw according to need, with no restrictions on the quantity or the method of withdrawal. The quality of the water, however, is to be protected. These regulations also apply to lakes. Water from small rivers is allocated to the users nearby. They are permitted to withdraw, divert or detain water until it is ankle deep, or until the trunks of their trees, up to ankle depth, are covered. The remainder is then released for users downstream, resulting in a diminishing supply. In the case where two users are equidistant from the water, they are required to share equally. If equal sharing is not possible, they are required to determine the priority of use by lottery, under the restriction that the first user is not allowed to use all the water. In the case of two or more owners on one piece of land, water is appropriated according to the size of the owned parcel. The principles also establish protected zones to prevent groundwater well interference.

Entitlement to water sources, such as existing wells, springs or canals, included the protection of adjacent land from harm with regard to its water requirements. The purpose of this regulation was to prevent new wells from depleting the aquifer, and to provide protection. The groundwater protective zones for well interference were established as: 40 cubits for an animal watering well, 60 cubits for an irrigation well, and 300 to 500 cubits for a spring (1 cubit = approximately 2.5 feet or 0.758 metres [m]).

Shariah and customary practices require that watercourses and facilities be maintained. Riparian owners are jointly responsible for the maintenance and cleaning of watercourses. Contributions towards maintenance are in proportion to irrigation rights. Those exercising their rights to quench their thirst are not obligated to contribute towards the maintenance of such water sources (ESCWA, 1996b). In the event a co-owner refuses to contribute to the repair and maintenance of a canal, he may legally be prevented from exercising his water rights. Regulations require that maintenance operations proceed in a downstream direction. The Hanifa doctrine states that riparian dwellers should only be responsible for the portion of the canal that crosses or borders their land. In other words, upstream maintenance costs are shared by all owners, whereas maintenance costs for downstream areas are shared only by the downstream owners (Caponera, 1992; ESCWA, 1996b).

3. *The Ottoman Majalla code*

The other legal framework that has influenced water legislation in some of the ESCWA countries is the Ottoman Majalla code. Some elements of this code remain as residual legislation for Iraq, Jordan, Lebanon, the Syrian Arab Republic, and the occupied territories. In the past, the Ottoman Majalla code also regulated the use of water in other countries that were under the control of the Ottoman Empire, such as what are now Egypt, Saudi Arabia, the United Arab Emirates and Yemen (FAO, 1978). Thus it is worthwhile to review some articles of the Ottoman Majalla code in regard to specific water issues that may have had the same impact that the Napoleonic code had on water legislation in Lebanon and the Syrian Arab Republic. The Ottoman Majalla code paid particular attention to water issues, dedicating 92 articles to them, from 1234

through 1326. Some of the Ottoman Majalla code articles that are believed to be relevant are cited below exactly as reported by Caponera in FAO publication No. 20/1, *Water Laws in Moslem Countries* (1973).

Article 1234 of the Majalla code defines water as a non-saleable commodity to which everyone has a right (*mubah*) while article 1235 defines groundwater as belonging to the community. Article 1236 states that as a publicly-owned commodity, water may not be sold. This applies to running water which has not been appropriated, to water contained in wells dug by unknown persons, and to water from the sea and large lakes. Rivers are divided into two categories: rivers forming part of the public domain, the beds of which are not privately owned; and privately-owned rivers flowing on private land. Water ownership rights are acquired by gift, inheritance or occupation, on condition that the land is occupied with the intention of taking possession thereof. Right of use is recognized for human and animal needs, where anyone may quench his thirst from both publicly—and privately—owned sources, including rivers. Article 1267 also extends this right to animals, provided that their number is not so great as to damage the waterway.

Article 1268 of the Ottoman Majalla code states that anyone who has on his property a natural stream, basin or well may prevent any person from trespassing upon his land to obtain drinking water. However, if there is no other public water source in the vicinity, the owner is obliged to allow the drinking of his water. This also includes permitting persons to cross one's land for this purpose. Even if the water is not offered freely, anyone who wishes to drink may cross another's property on condition that he does not cause any damage to the rim of the well or to the sides of the water conduit.

Water allocation for irrigation purposes is stipulated in article 1269. As for rivers and lakes forming part of the public domain, and as such constituting a public commodity, everyone is entitled to use them for irrigation purposes, provided the rights of third parties are not infringed upon. Irrigation canals and ditches, as well as pumping installations, may be freely constructed; however, any work which causes floods, exhausts the water supply of a river or lowers the water level so as to prevent the passage of boats is prohibited. The use of privately-owned waterways is restricted to riparian landowners. For example, it is prohibited to divert water from main irrigation ditches, to change the turn established by custom for the drawing of water, or to cede water rights to a non-riparian owner. Such a right requires the agreement of all riparian owners but can be revoked unilaterally at any time. Article 1216 addresses the sale of rights of way, with regard to irrigation water rights. The overflow water from conduits may also be included as part of the sale of the land. However, Article 1015 specifies that if the owner of a garden sells his land together with the rights to draw water from a certain river or canal, third parties having water rights to that river or canal benefit from a right of pre-emption. The landowner may, however, sell his land without the water rights.

The maintenance of waterways is governed by Articles 1321 to 1326 of the Ottoman Majalla code. The maintenance of rivers forming part of the public domain is incumbent upon the State. However, according to Article 1321, if the treasury is low, the expenses involved may be charged to private persons. Article 1322 states that the maintenance of privately-owned waterways is incumbent upon the owners, who are entitled to draw water for their fields or are allowed to have their animals drink therefrom. Persons who have only the right to drink water are not bound to help defray maintenance expenses. Article 1323 draws a distinction between cases in which several persons with rights to quench their thirst along a jointly-owned waterway wish to undertake repair or maintenance operations and those with equal rights oppose it. If a public waterway is involved, all persons having water rights shall be obliged to undertake maintenance operations jointly; in the case of privately-owned waterways, those who do such work after having obtained the proper authorization from the water master may prevent the other co-owners from exercising their rights thereto until they have paid their share of the expenses (Article 1323). On a jointly-owned waterway, if the co-owners refuse to undertake maintenance work, they may be compelled to do so for a public waterway but not for a private one. The responsibility for the maintenance of watercourses begins upstream, according to Article 1326, and all co-owners must contribute to the initial expenses. Provided upstream riparians have

met their maintenance obligations, they are no longer bound to contribute to the maintenance of the downstream sections. The principle of this provision is that everyone must contribute to maintenance expenses in proportion to the benefit he derives therefrom.

Articles 1281 to 1291 apply to the *haram* around wells and springs. The *haram* of a well is defined by Article 1281 as the protected perimeter area of 40 *arshuns* around the well (one *arshun* represents a cubit) where trespassing is forbidden. The *haram* of springs or sources, the waters of which are drawn from one single place and flow above the ground, is 500 *arshuns*, according to Article 1282. Article 1283 states that the *haram* of a river which does not require frequent maintenance extends on each side by half the width of the river. The *haram* of small rivers requiring frequent maintenance, such as water channels and canals, water pipes and underground conduits (*quanats* or *aflaj*) is of the width required to lay the stones and mud excavated when the waterway is cleaned (Article 1284). The *haram* of underground conduits as defined by Article 1285 is 500 arshuns on each side of the waterway, if made to flow on the surface of the land, equal to that of springs. According to Article 1286, the *haram* of a well on private property is the responsibility of the owner. Another person cannot exercise control over it in any way. If someone sinks a well in another's *haram*, the latter can cause it to be closed. The *haram* of springs, rivers and water conduits is also governed by this rule. In case a well is dug, with the permission of the sultan, next to another well, the *haram* of the new well shall also be 40 *arshuns* on all sides, except that on the side of the first well, without encroaching on that of the original well (Article 1287).

In the case where a well is sunk outside the *haram* of another well (Article 1288), it is permissible for the water of the old well to flow into the new one. The bank of a water channel dug across the land of another person belongs to the owner of the channel up to the water level. If the owner raises the banks on both sides, the land so raised also belongs to him. If the banks have not been raised and there is no evidence that the owner of the land or the owner of the channel has taken possession or planted trees thereon, the portion of the banks above the water level belongs to the owner of the land. When he cleans his channel, however, the owner has the right to throw mud onto both sides. Finally, according to Article 1291, a well dug by someone on his own property has no *haram*. A neighbor can thus dig another well near it on his own land, without objection from the owner of the first well.

C. WATER INSTITUTIONS

A review of institutional arrangements undertaken for this study revealed that the administration of water affairs has not received adequate attention throughout the history of the region. Islamic and customary water laws in the past did not clearly address water administration or organization. Administrative aspects of water resources were dealt with mainly through either local tribal systems or traditional practices (Caponera, 1992). At the local level, especially in remote areas, water distribution was administered by local chiefs given different titles, depending on the locality. Sometimes, domestic supply in towns and villages is still administered by the head of the community.

During the last 25 years, development and management of water resources to meet the water requirements of various sectors of the economy have traditionally been implemented by many governmental institutions in the ESCWA region. In most countries of the region there has been no standard format for either institutional or legislative frameworks dealing with water issues or their implementation. Many water functions are dispersed among a variety of related institutions and departments. Some of these institutions are operating according to specific regulatory legislation, or fragmented regulations issued by them or the central Government. Usually, multiple institutions are mandated to enforce regulations controlling water delivery to ensure that water is safe and adequate for various intended uses over different parts of the country concerned. There may be numerous ministries that deal with water and agricultural activities, water and public works, and water and electricity; or there may be single-function ministries. The establsihed ministries

usually operate at the national and regional level and represent the major decision-making centres. When a centralized organization with relatively absolute power is present, it tends to reduce coordination among peripheral water organizations. However, in most countries of the region, administrative responsibilities for water resources, including the assessment, development, conservation, and protection of water resources, are divided among a variety of ministries, authorities and departments.

Prior water institutional functions have focused on water development to provide water services. However in recent years, in addition to water development, water sector management has been recognized as an important and essential function. In particular, responsibility for efficient utilization, allocation, planning and protection of water resources is increasingly being given to institutions created for that purpose.

Increasing competition for water sources in many of the ESCWA member countries has compelled the Governments of the region to look for means of improving the administrative aspects of water and water-related sectors. Efforts have concentrated on centralizing water institutions. Recently, some countries have begun to streamline their responsibilities with the establishment of a single ministry or coordinating water council which deals with water activities. In Oman and Yemen, a single ministry or authority has been established to deal with all water issues.

With regard to the current administrative aspects of water distribution, organizational frameworks differ between countries, ranging from old traditional practices to complex regulations. In most towns and villages of the ESCWA region, water for domestic and industrial purposes is currently managed and administered by Government appointed-administrators, especially for water and sewerage services, while in larger cities water is managed by the municipality, water authority or water department. Distribution procedures for water irrigation from rivers, flow from reservoir releases, and floods range from simple to complex. River flow and reservoir releases are usually administered by specialized Government authorities created for that purpose, according to planned modern allocation procedures. Regulations governing the allocation of water, whether carried out according to operational rules based on old practices or modern optimization criteria, are applied in Egypt, Iraq and the Syrian Arab Republic, and to a lesser extent in Jordan, Lebanon and Saudi Arabia.

Simple traditional operational rules and guidelines are predominant in the countries of the Arabian Peninsula. Flood water allocation in some areas is still carried out according to local traditional customs. Irrigation from *wadi* (dry watercourse) flood flow in the main channel, as well as on the flood plain, is appropriated to upstream users who have first priority. The *wadi* is divided into zones: upstream, midstream and downstream. Each zone is usually administrated by a *sheikh* or water master. Water allocation in each zone is accomplished according to an established order of priorities. Areas near the *wadi* receive water first, followed by those with earlier established water rights, and then by those with more recent ones. Finally, the lands on higher ground receive water first, before those located on a lower level (Caponera, 1992). A channel master known as a *sheikh al shariq* is responsible for keeping a record of all water rights for plots of land attached to diversion channels. The quantity and frequency of watering depends on traditional customs and local agricultural practices. These types of procedures are usually practiced in Oman, some regions of Saudi Arabia, the United Arab Emirates and Yemen.

The above has provided a brief historical overview of the evolution of water legislation which forms the basis for many of the laws and regulations that are being observed in some of the ESCWA member countries today. The following section provides some further details on the status of water legislation in selected countries.

II. WATER LEGISLATION IN JORDAN

A. WATER RESOURCES: GENERAL

Water resources in Jordan consist of groundwater, surface water and treated wastewater, which are all being used to meet water requirements. Groundwater from renewable shallow and deep aquifers supplies 60 per cent of the total water demand. Total surface water is estimated at 660 million cubic metres (MCM). Surface water consists of flow available from the Jordan, Yarmouk and Zarqa Rivers (Salameh and Bannayan, 1993; ESCWA, 1995d), estimated at 320 MCM, and *wadi* flood flow in Kerak, Mujib, and Hasa, estimated at 340 MCM. Groundwater is stored in the relatively deep sandstone and carbonate formations at Disi, Kurnub, Zarqa, Amman and Wadi Es Sir as well as in shallow basaltic and alluvial formations. The non-renewable groundwater available to meet part of the demand is estimated at 360 MCM (regional distribution; north 260 MCM, south 100 MCM), while that available from renewable sources is estimated at 290 MCM. Water demand in all sectors reached 883 MCM in 1990, with 650 MCM allocated for irrigation and the remainder for industrial and domestic uses. Total demand is expected to reach 1,508 MCM and 2,015 MCM in the years 2000 and 2025 respectively. Domestic demand is expected to reach 340 MCM and 750 MCM in the same respective years, with industrial demand accounting for 78 MCM and 173 MCM respectively (ESCWA, 1995a and 1995d).

B. INSTITUTIONS

The organizational framework of Jordan's water sector has evolved over the years to suit various requirements at different times. Water resource institutions acquired legal status in 1959 through the establishment of the East Ghor Valley Authority, and the Central Water Authority, dictated by Laws No. 14 and 51 respectively. Law No. 14 mandated that the East Ghor Valley Authority be responsible for planning, management and reclamation of water and land under the East Ghor Canal Project, in the Jordan River Valley area. The Central Water Authority was responsible for water activities in the remaining areas of Jordan. The two water authorities functioned independently until they were merged with the Geological Survey and Bureau of Mines (ESCWA, 1996e) under a new institution known as the Natural Resources Authority (NRA). This institution (NRA), established by Law No. 37 in 1966, took over the responsibilities of the Central Water Authority. In 1973, Law No. 54 detached and established the Water Supply Corporation as an independent agency responsible for domestic water activities, including planning, design, operation, and maintenance of water supply projects as well as treatment, distribution and sale of water to all of Jordan except the Amman area (Shatanawi and others, 1992).

To meet water demand in the Amman area, the existing water department of the city municipality was reorganized through the enactment of Law 48 of 1977, establishing the Amman Water and Sewerage Authority. Institutional arrangements with regard to the development and management of water resources in Jordan were further altered through the establishment of the Jordan Valley Authority (JVA) in 1977. Law No. 18 of 1977 assigned responsibility for water activities in the Jordan Valley region up to an elevation of 300 metres above sea level to the Jordan Valley Authority.

Before the establishment of the Water Authority of Jordan in 1983, water affairs were managed by the following major institutions: the Natural Resources Authority (NRA), the Water Supply Corporation (WSC), the Jordan Valley Authority (JVA), and the Amman Water and Sewerage Authority (AWSA). However, many small municipalities, towns and villages operated and maintained their own water supply systems and sanitary services.

From 1983 to 1987, the water sector was managed by two independent authorities: the Water Authority of Jordan (WAJ), and the Jordan Valley Authority (JVA). The Water Authority of Jordan, an

independent institution, was established by Law 34 in 1983 and, by its mandate, entrusted with the responsibility for planning, development, allocation and management of all water resources throughout Jordan, with the exception of the Jordan Valley, including the provision of water supply and sewerage services. It also assumed the functions of all agencies and municipalities including those performing its duties prior to its creation: the Amman Water and Sewerage Authority, the Water Supply Corporation, the Water Resources Branch of the Natural Resources Authority and the Municipal Water Department of the Jordan Valley Authority (ESCWA, 1996e). The Jordan Valley Authority was responsible for irrigation and development in the Jordan Valley. The presidents of both the Water Authority of Jordan and the Jordan Valley Authority had ministerial rank.

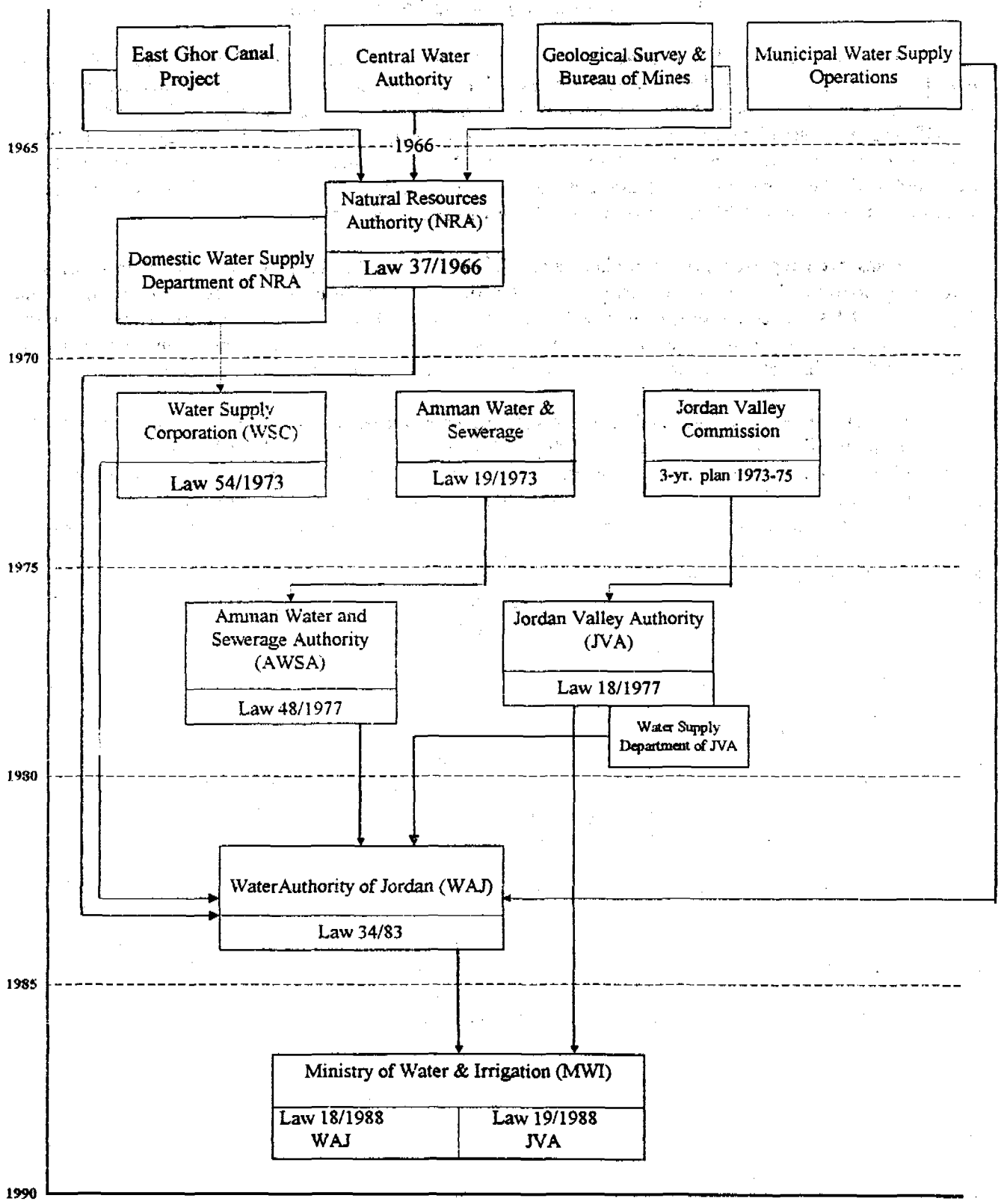
The diffusion of water responsibilities among different water institutions in Jordan resulted in poor coordination, and in some cases led to duplication of efforts and ineffective planning, making it difficult to achieve efficient management of water resources. In order to further strengthen institutional arrangements in Jordan, two laws were issued in 1988 requiring the two existing water institutions, the WAJ and the JVA, to become legally attached to the Ministry of Irrigation and Water Resources. Law No. 18, the Water Authority Law, and Law No. 19, the Jordan Valley Development Law, further strengthened and defined the functions, responsibilities and jurisdictions of these two water authorities.

Under the arrangements established by Laws 18 and 19 of 1988, the Ministry of Water and Irrigation became the main authority dealing with water resource development, utilization and management in Jordan, with both the WAJ and JVA authorities under its jurisdiction. Since then the Ministry has been responsible for project development and management of water resources, and delegates specific responsibilities to the two water authorities. Overall responsibility for all water resources in Jordan, according to Law No. 18, rests with the Water Authority of Jordan, while Law 19 defines the functions of the JVA in the Jordan Valley, in particular with regard to irrigation activities.

Water Authority Law No. 18 contains 33 articles which define its jurisdiction, mandates and enforcement measures. Under this Law, the Water Authority's responsibilities include the assessment, development, management and protection of water resources. Consisting of a board of directors from different ministries, the Water Authority is assigned all duties, responsibilities and obligations related to water and public sewerage, including development of a water policy. Controlling mechanisms include mandates for the regulation of groundwater development through drilling, design, construction, operation, maintenance and administrative contracts, as well as water sewage projects and the issuance of permits and licences. The law also transfers all duties, responsibilities and obligations with regard to water and sewage that were previously undertaken by other Governmental departments or commissions solely to the Water Authority.

Law No. 19 of 1988 names the Jordan Valley Authority as an autonomous corporate body with financial and administrative independence, but subject to the rules that bind ministries and other Government authorities. While the Jordan Valley Authority's mandate covers the assessment, development and management of water resources and infrastructure as well as the mediation of water-related disputes, it is also responsible for a wide range of other activities in the Jordan Valley, including the development of roads, social and environmental improvements, and tourism. The primary institutional responsibility for water therefore lies with the Water Authority, which is also responsible for routine monitoring of water quality. The Ministry of Health and the Royal Scientific Society are responsible for ensuring that water quality meets drinking water standards set by the World Health Organization (WHO). The historical development of institutional arrangements in Jordan (ESCWA, 1996e) is shown in figure I.

Figure I. Evolution of water sector management institutions in Jordan



C. Evolution of water legislation

1. *Water legislation from 1937 to the present*

Water legislation in Jordan began as early as 1937 with the enactment of Law No. 107 (Shatanawi and others, 1992). Law No. 107 defined water as public property and every water resource development project under the supervision of the Government was considered to be a public project. Law No. 2 issued in 1938 delegated jurisdiction to undertake water resource investigations to Government agencies. In 1946, water rights issues were specifically addressed by Law No. 38. This law required that water rights be registered with the Department of Land and Surveys. In addition, Law No. 38 addressed enforcement procedures through the establishment of a special court to settle water disputes.

It has been reported that in Jordan, about 5,500 hectares (ha) (55,000 *dunums*) of land are still covered by traditional or customary irrigation water rights. This estimate has been recognized by the Department of Land and Surveys, mandated by Law No. 38 of 1946 to recognize customary water rights, which are seen as being linked with land area. These water rights are to be certified by means of registration bonds specifying the water right (in 1 cubic metres [m^3]), and are required to be entered into a water register.

Further refinement of the legal status of water rights in Jordan continued in the early 1950s with the establishment of a linkage between land ownership and surface water rights. In 1951 Law No. 87 was issued to strengthen enforcement mechanisms with respect to the settling of water disputes and the receipt of water rights complaints. This law stipulated that a court's ruling was to be considered the final judgement. Decrees No. 4 and 12, issued in 1952 and 1968 respectively, awarded private surface water rights to land owners, provided that any agreement specifically stated that there was water on the land parcel. Municipalities Law No. 29 of 1955 defined water resources as owned and controlled by the municipalities in which they were located. All other surface water, including excess flow from private lands, was considered public property, as stated in Decree No. 48 issued in 1977, in addition to the guidelines set forth in Decrees 4 and 12.

Important water legislation controlling groundwater development and protection was enacted in 1977. The new regulation, Law No. 36, also known as the Groundwater Monitoring Law, included 29 articles covering the definition of water terms, drilling contract registration, volume of pumpage, the type and purpose of well uses, and the delineation of requirements for well construction and development permits. Law No. 36 focused on stricter guidelines for well construction, location, spacing, and metering, as well as the delineation of restricted pumping areas to prevent overdevelopment and interference with adjacent springs. However, the regulation lacked enforcement measures.

In addition to the Groundwater Monitoring Law of 1977, Law No. 18 of 1988 (the Water Authority Law) also outlined several means of water regulation and established new ownership guidelines. The law indicated that all water sources were to become State property with fulfilment of previously established rights. It defined enforcement procedures, imposing fines and imprisonment for various infringements. Possible offenses included: damage to water and sewage authority projects and properties, pollution of water resources, unlicensed drilling, violating the conditions of a licence, encroachment into prohibited areas, water allocation, and illegal use of water.

2. *Selected articles: Law No. 18*

As noted above, laws No. 18 and 19 of 1988 define the responsibilities of both the Water Authority of Jordan and the Jordan Valley Authority of the Ministry of Irrigation and Water. The most significant legal instruments are found in Law 18 of 1988 and are contained in articles 6, 25, 27 and 30, dealing with water studies, development, water rights and utilization, as well as the responsibilities of the water authorities. In

order to achieve all of the objectives intended by these laws, the Water Authority of Jordan is mandated to exercise the responsibilities and tasks addressed therein. As these articles may serve as guidelines for countries in the region that are in the process of updating or formulating new groundwater laws, the full texts of the most relevant articles are given below.

Article 6:

(a) Survey the different water resources, conserve them, determine ways, means and priorities for their implementation and use;

(b) Develop the potential water resources in the Kingdom, increase their capacity and improve their quality, protect them from pollution, supervise them and administer their affairs and put forth programmes and plans to meet future water needs by providing additional water resources from inside or outside the Kingdom and through the use of water treatment and desalination;

(c) Regulate, and advise on, the construction of public and private wells, investigate groundwater resources, drill exploratory, reconnaissance, and production wells, and license well drilling rigs and drillers;

(d) Study, design, construct, operate, maintain, and administer water and public sewerage projects including collecting, purifying, treating, disposing and the use of any other methods dealing with water;

(e) Draw up terms, specifications and special requirements in relation to the preservation of water and water basins, protect them from pollution, and ascertain the safety of water and sewerage structures, public and private distribution and disposal networks, and take the necessary action to ensure technical control and supervision, including all necessary tests;

(f) Carry out theoretical and applied research and studies regarding water and public sewerage to achieve the Authority's objectives including the preparation of approved water quality standards for different uses and technical specifications concerning materials and construction in order to apply the findings to the Authority's projects in coordination with other concerned departments; and publish the final findings and standards so as to generalize their application by all means available to the Authority;

(g) Issue permits to engineers and licensed professionals to perform (tasks on) public water and sewerage works; and participate in organizing special training courses to qualify them in order to improve the standard of such works and to reduce water losses and pollution. All those involved in water and sewerage works are requested to adjust their practice in accordance with the provisions of this article and to obtain the specified permit accordingly;

(h) Regulate the uses of water, prevent its waste, and conserve its consumption.

Article 25:

(a) All water resources available within the boundaries of the Kingdom, whether they are surface or groundwaters, regional waters, rivers or internal seas, are considered State-owned property and shall not be used or transported except in compliance with this Law;

(b) Any water resources that are not under the management, responsibility or supervision of the Authority shall not be used in excess of personal or domestic needs or other acceptable private usage; nor in excess of legal water rights in accordance with the law and regulations in effect, including drinking and irrigation rights applicable to the area of land which contains that resource;

(c) All natural and judicial bodies are prohibited from selling water from any source, or granting or transporting it, without obtaining in advance the written approval of the Authority and within the conditions and restrictions decided or included in the contracts or agreements concluded between them and the Authority.

Article 27:

No official or local person or party is permitted to carry out any works related to water and sewerage of any nature, if these works are considered to be within the sole responsibility of the Authority under this Law, and the regulations issued in accordance with it, except after obtaining the Minister's written approval.

In addition to these articles, Article 30 of Law No. 18 defines penalties for violations of rules and conditions stipulated in the different articles of the Law, which were needed to strengthen the control of both water authorities as well as the Ministry of Irrigation and Water.

3. *Selected articles: Law No. 19*

The other main legislation was Law No. 19, also issued in 1988, which defines the responsibility of the Jordan Valley Authority and provides it with the power to enforce its provisions. There are many similarities in function and jurisdiction between the Water Authority and the Jordan Valley Authority; however, the latter focuses on responsibilities related to the administration and management of irrigation and land resources. The main features of Law No. 19 with regard to water rights and consumption ceilings are contained in Articles 18 and 24, which read as follows:

Article 18:

(a) The waters acquired by means of projects constructed by the Authority and which were not used or exploited for irrigation purposes in any area prior to the declaration of a water settlement in accordance with the land and water settlement law in effect, shall be considered Government property. Such waters may be sold, leased or otherwise disposed of in the way as may be decided by the Authority;

(b) The Authority shall have full authority in the allocation or usage of all surface or groundwaters which are developed under the supervision of the Authority;

(c) When the Authority constructs an irrigation project, it shall first consider the rights to water registered in the Water Register, and any excess water shall be considered Government property.

Article 24:

The Authority has the right to fix the upper limit of the amount of water it supplies to the holders [of land and/or water rights] in accordance with water availability and with the crops

planted in the farm units. It also has the right to supervise the water and its supply and distribution and to fix its price and to stop supplying water to the farm units.

Additional laws were passed in 1992 when By-law No. 54 was issued by the Ministry of Water and Irrigation. This by-law reorganized the Ministry and defined a new framework for administration of water resources. The most relevant aspect of the by-law is Article 4, emphasizing management of water resources. It states that the Ministry has the jurisdiction to formulate water policy and submit it to the Cabinet of Ministers for approval. In addition, some articles of the by-law state that the Minister's Directorate shall undertake and evaluate policy and strategy formulation, and prepare plans for water resource development.

D. LEGISLATIVE ASPECTS

1. *Surface water and groundwater*

Groundwater resources are considered public property. However, if discovered or developed by the private sector or when accompanied by a permit to drill, they become privately owned. Law No. 12 of 1968 and Law No. 26 of 1977 address the development and protection of groundwater sources extracted through wells.

Groundwater development by the private sector is largely governed by Law No. 26 of 1968 which mandated the Natural Resources Authority, the agency responsible for control of water resources at that time, to issue drilling permits. However, jurisdiction over drilling permits has now been shifted to the Ministry of Water and Irrigation. Drilling permits may be issued to well contractors based on compliance with the following conditions:

(a) Water has to be used for irrigation purposes and the land should be at least 50 *dunums* in size (1 *dunum* = 1,000 square metres [m^2]);

(b) The drilling of wells to be used as standbys is prohibited, unless for public benefit;

(c) Adherence to the specified distance required between wells, and the depth of the wells as specified in the issued permit, in order to prevent water mining and deterioration in quality;

(d) Pump tests have to be made under the supervision of the authority;

(e) The well owner must submit a completion report detailing compliance with the well specifications and constraints, terms of the contract, and results of the pump test.

Permits are also required for deepening a well, or for well replacement. These regulations governing well contractors include the registration of their drilling equipment.

Permits for the use of groundwater outline a number of specifications including: the maximum volume that can be extracted during a specified period; time and average pumpage; purpose of use; and installation of water meters at the expense of the land owner. The objectives of these regulations are to combat the mining of groundwater, prevent the deterioration of water quality, and ensure public rights to water.

Law No. 12 of 1968 addresses the prevention of water resource pollution from human, industrial and animal sources. Groundwater abstraction permits cannot be granted if the rate of abstraction is likely to contribute to the depletion of groundwater resources. The groundwater monitoring regulation enacted by Law

No. 26 of 1977 further defines the requirements of groundwater development and its protection, mainly from depletion. The regulation contains 29 articles. Most of the articles describe conditions similar to the 1968 law, with further elaboration on the means by which groundwater development, utilization and regulation can be controlled.

2. *Utilization*

The first legislation governing water use was enacted in 1946 through Law No. 10. (Shatanawi and others, 1992). This law outlined regulations for the establishment of a water committee, with members elected from among landowners of irrigation projects. Traditional water rights were defined by Law No. 38 of 1946, in which water use rights were appropriated according to the size of land owned, through regulations enforced by the Department of Land and Surveys. Under this law the Department was mandated to issue registration bonds to define water shares in terms of m^3/hour per unit of land.

Law No. 12, issued around the same time as the first legislation (1946), regulated water utilization, including surface and groundwater sources, of privately owned land. However, water authorities had the right to revoke water rights as established by water policy, as well as social and economic developmental requirements. The public was allowed free utilization of water up to 5 m^3 per hour; more than this amount required a permit.

In 1952 Law No. 40 was issued, which delegated to authorities in the Department of Land and Surveys the power to allocate water shares based on the size of land to be irrigated. Water utilization was defined using a policy and planning framework (Shatanawi and others, 1992), and priority was given to domestic use, followed by agriculture and lastly industrial purposes.

Laws 18 and 19 of 1988 remain the official legal instruments of the Ministry of Irrigation and Water for the development, protection and management of water resources in Jordan. According to Shatanawi and others, (1992), the Ministry of Irrigation and Water, in cooperation with the Canadian International Development Agency, undertook a study with respect to restructuring institutional arrangements. As a result, Law No. 54 was enacted in 1992 to establish the by-laws of the Ministry of Irrigation and Water.

III. WATER LEGISLATION IN LEBANON

A. WATER RESOURCES: GENERAL

The water resources of Lebanon consist of flow in major rivers, groundwater reserves in the limestone aquifers, including discharge from a large number of springs, and *quanats* or, irrigation canals. Available surface water from river flow is estimated at 3,100 MCM (ESCWA, 1993b; ESCWA, 1996g). Groundwater is available in formations composed of fissured karstic limestone and dolomite in the mountainous regions, in the basaltic deposits in the north, and in the tertiary and quaternary deposits in the Bekaa Valley and the coastal zone. Surface water is utilized to satisfy the major portion of water demand, supplemented with groundwater. Surface water from river flow and water diversion structures provided 60 per cent of the irrigation requirement in 1995. Groundwater contributed to over 71 per cent of industrial water requirements. Domestic, industrial and irrigation water requirements in 1995 were estimated at 415, 60 and 750 MCM respectively. Demand is expected to reach more than 1,900 MCM in the year 2000, with 550 MCM in the domestic sector, 178 MCM in the industrial sector, and 1,200 MCM in the agricultural sector. In the year 2025, total demand could possibly reach 3,150 MCM, with 1,600 MCM, 1,100 MCM and 450 MCM, respectively, for the agricultural, domestic and industrial sectors.

B. INSTITUTIONS

Water institutions in Lebanon have been undergoing changes in function and responsibility over the last three decades. There has been a shift of responsibilities between ministries, as well as the establishment of new ministries. The Ministry of Public Works and Transport was responsible for water management until 1966.

Currently, there are three main institutions which deal with water and water-related activities: the Ministry of Hydraulic and Electric Resources, the Ministry of Agriculture, and the National Office for the Development of the Litani Basin (Al-Safady, 1985). The Ministry of Hydraulic and Electric Resources was established by Decree No. 20 issued in 1966. The Ministry of Hydraulic and Electric Resources is the primary institution responsible for water resource management, including the study, design and implementation of water supply projects. The Ministry has two general directorates: the Directorate for the Provision of Water and Electricity and the Utilization Directorate. The Directorate for the Provision of Water and Electricity is responsible for studies and their implementation phases in regard to water and electric infrastructures. Following completion of all water projects, their operation becomes the responsibility of the General Investment Directorate. The Ministry of Hydraulic and Electric Resources is also responsible for the implementation of laws regarding the protection and use of public water, supervision of autonomous offices and water boards, and control of water concessions. The Ministry of Agriculture has limited responsibilities in the area of implementation of pilot projects. The Litani Basin Authority, established in 1954, is responsible for activities in the Litani Basin, including large-scale irrigation, drinking water, land reclamation and electricity projects (Al Safady, 1985).

Administration of other water activities, including operation on local and regional levels, is the responsibility of various autonomous water authorities and water committees which have received authority from the General Investment Directorate of the Ministry of Hydraulic and Electric Resources. The Regional Authority Board for Potable Water and the Regional Autonomous Water Office both enjoy the flexibility to manage water as they deem necessary. They are responsible for the operation, maintenance and distribution of drinking water supply projects completed by the Ministry (ESCWA, 1993b). Nationwide prior to 1972, there were 22 autonomous water offices and more than 210 committees for potable water (ESCWA, 1993b). The water offices consisted of branches of an executive administrative board and other sectors responsible for the implementation of water activities, as well as financial and technical support. These regional entities

were supervised by the Ministry of Hydraulic and Electric Resources, the Ministry of Finance, the Civil Service Commission and the Central Inspection Office (ESCWA, 1996g). The existence of a large number of water offices and boards made it difficult to coordinate and implement activities efficiently. There were too many municipalities and regional commissions responsible for domestic and industrial wastewater collection, treatment and disposal.

In 1972, in order to improve the management of water resources, the Government enacted a law requiring the merger of all water offices and boards into five autonomous water offices, one for each region of the country. Unfortunately, civil events created difficulties in the implementation of the enacted law until recently, when the ministerial decree was revived and its enforcement led to the formulation of three water authorities: one in the southern part of the country, one in the Bekaa Valley and another in Beirut. The Ministry of Agriculture has also limited the number of autonomous offices and boards with respect to agricultural projects. The old traditional irrigation projects were managed by local commissions, while the new projects are controlled by the autonomous offices.

C. EVOLUTION OF WATER LEGISLATION

Water legislation in Lebanon originated from and has been largely governed by the Ottoman Majalla code (Articles 1281-1291), enacted between 1870 and 1876, as well as the French civil code. The code for the use of water in Lebanon incorporates concepts from the Napoleonic Code, Middle Eastern customary law and traditional practices, and Shariah laws (Mallat, 1995). Early legislative efforts began in 1870 when water concessions were granted to provide water to Beirut from the Kalb River, and water rights were transferred with land ownership in most cases. The old water legislation has been modified and updated through various laws enacted in 1913 (irrigation code), 1918 (canal repair and maintenance), 1925 (public domain) and 1926 (water protection and utilization). The irrigation code of 1913 dealt with issues related to the concession, sale and purchase of water rights.

The most relevant historical water legislation in Lebanon dates back to Law No. 144 of 1925 and Law No. 320 of 1926. These laws are the same as those practised in the Syrian Arab Republic. Law No. 144 deals with aspects of the public domain including water rights, while Law No. 320 addresses water protection and utilization issues. Law No. 144 of 1925 deals with public water rights with respect to rivers and springs, distribution canals and the protection of groundwater. It also mandates State control over all water resources. It gives the State full ownership of surface and groundwater resources, including the leeway of water courses to achieve protection of the sources. However, private ownership of water rights can be achieved by property acquisition through inheritance, sale or settlement, in addition to rights acquired prior to passage of Law No. 320 of 1926 (Mallat, 1995). In these laws, water rights are established according to legal status or continuous use of surface and groundwater resources.

Law 320 of 1926 addresses regulations dealing with public water and its conservation. It restricts the undertaking of activities that would have an impact on river flow or the river channel, as well as groundwater exploration near springs and along river banks. The law also addresses well permits for drilling water; the quantity of water withdrawal that is exempt from fees; rules for the establishment of commissions or committees for administration of irrigation and drinking water; collection of government fees; imprisonment penalties; water quality regulations; and disposal of domestic wastewater. Other provisions of the law cover formalities and mandates for licences and concessions, land use, settlement disputes over water rights, land leases for drinking water projects and penalties.

In addition to these two main laws, other laws that were enacted more than a century ago continue to govern water resource development, allocation and management.

Important legislative steps were taken with the enactment of Law No. 16 of 1932, followed by Decrees No. 2761 in 1933 and 222 in 1942. The 1932 law set up health regulations for the protection of water resources, as well as the collection, diversion and transport of drinking water. Decree No. 2761 of 1933 established instructions for the disposal of effluent from buildings, hospitals and factories and sanitary regulations for slaughterhouses, including penalties. The 1942 decree required prior approval from the Ministry of Health to use water sources for drinking purposes.

After Lebanon became an independent sovereign State, several laws, decrees and regulations were issued to regulate water development and distribution. Prior to 1951, water was supplied by the Beirut Water Company. However, in 1951 a decree was issued cancelling its concession. This was followed by Decrees No. 4369 and 4370 in 1951 dealing with water allocation from the Al Maymona, Al Qassuma and Ras Al Ayn water projects (ESCWA, 1996g).

D. LEGISLATIVE ASPECTS

1. *Surface water and groundwater*

Groundwater utilization was regulated by the issuance of drilling permits according to rules set forth in Law No. 320 of 1926. Individuals were required to receive prior authorization to develop groundwater sources and provide information on intended use. The water authority concerned had a period of four months to respond to the request for drilling and give authorization. Law No. 320 also required the particulars about the intended well to be provided, including the means of drilling and material to be used. Cutting samples were to be supplied to the appropriate authority.

Several decrees were issued between 1951 and 1970 dealing with groundwater development and protection, and prior acquired water rights. Decree No. 10276 of 1962 regulated the size of protective zones around springs, and Decree No. 1286 of 1963 set forth regulations for groundwater exploration activities, including the designation of prohibited drilling zones. Increased groundwater development activities compelled water authorities to issue Decree No. 14438 in 1970, addressing the organization of activities with respect to groundwater exploration, development, and protection. This decree emphasized the issuing of drilling permits, and required individuals either to obtain prior permission to drill or an exemption from a permit. These regulations applied to wells up to a depth of 150 meters. Drilling a well deeper than 150 meters required a permit from the Ministry of Hydraulic and Electric Resources. The decree also required applicants to submit information about the well, including the type of well, location, intended purpose, land registration, and land survey maps (Mallat, 1995), to the Director General for Equipment of the Ministry of Hydraulic and Electric Resources.

Under Decree No. 14438, the drilling permit issued by the Ministry of Hydraulic and Electric Resources is valid for one year and requires payment of a fee. The permit contains specific information about the well for which it was issued, including location, type, and method of drilling, as well as an estimate of the volume of discharged water. It also specifies the type of sampling and analyses which must be submitted by the applicant. Drilling permits are not required for private wells of depths up to 150 metres; however, the Ministry requests prior notification of the intended work, including the submission of information related to the well. The Decree also limits the pumping of groundwater to a maximum of four years from any particular well. Subsequent utilization is based on paying a tax as mandated by the Ministry. The magnitude pumped is also regulated by issuing a permit for amounts over 100 m^3. Wells where less than this volume is being extracted are exempt from the permit. The Decree also defines the types of penalties for violations, as mentioned in Article 77 of the Lebanon Penal Code (Mallat, 1995).

Some of the rules contained in the original Ottoman Majalla code are still being practised with regard to groundwater protection as, for example, in the delineation of the parameters of protected groundwater zones, or *harams*. Drilling is now banned in the Bekaa Valley.

Under Decree 14438, surface water is regulated through the issuance of permits with conditions similar to those for groundwater permits. Permits allow pumping from a waterway and land irrigation from publicly-owned surface water. Permits to use water on farmland are valid for four years and can be renewed indefinitely for up to 40 years. In response to concessions, the validity may be extended to last up to 75 years in some cases. Penalties also exist for misappropriation of surface water, and encroachment into any warercourse, including irrigation and drainage canals. The Decree also includes regulations concerning trespassing on watercourses, marshes, lakes, and irrigation distribution systems. It also addresses the permissible quantity of surface water that can be extracted from surface water bodies, including rivers and lakes.

In regard to water bills and fees for the development and utilization of drinking water projects, the Government charges the public, taking into consideration investment costs, maintenance, and Government fees (Mallat, 1995). Irrigation project beneficiaries bear the construction costs associated with the project, which are paid over a number of years. Annual fees are assessed to cover investment and maintenance costs, in addition to government fees (Mallat, 1995).

2. *Utilization*

Water utilization in Lebanon is still being influenced by the Ottoman Majalla code and Laws 144 of 1925 and 320 of 1926. In the past, although priorities in water utilization were not clearly defined according to sector demand, the rights of individuals and animals were based on historical Shariah principles contained in the Ottoman Majalla code. Two aspects of water use were recognized: the right of an individual and his animals to drink, and the right to use the public water supply for irrigation purposes provided it did not infringe on the rights of others (Mallat, 1995). However, during the period 1950-1974, efforts were made to allocate water for drinking and irrigation purposes through re-evaluation of previously acquired water rights.

At the present time, a combination of the old rules and laws and some of the more recently enacted laws is practised. Priority has been indirectly given to domestic water requirements. Some articles of the 1926 law provide support for domestic water allocation through provisions whereby the head of State has the authority to appropriate land for the construction of water supply networks. This provision has been used as a pretext to give priority to domestic water requirements. There is no specific legislation, however, regulating water use in the domestic sector. Drinking water standards are maintained under Law No. 227, enacted in 1942, requiring the Ministry of Public Health to assume responsibility for chemical and bacterial analysis of all water sources.

Agricultural water utilization is still regulated by the old Ottoman irrigation code of 1913, particularly in some rural parts of the country (Mallat, 1995). The irrigation code lacks scientific and systematic water allocation principles. It allocates water based on subdivisions of irrigation according to a crude distribution network, outdated irrigation practices, and a system of penalties (Mallat, 1995). The eight different articles of the code define simple irrigation systems and components, with reference to an irrigation main together with lateral and sublateral delivery systems. The water distribution system is described as: *quanats* (main canals) for the purpose of conveying water to other smaller canals; *yadats*, which are lateral canals branching off of the main canal; *khoraks*, which were the first canals branching off of the *yadats*; and finally *aghzalogs*, which were the sublateral canals which actually delivered the water to the land. (Mallat, 1995).

The old irrigation code also covers drainage systems with different components, like the irrigation system. The irrigation code specifies that all irrigation systems are public property and that the State is responsible for their maintenance. However, drainage systems are for the benefit of private citizens who bear the cost of operation and maintenance. The code establishes some penalties in relation to water damage, especially with regard to drainage water. Some conditions are set forth in the code whereby drainage from an upstream landowner must be received by the owner of a lower area; however, the owner of the lower land parcel is entitled to compensation in cases of damage to his land (Mallat, 1995). The code also provides the local authority or Government with the authority to construct irrigation and drainage systems on privately owned land when necessary. However, there are also rules addressing the individual owners' rights to compensation in cases of encroachment on their property. Rights of passage to privately owned irrigation and drainage systems on public or private lands are also addressed. Also contained in the code are guidelines for the administrative authorities in regard to granting permits for the construction of private irrigation and drainage systems. Articles defining certain types of criminal and financial penalties were also included; however, these penalties have never been put into practice (Mallat, 1995). Another law, No. 1334, enacted in 1918, requires the maintenance and renovation of irrigation canals (Mallat, 1995). Individuals with private irrigation and water rights are responsible for maintenance and improvements.

Industrial water utilization has not received adequate attention owing to the small magnitude of water consumption in this sector. Industries rely mainly on groundwater sources. The bottled water industry has flourished in recent years, using mainly water from mountain sources. This compelled the Government to enact Law No. 108 of 1983, defining technical and hygienic specifications for such industries (Mallat, 1995). Water rights acquired for bottled water industries were established under Law No. 144 of 1925.

Wastewater disposal from domestic, commercial and industrial sources is regulated by Decree No. 8735 issued in 1974. The decree prohibits the disposal of wastes into any natural water sources, including marine environments and deep well systems. The law requires industries to filter the wastewater prior to its disposal. Some efforts have been made to regulate the reuse of wastewater through Decree No. 8735 of 1974, which prohibits its use for the irrigation of fruits and vegetables. However, most provisions of the law are not properly enforced (Mallat, 1995).

3. *Recent trends*

Serious efforts have been made to organize the water sector (ESCWA, 1996g) with emphasis on allocation priority for drinking water supply, followed by irrigation and industries, as well as consideration of privatization schemes. Legislation is being formulated to promote availability of an adequate water supply for different purposes, as well as the establishment of six private companies to distribute and manage water supply, irrigation, and wastewater. It is intended that these six regional water companies have jurisdiction over planning, design, implementation, operation and maintenance of water and wastewater infrastructures, with their budgets based on revenues from public shareholders. These companies will have public and private stockholders and will be mandated to provide water services. The Ministry of Hydraulic and Electric Resources will supervise the water companies, including planning, formulation of strategies with regard to monetary activities, distribution, setting up of specifications for water development and services, the establishment of supervision regulations, and evaluation of water services. The Ministry will also be responsible for deciding on water pricing mechanisms.

IV. WATER LEGISLATION IN OMAN

A. WATER RESOURCES: GENERAL

Water resources in Oman consist of flood and groundwater sources, as well as non-conventional desalination and treated wastewater. Surface run-off in terms of intermittent flood flow is estimated at 918 MCM. Flood water is utilized for limited flood irrigation practices, and is also stored behind small check dams to recharge the shallow alluvial aquifers. Groundwater represents a major source of water and is mainly available in alluvial deposits along *wadi* channels and coastal desert plains. A limited amount of groundwater is also available in relatively deep limestone, dolomite, and ophiolitic formations and is being used at the present time. Water from *aflaj* systems, a total of 4,300 in number, accounts for 60 per cent of irrigation requirements, (ESCWA 1996h). These *aflajs* are used mainly for irrigation, and to a certain extent for domestic requirements. Desalinated water is used for drinking purposes in the major cities. Treated wastewater is used for urban landscaping in the Muscat area.

Water demand in Oman has been increasing as a result of improvements in the water supply and sanitation, as well as the expansion of irrigation activities supported by Government subsidies. Total demand reached 1,236 MCM in 1990, with the agricultural sector accounting for 1,150 MCM. Demand is expected to reach 1,417 MCM and 1,950 MCM in the years 2000 and 2025 respectively, with a corresponding irrigation demand of 1,270 MCM and 1,500 MCM. Demand for the agricultural sector may not reach the forecasted level as a result of Government controls on drilling and limitations imposed on the expansion of farming activities.

B. INSTITUTIONS

Water resources development and management at the present time are the responsibility of a single institution, the Ministry of Water Resources, established by Decree No. 100 of 1989 (ESCWA, 1996h). The Ministry presides over all water functions. It is mandated to formulate water policy for the investigation, development and management of national water resources, to be achieved through the implementation of regulations and water legislation. It is also responsible for survey and registration of wells, the issuance of well permits, the establishment of well construction specifications and the supervision of drilling operations. The Ministry's functions cover the dissemination of hydrological information to other ministries and the operation and maintenance of recharge dams and *aflajs*.

In the past, efforts to develop, protect and manage water resources were distributed among a number of institutions, including the Ministries of Agriculture and Fisheries, Electricity and Water, and Environment, as well as the Water Resources Council and the Water Resources Authority. The Water Resources Council was established by Decree No. 47 of 1975 with a mandate to provide advisory services on all water issues. In 1979, Decree No. 63 created the General Water Resources Authority for the purposes of assisting the Water Resources Council to achieve its objectives. The Authority was responsible for suggesting policy, legislation and regulation on water issues, as well as carrying out water development projects.

The Ministry of Agriculture and Fisheries was established in 1970 and is responsible for water allocation for irrigation and animal husbandry, with a focus on the promotion of modern irrigation techniques to improve farm water management. The Ministry of Electricity and Water was also established in the same year, and was mandated to provide drinking water supplies to different regions of Oman through the drilling of its own wells and through desalination facilities. Its functions include distribution of potable water, and the operation and maintenance of wells, desalination plants and distribution systems. The Ministry of Regional Municipalities and Environment, which was established in 1991 and has since undergone a change of name and function, is responsible for the reuse of treated wastewater and water pollution control, including

surface and groundwater sources. The Ministry is also vested with the power to supervise activities of the Council for Conservation of the Environment and Water Resources, and the prevention of pollution. Prior to 1991, there were two institutions responsible for these activities: the Ministry of Environment, established in 1984, and the Ministry of Regional Municipalities. There are also two large Municipalities, Muscat and Dhofar, with responsibilities similar to those of the Ministry of Regional Municipalities.

C. Evolution of water legislation

The Shariah principles are the governing legal framework of the State, including those aspects dealing with the water sector. Traditional Muslim law and local customs remain the main legislative guidelines for the development and management of water resources in the country (FAO, 1978). The ownership of water rights, according to Shariah principles for domestic use (human and animal), is permissible when water is contained in a receptacle such as a container or well. For irrigation purposes, surface run-off and groundwater rights, especially for water provided through the *aflaj* system, the law recognizes four types of ownership: (1) private, (2) belonging to the public treasure (*beit al-mal*), (3) endowment (*waqf*), and (4) public (FAO, 1978). Water from wells dug for irrigation purposes can be owned; however, water from the *aflaj* is shared among those entitled to its use as established by inheritance or physical maintenance. For free uses, water rights from wells may be classified as *beit al-mal* or *waqf*.

The Ibadat doctrine practiced in Oman originated as a contribution from one of the Islamic schools and provides further elaboration with regard to water rights. Its interpretations of Islamic principles are applied over most of Oman. This document allows the sale of irrigation water rights from wells or *aflaj*, independently from the sale of land, especially in cases of excess water. Water rights for *aflajs* are appropriated according to a share system known as *kaburas* (FAO, 1978). The water rights for each share are allocated based on the amount of labour and financial contribution devoted to the construction or repair of the *aflaj* system. The magnitude of water allocated to each shareholder is determined by a local water expert according to a time unit known as *al-badah* and *al-ather*. The duration of the *al-ather* time unit in the past was established during the daytime using the sun's shadow, and during the night by the movement of the stars.

In 1982 Royal Decree No. 10 was enacted, dealing with legislation for conservation of the environment and pollution control. This law is known as the Law on Conservation of the Environment and Prevention of Pollution, and includes comprehensive articles addressing objectives; duties of individuals, ministries and organizations with regard to the disposal of pollutants; and enforcement measures and penalties. The main goal of the law is to create a mechanism by which environmental pollutants can be disposed of safely. Several amendments enacted in 1985 through Royal Decree No. 63 are intended to strengthen the law in terms of enforcement for ministries and agencies that license industrial activities. The objective was to minimize industrial pollution. The amendments require industries that can potentially produce hazardous wastes to obtain an operating licence. Prior to approval, environmental impact studies have to be completed, and the Government has the right to enforce specific safety regulations such as regular monitoring of pollution levels and reports. The amendments call for enforcement officers to inspect operations and take samples. Penalties include requiring the plant to clean up any pollution, repair damage and pay fines. The Government can revoke an operating licence in the event of unlawful discharge causing damage or harm to humans.

D. LEGISLATIVE ASPECTS

1. *Surface water and groundwater*

Groundwater rights in Oman are regulated through customary laws and classifications for water wells dug to meet domestic water requirements. Water is considered to be the property of the general public. In the case of privately dug wells on desert wastelands, the owner has priority in using the water, but does not own the water rights (FAO, 1978). Thus, excess water is available for other users, with priority given to human and animal needs. Private land owners who construct wells are covered by another type of water rights. However, in some parts of Oman water rights are established only after an individual has actually extracted water from the well.

Groundwater rights and utilization have also been classified on the basis of whether a well or *aflaj* (infiltration gallery) is used as the means of water extraction. In the case of an *aflaj*, where water is collected by underground canals intercepting the water table, joint water right ownership predominates. Water rights are awarded to those who contribute to the construction of the galleries. In addition, part of the water is allocated as shares to those involved in the maintenance and operation of the *aflaj*. The operation of the *aflaj* and the distribution of water, as well as the settlement of disputes concerning water from the *aflaj*, are carried out by local people according to customary laws.

Groundwater rights from wells or *aflajs* are not associated with land ownership. However, in some parts of Oman, records for inheriting, trading and selling or buying water rights are maintained in the local communities. Water on endowment (*waqf*) land, which is considered to be public property, is to be used in a manner that serves the public interest. Existing customary laws protect *aflajs* from interference from mining and wells. Generally accepted spacing requirements between *aflajs* are established at 25 metres. The cost of maintenance is covered by what is known as a poll tax, and by sales of water shares. In cases where allotted revenues are insufficient for the repair of irrigation systems, users may be asked to contribute additional funds. For large *aflajs*, the *arif* (chief) of the local township is responsible for water distribution. Traditionally, he had to be knowledgeable in the methods of water time-sharing according to the lunar calendar. More recently, time-measuring devices are being used. This responsibility is usually passed on from father to son within a certain family (FAO, 1978). There is also another minor official known as the holder of the *aflaj* book. He keeps records of water share timing, water allocation, income and expenditures.

2. *Utilization*

Groundwater represents the main source of water, especially the contribution from the *aflaj* system, for irrigation purposes. Utilization of groundwater from the *aflaj* is based on time and not volume. Water rights consist of use of the water source for a specified period of time, particularly when water is diverted from the main *aflaj* canal. As in all countries of the region, individual drinking water requirements receive first priority, even if a well is privately owned.

Priorities for the use of irrigation water vary among the different regions in Oman. In Dhofar, flood water diversion priority is from upstream to downstream. In other areas, local water experts keep records of priorities according to shares allotted to each plot of land for a specified period of time. The volume of water to be allocated for land irrigation in some areas is determined based on the size of the land and its proximity to the water source. In other cases, priority for irrigation water is appropriated according to the landowners' contribution towards the construction and maintenance cost of the water delivery system (FAO, 1978).

3. *Recent trends*

Increasing competition among sectors for utilization of groundwater resources during the last two decades, especially for irrigation purposes, has contributed to an alarming rate of depletion. The introduction of pumping technology in 1970 contributed to increased water consumption patterns. In addition, existing customary laws have become less effective in the administration and management of water resources. The Government of Oman has recognized the potential dangers in this trend and acted in an effective manner to regulate groundwater development. Government efforts in this direction began with the establishment of the Ministry of Water Resources, which carries full responsibility for water issues, followed by the enactment of comprehensive regulations on wells and *aflaj* systems. In addition to Royal Decree No. 10, the other major ruling, issued in 1988, was Royal Decree No. 82, which declared that natural water reserves were national resources. This decree underscored the need to preserve and protect water resources in the country.

During the last five years, serious legislative efforts have been made by the Ministry of Water Resources with regard to well registration, new well permits, and the development of groundwater through wells and *aflajs*. Ministerial Decrees No. 2 (1990) and 13 (1995) regulate groundwater development and management. Ministerial Decree No. 10 of 1992 calls for the registration of existing wells and the issuance of drilling permits for new wells. Published in Food and Agricultural Legislation (1992), the regulations are intended to control the development of groundwater resources and minimize depletion.

Article 2 of Decree No. 2 mandates that all wells drilled or dug prior to its issuance on 31 March 1990 be registered with the Ministry of Water Resources. According to Articles 4 and 5 of the same Decree, unregistered wells are considered to be illegal and can be subject to backfilling. The Ministry determines the permissible water quality from registered wells, and the installation of flow meters may be required to monitor water production. Permits that are valid for a period of six months are required for drilling new wells and for deepening or enlarging existing wells. The granting of a permit is contingent on land ownership, either by title or by approval from the Ministry of Housing. This requirement can be waived in certain cases (Articles 7 to 9). Well construction activities are to be undertaken solely by registered contractors. Articles 17 to 23 address rules governing the registration and classification of wells and the obligations of drilling contractors. Among these rules are stipulations for obtaining a drilling permit for intended wells. Breach of these obligations can lead to loss of well registration. Articles 32 to 35 detail the actions to be taken for backfilling unauthorized wells, different types of fines, and conditions for forfeiture of deposits.

Further efforts were made by the Ministry of Water Resources to strengthen regulations set forth in Decree No. 2 of 1990 through Decree No. 13 of 1995 (Ministry of Water Resources). The new regulations supersede the previous regulations. Therefore, the well and *aflaj* regulations of 1995 have become the legal instrument guiding the development and management of groundwater resources in Oman. The enacted regulations, translated for this study from the original Arabic, cover many important issues with regard to groundwater development, utilization, protection and management and are presented in this document for the purpose of sharing knowledge on the formulation of water legislation. Below is an approximate translation from the Arabic text, highlighting its salient points.

In the new regulations there are nine chapters and two appendices. The first section describes ministerial administrative posts, and defines groundwater terms and other relevant terms. The second section contains six articles dealing with procedures for requesting permits to undertake the following: drilling of new wells, deepening or enlarging existing wells, maintaining and repairing wells, altering water utilization from its intended purposes, replacing a well, and installing or replacing of a pump. The administrative water offices concerned are to act on a request within a period not exceeding four days from the request. Article 8 states that permits are issued only for owned land, except for Government projects or wells intended for

explorative purposes. Implementation of a permit requires a deposit of 100 or 200 rials Omani (RO) for dug wells and drilled wells, respectively. Persons receiving social welfare are exempt from the deposit. Article 10 requires that wells be registered, and a well-completion form with the required information must be submitted within 15 days of completion of construction. It states that unregistered wells or *aflajs*, as of 31 July 1990, will become illegal, and also states the requirement to register new wells. The regional water administration office is responsible for making field visits to verify information and for issuing well-registration certificates. The Ministry has the authority to allow late well registration in the following cases: well-owner illness, widows, people in remote areas, joint ownership, and Government wells.

Section 3, made up of 18 articles, discusses conditions for well registration and cancellation of permits. The articles cover permit requests, purpose of permits and conditions, amount of the deposit for the permit, well completion reports, well spacing, well deepening, and community wells with respect to groundwater development. Article 7 addresses the submission of an application, Articles 11 and 12 state that a permit is usually issued for one well and is valid for six months. The well owner is expected to allow a Government official to visit the site to measure and collect samples. Article 14 addresses the conditions for deepening a well, and states that only registered wells may be modified and the intended purpose must not change, according to Article 2. In areas with small water production capability, permits are usually denied when requests are made to establish a new farm or expand an existing one, especially when other water sources are already available on the farm itself, or in areas adjacent to it. As a consolation, the farmer is allowed to either deepen or enlarge his wells, or replace a pump setting. Article 16 states that a permit may be granted for clusters of new wells, or for deepening them as long as they are intended for community drinking purposes, provided that they are spaced at least one kilometre from public water supply sources, or, with permission from *aflaj* deputies, for placing wells near protected *aflaj* zones. In addition, water utilization should be intended for drinking purposes. Article 23 addresses water rights whereby the Ministry has the jurisdiction to prevent the sale or granting of water from private wells if its development will contribute to depletion of groundwater reserves or cause interference with nearby water sources. In addition, water transfer to nearby land is not allowed except under certain circumstances (damage to pumps, well collapse, drought, or water quality deterioration). According to Article 24, the Ministry has the right to establish the magnitude of water to be pumped as well as to install a flow meter.

The fourth section of the regulations consists of articles addressing Governmental procedures for issuing well permits. Relevant articles with regard to groundwater development are Nos. 25, 29, 30 and 31. According to Article 25 a request to drill a new well or deepen or repair an existing well, accompanied by proof of land ownership or the permit for an existing well, must be submitted to the administrative water office on a prepaid application form. Article 29 indicates that a well-drilling permit can be issued, and copies of the permit are to be forwarded to the regional governor, director general of regional affairs, and the local police officer. According to Article 30, well-completion certificates must be filed upon completion of the well. Well-registration certificates are issued after field inspection to ensure compliance with pre-established conditions. Copies are sent to the regional governor and the director general of regional affairs and the landowner receives a refund of his deposit. If violations of the conditions of the permit are found upon field inspection, the well owner is required to comply with the requirements or face penalties. Article 43 defines the penalties for the violator of the permit conditions. According to Article 31, the permit indicates intended groundwater use, well location, depth and diameter, pump capacity, pump pipe diameter, and daily water production.

The fifth section contains two articles addressing the procedures for issuing *aflaj* permits. According to Article 33, *aflaj* owners or their legal representatives are required to have a permit from the concerned administrative office to carry out any construction or maintenance on the canals connected to the main *aflaj* water source. Priorities for permits are based on the nature of the modification. Exceptions are made for emergency situations. Article 34 indicates that the local Government official has the authority to make

decisions concerning the nature of work required for the *aflaj*. Construction and maintenance work are not allowed without a permit. The regional governor is to be informed about the completed work and is obligated to inform the concerned officials in cases where any unplanned activities are implemented.

The sixth section contains three articles dealing with registration requirements for drilling contractors. Articles 35 and 36 mandate the registration of contractors who undertake activities dealing with well construction, development and maintenance, testing capacity, and well pump installation. Based on the application information, the Ministry of Water Resources has the responsibility to classify contractors into categories according to their technical and financial capabilities. Their registration is valid for one year and is renewable. The Ministry has the jurisdiction to deny contractor registration or renewal.

Section seven addresses the obligations of the contractor, specified in four articles. Article 38 requires that a contractor have a valid permit prior to carrying out any specific activities. Article 39 says that the contractor is obligated to follow the conditions specified in the permit. According to Article 40, the contractor is required to submit two copies of the well completion certificate, one to the water administration office and the other to the well owner. In the event the contractor condemns or closes the well, the certificate must state the reasons. Article 41 specifies that the well contractor is required to make a cash deposit or bank guarantee for undertaking the following works: RO 100 for a dug well, RO 500 for a drilled well, and RO 100 for well maintenance, enlargement or deepening. The water authority may require higher deposits in sensitive groundwater areas. The deposit will be refunded following compliance with Articles 39 and 40.

Section eight addresses contractor violations through two articles. In case of violation of regulations, concerned offices must make a field visit to the site to record equipment registration numbers and gather information to complete the violation document. The administrative office can request the police to confiscate equipment from unregistered contractors or from wells constructed without a permit.

The final section contains eight articles that address the types of penalties. Article 44 states that violators of any condition in the permit will be imprisoned for one week or fined RO 500. Article 45 says that well owners will be imprisoned for one week or fined RO 500 for undertaking any of the following activities without a permit: increasing well capacity through enlargement or deepening; maintenance or repair; change of intended water use; and installation or replacement of a pump. Article 46 calls for a two-week imprisonment term, or fine of RO 1,000, for any well owner who drills a new well or replacement well without prior permit, as well as condemnation of the well. Article 47 stipulates the same types of penalties for violations which may be committed by drilling contractors. Article 48 states that a registered contractor will be either imprisoned for three weeks or fined RO 1,500 for any of the violations stipulated in Article 46. Stiff penalties of two months in jail a fine of RO 2,000 are assessed on registered contractors for drilling new or replacement wells without a permit, with consequent condemnation of the well. Article 50 calls for a fine ranging from RO 300 to RO 500 to be assessed on any person violating any articles or sections of this regulation. The final article indicates that penalties will be doubled for repeated violations. Appendix 1 of the Omani regulation describes circumstances that lead to the refusal of a permit, and appendix 2 contains general guidelines for issuing permits.

V. WATER LEGISLATION IN THE KINGDOM OF SAUDI ARABIA

A. WATER RESOURCES: GENERAL

Saudi Arabia, along with other countries of the Arabian Peninsula, is located in an arid environment with very limited water resources. Groundwater represents the major dependable source of water and is supplemented by intermittent surface run-off from flood flow, as well as desalinated sea water. Surface run-off is estimated at 2,230 MCM and occurs mainly in the south-western region of Saudi Arabia. Owing to the sporadic nature of flood flow, this source can not be considered dependable. When it occurs, flood flow is used for traditional irrigation and impoundment behind recharge dams. In addition, water released from some relatively large dams is also used for irrigation purposes.

Groundwater reserves are stored in the shallow alluvial aquifers of *wadis*, along the coastal plains and interior areas, as well as the deep Saq, Tabuk, Minjur, Wasia, Umm Er Radhuma, Neogene and Dammam sedimentary and limestone formations. Extensive groundwater reserves are used to meet part of the domestic water requirements and the total requirements for the agricultural sector. Desalinated water is estimated at 795 MCM and provides water for major urban centres and coastal cities. Treated wastewater, estimated at 107 MCM, is used for urban landscaping, irrigation and industrial cooling.

Substantial agricultural water demand has been experienced during the last two decades from many groundwater sources, especially those of the deep aquifers. Water demand reached 16,300 MCM in 1990 with 14,600 MCM allocated for agricultural purposes. Total demand is expected to reach 12,400 MCM and 22,900 MCM in the years 2000 and 2025 respectively. Agricultural water demand is expected to reach 9,500 MCM and 15,000 MCM in the years 2000 and 2025 respectively. Trends in water demand indicate that Saudi Arabia will continue to rely on further exploitation of groundwater sources and brackish and sea water desalination. Groundwater will continue to represent the main source of supply for agricultural purposes, while desalination will contribute significantly towards satisfying domestic water requirements.

B. INSTITUTIONS

Planning, management and coordination processes in Saudi Arabia's water sector involve delicate intergovernmental relationships. Water resource assessment, protection, distribution, and the construction of water infrastructure are the responsibilities of many ministries and authorities. There are four main ministries and authorities dealing with planning, development, production and distribution of water resources.

The Ministry of Agriculture and Water, established in 1961, is the main institution which has full national authority over water resource development and management. The Ministry also plans and supports agricultural activities. It is the Ministry of Agriculture and Water's responsibility to carry out all types of water assessment and to enact water legislation. Its mandates include managing water resources through control of drilling activities, water development, water conservation, and the formulation and implementation of policies, plans and programmes, as well as the undertaking of hydrological and hydrogeological studies for the purpose of development and regulation of water resources. Also included in its duties are the design and supervision of water supply systems in rural areas and dam projects for flood control and recharge and irrigation purposes. Water conservation Regulation No. 34 issued in 1980 (Al Sadhan, 1981) empowers the Ministry of Agriculture and Water with an extensive mandate covering the formulation and updating of legislation including the development, management, and protection of all water resources. Two autonomous agencies associated with the Ministry of Agriculture and Water deal with water production and allocation: the Saline Water Conservation Corporation, and the Al Hassa Irrigation and Drainage Authority. The boards of directors of these two agencies are chaired by the Minister of Agriculture and Water. The Saline Water Conservation Corporation is responsible for the production of desalinated water as well as for the operation

and maintenance of desalination facilities, and the Al Hassa Irrigation and Drainage Authority is responsible for the operation and maintenance of large-scale irrigation and drainage projects in the eastern region of the Kingdom and water allocation for irrigation projects. The source of water for the Al Hassa Irrigation Project is the spring discharge from shallow and deep aquifer formations.

The Ministry of Municipal and Rural Affairs is the second authority dealing with the water sector through regional offices. Its main responsibility is the operation and maintenance of urban water supply systems, sewerage systems including wastewater treatment, and water storage facilities. The Ministry of Municipal and Rural Affairs is divided into six regional Water and Sewage Boards, which are located in major urban centres and are responsible for carrying out ministry functions at a regional level.

The Ministry of Planning also deals with planning and coordination of water sector activities with other ministries, as well as planning for development activities in regard to the national five-year development plan. The other institution dealing with water-related issues is the Meteorology and Environmental Protection Agency, which is responsible for water pollution control, standards, and regulations.

C. Evolution of Water Legislation

In 1932, before Saudi Arabia became a Kingdom, the Ottoman Majalla code was practised in some parts of the country. The code, based in part on Islamic principles, prevented the sale of water as a commercial commodity, and recognized the water rights of each individual. Groundwater wells were recognized as being community property and publicly owned (FAO, 1973). However, once the Kingdom of Saudi Arabia was established, the Ottoman Majalla code became void, and strict Shariah principles took effect.

Historically, water rights followed Shariah law and were shaped by traditional customs. Shariah law basically states that water should be free for everyone. Humans and animals have a right to quench their thirst, and therefore that water should remain free for everyone to use. However, over time water has become a legal obligation and ownership is possible provided the owner is fair and effective in its apportionment (FAO, 1978). Besides Shariah laws, which are based on Islamic principles, traditional practices govern the development and allocation of groundwater and flood flow.

Shariah law was practised prior to the extensive development of groundwater resources. Subsequently, water rights became associated with land ownership: water from wells dug on privately owned land is now exclusively for the use of the owner. Groundwater rights can also be acquired through cultivation and through acquisition of water found on the land. Water rights are transferred through land sales.

Modern water legislation in Saudi Arabia began during the period from 1968 to 1983. A variety of new regulations took effect, and a series of royal decrees were issued by the Government. In 1968 Royal Decree No. 1005 was issued, stipulating requirements for land use and distribution. The land distribution decree stated that undeveloped lands are owned by the Government. It also stated that the owner of the land had the right to request a drilling permit. This decree indirectly addressed groundwater and surface water rights for virgin farmland distributed to the public by the Government. This decree stipulated that wells on irrigated land allocated by the Government should be at least 500 metres apart.

The most significant water legislation instrument in this period was Royal Decree No. 34, enacted in 1980, known as the Water Conservation Ordinance. Procedural requirements to implement Decree No. 34 were issued in 1983 by the Ministry of Agriculture and Water. The Water Conservation Ordinance defined water as public property for the beneficial use of everyone, and this right could not conflict with

rights established according to Shariah law. Most of the articles of the 1980 decree addressed groundwater development, utilization and management, particularly in shallow alluvial aquifers.

D. LEGISLATIVE ASPECTS

1. *Surface water and groundwater*

The earliest legislation in Saudi Arabia governing groundwater was issued in 1966 through Royal Decree No. 5584 (Al-Sadhan 1981). This decree mandated the Ministry of Agriculture and Water to issue well drilling permits and licences for the purpose of regulating groundwater development. In the same year (1966) the Council of Ministers issued Decree No. 328 defining national policy and setting priorities for drilling wells. This decree was intended to establish regulations and specifications with respect to the quantity and quality of groundwater needed for drinking water requirements in urban and rural areas (Al-Sadhan, 1981). Well-protection zones (*harams*) were set up to protect groundwater from depletion. A *haram*, or a distance of approximately 60 arm-lengths (45 to 56 centimetres [cm] each) must be maintained between wells or canals, if the well or canal is to be used for irrigation purposes. From 1968 to 1980, well-drilling permits were issued by the Ministry of Agriculture and Water.

In the 1970s and 1980s several royal decrees were issued barring drilling in certain regions of the country, either where groundwater was at risk of depletion, or where the magnitude of recharge was less than that of the volume of pumped water. The protection of public water infrastructure and water sources from trash dumping, abuse or vandalism was addressed in Decree No. 225 of 1978. The preservation of aquifers was addressed by Decree No. 114 of 1988, which prohibited the removal of sediments from *wadi* channels. The protection of water sources from by pollution different sources was also considered a major concern of the Government during the early years of the development process. Water pollution Decree No. 62 of 1978 emphasized the need to protect water from solid and liquid waste pollution sources. The decree set up a fine and penalties, including imprisonment, for improperly disposing of pollutants such as used oil, batteries, and industrial or hazardous wastes. In addition, in accordance with its charter, the Meteorology and Environmental Protection Agency issued a set of environmental standards in Decree No. 1409 of 1982, which aimed to protect air and water quality by limiting the emission of pollutants.

In addition to these main royal decrees, there were a number of decrees and regulations issued by the Ministry of Agriculture and Water with respect to prohibited drilling areas, identified as restricted zones throughout the country. These restricted zones are delineated based on the rate of development and extent of groundwater depletion in order to minimize interference with existing well fields, and to protect against pollution and salinization. Shariah law still governs the utilization of surface water, including flood water. Private irrigation rights may be subject to appropriation if upstream land parcels are irrigated prior to the water reaching downstream areas. The quantity of water used to irrigate a farmed basin is not to exceed ankle depth. This law is applied in the southern region of the country along the *wadi* courses during flood season. The right to use flood water is now attached to land ownership. Land acquisition and the subsequent water rights may be secured through inheritance, and the transfer of title to land by sale. In addition, land adjacent to *wadi* courses, including tributaries, shares a portion of the flood water. Surface water allocation is not subject to permit regulations, but is established through a system of customary registered rights administered by tribal leaders or government-appointed administrators.

The water conservation regulations of 1980 and 1983 address the use of groundwater development through permits. These regulations require private groundwater development projects to be regulated by permit. Permits from the Ministry of Agriculture and Water are required for drilling, deepening, and cleaning wells to be used for all purposes. The construction and supervision of domestic water infrastructures owned by the Government, including the drilling of wells, is to be supervised by Government staff, and therefore

the issuance of permits is coordinated among the different agencies. Prior to issuing a drilling permit, land ownership has to be confirmed through land title. An investigation of adequate groundwater quantity and quality is made through a field visit, and the location of the well in relation to prohibited areas is ascertained. The issued permit defines the depth of the well, as well as the technical specifications to be followed for well construction and development. Owners must first have obtained a drilling permit, and the technical specifications are to be precisely followed. A well-completion report is to be filed with the Ministry of Agriculture and Water within 15 days after completion. The water conservation regulations oblige contractors to register and obtain professional licences, and specify stringent conditions that are to be fulfilled. The regulation also contains provisions for penalties with respect to violations, especially regarding groundwater development and utilization. Monetary penalties for such violations as illegal drilling practices, drilling without a permit by either a land owner or a contractor, or delay in submitting well completion reports range from 5,000 to 100,000 Saudi Arabian riyals (SRls) (1 US$ = 3.75 SRls).

Royal Decree No. 34, issued in 1980 and containing 13 articles, represents the only regulation issued so far with regard to water resources development and management in Saudi Arabia. The following is an approximate translation of the Arabic text of the regulations, intended only to provide an explanation of its contents in regard to water resources development and management.

Article (1) Water is considered as being in the public domain for the beneficial use of the public without prejudice to other rights established according to Shariah principles.

Article (2) The Ministry of Agriculture and Water is mandated:

(a) To conserve all water resources and organization of utilization, including the development of regulations and procedures needed for the conservation of water resources, as well as their protection from pollution;

(b) To organize the means of water utilization in a manner that can ensure its availability and fair allocation;

(c) To develop guidelines and specifications needed for well drilling and dam construction, as well as other projects;

(d) To determine drilling contractor requirements and their classification based on their technical, administrative and financial capabilities;

(e) To supervise and carry out inspections to ensure compliance with this regulation.

Article (3) Priority in water utilization is to be given first to basic human requirements, followed by animals, and then by agricultural, industrial, urban construction and other purposes. For the third priority category, allocation among the different sectors is to be decided by a ministerial decree.

Article (4) In the case of emergency or water scarcity, the Ministry of Agriculture and Water is mandated to take technical and administrative measures for fair and just allocation of water among users based on the priorities mentioned in Article 3. In addition, the Ministry is authorized to ban well drilling for a limited period, or permanently; determine water utilization quantity; and organize the means of water consumption and allocation in order to achieve conservation of available water resources.

Article (5) The Ministry of Agriculture and Water has the authority to repair or condemn wells that expose water resources to misuse, soil damage and water pollution. These actions are to be carried out at Ministry expense for wells drilled according to permits issued by the Ministry. However, for wells without permits, action will be taken at the owner's expense if he refuses to correct the situation.

Article (6) A Ministry of Agriculture and Water permit is required for construction of a well, dam or any other water infrastructure, and due consideration must be given to Ministry instructions and specifications during the execution of work.

Article (7) Well contractors are required to obtain a permit to practise drilling operations according to their classification status. In addition, contractors who were conducting drilling operations prior to the issuance of this regulation are required to submit a permit application within one year from its date of issue.

Article (8) Drilling contractors should not perform drilling operations on private land unless in possession of a drilling permit, and drilling specifications must be followed exactly as indicated in the issued permit. Contractors are liable for repair of damage in case of violation of specifications.

Article (9) Anyone who violates this regulation and its execution mechanisms will be fined an amount not exceeding SRls 100,000.

Article (10) The Ministry of Agriculture and Water is mandated to withdraw permits from owners and contractors when violations are repeated. The offender, however, has the right to appeal this action in a court of justice within one month.

Article (11) Penalties are issued by decree from the Minister of Agriculture and Water and executed according to instructions to be determined by the Ministry of Interior and the Ministry of Agriculture and Water.

Article (12) The Ministry of Agriculture and Water will issue implementation procedures for this regulation to become effective from the date of its issuance.

Article (13) This regulation will cancel all rulings and laws in conflict with its articles, and become effective three months from the time of its publication in the official newspaper.

2. *Utilization*

Shariah principles, and the water conservation regulation of 1980, gave priority to domestic water requirements, followed by livestock, and finally by agriculture (FAO, 1978). More recently, new regulations have given the industrial sector priority over urban development with respect to construction and cooling. During the last three decades, various ministerial resolutions have been issued regulating the drilling of wells to provide water for drinking purposes.

The water conservation regulation of 1980 specifically addresses water allocation, mainly from groundwater sources. Utilization priorities are established for drinking water, animals, irrigation, industry and urban development. The Ministry of Agriculture and Water may alter the priority of water rights in order to accommodate the well-being of the public. The water conservation decree also addresses the allocation of water for the agricultural sector according to the regulated status of farms; first priority is given to old

farms based on the date of their establishment, followed by land granted during Government distribution programmes, and finally land distributed by royal or other decrees.

Irrigation water allocation for the eastern region of Saudi Arabia was established in 1972 through Decree No. 28. This decree established the Al-Hassa Irrigation Authority in the eastern region of Saudi Arabia. This Governmental authority, under the auspices of the Ministry of Agriculture and Water, is responsible for monitoring and regulating groundwater utilization from the large number of natural springs that are the main source of water for some large irrigation projects. The decree prohibits unauthorized drilling in the area of the projects.

VI. WATER LEGISLATION IN THE SYRIAN ARAB REPUBLIC

A. WATER RESOURCES: GENERAL

Water resources in the Syrian Arab Republic are composed of surface water from river flow, flood run-off, and groundwater reserves contained in shallow and relatively deep aquifers. Surface water flow, estimated at 6.9 billion cubic metres (BCM), is made up of the flow from nine major rivers: the Orontes, the Afrin, the Yarmouk, the Jajer, the Kabir, the Janoubi, the Sajor, the Khabur, and the Bardah Al Sin. In addition, the total volume from the Tigris, which flows at the international boundary, and the Euphrates is estimated at 49.9 BCM; however, upstream regulation and utilization result in flow fluctuations with substantial volume reductions (ESCWA, 1996d). Groundwater is available in alluvial deposits and in carbonate, andrite, basalt, dolomite and limestone formations located in the coastal, western and north-eastern plains. Water sources are being used mainly to meet domestic water requirements, followed by industrial use and irrigation. Groundwater utilization, estimated at 3 BCM, is in excess of the safe yield of the aquifer.

Water demand was estimated at 7,726 MCM in 1990 and is expected to reach 16,570 MCM and 29,442 MCM in the years 2000 and 2025 respectively. The major consumer is the agricultural sector with an estimated requirement of 6,930, 14,820 and 25,000 MCM in the years 1990, 2000 and 2025 respectively. Development activities in various sectors are expected to result in high water consumption in the future.

B. INSTITUTIONS

During the last four decades, numerous efforts have been made to establish, organize and define the functions of water institutions in the Syrian Arab Republic. Legislation enacted in 1954 (Law No. 23) and 1959 (Law No. 69) established the Hama and Homs Water Board (Al Safady, 1985; ESCWA, 1996d). Another legislative decree, No. 115 of 1967, created the High Committee of the Euphrates Dam Project (FAO, 1978), which was followed by Decree No. 14, establishing the Dam Management Board for the same river in 1968. The functions of the High Committee of the Euphrates Dam Project were defined in Legislative Decree No. 134 of 1969. The Committee's responsibilities include formulating project policies as well as setting the stage for development and policy implementation (FAO, 1978). Legislative Decree No. 45 of 1967 was issued to establish the Syrian Arab Waterworks company (FAO, 1978). The Syrian Arab Waterworks Company is a semi-private organization that carries out all kinds of development work, including the implementation of water resources projects.

Further efforts were made towards the organization and enhancement of the function of water institutions when a decree was enacted for the establishment of the Ministry of Municipal Affairs and Rural Development, with responsibilities for all domestic supply systems. Since 1982, four ministries have been dealing with various water and water-related issues. These ministries are: Public Works and Water Resources, Housing and Utilities, Health, and Land and Irrigation. The Public Works and Water Resources Ministry is responsible for all water resource policies and planning, including groundwater investigation. Its responsibilities also include delineating limits on water allocation for irrigation, imposing restrictions on drilling activities to minimize depletion of groundwater resources and promote water conservation, and small dam design, construction, operation and maintenance. It also supervises the activities of the Syrian Arab Waterworks Company and the Ministry of Irrigation's distribution system. The Ministry of Health is responsible for monitoring of drinking water and setting standards to ensure health-risk compliance. The Ministry of Housing and Utilities, established in 1974, is responsible for planning studies of domestic water supply and for sewage projects, including the design and operation of distribution systems. Regional Water Supply and Sewage Authorities, known as *mohafazat*, were established under the authority of the Ministry of Housing.

The Ministry of Irrigation, established in 1982 under Law No. 16, is responsible for water resource activities that previously fell under the jurisdiction of the Ministry of Public Works and Resources. Ministry mandates include conducting water resource studies, and overseeing measurement, development, protection and water utilization. It also includes the study, design, implementation and operation of irrigation and drainage projects as well as dam construction (ESCWA, 1996d). The High Council for Planning is the agency which approves, plans and coordinates the activities of the Ministries, including water activities. This is accomplished through a series of planning frameworks leading to the preparation of annual, medium and long-term national plans. The High Agriculture Council approves utilization plans in the agricultural sector. The Irrigation and Water Utilization Directorate of the Ministry of Agriculture and Agrarian Reform implements these water utilization plans and determines irrigation water requirements.

C. Evolution of water legislation

Water legislation has been evolving since pre-Islamic times. This process is recorded in various water rights regulations and court documents (FAO, 1978; Al-Safady, 1985; ESCWA, 1996d). Under Ottoman (Turkish) control, various water rights and regulations in urban and rural areas practised during the period 1516-1920, especially those based on the Majalla code, were recorded in court documents known as *hojajas*. These documents delineated the quantity of water to be used from a specific source in a local measuring unit known as the *qrat* (one *qrat* = 1/24 of the water quantity in question). During the same period of time, the Shariah courts settled water rights disputes. The promulgation of the Ottoman Majalla code in 1870 further regulated water rights, protection, and utilization. The most relevant articles of the code with regard to water issues are Nos. 1248-1253, 1262-1269 and 1430-1448.

The basis for the current legislation is outlined in Laws No. 144 of 1925 and No. 320 of 1926. Public property regulation No. 144 of 1925 (Al-Safady, 1985) addresses water rights in some of its articles. The 1925 law contains four sections addressing such water issues as public ownership and, limitations of ownership, temporary public works ownership, as well as setting forth general rules that included penalties. In the same year, Decrees No. 64 and 110 were issued for the formulation of a committee charged with settling disputes and approving committee utilization of fresh water sources for commercial and industrial purposes.

Law No. 320 of 1926 addresses the protection of public water sources, including rules for regulating licenses and water concessions. The 1926 law is made up of nine sections with 64 articles containing regulations regarding public access to water and its protection, regulations to control trespassing on public lands, and the determination of prohibitive zoning for water resources. Other sections also address water concessions, settling of water rights disputes, land right-of-way, allocation for drinking purposes, water commissions, legal authorities and violations, and penalties. Still another law enacted in 1944 imposed penalties for trespassing on public water sources. The civil code introduced in 1949 also defined private ownership of water rights including water from springs and groundwater sources. The utilization of public water from river flow and groundwater sources for agricultural purposes was dealt with in Law No. 165 of 1959. The same law also covered pumping regulations from both surface and groundwater sources, guidelines for issuing drilling permits, and installation of pumps. Law No. 165 granted jurisdiction to the Ministry of Public Works and Water Resources to set limits on water quantity and size of area to be irrigated within a particular catchment, as well as establish restrictions on groundwater extraction and encourage protection. The law required that during the exploration phase, geological and hydrogeological sections be submitted to the concerned ministry.

The 1969 provisional State constitution outlined, among other things, the conditions for public ownership of natural resources, those to be exploited for the benefit of the public as a whole (FAO, 1978), as well as for private ownership. The provisions of this law were conditional, based upon avoiding conflict

with the civil code. Under the agrarian reform, implemented during the period 1958-1968, when the State appropriated land in excess of authorized land sizes, water rights became public property.

From 1950 to 1960 additional legislative effort was directed at the regulation and protection of water resources. Relevant laws were No. 56 of 1950, setting up programmes to provide water supplies to rural areas; Law No. 109 of 1959, establishing criteria for issuing permits; Decree No. 208 regarding qualification of groundwater to be used for irrigation projects (Al Safady, 1985; ESCWA, 1996d); and Law No. 3 of 1972 concerning construction of small and medium-sized dams to regulate flood water for the purpose of satisfying rural water demand, annual water requirements and the development of range and forest areas. Also significant was Law No. 46 of 1972, which addressed the issue of public water utilization from Government irrigation projects. It required the payment of fees and established a means to collect them, as well as determining the size of areas to be irrigated.

According to Al-Masri (ESCWA, 1996d), from 1960 to 1970 there were 63 decrees, laws and regulations enacted, dealing with such aspects as drilling regulations and prohibitions in areas close to springs (*haram* zones), as well as the introduction of legal measures to combat pollution of sources. Decrees No. 79 of 1960 regarding drilling permits, No. 15 of 1962 and No. 402 of 1969 established protective zones around springs; Nos. 113 and 1113 of 1965, and No. 325 of 1966 prohibited drilling in the Al-Qabfut, Al Qasim and Mubain areas.

Between 1971 and 1980 a total of 33 additional laws were enacted to address specific water or water-related issues (ESCWA, 1996d). The most important legal measures concerned the establishment of a water pollution control department; the construction of dams on large rivers (Law No. 3 of 1972); the organization of public irrigation networks and the establishment of appropriate water charges for these services (Laws No. 46 and 64 of 1972); and the establishment of the Ministry of Housing and Utilities (Decree No. 69 of 1974). Other laws and decrees established protective zones for springs (Decrees No. 687 of 1975; No. 125 of 1978), and banned permits (Decrees No. 288 of 1973, 199 of 1977, 128 of 1978, and 152 of 1979). Additional laws enacted during the period 1980-1995 provided for the monitoring of urban and agricultural activities with regard to their influence on local discharge and pollution of water from springs (Decree No. 395 of 1980). The most significant laws and decrees enacted during the period 1980-1990 were Law No. 16 of 1983 establishing the Ministry of Irrigation, and Law No. 17 of 1986, establishing the Irrigation Directorate on a basin level (ESCWA, 1996d).

Serious efforts to regulate water resources have been made in the Syrian Arab Republic during the last five years. More than 200 regulations, decrees and laws concerning such areas as development, protection and management of both surface and groundwater sources at the basin level have been issued. Most of the legislation gives priority to the allocation of water for drinking, followed by irrigation, and finally for industrial purposes (ESCWA, 1996d).

D. LEGISLATIVE ASPECTS

1. *Surface water and groundwater*

Most water used in the Syrian Arab Republic is pumped from water stored behind small dams, or from surface and groundwater sources. Guidelines for granting pumping permits are based on the horsepower of the pump. Either the Ministry of Public Works and Water Resources or the regional government (*Muhafiz* offices) grants licences for pumping water, especially for agricultural purposes. The *Muhafiz* (governor) is the executive authority in each region and acts on behalf of all ministries to issue licences to lift water using pumps with less than 10 horsepower (HP), and to regulate services including water supplies, delivery, and distribution from surface and groundwater sources, as well as dam construction and flood control. Permits

for pumps with over 10 HP are the responsibility of the Ministry of Public Works and Water Resources. The Ministry and the *Muhafiz* are responsible for establishing the maximum water volume allocation limit for a particular permit holder per hour, as well as the number of allowable pumping hours per day. These regulations govern pumping from both surface and groundwater sources.

Few laws and regulations have been issued with respect to the development, protection and management of groundwater. In 1960 Law No. 79 was issued prohibiting well drilling without prior approval through licensing procedures (Al Safady, 1985; ESCWA, 1996d). According to this law the granting of a licence to drill a well to a specified depth is contingent upon the surrender of supporting documents, as well as the assurance that a well-completion report will be submitted to the Ministry. The basic application requirements for the licence have to be fulfilled, including the specifications of how the water will be used and the size of the pump. Licences are usually valid for a 10-year period, renewable after proving that the conditions of the original permit have been fulfilled as well as providing any additional information required. Well owners are required to pay annual dues. More than two violations of the conditions of the licence result in revocation of the permit. The conditions for obtaining licences for surface water are basically the same as those for groundwater.

Recently the Ministry of Irrigation issued a number of laws delineating restricted areas with regard to the development and pumping of groundwater, and prohibiting the issue of well drilling permits. These laws also include pumpage from surface water sources. Additional laws have been issued prohibiting drilling in areas adjacent to springs, and establishing a system of restrictive zoning around such springs in order to protect them from depletion through interference. Some efforts have been made to minimize groundwater mixing from different aquifers, such as Law No. 14 issued in 1970. The purpose is to maintain water quality within the aquifers. Law No. 393, issued in 1980, addresses the protection of groundwater, including springs, from pollution resulting from agricultural, industrial, or urban construction activities. Several decrees have also been issued requiring factories and refineries to treat their wastewater prior to its discharge.

2. *Utilization*

Utilization of public surface and groundwater for any purpose is regulated by the Ministry of Public Works and Water Resources through the issuance of water utilization licences. Private water rights, however, are associated with land ownership, and can be acquired by succession, transfer or sale of land deeds. The Ministry issues the licences based on the recommendations of a regional commission made up of members from the Ministry of Public Works Water Resources, the Ministry of Agriculture, and local representatives. The Ministry of Public Works and Water Resources is authorized to set the maximum quantity to be extracted from public water sources.

Domestic water supply and services are regulated at the local and regional levels by different types of institutions. At the local level, city and town councils regulate water supplies from both surface and groundwater sources, as well as from water stored behind dams. On the regional level, a four-member commission is responsible for the regulation of water supply and sanitary services. In the agricultural sector, the regulation of water rights prior to 1958 was carried out through Law No. 144 of 1925. Since the passage of Law No. 165 in 1958, water allocation, including the utilization of surface and groundwater, has been regulated through licensing procedures (Al-Safady, 1985). Law No. 165 of 1958 specifies that the granting of water utilization licences is contingent upon land ownership. In the past, the Ministry of Public Works and Water Resources was responsible for licensing. This responsibility has now been shifted to the Ministry of Irrigation. In order to determine the magnitude of water being allocated, the Ministry takes into consideration water availability in a given region as well as the land area to be irrigated. These conditions suggest that allocation of water is based on the safe yield of the aquifer and stream capacity assimilation.

The 1958 law also prohibits the issuance of licences if the water allocation is in conflict with other users or against the public interest. It also empowers the Ministry to withdraw licences, if deemed necessary in the interest of the general public, with just compensation. The law, however, allows those with licences to utilize public water sources for agricultural purposes. The licence is valid for a particular parcel of land and can be transferred to other owners.

The ministries, particularly the Ministry of Public Works and Water Resources in the past, and since 1982 the Ministry of Irrigation, have been mandated to issue limit licences for water allocation according to Law No. 208 of 1959. In cases where water is drawn from public sources, the magnitude of water that can be withdrawn is dependent upon the condition of the network, as well as on the conditions set forth in irrigation system Law No. 46 issued in 1972 (Al-Safady, 1985). The 1972 law is considered to be an important piece of legislation with regard to the establishment of fees. It specifies an annual fee of 70 Syrian pounds (LS) per hectare to supply water from Government irrigation projects, and LS 55 for maintenance. The 1972 law was amended by Laws 19 and 128 of 1989, which increased the fees to LS 1,075 per hectare for operation and maintenance costs for irrigation projects and to LS 200 for water allocation from small and medium-sized dams. The fees were increased to LS 2,500 in 1993. Additional efforts are being made to conserve water in the agricultural sector through technical and financial support to farmers under Law No. 141, enacted in 1970, which encourages the implementation of advanced irrigation technology.

The use of water released from dams for irrigation purposes is subject to an annual fee. The charge is fixed by a decree based on the recommendation of the Ministry of Public Works and Water Resources, in agreement with the Ministry of Finance (FAO, 1978). Law No. 3 of 1972 regulates the utilization of surface water stored behind dams.

3. *Recent trends*

Increasing competition for water among the various sectors, the depletion and pollution of water sources, and the existence of diversified water or water-related legislation have made it necessary to formulate and enact an effective legal framework. To meet this need, the Ministry of Irrigation is making a serious effort to draft comprehensive water legislation. The proposed legislation currently under consideration by the Ministry of Irrigation (ESCWA, 1996d) consists of 64 articles contained in nine sections. A brief description of each section, as reported by Al-Masri (ESCWA, 1996d), is contained in the following paragraph.

The first section discusses the general terms and definitions that are important in the identification of public water and water pollution sources. The second section addresses public ownership of water rights with regard to sea water and natural water sources. Fresh water resources are considered to be publicly-owned, including water from rivers, storage dams, floods, lakes, waterfalls, groundwater, and springs. Section two also stipulates that the water supply, sewage, and irrigation and drainage network should be publicly owned. Delineation of protective zones for water sources is given priority based on different purposes, with a 10-metre protection zone for wells used for providing drinking water. For Government irrigation projects, the size of the protective zone is established by the ministry concerned. Under the second section, the Minister of State is authorized to increase the distance and area of different protected zones.

The third section of the proposed legislation deals with settling water disputes and the establishment of water rights. This section states that the settlement of disputes will be carried out by a consulting committee. The findings are to be advertised and a grace period completed before the final decision is made, in the event there is any objection to the settlement. The fourth section deals with the establishment and affirmation of water rights for public sources. This section contains 11 articles addressing water rights (ESCWA, 1996d). The fifth section, composed of seven articles, addresses temporary development, operation

of public water projects, and beneficial uses. The articles provide legislation guidelines on the means whereby the Ministry of Irrigation or other Ministry may grant permits for undertaking temporary operation and maintenance work, including groundwater investigations, sewage and/or water supply networks. It also stipulates that the Ministry concerned has the right to estimate crop water requirements and per capita water consumption, fix the duration of the irrigation cycle, and issue regulations related to the maintenance of the water distribution network. Section six defines the requirements for obtaining licences for drilling wells and permits to install pumps, as well as the conditions under which cancellation of the permits may occur.

Section seven deals with the protection of water resources from pollution. The nine articles in this section contain regulations prohibiting the burning of waste which would contribute to water pollution, as well as requirements for the installation of water treatment equipment in facilities which potentially pollute water sources, in order to force violators to comply with prior licence restrictions. The eighth section of the draf legislation addresses different kinds of penalties, described in nine articles. Violators of the law may be fined or imprisoned. Fines may range from LS 100 to LS 30,000, and imprisonment terms range from one month to three years. In some cases, penalties may include both a fine and imprisonment. The stiffest fines are assessed on water polluters. The final section deals with general procedures.

VII. WATER LEGISLATION IN THE UNITED ARAB EMIRATES

A. WATER RESOURCES: GENERAL

The United Arab Emirates has limited surface run-off and groundwater resources. Groundwater from shallow and some relatively deep aquifers represents the main source of water for agricultural purposes, as well as partially fulfilling domestic requirements. Surface water in the form of flash floods that may occur irregularly is used mainly to recharge shallow alluvial aquifers and carbonate formations. The Dammam, Rus and Umm er Radhuma carbonate formations represent the main aquifer systems. They contain fossil water of very poor quality. The shallow alluvial aquifers in some locations contain water of reasonable quality. These aquifers are used to satisfy the major portion of irrigation requirements.

Water production from desalination facilities, estimated at 345 MCM annually, satisfies the major portion of domestic water demand. Reclaimed wastewater is estimated at 62 MCM and is used mainly for urban landscaping and limited farming practices. Substantial volumes of groundwater are being exploited to meet irrigation water requirements, while for domestic supplies desalination is the main water source. Total water demand in 1990 was 1,490 MCM, with 950 MCM allocated to the agricultural sector. Water demand is expected to reach 2,232 MCM and 3,150 MCM in the years 2000 and 2025 respectively. Irrigation requirements are expected to reach 1,400 MCM in the year 2000 and 2,050 MCM in the year 2025. Further exploitation of groundwater is expected to meet rising demand.

B. INSTITUTIONS

In the United Arab Emirates there are many institutions involved in the development, protection, utilization and management of water resources. The main institutions are: the Ministry of Agriculture and Fisheries, the Ministry of Electricity and Water, and the General Directorate of Water in Dubai and Abu Dhabi. Federal Law No. 12 of 1980 mandates the Ministry of Electricity and Water to provide water for domestic and industrial purposes, from groundwater and desalination sources, to all of the Federation States except Dubai and Abu Dhabi. The Ministry has the authority to regulate water consumption and charge water fees for domestic and industrial use. The Ministry is also mandated to develop, produce, distribute, protect, and manage groundwater and desalination sources, including the execution of water projects. Recently, it has focused its activities on sea and brackish water desalination and distribution. In addition, the Ministry provides groundwater for domestic requirements in rural areas.

The Ministry of Agriculture and Fisheries is responsible for water development and management in the agricultural sectors. In the past, it provided funds and technical assistance for drilling wells for agricultural purposes. Recently, the Ministry's efforts have been shifted to monitoring groundwater and regulation of drilling activities through the classification of drilling contractors and the issuance of drilling permits. The Ministry coordinates drilling activities and regulations with its local branch offices throughout most of the Federation States. The water departments in the Emirates of Dubai and Abu Dhabi have jurisdiction over the development and production of water for the major cities in their States, mainly through sea water desalination supplemented by groundwater. In addition, there are other authorities that deal with wastewater treatment and reuse.

The existence of many water and water-related authorities and the lack of coordination among them, combined with increased water consumption, compelled the federal authorities to introduce a law known as Federal Law No. 21 of 1981. This law established the Water Resource High Council (WRHC), to be responsible for all aspects of water resources including investigation, development, production and management, in all States of the United Arab Emirates. The law consists of 24 articles covering such aspects as a governing board, its composition and jurisdiction, the drafting of water laws and regulations, the

establishment of technical committees, and the delineation of short- and long-term water policy. The most important aspects of this law are outlined in Articles 15 and 16, which define the responsibilities of the WRHC with respect to water investigations, including data collection and analysis, water quality and quantity requirements, formulation of water policies and plans, coordination among water projects, and the establishment of pilot water projects. Article 15 directs the Council to manage water resources through a number of measures including: regulations and permits governing development and utilization; standards; water pricing; and public education and training programmes. Article 16 deals with water legislation, providing ground rules for arbitration with regard to registration and loss of water rights, the authority to supervise and enforce water laws and regulations, and the ability to draft enforcement policies for the purpose of reducing water consumption.

The jurisdiction of the Water Resource High Council was established by Articles 5 and 6 of Law No. 21 of 1981. These two articles focus on the mandates of the Council with regard to water resource development, protection and management. The text of the articles has been translated into English and cited in this document to reflect their emphasis on groundwater resources, which may provide information for those countries considering the use of similar institutional arrangements. Article 5 delegates responsibility to the Council for carrying out the following functions:

(a) Collection, organization and classification of water data including undertaking investigations for such purposes. Estimates of sectorial water consumption. Suggestions for appropriate methodology for its development in order to establish water reserves to meet the county's social and economic development requirements;

(b) Formulation of comprehensive water policy in the light of the available data, taking into consideration council research and study findings;

(c) Preparation of an integrated water plan addressing the available water resources and utilization, including action plans and programmes for its implementation, as well as updating based on the outcome of the implementation plan;

(d) Coordination of water projects and sectorial consumption plans, including those undertaken by federal and local governmental authorities and the private sector;

(e) Evaluation of the impact of water projects on local conditions, especially with regard to heritage issues;

(f) Establishment of pilot and experimental projects dealing with water production, utilization or protection. This includes financial contributions to these projects as well as the provision of technical assistance in coordination with the governmental departments concerned;

(g) Establishment of complete jurisdiction over water resources management through regulations and the issuing of permits and concessions, including maintenance of records on water rights; management of all aspects of water including location, beneficiaries, and conditions under which water can be used, in order to ensure the provision of water rights;

(h) Provision of advice and assistance requested by the Federation Council of Ministers or any governmental agency with regard to all water issues;

(i) Formulation of policy to quantify water consumption, including unification of water pricing and fees in regard to water utilization as well as disposal;

(j) Establishment of a water data bank containing information on all water sources and consumption, as well as dissemination of the information;

(k) Evaluation of action plans that are being applied in the investigation and management of water resources, including updating of plans as deemed necessary;

(l) Investigation of alternative or supplementary sources for existing water supplies that are being depleted or whose reserves are being mined;

(m) Evaluation, endorsement and evaluation of water utilization rights. Issuance of new rights for specific purposes;

(n) Formulation of education and training programmes in water management, geared towards graduating water specialists;

(o) Assistance to Governmental agencies in organizing a team of water experts to serve as delegates representing the designated agencies at international conferences dealing with water resource investigation, utilization and protection;

(p) Enhancement of public awareness, to encourage water conservation and establish a balance between supply and demand, as well as to limit misuse and pollution of water sources.

Article 6 of Federation Law No. 21 of 1981 establishes the terms for the enforcement of water rights:

The Water Resource High Council has the right:

(a) To obtain access to areas for the purpose of investigation or implementation of policies or actions related to water activities;

(b) To establish and administer laboratories, research centres, and experimental facilities;

(c) To conclude agreements or contracts that are needed to carry out responsibilities with federal or local authorities, including the private sector or international organizations, as well as institutions;

(d) To provide decisions on compensation with regard to cancelled water rights;

(e) To monitor and evaluate all activities dealing with the water sector and undertake all measures necessary to ensure compliance with endorsed policies;

(f) To supervise the implementation of laws, rules and regulations in the water sector, including the enforcement of conditions for permits and conservation. It also has the right to request assistance from specialized authorities, if needed;

(g) To suggest policies to monitor water consumption for the purposes of conserving water resources;

(h) To obtain and evaluate statistical and technical information and reports dealing with water resources from Government ministries and departments, including public service and private legal sectors, for the purpose of achieving compliance with established policies and plans with respect to monitoring water utilization in accordance with feasible potential;

(i) To own, or have access to, properties needed to implement its activities.

Information on enforcement of the articles of Law No. 21 is not available; therefore, it is not possible to determine to what extent the High Council is exercising its mandated functions and jurisdiction.

C. Evolution of water legislation

The Shariah law of the Hanbali School (FAO, 1978) is the fundamental law governing land ownership and water rights in the United Arab Emirates. Under Islamic law, water cannot be owned by anyone, but instead is regarded as a gift from God to be used in a rational manner. Water rights are mainly associated with groundwater, owing to the absence of dependable surface water sources.

Groundwater rights have subsequently become associated with land ownership. While there are no written laws concerning groundwater use and management, the customary laws that are currently practised distinguish between two types of wells: those that produce water for community purposes, and those on privately owned land. Water from community wells (FAO, 1978) is provided free of charge to local inhabitants and tribes. The owner of a well on private land has the right to exploit the water beneath his land. Customarily, wells on private land are hand dug or drilled. Land owners have the right to utilize groundwater as long as they own the deed to their land, and the deed contains no restrictions regarding the number of wells, or the volume of water extracted. Chiefs of local tribes, as well as local courts, usually have the prerogative to intervene in cases of water disputes, based on the basic human need for and right to water, in order to avoid harming the public interest.

D. Legislative aspects

1. *Surface water and groundwater*

The absence of established laws governing groundwater development and management has forced the Ministry of Agriculture and Fisheries to take the initiative in establishing committees to issue permits for drilling activities for the purpose of providing water to the agricultural sector. Prior permits are required by well drilling contractors and land owners requesting permission to drill. Ministry Regulations No. 23 and 24, issued in 1985 and 1992 respectively, classify drilling contractors into four categories based on their technical and financial capabilities. The regulations also created a Ministry committee to review one-year drilling permits, including the delineation of permissible drilling depth. Permits are renewed annually, or cancelled in cases of violations of specified conditions, as set forth in Federation Law No. 21.

Further efforts to regulate the exploitation of groundwater were made by the Ministry of Agriculture and Fisheries in 1982 through the issuance of a ministerial decree banning the drilling of new wells for irrigation purposes. The decree requires all land owners intending to exploit groundwater, regardless of whether their farm is old or new, to obtain drilling permits directly from the Ministry of Agriculture and Fisheries. Information required for a permit application includes whether the farm is old or new, its location and size, the type and number of existing wells including depth and production, irrigation system and type of crops. Well specifications have to be documented, including diameter, depth, volume of water, and name of the drilling contractor. The application is then referred to the Ministry committee, where it is decided either to recommend or deny the issuance of a drilling permit to the land owner. A violation of the well drilling decree results in the withdrawal of all Government subsidies, loans and technical services.

2. *Utilization*

All water uses, including the construction and operation of water infrastructure, are regulated through the issuance of Government permits. The use of groundwater for irrigation is regulated through permits to land owners and/or drilling contractors: however, there are no control mechanisms regarding volume. In the domestic and industrial sectors, governmental institutions such as the Ministry of Electricity and Water and the Dubai and Abu Dhabi Water Departments provide water services including operation, distribution and maintenance.

The Ministry of Electricity and Water issued many regulations between 1972 and 1994 governing water tariffs in the domestic and industrial sectors, as well as water production from groundwater and desalination sources. In the domestic sector, different water tariffs exist for metered and unmetered users. These regulations are reviewed on an annual basis.

In the absence of established Government regulations dealing with water allocation priorities, customary laws are still being practised in different parts of the United Arab Emirates. These customary laws establish a priority for water use according to Shariah principles, with top priority being for human consumption, followed by animals and then agriculture. Human and livestock requirements override other requirements. In addition, customary law awards water allocation rights to land owners with parcels adjacent to water sources; this law is applicable to farmland located near *wadi* beds where flood water can be easily diverted for irrigation purposes.

The above review of existing legislation reveals that few laws and regulations have been enacted in the United Arab Emirates to develop, protect and manage water resources efficiently. Although Federation Law No. 21 called for the establishment of the Water Resource High Council, lack of implementation and enforcement has contributed to increased water consumption and mismanagement of water resources. Further efforts are needed to update existing water laws, as well as introduce new laws that emphasize proper development and management of water resources.

VIII. WATER LEGISLATION IN THE REPUBLIC OF YEMEN

A. WATER RESOURCES: GENERAL

Groundwater and surface run-off in Yemen represent the main sources of water to satisfy demand in all sectors. Groundwater is contained in *wadi* alluvial deposits, in flood plains, especially those of the Tihama coast, and in relatively deep formations known as the Kholan, the Tawilah, the Mejd-Zer Series, the Wajed (sandstone), and the Umm Er-Radhuma (limestone), as well as in basaltic lava deposits. Extensive volumes of water may be stored in these formations; however, quality is usually poor and access is usually in remote areas. Groundwater abstraction, used mainly to satisfy domestic and irrigation requirements, reached 2,200 MCM in 1990 (Government of the Republic of Yemen, High Water Council, 1992). Seasonal flooding during the summer period usually generates run-off of reasonable magnitude.

In 1990, groundwater resources contributed 30 per cent towards irrigation purposes, and flood water contributed 70 per cent, delivered mainly through spate irrigation. Surface water from seasonal floods also contributes to meeting irrigation requirements in some parts of Yemen, where abundant rainfall supports terrace agriculture. The volume of surface water is estimated at 2,440 MCM. Groundwater contribution to the domestic sector in 1990 was estimated at 187 MCM. Domestic and industrial water demand reached 271 MCM in 1990, with an estimated 2,500 MCM used for irrigation purposes. Total demand is expected to reach 3,670 MCM and 4,875 MCM, respectively, in the years 2000 and 2025 for combined sector use, while the figures are 3,250 MCM and 3,900 MCM in the agricultural sector alone, for the years 2000 and 2025 respectively. Domestic and industrial demand is expected to reach 420 MCM in the year 2000 and 975 MCM in the year 2025.

B. INSTITUTIONS

Development, protection and management of water resources over the last three decades in Yemen has been divided among several organizations, each of which has jurisdiction over water and wastewater activities. Until recently these institutions operated independently, with limited coordination of their activities. The authorities involved in the water sector include the Ministry of Agriculture and Water Resources, the Ministry of Electricity and Water, the Ministry of Oil and Mineral Resources, and the National Water and Sanitation Authority. The Ministry of Agriculture and Water Resources is mandated to develop surface water from intermittent flood flow, and groundwater for agricultural purposes. The Ministry of Agriculture and Water Resources manages a number of regional units, departments and authorities. These include regional project units, general administration for irrigation and rural development, and the northern and eastern regional agricultural development authorities (ESCWA, 1992a). The Ministry of Electricity and Water is in charge of urban and rural water supply and wastewater. There are three main institutions which operate under this Ministry: the National Water and Sanitation Authority, the Public Works Corporation, and the Rural Electric and Water Supply Board. The National Water and Sanitation Authority is responsible for water supplies and wastewater collection and treatment in the major urban centres of Sana'a, Hodeida, Taiz, and Hajjah, as well as in other larger towns.

The Public Works Corporation is in charge of urban and rural water supply in the southern territories, while the Rural Electric and Water Supply Board has limited responsibilities for rural water supplies, mainly in the northern provinces. The Ministry of Oil and Mineral Resources is responsible for undertaking groundwater studies through hydrogeological development projects. In addition, the Ministry of Housing and Urban Planning is involved in wastewater collection, treatment and disposal. There are many regional directorates and/or departments, as well as autonomous authorities, for the purpose of developing water resources, specifically rural water supplies and wastewater projects.

The existence of such a large number of institutions in the water and water-related fields has not contributed to efficient allocation and management of water resources. To overcome the difficulties associated with the fragmentation of water institutions, the Government established the High Water Council (HWC) in 1981, made up of members from the Ministries, and chaired by the Prime Minister. The function of the HWC was to develop policies and plans, as well as coordinate and monitor water activities disperged among the different water use sectors and institutions. However, the Council failed to establish its mandate in the coordination of water activities. This failure may be attributed to a lack of legal enforcement mechanisms and the unavailability of technical support as well as the reluctance of other institutions to achieve the needed cooperation. A detailed elaboration of the functions of HWC is provided below.

C. Evolution of water legislation

Historically, there are many water laws, regulations and customs related to water rights, allocation and protection that have been practised in different parts of Yemen over many decades. The legal framework governing water issues and practices is composed of the Shariah principles and customary practices (see chapter I). Yemen's constitution, civil laws and customs are basically similar to the ancient laws of other countries, originating from the Islamic law system (Haddash, 1996). Islamic law contains articles addressing various aspects of water rights. In Yemen, traditional practices serve as a complementary legislative mechanism governing water rights and are still observed today. These practices can be defined as certain actions or customs that become legally binding as they continue over a period of time (Haddash, 1996). Both civil law and customary law serve as legislative water instruments supplementary to the Shariah principles.

In Yemen, water ownership, diversion, use and administration rights are governed by a mixture of laws and customary practices depending on the water source, land use, economic activities, and prevailing social and religious customs. Water rights are established by Article 8 of the Constitution of Yemen (1991), which addresses the legislative status of natural resources, and states that water is in the public domain and the property of the State. According to Article 8, all types of natural resources, including energy and water sources, whether above or below ground, in territorial waters, or on the continental shelf, are the property of the State. This measure assures the exploitation of these resources for the public welfare. In addition, Shariah law states that water is a non-saleable, publicly-owned commodity to which everyone is entitled (Haddash, 1996). The prevailing view, however, is that water can be sold when appropriated by carrying it in containers or by other means of transportation, which can be interpreted as a modern water distribution system.

Article 1366 of the Civil Law of 1992 addresses water rights. It allows private water right ownership when water is enclosed in a container such as a drilled or hand-dug well, or when it is transported. Surface and groundwater rights are established through Civil Law Articles 1163 and 1366. Article 1163 provides the land owner with the right to control of resources below and above the ground surface with the implication that land owners have the right to the water in the underlying aquifers. Article 1366 also grants land owners the right to groundwater when a well is drilled (Haddash 1996). Civil Law Article 1185 and Rule No. 58, part of the nationally recognized Document of Seventy Rules (see below), recognize the right to initiate ownership of groundwater and surface water rights on public land, either through cultivation or well construction, or by use of the water for irrigation purposes.

D. Legislative aspects

1. *Surface water and groundwater*

Customary laws protect groundwater wells from interference from other wells. The Document of Seventy Rules represents a set of customary laws dealing with well-protection zones. This document, drafted and signed by various tribal sheikhs more than three centuries ago (Haddash, 1996), is still recognized and

implemented in some parts of Yemen. The document defines private well ownership, and stipulates that the radius of the protection zone around a well should be equal to the well's depth. The specifications in the Document of Seventy Rules have been interpreted by water professionals and it has been determined that the protection zone around a deep well should be 500 metres.

The regulation of natural resources, including exploitation of water from both surface and groundwater sources as well as groundwater resource development, is accomplished by awarding concessions, as indicated by Article 18 of the Constitution of Yemen (Haddash, 1996).

2. *Utilization*

There are three legislative instruments used to establish water use priorities in Yemen: Shariah and civil laws, and customary or traditional law. These three instruments establish almost identical priorities: that of the right for humans and animals to drink, followed in order of importance by domestic purposes, and finally irrigation.

In Yemen, two types of water allocation are recognized: water rights established by the historical diversion of water, and those established by the use of water over a specified period of time. Traditionally, historical rights take precedence over other allocation rights in the agricultural sector. Water allocation rights also apply to water from flood flow sources, springs, and *quanats* (infiltration galleries). Civil Law Article 1367 establishes water allocation priorities. Article 1367 regulates water seniority rights as well as water quantity. In the case of non-appropriated water, whoever reaches it first is entitled to use the quantity that satisfies his requirements as long as other users do not violate the *haram*. This type of water appropriation is applicable to both surface and groundwater sources.

Time-share arrangements or structured diversions are used to allocate water where water rights are shared. The time-share arrangement is based on the number of hours per day or per week, while structured diversion (by a weir-shaped structure) is based on appropriate openings dug along water channels as needed. The time period or opening size is determined according to the area of cultivated land (Haddash, 1996). The consent of all parties involved is required for changes in magnitude of water allocation, which usually takes place during periods of drought.

Article 1371 of the Civil Law of 1992 stipulates that water utilization for irrigation, especially spate irrigation, should be no higher than ankle deep. This article provides downstream landowners along a *wadi* channel the right to surplus water after the upstream user has fulfilled his irrigation requirements. The water requirements of the senior user are determined by what was considered to be sufficient either when the land was first reclaimed, or when it was being irrigated (Haddash, 1996).

Other civil rules and customs regulate surface and groundwater utilization. Surface water rights are considered to be a right of the land. Civil Article 1372 of 1992 indicates that a person is not allowed to draw water to irrigate land unless he is the owner of the land. There are no restrictions on the place of use or transfer of groundwater resources.

The settling of water disputes in Yemen is achieved through a judiciary or arbitration system. Legislation enacted in 1990 authorizes the judiciary to rule concerning litigation or crime. Within this system there are primary courts, appeals courts, and a supreme court. Arbitration may be carried out under existing legislation or under customary laws. The former follows the judiciary system and can produce out-of-court settlements. The latter is commonly used in rural areas to resolve water right disputes. Usually there are several levels of arbitration, beginning at the village level and ending up at the tribe's sheikh of sheikhs.

3. *Recent trends*

One of the most recent and comprehensive pieces of water legislation in the ESCWA region has been Presidential Decree No. 154, issued in 1995, defining the functions and responsibility of the National Water Resources Authority (NWRA) in Yemen. The NWRA decree seeks to merge all water resource activities undertaken by various ministries and water authorities, including the Ministry of Agriculture and Water Resources, the Ministry of Oil and Mineral Resources, the Department of Hydrogeology, the National Water and Sanitation Authority, the Rural Electrical and Water Supply Board, and the Technical Secretariat of the High Water Council. These merged authorities are to become part of the responsibility of the NWRA. The NWRA has been mandated with responsibility to undertake the formulation of a national water strategy, policies and plans that are needed to ensure proper development and management of water resources within the context of the country's socio-economic development plans. Decree No. 154 also grants the NWRA the authority to guarantee optimal development and management of water resources. The organizational structure of the National Water Resources Authority is shown in figure II.

The responsibilities of the NWRA consist of the following:

(a) Proposing national water resources policy and submitting it to the Council of Ministers for approval;

(b) Implementing the approved policy in consultation and coordination with relevant agencies;

(c) Carrying out surveys, studies and research aimed at the optimal development and management of water resources;

(d) Enhancing water resources management at the basin level;

(e) Establishing and managing a water resources data bank including collection and dissemination of information;

(f) Preparing a draft of laws, by-laws, and regulations related to water resources, including their implementation, as well as mediating in water disputes;

(g) Regulating exploitation of water resources through the issuing of permits for construction or deepening of wells, or for construction of dams. Regulation also includes field inspection, supervision and evaluation of water usage, monitoring of violations, and cancellation of permits;

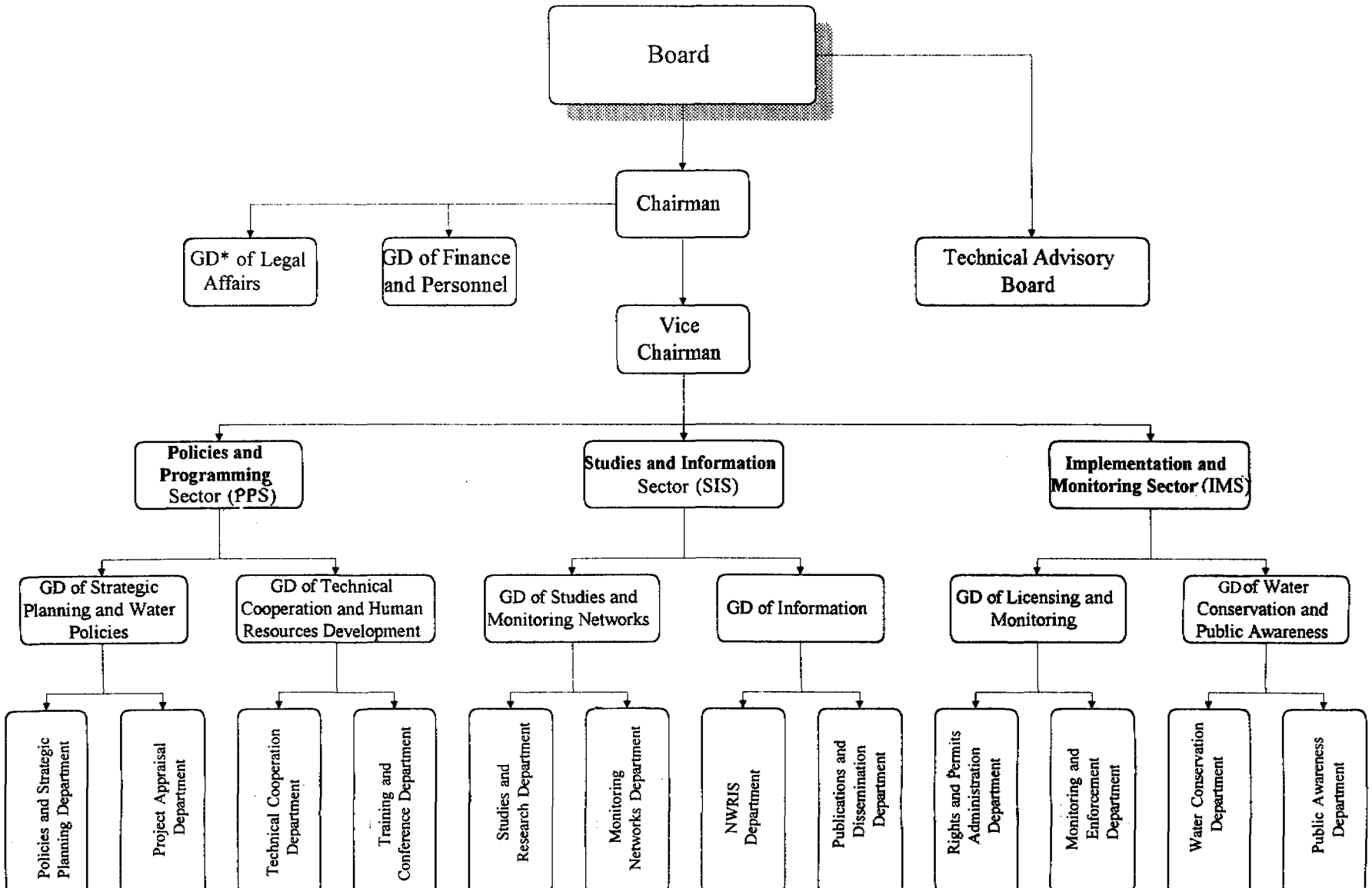
(h) Reviewing, evaluating and coordinating all water resources development projects, including those undertaken in the private sector, prior to consideration of development and financial plans;

(i) Regulating and supervising the water drilling industry and related consulting firms and contractors;

(j) Organizing and managing a registration system for water rights;

(k) Administration, operation and maintenance of water resources monitoring networks in coordination with relevant agencies;

Figure II. Organizational structure of National Water Resources Authority in Yemen



Source: *Basic Documents for the Establishment of the National Water Resources Authority,* final report, The High Water Council (UNDDSMS/Project YEM/93/010), 1995.

* GD - General Directorate.

(l) Coordination and consultation with water authorities for the purpose of proposing appropriate measures and incentives to rationalize water resources utilization and management;

(m) Developing and implementing public awareness campaigns as well as securing community participation in the water management process;

(n) Developing and coordinating internal and bilateral cooperation programmes in the water sector;

(o) Achieving equitable allocation and sustainable use of surface and groundwater resources in consultation and coordination with the ministries concerned;

(p) Developing, implementing and supervising short- and long-term training plans in water resources development and management;

(q) Organizing water resources conferences and seminars, as well as representing the Government in regional and international meetings and conferences.

Increasing competition for the use of surface water and groundwater resources in Yemen, combined with lack of effective legislation and control over water allocation, utilization and management, is contributing to the depletion of the existing groundwater resources. The recognition of the importance of implementing a national water policy, as well as the need to delegate enforcement power to the recently established National Water Resources Authority to achieve desirable socio-economic development, has compelled the Government to develop effective legal water tools.

In addition to the creation of the NWRA in 1995, serious efforts have been made in the last five years to formulate effective water legislation. Two water legislation laws have been drafted, one by the Technical Secretariat of the High Water Council, and the other by the Ministry of Agriculture and Water Resources. However, conflicts of interest with regard to function, and competition between the water authorities, have resulted in a delay of the formulation and enactment of water legislation. To overcome this problem, the Government assigned an independent team of national experts with backgrounds in water and water-related fields to draft a comprehensive national water law document. The national expert team recently completed a draft of the water law, which is being reviewed at different Government levels as well as by water-resource and water-law experts from within and outside the country.

The draft form of the proposed law, formulated by the national team and known as the Water Resources Law, is currently under consideration by the Government of Yemen. It represents the most comprehensive and up-to-date legislation to have undergone revisions in the region. Owing to its comprehensive nature, the draft law has been cited in this document for the contribution it can potentially make to countries that are planning to draft new legislation or update current water laws. The draft law seeks to facilitate the optimal use and protection of water resources in Yemen.

The draft of the water law defines the basic guidelines governing specific water resource conditions within the country. It addresses the establishment of water basin committees, water use priorities, water rights and water use permits, and defines technical criteria and standards for water use. The main procedures for conservation and protection of water resources are also outlined. The draft law contains a system of enforcement procedures and penalties with regard to water resource development and management.

The proposed water law consists of 98 articles distributed among 9 sections covering topics ranging from general objectives to water rights and penalties. The basis for formulation of the law and the goals for

establishing such water laws are reviewed in the first section under the title "General provisions and goals". The main features of this section include the recognition of water specifically as a natural resource, which implies that it is part of the public domain. This section also delineates the role of the Government in undertaking water activities that serve the public welfare. The importance of groundwater as the main source requiring special consideration is recognized by stating that all benefactors of the source be required to share duties and responsibilities for its protection from depletion and pollution.

The need to manage water resources is addressed in section 2 of the draft law, which identifies management principles based on the country's hydrological divisions in cooperation with the responsible water basin committees. These water committees are to be linked to the appropriate branch of the NWRA and are responsible for monitoring and follow up of basin plans and implementation at the hydrological basin level. Water resources are to be managed according to the general policies proposed by the NWRA, as issued by a Government Cabinet resolution.

Section 3 of the draft water law deals with various aspects of water resource planning, including the delegation of responsibility to the NWRA for formulation of water plans for basins throughout the country. A number of the articles establish guidelines for the formulation of such plans, as well as the contents of the plans. This section empowers the NWRA to review water-related development projects according to certain criteria, including maximization of economic and social return for each cubic metre of water utilization. It also states that the operation and maintenance costs of water structures are to be borne by the benefactors of the facilities.

Important aspects of the draft water law are contained in section 4, which addresses five main issues: water use priorities, rights of servitude, water rights, permits, and technical criteria and standards. With regard to water use priorities, drinking requirements are given absolute priority over other uses. This section also states that water should be appropriated according to established priorities set forth in each basin plan. Under the rights of servitude, the NWRA is granted permission to enter any private, commercial or industrial establishment or the premises thereof, for the purposes of making water resource measurements, taking samples, or carrying out field investigations. Water rights are divided into three main categories: traditional rights to flood water; rights to natural spring or flowing water on private property; and rights acquired by permits for all water sources, including wastewater and drainage. Provisions are made with regard to the ownership of water rights to irrigated land. The right of the State to acquire rights is recognized as being in the public interest, with requirements for just compensation to the owner. Under this section some of the law's articles recognize traditional surface water rights, as well as those of the owners of groundwater wells, and require their registration with the NWRA within a specified period. The NWRA is mandated to administrate water rights and regulations dealing with water resource development and utilization, as well as enforcement. The draft law requires that permits be obtained from the NWRA for the purposes of drilling, deepening a well, increasing the capacity of a well, and selling groundwater.

The construction of any surface water structure that serves as a water storage vessel or that blocks flood water, as well as the diversion of water away from its natural course, requires a permit. Well drilling permits are not transferrable and have a six-month limitation. The well must be dug according to registration requirements. The draft water law also contains articles defining the responsibility of the NWRA for control of the magnitude of water extraction and the regulation of well drilling equipment and material imports. There are also articles dealing with the establishment of criteria and specific zones for the protection of wells, springs and streams from hydrologic interference. In addition, standards are defined for the construction of surface water structures, as well as standards of quality for industrial and irrigation water and treated wastewater.

Other relevant parts of the water law address water resource conservation and protection (section 5), flood control (section 6), and means for enhancing development of water resources (section 7). Under the draft law, the NWRA would recommend and adopt water conservation measures, following Cabinet approval, including regulations for water transfer in and outside of hydrological basins, with priority being given to water for domestic requirements. Regarding the protection of water resources from pollution, the law prohibits the discharge of all pollutants, regardless of their form.

Section 6 outlines the role of the State in the implementation of flood mitigation measures, including flood warning systems, zoning, and protective structures. The draft law recognizes that the water sector carries out development and planning using Government-allocated funds which are generated through fees and charges on drinking water and industrial and commercial utilization.

Enforcement procedures and penalties represent one of the major factors needed to develop and manage water resources efficiently. The relevant articles of the draft law provide the NWRA staff with the authority to monitor and inspect water activities in order to identify infringements and offenses. Three types of penalties can be levied for violation of the law: fine, imprisonment, or both. The majority of violations have specified imprisonment terms and maximum fine amounts. In some cases it is the prerogative of the court to set the limits.

The final section of the law recognizes the National Water Resources Authority as the sole institution responsible for formulating water policies and strategies, including planning, development and management of all water resources.

4. *Selected articles: draft water resources law*

The proposed law contains many articles dealing with groundwater resource ownership, investigation, development, monitoring and management. In consideration of the important contribution of groundwater sources in meeting sectorial requirements in Yemen, as well as in other countries of the Arabian Peninsula, the most relevant articles are cited here, as they may be of benefit in the drafting of future water legislation and regulations.

(a) *General water regulations*

Article 3:

All water resources which exist within the boundaries of the Republic, whether on the land surface or underground, are considered natural resources owned as public property, and the State shall orient and organize their exploitation so as to serve public welfare.

Article 5:

Groundwaters shall be considered natural resources shared among their beneficiaries, according to the law. Each benefactor from any groundwater reservoir shall enjoy the right of benefaction from that resource without harm to the welfare of the group of other beneficiaries, and shall bear the same duties which are imposed on them in regard to the conservation and protection of these resources against depletion and pollution. The State intervenes to organize these rights and duties through the imposition of protection measures on these reservoirs, whether at basin level or at the level of the Republic as a whole; and the prevention of their exploitation except by prior permit, in accordance with the provision of this law and its implementing by-laws and regulations.

Article 27:

By a water benefaction right, the holder is authorized to use a specified volume of water out of the total water available annually for use from a certain aquifer or aquifers or from the lake behind a dam, as determined by the Authority. In all situations, the benefaction right shall remain appurtenant to the land it was allocated to irrigate or to the use it was allocated for. The by-laws shall determine the rules and provisions by which this right is regulated and the exceptional cases under which this right may be separated from the land or the type of use may be changed.

Article 34:

The utilization of groundwater and dam water shall be forbidden and the rights to benefaction from these waters cannot be acquired except by a permit to be issued in accordance with the provisions of this law and its implementing by-laws and regulations.

Article 36:

Benefactors of groundwater wells drilled prior to the issuance of this law, whether used or unused or abandoned, shall register these wells with the Authority within a period of three months from the date of the announcement by the Authority of the duty to register such wells and enjoy the benefaction right in accordance with the provisions of this law. The registration period may be extended at the discretion of the Authority for a similar period. A non-registered well shall be treated as an unauthorized well in front of this law.

The Authority shall issue a receipt for each well registration application received. However, the well registration certificate shall not be issued until after field verification of the information given in the registration form.

Article 37:

No individual or group or entity of the Government, civil or military, or any private legal entity may drill water wells, or develop or deepen such wells or increase their capacity or test their yield or maintain them or equip them with pumps by using drilling rigs; or construct any surface water structures to block or store floodwaters or divert such waters away from their natural course except after obtaining a prior permit from the Authority.

Article 38:

The Authority shall review the permit applications submitted according to the previous article, whether for drilling of wells or construction of surface water structures; and may grant these permits or require additional information on these wells or structures or modify their specifications or deny these permits because of the water resources situation in the region or for any other objective reasons in the public interest. Permit denials shall be justified to the applicant in writing. The by-laws shall define the rules and procedures to implement the provisions of this article.

Article 39:

Before a permit is issued, applicants for any of the works mentioned in Article 37 of this law must deposit with the Authority a performance bond of 1 per cent of the estimated cost of the authorized work, the purpose of which is to ensure the seriousness of the applicant, and adherence to the

conditions and specifications as set in the permit. Water wells and structures financed totally or partially by the Government shall be exempted from this provision.

Article 40:

By the powers of this law, water-well drilling permits shall be revoked unless the authorized person completes the drilling works within six months after issuance of the permit. In all situations, it shall be forbidden for the holder of a permit to lease his permit to another person, whether for free or for a compensation, except by prior permit of the Authority.

Article 41:

Holders of permits to drill water wells or construct surface water structures shall approach the Authority within 15 days after completion of the authorized works to register their wells or surface water structures and acquire the water right; and to provide the Authority with a copy of the work completion certificate and submit the technical information form issued by the Authority after the certificate has been filled out by the contractor, so that the Authority may issue the registration certificate and release the performance bond.

In all situations, it is forbidden to begin withdrawing water from the drilled well or the constructed structure and enjoy the water benefaction right until the registration procedure is completed in accordance with the provisions of this law.

Article 44:

Effective from the date of the announcement by the Authority via the media, it shall be forbidden to practise any of the following businesses except after obtaining a permit from the Authority:

1. The drilling of water wells or the development or deepening of such wells or increasing their capacity or testing their yield or maintaining them or installing pumps on such wells using drilling rigs, or constructing any surface water structures to block flood waters or store or divert such waters away from their natural course;

2. The exploration for groundwater or the execution of consultative studies and works in the field of water resources, by individuals and private firms;

3. The sale of water from wells, either directly or indirectly, through private supply networks or by bottling, by individuals or private companies.

   All natural and legal persons who are engaged, at the time of issuance of this law, in any of the businesses mentioned above must approach the Authority within 30 days from the date of the call issued by the Authority via the media to register themselves, or their offices, firms, or companies and obtain the permits to practise their respective businesses. The by-laws shall outline the rules, provisions and procedures to implement the provisions of this article.

Article 46:

It is forbidden to import water well drilling rigs or any of their auxiliary equipment or spare parts or drilling material or metal casings of wells or other supplies for water well preparation, or to

market or trade in any of this equipment and material except after prior agreement of the Authority. The Authority may issue a resolution in which it lists the equipment and material whose importation shall be subjected to prior agreement in accordance with the provisions of this article.

Article 47:

The following works shall be subject to technical criteria and standards:

1. The drilling, development, completion and testing of water wells and all technical work relevant to such wells;

2. The *haram* around wells, well fields, springs and baseflow.

The by-laws shall define these criteria and standards as well as the rules and procedures to implement the provisions of this article.

Article 74:

Every contractor who proceeds to drill water wells or construct any surface water structures to store floodwater or divert it away from its natural course, without being licensed by the Authority to conduct such business, shall be imprisoned for a period not to exceed three years and fined no less than 150,000 Yemeni rials (YRls). Should the violation be repeated, the drilling rig shall be confiscated, for drilling contractors, or the contractor's licence shall be suspended for three years, for contractors of surface water structures.

Article 75:

Every drilling contractor or contractor of surface water structures who is licensed for this business, and who proceeds to drill, or develop or deepen water wells or increase their capacity or test their yield or maintain them or equip them with pumps using drilling rigs, or proceeds to construct any surface water structures to divert floodwater from its natural course when the beneficiary has no valid permit to perform such works, shall be imprisoned for a period not to exceed two years and fined no less than YRls 100,000. Should violations be repeated, the penalty shall be doubled. Should the violation be committed for a third time, the drilling rig shall be confiscated, for drilling contractors, or the contractor's licence shall be suspended for three years, for contractors of surface water structures.

Article 76:

Every person who proceeds to drill or develop or deepen water wells or to increase their capacity or test their yield or maintain them or equip them with pumps using drilling rigs, or proceeds to construct any surface water structures, whether to store floodwater or divert it away from its natural course, whether for personal use or for the benefit of others, and whether for remuneration or for free, without having a permit for such works from the Authority, shall be imprisoned for a period not to exceed two years and fined no less than YRls 100,000 or penalized by either one of these two penalties. Multiple penalties shall be applied to multiple violations.

Article 80:

Every person who imports or brings into the country any equipment for water-well drilling or supplementary equipment or spare parts for such rigs or drilling material or metal casings of wells or other supplies for water well preparation, in violation of the provisions of Article 46 of this law, shall be imprisoned for a period not to exceed one year and fined no less than YRls 100,000; or penalized by either one of these two penalties.

Article 81:

Every drilling contractor or contractor of surface water structures or owner of a consulting office or any person engaged in the water selling and trading business who does not register within the period defined in Article 44 of this law to obtain a work permit shall be imprisoned for a period not to exceed six months and fined no less than YRls 50,000 without prejudice to the late registration fines as defined in the by-laws.

Development, protection and management of surface water, which consists of flood run-off, base flow and spring discharge, are the subject of various articles in the water resource law. Selected articles governing surface water are given below:

(b) *Surface water regulations*

Article 28:

The traditional rights to benefit from naturally flowing flood waters shall be preserved, as long as they are used for irrigation. These rights shall be subject to traditions and customs which are recognized in each region within the country.

Article 29:

Private ownership rights on surface water which exist prior to the issuance of this law, on the waters of natural springs and baseflow, shall remain preserved as acquired traditional rights, without prejudice to the rules of registration and provided that they remain allocated for the purpose they are prepared for, so that if the benefaction right belongs to a certain agricultural land then it remains allocated for the irrigation of that land, and if its ownership is changed to another owner then it necessarily transfers to the new owner, and if the land is divided then the water is divided proportionally.

Article 30:

Holders of traditional water rights on flood waters and private ownership rights on the waters of natural springs and baseflow, which are acquired in accordance with the two previous articles, shall be subject to the technical instructions, measures and directions emanating from the Authority and aiming at the improved utilization of these waters, the rationalization of their use and the protection of their quality against pollution.

Article 32:

Holders of those rights acquired on water in accordance with Article 29 of this law are required to register their rights with the Authority within a maximum period of one year from the date of the

announcement by the Authority via the media, or the beneficiaries shall be subject to penalties in accordance with the provisions of this law.

Article 33:

Except for the traditional rights to benefit from flood waters and the private ownership rights on surface water which are defined in Articles 28 and 29 of this law, all other sources of water; whether groundwater, dam water or other water, shall be considered public property and the users shall only have the right to benefaction in accordance with the provisions of this law.

Article 35:

The Authority shall keep a Register of Water Rights which shall include private ownership rights on surface water as well as the authorized benefaction rights. The by-laws shall define the rules for registration and cancellations of water rights.

Article 85:

Every owner of a private ownership right on the surface waters in accordance with Article 29 of this law who does not register within the period specified under Article 32 shall be fined no less than YRls 20,000; without prejudice to the late registration fines as defined in the by-laws.

Article 87:

Every person who commits any of the following violations shall be imprisoned no more than two years and fined no less than YRls 100,000:

1. Commits any of the prohibited actions of Article 56;

2. Discharges any liquid wastes of industrial, or agricultural, or commercial, or medical sources into the public sewer system, without having the required licence;

3. Begins transport or discharge of liquid wastes before obtaining the necessary licence from the Authority, or continues his activity after the period defined in Article 59 of this law, without adjusting his situation in accordance with the provisions of that article;

4. Sells water for drinking and household purposes without carrying out periodic analyses of water samples and providing the Authority with the results;

5. Violates the conditions and technical standards shown in his waste-discharge licence.

(c) *Water allocation regulations and fines*

Article 22:

The waters of each basin shall be used in accordance with the priorities and the purposes stated in its water plan. In all situations, drinking and household water use in urban and rural areas shall have absolute priority in the water plans of all basins before any other use. The same level of priority shall be given to the quantities of water necessary for public places.

Article 23:

Without prejudice to the provisions of Article 23, water may be allocated for the following uses:

1. Drinking and domestic use, including the drinking water for household animals and public uses in cities and rural areas;

2. Drinking of commercial animals and wildlife;

3. Irrigation uses;

4. Industrial uses;

5. Environmental, recreational and aesthetic uses.

Article 27: Addresses water rights and allocation from surface water sources (see [a] General water regulations).

Article 34: Regulates utilization of groundwater and dam water through permits (see [a] General water regulations).

Article 42:

Without prejudice to the penalties outlined in section VIII of this law, the Authority may temporarily suspend the water benefaction right for a certain period or amend it or revoke it if any of the following holds:

1. If it is proved that the beneficiary provided the Authority with false or misleading information, on the basis of which the permit and registration were issued;

2. If the water is used for purposes other than that specified in the permit, or if the beneficiary violates any of the conditions of the permit;

3. If the beneficiary wastes the water or uses it wastefully, and refuses to comply with instructions from the Authority to terminate such practices;

4. If the beneficiary gives up the permit to another person without prior permission from the Authority;

5. If the water of the well or surface water structure is polluted and harms public health;

6. If the purpose of benefaction terminates for any reason.

Article 43:

When deemed necessary, the Authority may revise the quantities of water permitted to be withdrawn from any groundwater aquifer or aquifers in proportion to the total resources available from that aquifer. It may also limit the allowable quantity of water withdrawn from each and every well within the water basin, and require the beneficiaries to adopt conservation measures and practices to save water, including the installation of water meters on pumps or it may itself install such meters to

measure discharged quantities. The beneficiaries are required to maintain such meters in good condition. The by-law shall outline the rules and procedures to implement the provisions of the article.

Article 53:

The Authority, after approval by the Cabinet, may give permission to pump specific quantities of surface or groundwaters from one water basin to be transferred on a temporary or permanent basis for use in another basin or basins, provided that all of the following conditions hold:

1. That the water is transferred for drinking and domestic uses only;

2. That the water in the receiving basin is either insufficient to meet the need because of water scarcity or unfitness for drinking;

3. That the transfer causes no harm to the drinking water needs in the source basin;

4. That no other economically feasible measure exists to satisfy the drinking needs of the receiving basin without the need for water transfer.

   In all cases, when several possible source basins exist and the economic costs of transfer from all or some of these basins is close to the cost of transfer from a single basin, then due consideration shall be given to the withdrawal of the required quantities of water from more than one source so as to distribute the impact of withdrawal among the basins.

Article 54:

The Authority shall have the powers to give permission to transfer water from one region to the other within the same basin subject to the same conditions as in the previous article.

Article 63:

All natural and legal entities engaged in the business of water selling for drinking and household purposes, whether directly from wells or by bottling and trading, shall periodically, as determined by the Authority, analyse samples of these waters in laboratories approved by the Authority. The results shall be submitted to the Authority.

The Authority may, at any time, inspect these sources and analyse samples of their waters to ascertain compliance with approved standards. The by-law shall define the rules and measures to implement the provisions of this article.

Article 77:

Every person who sells water from any source, or bottles and trades water, or transports it for the purpose of selling, in violation of Article 44 of this law, shall be imprisoned for a period not to exceed one year and fined no less than YRls 100,000.

IX. FRAMEWORK FOR EFFECTIVE DEVELOPMENT AND MANAGEMENT OF WATER RESOURCES

A. ENFORCEMENT OF LEGISLATION

Efficient development and management of water resources, especially in the ESCWA region where water resources are scarce, require the implementation and enforcement of effective legislation. The basic requirement for implementation and enforcement is that the legislation be accepted by the population and other interests that may be affected by it. Another important element is that legislation be clear and unequivocal for all water sector activities. The rules, regulations, and special provisions contained in the legislation should be clearly defined, along with the identification of authority of the water institution responsible for its administration and enforcement.

Implementation and enforcement can be carried out through sanctions and penalties to be imposed for every offence or misdemeanor that violates the provisions of the water code or any legal enactment regarding water matters. Sanctions and penalties should be strictly enforced against users who do not respect water regulations, permits, licences and concessions. Penalties should reflect the degree of the offence, ranging from simple administrative fines to imprisonment. Offenses may include damage or destruction of water works or structures and interference with official administration of water law permits, regulations, or requirements of those utilizing water. In the case of repeated offences, there must be some legal provisions where enforcement mechanisms involve seizing, destroying or impounding, either temporarily or permanently, any equipment or buildings utilized in illegal activities.

Implementation of water legislation can be enhanced by building trust in legal instruments when they are available as part of a fair judicial process. An appeals process through either water tribunals or water courts can be used to build trust in a fair justice system and make the enforcement and implementation of water legislation acceptable to the community. An appeals process must be an integral part of any water legislation so that claims by anyone against the decisions of water authorities, who are mandated with the implementation of the water code, can be challenged in a legal manner. The first appeal against administrative decisions with regard to all water issues, including the granting of water rights and permits, should be addressed to the chief of the water authority (ESCWA, 1996a). Further appeals should be allowed against negative decisions of the chief authority, which could be referred to other ministries or regular water courts.

Water tribunals or water courts can contribute to the process of implementation and enforcement of water law. Courts dealing exclusively with water matters can help resolve conflicts of water ownership and water use, protect the rights of water users, provide fair and legal means of addressing complaints, establish justice, and make permit enforcement easier. The functions, procedures, jurisdiction and composition of the water courts should be specified in the water law. The courts functions would be to review, judge, and settle disputes between different public parties or between the public and water authorities. The functions of the court could also include judgements on existing water rights, conflicts in water use, the magnitude of compensation to be paid for lost water rights, and on any other water-related dispute. The court may be given the power to issue rulings on penalties, sanctions, and other punishments against violators of the water law, which can then be implemented by an enforcement authority.

The jurisdiction of the water courts could be a basin, sub-basins, country or an entire region, depending on the mandate of the country's legal system. Court procedures could be designed according to the existing legal system or administrative rules, in order to be conducive to achieving optimal development and management of water resources (ESCWA, 1996a). The composition of the court could include one or

two judges and two to three water specialists. A court's judgement would need to take into consideration water law, the public interest, local requirements, and emergency circumstances.

In regard to the role of water institutions in achieving effective implementation and enforcement, they need to possess the qualities of persuasiveness, trustworthiness, neutrality, integrity and impartiality. It is critical that the task of water management be performed in a neutral fashion without a hint of conflict of interest (ESCWA, 1996b). In addition, the institutions empowered to implement and enforce water regulations should have the financial and human resources required to achieve their task. The jurisdiction and mandate of the concerned institutions should be clearly defined and should be supported by effective legal and policing measures. The water administration should be empowered to inspect sites at all times, as well as install devices deemed necessary to implement the water code.

B. INSTITUTIONAL REFORM

Institutions play a dominant role in the water sector. They are usually created to perform certain well-defined functions. In the water sector, legislation is formulated to implement institutional functions. Institutions may be mandated to deal with the assessment, development, distribution,and management of water resources (ESCWA, 1996b).

Enhancement of institutional arrangements can be achieved through defining legal responsibilities and granting power to water authorities to exercise rights and carry out their duties. In the context of drafting a modern water law, there is a need to address the issues regarding the type, legal power and jurisdiction of water institutions (ESCWA, 1996a). The water code must define the function of the water authority with regard to water resources investigation, development, utilization, monitoring, protection, management, and provision of services. The law must include provisions for these institutions to grant permits, licences, concessions, or rights, and the power of enforcement for the purpose of extraction and use. These provisions may include supervision and the enforced distribution of water among users in accordance with legal rights.

Water law must identify the type of institution according to its intended purpose. Water institutions are classified according to function, including assessment, development, water supply, and water management. Water supply institutions are responsible for assuring adequate water supply treatment and distribution to users. However, in the future, responsibility for making water available may be the responsibility of private entities including privatized governmental institutions. For this type of institution, legislative efforts need to be concerned with water supply regulations to protect the basic interests of the users with regard to quantity and quality. In addition, legislation may need to establish operating guidelines to ensure that the institutions provide users with reasonable access to the available water.

Water resource management institutions, which are responsible for water allocation and planning issues, have received significant attention in the past several years, especially in areas with scarce water resources. Institutions dealing with these issues focus on coordination among multiple areas of specialization and water user sectors. Water management institutions can also achieve organization in some critical areas such as institutional mechanisms for water allocation with regard to the creation of new water rights through the issuance of water use permits for new rights and management of trade in water rights (ESCWA, 1996b). An institutional mechanism can also establish charges for public water use, as well as fines for pollution.

Another type of institution is responsible for wastewater and environmental protection. Wastewater facilities may operate independently, or jointly with water supply facilities under one institution. Legislation requirements resemble those for water supply facilities. Legislation is required to prevent undue harm to the people or the environment.

Water resource institutions should be empowered by the water law to act when emergency circumstances arise; they should be able to declare certain areas to be protected or restricted as well as ration water as required for appropriate water development and management (Caponera, 1992). The mandate may also include limitation of existing rights to use water, the imposition of limits on water withdrawal or diversion, and the prohibition of certain uses. The specific provisions for power granted to the water institutions through the water law may include other limitations or obligations believed to be in the interest of public security and health, as well as necessary for the preservation of the environment. However, separation must be made between exceptional provisions extending power over a limited period, and regular administrative control over water (Caponera, 1992).

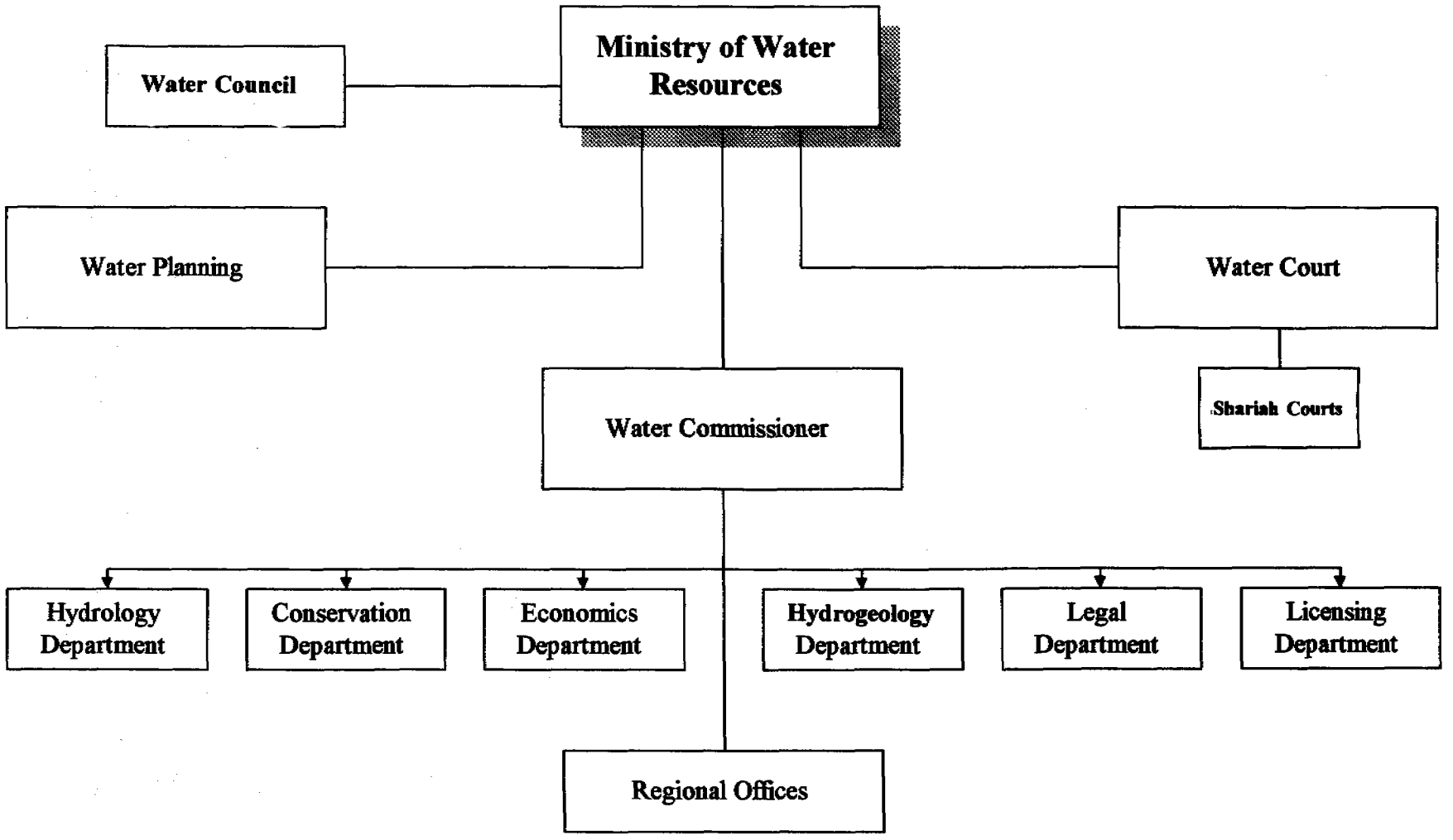
It has been recognized that integrated development and management of water resources requires, to a large extent, the existence of an organized and efficient water authority operating within an institutional framework. Such water authorities or institutions should be mandated to take charge of the administrative aspects of all water issues in order to ensure successful implementation of governmental water policy. The policy objectives are to achieve the most appropriate economical, social and rational use of water, as well as to develop and conserve the available water resources in any country. Thus, water institutions may necessarily have extensive obligations with regard to the investigation, development, monitoring, protection and management of water resources.

The creation or reorganization of institutional frameworks which incorporate both development and management aspects of water resources is the concern of both developed and developing countries. As most of the ESCWA member countries have established water ministries, councils, or authorities, emphasis may now be placed on institutional reform with regard to the coordination and strengthening of administrative jurisdiction.

In most of the ESCWA member countries, more than one ministry deals with water and water-related activities, although recently some countries have placed their water-related activities under the jurisdiction of a single water institution. The idea of a centralized water institution may be appealing for the development and management of water resources; however, in reality there is no clearly defined solution for the countries in the region. In addition, detailed solutions enhancing institutional arrangements can only be organized based on the prevailing conditions for each individual country. Two possible institutional frameworks for developing and managing water resources are illustrated in this study. Figure II illustrates the organizational structure of the National Water Resources Authority in Yemen. As a general guideline, figure III offers an equally well thought-out framework for a water institution (Caponera, 1992; ESCWA, 1996a). The most relevant issue is the need to establish coordination among the various agencies and departments operating below the ministry level, although coordination must be made obligatory at all levels. The water law or separate legal instrument should specify obligatory coordination and implementation mechanisms among ministries dealing with water and water-related issues, as well as among departments and independent water institutions. The coordinating legislation should address this problem at every level and define the powers, function and responsibilities of each entity involved.

To overcome coordination problems among ministries, the establishment of a water resources council may be a possible solution, as in Oman and the United Arab Emirates. The members of the council may be ministers with sectoral responsibility in water and water-related issues, as well as representatives of the private sector. The council may be given the authority to make decisions on setting up water policy objectives, accepting water plans, allocating funds for water investments, answering financial questions concerning water, and implementing water policies including pollution control and environmental protection (Caponera, 1992).

Figure III. Water management administration



In addition to a water council, it may be appropriate to establish in parallel a national water commission with members from ministries with technical and economic interests. This commission would have to ensure, on the national level, institutional cooperation and coordination from the technical and economic standpoints (Caponera, 1992). The water law may specify the nature of the commission either as an advisory or executive body, as well as the binding force of its decision-making capacity. The relationship between the council and the commission must be addressed within the water code.

At the regional level, a basin management authority with the power to execute projects may be appropriate. At the local level, water users' associations may be very effective, particularly in the area of administration of water rights. The establishment of a single unified water institution would contribute to enhanced coordination. The centralized water institution could be responsible for functions such as executing decisions, evaluating, controlling, monitoring, inspecting and managing all water resources and water-related activities.

Another option for enhancing institutional arrangements is the establishment of two distinctive types of institutions, one with regulatory and the other with developmental functions. The regulatory institution would act as a policy-making body responsible for coordinating all activities related to water utilization by various users. The other institution would be responsible for the actual development and utilization of water resources. A legal enactment would be necessary to establish the link between the regulatory water administration and the developmental institution.

It can be seen from the above that institutional arrangements can be improved through effective coordination mechanisms supported with legal instruments. Various options to achieve coordination and cooperation have been presented, and the criteria depend on the circumstances within each country. Water legislation should clearly indicate the responsibilities of the water institutions in charge of water resources, and provide them with the necessary power to implement of their functions.

C. MODERN WATER LAW REQUIREMENTS

In the ESCWA region most member States, with the exception of Egypt and Iraq, depend mainly on groundwater resources. In addition, they share similar climates, water sources, constraints and economic development objectives. Thus, it is logical that countries of the region should pursue similar water legislation and formulation of institutional frameworks. In regard to shared water resources, the countries should develop and implement technical and legal frameworks to enable coordination as well as the formulation of common legislation to optimize development of their shared water resources.

It is evident from the above review that some of the ESCWA member countries have updated existing water legislation, or are in the process of updating and formulating new water legislation, and have attempted to centralize their water institutions. However, content, coverage, and jurisdiction of their water legislation may fall short of meeting requirements for achieving effective development and management of water resources. Further effort is still needed to overcome fragmented institutional arrangements, as only a few countries have actually achieved centralization. In addition, future efforts need to be focused on the drafting of effective legislation with the flexibility to cope with integrated development activities and the challenges of meeting water requirements. In the following section, ideas are suggested on what constitutes modern water legislation. The emphasis on components of a given code depends on the nature of water resources as well as the socio-economic conditions in the countries concerned. In order to achieve effective and implementable water laws, some basic considerations for drafting or amending water legislation (Caponera, 1992; ESCWA, 1996a) are given below.

1. *General requirements*

The basic principles of an effective water code are: simplicity, clarity with regard to legal aspects, specificity, social acceptability, and the requirement of minimal organization for enforcement. Institutional administration of water laws at every level may be either part of the water code or another special legal enactment (ESCWA, 1996a). Political, social, economic, religious and administrative implications should be given due consideration. A new law must be compatible with existing systems and be able to maintain its role in achieving its objective. Water legislation should also take into consideration the following:

(a) National and regional availability of water;

(b) Water utilization by various users for different purposes;

(c) Environmental consequences of water development;

(d) Cost of water development, production and distribution from different sources;

(e) Present and future water requirements of the country or region;

(f) The Government's water policies, plans and strategies;

(g) Function and jurisdiction of water and water-related institutions, including the private sector;

(h) Ownership or other judicial status of water resources;

(i) Mode of acquisition of the right to use water, and limitations;

(j) Order of priorities among regions, sectors, areas and users;

(k) Provisions for preventing, controlling and/or mitigating the harmful effects of water such as floods or salinization;

(l) Provisions for water quality control and prevention of pollution;

(m) Measures to protect waterworks and structures;

(n) Setting up of water rates and fees and financial resources;

(o) Provisions for declaring special water resources development or conservation zones, as well as a mechanism for implementation and enforcement of water legislation;

In addition to the general requirements mentioned above, modern water law should include special emphasis on the elements concerning water sources, water policy, ownership, water rights, priorities for water allocation, beneficial uses of water, provisions for groundwater sources and pollution controls.

2. *Water sources*

In drafting legislation, it is necessary to consider the nature and availability of water resources in time and space, current and future water demand, and intended purposes, over specified time horizons. Consideration should be given to the cost of water production, distribution and maintenance, as well as to

trends in socio-economic development. Water laws should encourage activities in regard to the development and conservation of water sources and environmental preservation. The major objective of legislative efforts should be to achieve the most rational management of all the available water resources, including privatization of water services. The notion of rational management includes economic efficiency, requirements for the benefit of society and State development objectives. A water law must recognize that water resource development, from surface and groundwater sources, and distribution entail costs that may be partially defrayed by the consumer. It should also include clauses relating the financial aspects of water resource development, utilization and management. Water management objectives should include the integration of all activities into a comprehensive water plan. The water law also may contain certain provisions governing hydraulic structures: primarily, the design, construction, operation, maintenance and inspection of pumps (Caponera 1992; ESCWA 1996a). The water code may designate agencies to be responsible for this field. The water code should establish proper legal and administrative coordination mechanisms between the water sector and other sectoral functions. The water code may also include regulations for the establishment of a protective parameter or *haram* around water works and structures to avoid pollution and/or public hazards.

3. *Water policy*

Those responsible for drafting a new water law or updating an existing one should allow for a range of possible scenarios for the execution of water policy within a framework of flexible directives (Caponera, 1992). Water policy decisions should define water source ownership; user rights; priorities according to region or use; limitations, restrictions or obligations governing users; and the method and magnitude of water charging. Following the concept of an integrated approach, policy decisions should also define water planning procedures, the level of planning, the extent of involvement of specialists and decision makers, and the relationship of water to other national resources and water sector users.

4. *Ownership*

An effective water code needs to address all possible water ownership situations in a systematic, clear and concise manner. In the past, water ownership has caused confusion and disputes, leading to the need for implementation and enforcement of water law. A distinction needs to be made between water ownership and water rights. The distinction between water ownership and water rights is relevant to the administrative aspects of water management, especially during the implementation and enforcement of water codes. Water ownership covers different aspects of possession, transfer and utilization, including the right to use water. In general, ownership should define the right to dispose of water as a property through sale, donation, transfer, or inheritance, at the discretion of the owner. It is appropriate that any water code define the legal status of water ownership within a country, including the various types of sources under consideration. Water codes may emphasize that water should be declared State property, and therefore subject to State control, especially groundwater.

The separation of water rights from land ownership should be established in the proposed water law. It is appropriate to transfer ownership of groundwater to the State. With regard to the mobility of groundwater, it can be treated in a manner equivalent to property rights. Water ownership should also address the exact volumes of water to be allotted to property such as farmland; delimitation of sources; point of extraction; location of diversion works or wells; purpose; and the location where the water is to be used (ESCWA 1996a). Water law must consider the interest of the public in regard to private ownership, particularly in the case of groundwater. Private ownership may be addressed in the water law or in a separate legal enactment. It is appropriate to compile a public water index registry for the purpose of administering all types of water ownership rights. Finally, an important element that should be addressed in any water law is the right to use water for different purposes.

5. *Water rights*

Public water rights can be defined as the right to use water, subject to Government authorization through permits, licences or concessions. These regulations should determine the quantity of water to be used, as well as the intended purpose. Private water use should be free, but should be limited according to the principles governing private property rights. Any right to use water without the need for administrative approval should be clearly specified in the water legislation.

The right to use water, which differs from water ownership, can be successfully controlled through permit regulations. A permit system should apply to all types of water utilization, including municipal, industrial and agricultural effluents. Different types of water use permits should be specified in the water law. A distinction may be made according to the type of water use: domestic, water supply, sewerage, rural, mining, industrial, commercial, irrigation, or reuse of drainage effluent. Further distinctions may be established within each type of use. Water law should specify, within the permit, the limit of each type of use, discharge or category of use (Caponera, 1992). The law should emphasize the need for detailed procedures in the granting of permits when dealing with large volumes of water use. Permit type and characteristics as contained in the law should be included in the water law. Procedures for the issuance and enforcement of permits, concessions or licences should be established and stated in the water law.

Effective water law must deal with existing water rights which may have been practised over long periods of time. Existing customary water rights should be recognized; however, the water law should emphasize their registration. The acknowledgment of existing water rights should be subject to the same restrictions as rights granted under water legislation. Another option is to consider these water rights as property rights to be handled by the owner. In the interest of the public, existing water rights, or water use rights, may be reduced or modified but provisions for their administration need to be established. New water laws should restrict the sale or transfer of existing water rights and require the consent of the water authority. The abolition of existing water rights should be accompanied by suitable compensation to those persons who are entitled to them.

The law should also address procedures for granting new water use rights and appropriating public and private land. The law should include a means of compensation when such measures are taken. The rights of the parties should also be protected. The water law should provide for the right of appeal, with regard to the application for water use rights, against water authorities.

The concept of equitable water rights must be recognized as an emerging issue in the region. Equitable water rights should provide the owner with the assurance of undisturbed use of water for a reasonable period of time, adequate to amortize the investment made as well as realize appropriate investment benefits.

6. *Priorities for water allocation*

Priority is very important when dealing with water allocation. Depending on the status of water resources and development objectives, a State usually designates different priorities depending on use. Sometimes, for certain types of water use, priority may be established based on time, or depending on the stage of a country's economic and social development. Priority in water use should also be addressed in water law. However, the setting of water use priorities may cause some drawbacks with regard to the difficulty of changing these priorities, especially when it is expected that social, economic and technological change may take place (Caponera, 1992; ESCWA, 1996a). This consideration should be carefully assessed and provisions should be made for future amendments, if required. The establishment of priorities in water utilization should be left to the discretion of the responsible water authority.

Water law should give priority to use for domestic purposes with emphasis on adequate water quantity and quality. The management of water resources may require that water law establish policies and procedures for the assessment and collection of water charges and fees. In this regard, the water code should consider market forces, social needs, religious motives, the public interest, the availability of water, political requirements and reimbursement policies (ESCWA, 1996a).

7. *Beneficial uses of water*

The beneficial uses of water, including domestic, commercial, recreational, agricultural and industrial, as well as the generation of hydroelectric power, should be regulated through the issuance of permits or concessions specified in the drafted water law. Water legislation should regulate municipal wastewater disposal. Municipalities should be considered as primary users, as specified in the concessions, while the public should be considered as secondary users. In this way municipalities or water authorities have the right to distribute and sell the water granted through concessions to individual users. The extent, location, amount, and means of abstraction and/or diversion of water, as well as wastewater treatment and disposal of waste, should be specified in the concession.

Utilization of water for agricultural purposes should be regulated by legislation that includes a concession or permit system. Specific attention should be given to the agricultural sector, since it is a major water consumer, in order to enhance water resource management. Agricultural water use should be regulated by permit for small farms and by concession for large agricultural companies. Agricultural use should be subject to all requirements and procedures established within the permit or concession system. The regulating permit or concession should specify limitations and obligations needed to guarantee that the public interest is served. These mechanisms should also contain provisions concerning the use of fertilizers, pesticides and any other chemicals that are potentially hazardous to humans or the environment. Water used for industrial purposes should be brought under the water code as well as under the jurisdiction of water authorities or institutions. A water law should address the subject of water pollution control, as well as water reuse and recycling. Permits or concessions for industrial uses should impose all the necessary measures to achieve proper quality control.

In countries with a perennial flow of rivers, the subject of construction, maintenance and operation of hydraulic works including hydroelectric power generation, needs to be addressed within the water law. This topic can be addressed in terms of water allocation with regard to storage intended for this purpose. A section of the water law needs to contain permit and concession rules governing hydroelectric power production and distribution. The water law should contain regulations for plant construction, technical specifications and distribution of electricity generated from the use of water.

The water law should also include water tariffs, and recognize the precedent of previous regulations. The issue of the harmful effects of effluent disposal on water courses, including natural or man-induced actions, can be handled when the water law regulates by permit or concession. Appropriate provisions with regard to obligations and limitations can be inserted in the permit or concession to address water damage.

8. *Provisions for groundwater sources*

Comprehensive water legislation for groundwater sources is lacking and has not evolved far enough to address the increasing complexity of the development and utilization of this vital resource in the ESCWA region. In addition, groundwater development and management functions have customarily been the responsibility of many departments both in and outside of the water institutions concerned. Past legislative efforts have focused on development rather than management aspects of groundwater resources. Most of the existing laws and regulations in the region have dealt with groundwater drilling activities and the

establishment of protective zones. A legal framework to address groundwater resource development and management requires that great attention be focused on the depletion of water sources and pollution. Abstraction in excess of natural replenishment will lead to its depletion; pollution leads to loss of use of the resource. Regulation of abstraction is the key to sustainable utilization of sources. Monitoring sources of pollution ensures the safety and availability of groundwater sources. A legal framework for controlling the depletion of groundwater sources usually includes regulations that restrict development (FAO, 1995). The special nature of groundwater resources with regard to their mobility and renewability, and the risks involved in their extraction and use, make it necessary to enact effective water legislation addressing these issues.

In view of the dynamic nature of groundwater resources, it is essential that the water code in regard to water rights specifically define water entitlements in time and space, limitations, and terms of validity. A water law may include provisions restricting the issuance of water permits for groundwater use to high priority requirements such as satisfying public and domestic needs, with second priority given to industries and other users. The water code should stress basin management, with real time management of surface water through efficient allocation, and establish allowable pumping limits for groundwater.

The water law should include provisions to give water administrators the means to control groundwater exploitation, utilization and conservation. The water law should be subjected to a permit system for the development, monitoring and protection of groundwater sources. The rights of land owners to utilize groundwater freely for reasonable domestic requirements should be recognized in the water law (ESCWA, 1996a). The restrictions and limitations imposed on surface water should also apply to groundwater sources. The water law should disregard the division between surface and groundwater. The interaction of surface and groundwater through the infiltration and recharge process, as well as groundwater discharge through springs, should be given consideration in any new water legislation. The water law should contain provisions with respect to recharging schemes from dams, diversion structures, and recharge wells. The law needs to address a means of rationing this vital source through limitation of pumping volumes or installation of meters or other measuring devices, particularly in areas considered to be at risk of depletion. All means of groundwater development should be regulated by permits and licences according to the manner prescribed in the articles of the water code. The extraction and use of groundwater must be subjected to water use permits.

The water code must address the problem of salt water intrusion into coastal aquifers. Restricting groundwater pumping through regulation is the classical legal system response to preventing and controlling this phenomenon (FAO, 1993). The permit requirement for exploitation of coastal aquifers must evaluate terms and conditions in regard to the quantity, rate, location and manner of abstraction. The basic permit requirement is to maintain a balance between abstraction and the natural or artificial recharging capability of the aquifers. The water code must provide for periodic review to monitor the intrusion phenomenon by means of measuring devices as well as grant policing power to the administrative authority. This legal means of enforcement should include the power of entry and inspection; suspension or cancellation of permits; identification of the nature of remedial action needed; and prosecution of criminal offenses.

9. *Pollution control*

The proposed law should include provisions addressing pollution of both surface and groundwater sources. The direct discharge of pollutants into groundwater should be forbidden, particularly if they contain hazardous substances. The water law should regulate effluent and waste discharges into water sources through the issuance of permits and monitoring, subject to established standards. Regulation can be complemented by economic incentives to comply with restrictions (FAO, 1995). The law must specify the composition and quality of effluent and the treatment required prior to discharge. The water law must include regulation to deal with storage of pollutants both above and below the ground surface as well as

enforcement of prevention measures to address leakage and the percolation process. The measures to combat pollution should include a variety of sources such as pesticides, fertilizers, and urban run-off.

Finally, the water law must establish a close relationship with other existing legal disciplines. The proposed water law must conform to the constitutional laws of the country concerned, especially with regard to the legal requirements for its natural resources. The water law must consider some of the provisions included in the administrative law that regulates the relationship between public administration and society. In some countries, water ownership, use, and conservation may be included in civil water law. It is important that the proposed water law incorporate provisions for regulating water separately from the existing civil law, especially with regard to water ownership in relation to land. A modern water law must refer to the existing provisions in penal laws addressing punishment for water and water-related offenses. In countries that have established natural resources and environmental laws, the proposed water law must conform to the water-related provisions within these laws.

X. SUMMARY

The above review of the status of water legislation and institutional arrangements demonstrates that progress has been achieved by some of the member States during the last few years. However, the extent of this progress varies from one country to another, depending upon the magnitude of water resource development, water utilization, and the degree of competition among the different water-using sectors. Some of the ESCWA member countries have taken steps to unify and centralize their water authorities in order to improve institutional arrangements. Efforts are also being made to revise existing legislation as well as formulate new water legislation with respect to all areas of water development, but particularly in regard to the protection of water resources from pollution. Generally, most of the existing legislation in all water sectors addresses resource development and protection, without emphasis on management and enforcement aspects. Integration of the functions of water institutions has been undertaken by only a few countries. The historical evolution of water legislation from the pre-Islamic period to the present time is presented in table 1. The present status of both water legislation and institutional arrangements is briefly summarized in table 2.

Water rights within most of the ESCWA member countries are still governed by Shariah principles (Oman, Qatar, Saudi Arabia, United Arab Emirates and Yemen), or a combination of Shariah law, the Ottoman Majalla code (Lebanon and the Syrian Arab Republic) and some elements of a modern water code. Shariah principles governing water legislation in the region basically hold that water is a gift from God and belongs to the community as a whole, with priority being given to human and animal requirements. This belief has caused the authorities concerned to delay or avoid the implementation of regulations and water-pricing schemes which may be considered socially unacceptable. In practice, ownership of water rights is being achieved by adding value to this commodity by invested labour, or by selling it in containers, containing it in a well or canal, or through distribution infrastructures such as irrigation networks. Ownership of water rights in some cases is realized through water-sharing principles that are inherent in traditional customs, with acknowledgment of the right of prior appropriation. Most of the countries in the region have enacted laws which explicitly state that water resources are public property (Jordan, Oman and Yemen), while laws in other countries imply that water is either State- or publicly-owned (Bahrain, Kuwait, Lebanon, Qatar, Saudi Arabia, the Syrian Arab Republic and the United Arab Emirates).

In the countries of the Arabian Peninsula, as well as in Jordan and the Syrian Arab Republic, groundwater development is largely regulated by permits or licences. There is wide variation among the member States with regard to the requirements for obtaining a permit and regulations stipulating conditions for compliance. In general, proof of land ownership is usually a prerequisite in all cases. Owners may approach the Government to obtain a permit or authorization to drill a well for any purpose, subject to the terms and conditions set forth in the permit. Permits for the use of surface water require the fulfilment of certain criteria and place limits on quantity and sale, while for groundwater there is usually a defined set of guidelines with respect to the manner of abstraction, well specifications, and groundwater conditions. In addition to permit specifications, the condition of water resources with regard to quantity and quality in a specific area may call for additional restrictions. These procedures are followed in Jordan, Kuwait, Oman, Qatar, Saudi Arabia, the Syrian Arab Republic, the United Arab Emirates, and Yemen. Laws have been enacted in Jordan, Oman and the Syrian Arab Republic to minimize depletion of groundwater resources discharged from springs or abstracted from wells by establishing restricted areas (*harams*). Some countries have complemented drilling permit regulation by requiring the licensing or registration of professional well-drilling contractors. This mechanism is being implemented in Jordan, Oman, Saudi Arabia, the Syrian Arab Republic and the United Arab Emirates.

Surface water from river flow is usually State property and is subject to appropriation to different sectors. Flood water is still diverted and allocated according to traditional local customs in Oman, Saudi Arabia and Yemen. Water allocation priority is based on Shariah principles; however, clear priorities are

TABLE 1. HISTORICAL PERSPECTIVE ON THE EVOLUTION OF WATER LEGISLATION

Post Islamic: from the Ottoman Empire period to 1990	Development from 1900 to 1950	Development from 1950 to present
a) Customary local practices	a) Emphasis on Shariah principles	a) Residual Majalla code in some countries
b) Islamic principles - Koran and Hadith - Water, gift of God - Free use of water - Priority to quench thirst, human and animal - Concept of protective zone (*haram*) - Irrigation right allocation - Discourage misuse - Individual responsibility for maintenance work	b) Continued application of customary practices	b) Continued focus on Shariah principles
c) Ottoman Majalla code - Focus of 92 articles on water issues - Further elaboration of Shariah principles - Emphasis on human needs - Allows selling of irrigation water - Establishes rules for maintenance - Implicit public property	c) Majalla and Napoleonic codes - Majalla code practised in most countries until 1922 - Application of part of French code - Water as public property - Permits for uses and concessions - Affirmation and elaboration of protective zones	c) Diminishing role of customary practices
	d) Drafting of laws - Affirmation of State ownership - Regulation of water exploitation and use by permit - Emergence of water administration - Affirmation of prior water rights	d) Introduction of water laws - Water as State property - Registration of wells and water rights - Development of institutions - Affirmation of uses of permits to develop and utilize water - Fragmentation of water laws and decrees - Little comprehensive legislation - Water rights attached to land - Introduction of water allocation rules for surface water - Concept of pollution control

TABLE 2. LEGISLATIVE EFFORTS IN THE WATER SECTOR FOR SELECTED ESCWA MEMBER COUNTRIES

Country	Status of legislation status		Ownership	Use	Institutions
	Past	Present			
Jordan	Residual of Majalla and a few laws (1937-1988)	Fragmented; most recent laws 18, 19 (1988)	Explicit State property	Regulation by permit for both surface and groundwater	Single: Ministry of Irrigation and Water, with two water authorities (1988)
Lebanon	Residual of Mahalla and French code and a few laws and decrees (1925-1985)	Fragmented, but there is a plan for a comprehensive law.	Implicit public domain	Regulation by permit & old irrigation code	Ministry of Hydraulic and Electric Works, a few other ministries and many regional commissions (1966)
Oman	Shariah law, customary practices; wells and *aflaj* registration laws (1975-1988)	Fragmented regulation decrees for well and *aflaj* (1995)	Explicit State property	Extensive regulation by permit for development of groundwater and *aflaj*	Single: Ministry of Water Resources (1989)
Saudi Arabia	Shariah and customary laws, water conservation regulations and many decrees (1932-1988)	Planning for comprehensive law.	Implicit State property	Regulation by permit system; mainly groundwater	Several ministries, mainly Agriculture and Water Municipality, Planning, Saline Water Corporation
Syrian Arab Republic	Residual of Majalla code Shariah law, and many other decrees and laws (1925-1995)	Comprehensive water law under preparation.	Implicit public domain	Elaborate system of permits and regulation for both surface and groundwater sources	Several ministries, mainly Irrigation (1982); others, including Housing, Agriculture, Public Works and Water Resources
United Arab Emirates	Shariah and customary laws and a few decrees (1980-1994)	--	Implicit State property	Limited regulation by permit system for groundwater	Several ministries: Agriculture and Fisheries, Electricity and Water; Municipalities and High Water Council (1981)
Yemen	Shariah and many customary laws and decrees	Drafted comprehensive water law (1995)	Explicit State property	Regulation by permit system and traditional practices	National Water Resources Authority (1995)

lacking in most of the ESCWA member States. As a general rule, water infrastructure for the domestic sector is the responsibility of the State in most of the ESCWA member countries. The Government finances the construction, operation, and maintenance of water distribution systems, and is responsible for the majority of water supply activities. Existing legislation tends to provide limited coverage of land and water resource issues, especially with regard to land use practices and land-based pollution sources.

Lack of comprehensive water legislation in the ESCWA member countries has contributed significantly to inefficiency of management of water resources in the region. As a result of regional development activities within the last 20 years, existing laws and regulations which were effective half a century ago have become obsolete as competition for water utilization increases and water supplies diminish. Authorities responsible for water resource development and management continue to operate along traditional lines, with marginal changes brought about on an ad hoc basis.

Weaknesses in institutional arrangements represent a major constraint in achieving integrated development and management of water resources in the ESCWA region. In most of the member countries, there is a great deal of fragmentation of authority in the water sector owing to the large number of ministries that deal with water resources. This, combined with lack of cooperation and coordination of activities, prevents the implementation and enforcement of effective water legislation needed to achieve integrated water resource development and management. For example, in Saudi Arabia three ministries deal with water resource development: the Ministry of Planning, the Ministry of Agriculture and Water, and the Ministry of Municipal and Rural Affairs. In Bahrain, Kuwait, Qatar and the United Arab Emirates, the Ministries of Electricity and Water, and Agriculture and Municipalities, or Agriculture and Fisheries, share responsibility. In addition, in these countries there are a number of metropolitan water and sewerage authorities. In Egypt, Jordan, Lebanon, Oman and the Syrian Arab Republic, a single ministry deals with the water sector. Recently in Yemen, an important institution, the National Water Resources Authority, was established, which is responsible for all aspects of water resource activities. There still remains some overlap of responsibility and function among the water institutions in all the countries. Coordination and cooperation between agencies has not been mandated by legislative instruments, leading to mismanagement of resources. This also creates unnecessary duplication or gaps in monitoring activities and enforcement procedures.

Integrated development and management of water resources in the ESCWA region is contingent upon the development of an effective legislative framework and sound institutional directives to ensure that formulated policies are put into effect. Broad-based water legislation is needed to provide a framework for an integrated approach to the regulation, development and management of water and other water-related activities. Comprehensive water legislation needs to incorporate guidelines for national utilization of water resources including desalination, water use priorities, water ownership, jurisdiction of authorities responsible for controlling utilization, protection, pricing and beneficial uses, as well as the issuance of use permits and provisions for conflict resolution. In addition, appropriate water legislation would provide mechanisms for ensuring the most equitable economic and sustainable uses of available water resources, taking into consideration socio-economic conditions and the need for national development.

Serious consideration is currently being given to drafting comprehensive water legislation in the countries of Oman, the Syrian Arab Republic, and Yemen. Other countries are also in the process of updating their water legislation. Lack of enforcement of existing laws and regulations constitutes a major stumbling block in the achievement of efficient development and management of water resources.

Legislative efforts are needed to enact laws and regulations, and to address the integration of land resource use with water resource management. Legislation dealing with these two related subjects is important, especially with respect to agricultural development and pollution control. Discharged wastewater from the domestic and industrial sectors, as well as irrigation drainage, must be viewed as a potential hazard

to the productivity and sustainability of both surface and groundwater resources. Potentially hazardous activities need to be monitored and regulated, and liability appropriate to the magnitude of damage should be assessed. Specific concerns involve the use of pesticides and fertilizers and their impact on the quality of both surface and groundwater sources. Legislation is also needed which pertains to the pollution of groundwater in shallow aquifers from the discharge of treated wastewater. In many countries of the region, especially those of the Arabian Peninsula, the disposal and reuse of treated effluent is contributing to the pollution of groundwater, thereby diminishing availability of supply. The standards for treated effluent discharge, as well as its utilization and monitoring, need to be regulated through legislation.

While steps towards the formulation and implementation of some or all of these important regulations have been taken, progress has not been significant. A great deal remains to be accomplished in relation to all aspects of water legislation, but particularly with regard to the regulation and monitoring of use, pollution, and management of water resources. The enactment of legislation emphasizing the management of water resources is needed in all countries of the region. The incorporation of these important aspects into water resource legislation, together with enforcement mechanisms, will contribute significantly towards comprehensive, appropriate and workable water resource development and management.

There is a need to evaluate as well as learn from the experiences of both developed and developing countries that have drafted or updated their water legislation, particularly those with conditions similar to those prevailing in the ESCWA region. In addition, new concepts that focus on resource management and optimal water allocation need to be given due consideration. The citation of recent trends in legislation may be of benefit to those countries in the process of updating their water legislation as, for example, the tendency to abolish water ownership rights that do not conform to effective management of surface and groundwater resources. In addition, legislation is also focusing on bringing about State ownership of all water resources, particularly groundwater (Burchi, 1991). In some recently enacted water legislation in different parts of the world, many legislative trends are expressed through declarations that water belongs to the State or that the State enjoys rights of use superior to those of individuals.

When water rights are newly granted, they should be subject to a term of expiry. Before the expiration of the term, the assignment of the rights should be reviewed. If, when the permit is renewed, there is a reduction in the allocation, then some compensation should be provided. In regard to pre-existing vested water rights, newly enacted or modified water legislation in some countries includes provisions either to acknowledge rights to domestic and limited irrigation uses, which presumably do not significantly affect water availability to other users, or to provide a period of immunity from Government interference only for registered rights (Burchi, 1991). Most of the legislative efforts during the last decade have been focusing on curtailing long-standing privileges in water ownership.

Another trend is reflected in the concept of water rights mobility, or the water rights market, where rights can be bought and sold through a Government agency. A few countries in the developed world have experimented with this, supported by legislation (Burchi, 1991). The transfer of rights can be personal or permanent and is subjected to prior screening and administrative approval from the authority concerned, including determination of the amount of water. In the ESCWA region exports have been considering the concept of a water rights market as a means of allocating water efficiently. The transfer of water rights in regard to the amount of water saved by the implementation of conservation measures may be used as an incentive to encourage management of water resources.

All countries in the ESCWA region have recognized the need to improve their institutional arrangements. Serious efforts are being made by some of the member States to unify and centralize their water institutions in order to enhance coordination and planning of water activities.

The enhancement of institutional arrangements in the region is contingent upon the enactment of regulations and enforcement mechanisms, as well as the promotion of the merger of fragmented water authorities into a single authoritative institution. In the meantime, there is a need to enact legislation providing for the enforcement of coordination and cooperative efforts among the different water agencies, as well as the delineation of their responsibilities. Such legislation would contribute significantly to the move towards integrated water resource development and management.

In regions with scarce water resources, the improvement of institutional arrangements is considered an important element in their integrated development and management. This goal is being pursued in the developed and developing world alike. A significant amount of legislation enacted in the last two decades either centralizes or decentralizes the functions of water institutions and enhances coordination mechanisms. In the ESCWA region, the extent of functional integration of water institutions varies among the countries. As indicated above, no single model or institutional setting is suggested, owing to differences in the prevailing socio-economic and cultural conditions. (Caponera, 1992; ESCWA, 1996a; Burchi, 1991). The establishment of a single water ministry, as in the cases of Jordan and Oman, or a water resources authority, as in Yemen, may be a solution to overcome the problem of institutional arrangements. Another approach would be to establish a natural water resources commission with all water and water-related authorities under its jurisdiction. Such a commission would have a policy-making role and would have a mandate to direct the executive activities of all water agencies placed under its umbrella.

Yet another option may be to establish a basin development and management authority, specifically in large drainage basins; a regional water authority may present another option. The separation of utility functions from water authorities may be an appropriate way to resolve conflicts of interest between the two functions: water resource development and water management. One powerful rationale for such separation is the recent trend towards privatization of services, where the water utility function can be carried out by private companies operating under a licence from the water authority.

Finally, enforcement of existing or planned water legislation is still not receiving proper consideration. This can be attributed to a number of factors, including the need to establish an effective legal system, organized and mandatory inspections, legislative enforcement powers delegated to the appropriate authorities, manpower and financial resources. Effective enforcement is contingent upon investing ministries with the authority to enter and inspect premises, and suspend or revoke permits, in conjunction with a judiciary system that has the power to prosecute offenders. Field inspection of water development and user facilities, especially in the irrigation and industrial sectors, is needed to ensure compliance with laws and regulations. Throughout the region, field inspections are still not supported by the legal system, and the power to carry out such functions is minimal. While the issuance and renewal of permits is contingent upon the fulfilment of requirements, inspection of the actual conditions under which the permit was issued are seldom carried out on a regular basis. Prosecution of offenders is needed to ensure compliance with laws and regulations. Enforcement of penalties is also important in achieving compliance. Serious legislative efforts are needed to develop effective enforcement mechanisms for existing and planned water legislation.

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