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in the Water Sector of ESCWA Member States

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## Country Paper

### Jordan

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# Harmonization of Environmental Standard In the Water Sector

## 1- Background

The Hashemite Kingdom of Jordan covers a land area of 90,000 sq. Kms. the Jordanian climate is semi-arid. Rainfall ranges between 50 mm in the desert region to about 600-mm in the eastern mountains adjacent to the Jordan valley. The total rain fall in Jordan is estimated at 8.5 billion cubic meters of which about 85% is lost to evaporation with the remainder flowing into wadis and partially infiltrating into deep aquifer.

The population of Jordan is estimated at 4.8 million (1998). The population growth has not been natural over the past three decades. The recent average population growth rate stands at about 3.5% due to natural and non-voluntary migration. However, about 78% of the population are located in urban areas concentrated in four governorates: Amman, Irbid, Zarqa and Balqa. (The Annual Environmental Statistic Report, 1998).

The expanding population and the climatic and topographical conditions of the country have exerted enormous pressure on the limited water resources and created a severe water supply-demand imbalance where the renewable water resources are among the lowest in the world, and is declining with time. Resources are already seriously limited and are far below under the water poverty line of 1000 m<sup>3</sup> per capita per year. On a per capita basis, available water from existing renewable sources is projected to fall from 170 m<sup>3</sup>/capita/year in 1998 to 91 m<sup>3</sup>/capita/year by the year 2025. *The supply-demand imbalance has influenced the quality of water resources where over abstraction from groundwater aquifers exploited the aquifers at more than double their sustainable yield in the average.*

## **2- Water Supply**

### **2.1 Water Resources**

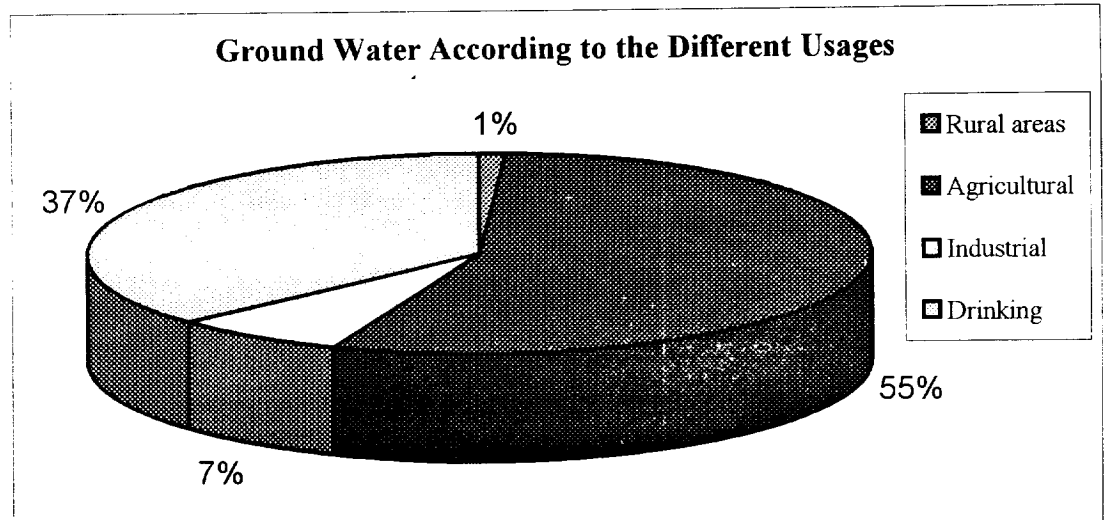
Jordan water is derived from surface and underground sources. Renewable water resources are estimated at about 750 million m<sup>3</sup> per year, consisting of approximately 275 million m<sup>3</sup> per year from underground sources, 475 million m<sup>3</sup> from surface sources. An additional 143 million m<sup>3</sup> per year are estimated to be available from fossil aquifers sustainable for between 40-50 years. Brackish aquifers are not yet fully explored but at least 50 MCM/ year is expected to be accessible for urban uses after desalination.

The total number of wells in Jordan used for drinking, agriculture and industry rose up to 2240 wells in 1997. Present water use already exceeds the renewable freshwater resources by more than 20%. Over abstraction from renewable ground water resources stands up to 149.25 MCM (54 % of the renewable water resources) and up to 72.86 MCM (52 % of the non-renewable water resources) from non-renewable water resources.

### **2.2. Water Consumption**

The Water Authority of Jordan supplied 239.864 MCM in 1997. The Jordan Valley Authority supplied 285.00 MCM in 1997 for irrigation purposes. The average per capita per day share of drinking water was 143 liters while the average share per capita for both domestic and irrigation purposes was 326 liters in 1997.

Table 1 shows the amount of water share for every governorate and the average per capita per day share.



**Figure 1**

Figure 1 above shows the percentages of ground water according to its usage. The water supply usage in the different governorates of Jordan differs according to the living standards and the activities taking place in each district.

### **2.3. Water Supply Connections**

The Government undertook the complete development of water resources and the construction of water projects beginning from the source all the way to the destinations of consumption. The percent connections to municipal network in Jordan constituting urban and rural population covered almost 96% of the population in 1997. 4% constitutes the non-served people mostly in rural areas. The number of network connections was around 630600 connection and served 4.38 millions covering 94.4% of the housing units in Jordan. In urban areas network connections served a population of 3.5 Million and covered 97.6% of the urban housing units while in rural areas it served a population of 0.885 million covering 87.3% of the rural housing units (annual environment statistic report, 1998).

Figure 2 below illustrates the percentage of water supply connections in each governorate to the total, while Figure 5 illustrates different water supply methods in urban and rural areas.

Although the level of services in the water sector in Jordan is fairly high, efforts are required to reduce the unaccounted for water, improve existing systems and expand them to cover areas not being served.

#### **2.4. Water Quality Monitoring Programs**

1- By law, the government represented by the Ministry of Water and Irrigation (MOWI) is responsible for providing and delivering water that comply with the Jordanian Standards 286 (Annex B) which is emanated from the WHO and International Standards.

**The water quality is of increasing concern due to the limited water resources and their vulnerability to sewage and industrial waste contamination and over abstraction and mining of aquifers.**

2- The Ministry of Health (MOH) is by law No.21- Public Health Law for the year 1971 is the responsible body for ensuring the safety of drinking water. However, the Ministry of Water and Irrigation, the Ministry of Health and the General Corporation for Environmental Protection (GCEP) under the Ministry of Municipal, Rural Affairs and Environment do monitor the water quality. Monitoring consists of field and laboratory analysis conducted by the Laboratory and Monitoring Department at the Ministry of Water and Irrigation and through the Department of Environmental Health and Health Centers at the Ministry of Health and through the Royal Scientific Society subcontracted by GCEP. Monitoring programs cover quality of water at sources before treatment, at pumping stations, main reservoirs, in the distribution and at the consumers tap. Programs are set according to the criteria of population size and type of water supply. 26481 samples (84076 analyses) have been collected by WAJ in 1997 and analyzed for chemical and microbiological parameters to assess the water quality at the source and in the distribution system. However, a full assessment of the drinking water quality in the distribution system is beyond the capabilities of the country in light of the available logistic facilities.

### Level of wastewater services

Since the year 1980, the Government of Jordan carried out significant and comprehensive plans with regard to the different issues of wastewater management primarily related to the improvement of sanitation. About 65% of the urban population and 50% of the total population gained access to wastewater collection and treatment systems thus, raising the sanitation level, improving public health, and strengthening pollution control of surface and groundwater in the areas served by wastewater facilities.

Table 2 and figure 4 show the method of wastewater disposal in urban and rural areas in comparison to the whole country.

**Table 2:** Percentage of housing units by method of wastewater disposal

District	Public Systems	Cesspools	Others
Whole Jordan	49.2	50.0	0.8
Urban	64.7	35.0	0.3
Rural	2.8	95.0	2.2

Source: Annual Environmental Statistic 1997.

freshwater in these streams dried was reduced as a result of increased pumping from the aquifers, and the flow was replaced with the effluent of treatment plants, a process that transformed the ecological balance over time.

#### **4. Water Quality Surveillance, Type and Reporting Procedures.**

Several surveillance programs are taking place by different institutions for different purposes according to the mandate of each of these institutions, these are:

1. The Water Authority of Jordan (WAJ) carries out on daily, weekly and monthly bases several analyses to provide incisive guidance to operational units and to assure the quality compliance with the standards. The analyses include many parameters that are analyzed in different laboratories. The results are reported on monthly and yearly bases in special reports, some for evaluation and planning purposes while others are informative for wider use, the parameters tested are annexes A & B .

The annual reports include quantities of water supplied, wastewater treated, population served, number of water and wastewater connections, efficiency, operational & maintenance costs, wastewater reuse and overall evaluation of each plant.

2. Ministry of Health (MOH) carries out an extensive inspection and monitoring program including sampling and testing the water sources and effluents from each plant against parameters that bear a public health significance with emphasis on coliforms, salmonella, and nematode eggs in addition to other parameters. The results of the analysis and the surveillance are reported in special reports, whereas health protection measures and enforcement of laws are within the jurisdiction of MOH.

- Discharge any raw sewage into the environment.
- Irrigate crops, which are eaten raw with treated effluent regardless of its quality.
- Irrigate crops that are eaten cooked unless the faecal coliforms are less than 1000/100 ml and the nematode eggs count is less than 1/liter.

All violations to these standards are dealt with very strictly and on time. Irrigated crops are destroyed under the supervision of the health and police authorities.

At present, the irrigated crops are limited to animal feed and trees including fruit trees. Treated water after mixing surface waters are used for unrestricted irrigation. Presently, there are no regulations as to the quality of irrigation water except for the effluents from wastewater treatment plants.

### **Water Authority**

The water authority is responsible for water and sewerage services throughout Jordan and for water resources management. The monitoring program, which is run by the water authority, covers all water and wastewater sources, and municipal treatment plants. The goal of their program is to ensure that the plants are functioning well and that the water quality and treated waters meet the requirements set in the Jordanian standard for different uses. The components of their program are similar to those of MOH with respect to laboratory analysis only.

### **GCEP**

The monitoring program is run by the Royal Scientific Society for the order of GCEP. The reports are received by GCEP and disseminated to concerned agencies for necessary action. The scope of the program and the small number of samples, which are tested, do not allow for proper assessment of the quality of water and wastewater. In addition, no crops are monitored.

by-laws development, conducting water quality monitoring programs, licensing and developing environmental requirements for any development projects.

Other governmental, non- and semi-governmental institutions are involved in research studies, monitoring programs and standard setting, these are

- 1- The RSS. The RSS provides technical and advisory services. One of its main contributions is the monthly monitoring programs for the effluent discharged from As-Samra plant. The aim of the study being the assessment of the treatment efficiency and the suitability of treated wastewater for irrigation and the purification efficiency throughout the river, in addition to the assessment of its effect on the groundwater quality in the area. Under a separate contract, the RSS monitors the water quality in King Talal Reservoir and the water released for the dam before and after mixing it with surface water.
- 2- The Water and Environment Research Center at the University of Jordan carries research projects in co-operation with WAJ and JVA.
- 3- The Ministry of Agriculture being responsible for the irrigation water quality it also establishes agricultural policies and provides services and advice to farmers with emphasis on the use of fertilizers and pesticides. The MOA works closely with the MWI on standard settings, it also conducts many research projects related to wastewater reuse and its effect on crops.
- 4- Standards and Metrology Establishment is responsible for standards setting and amendments in cooperation with the concerned parties.
- 5- The Royal Society for the Conservation of Nature (RSCN) and the Jordanian Environmental Society (JES) provide training, advisory services and carry out awareness programs.
- 6- The Ministry of Industry carries out industrial pollution prevention program and co-operates with MWI and MOH in setting industrial discharge standards and regulations.

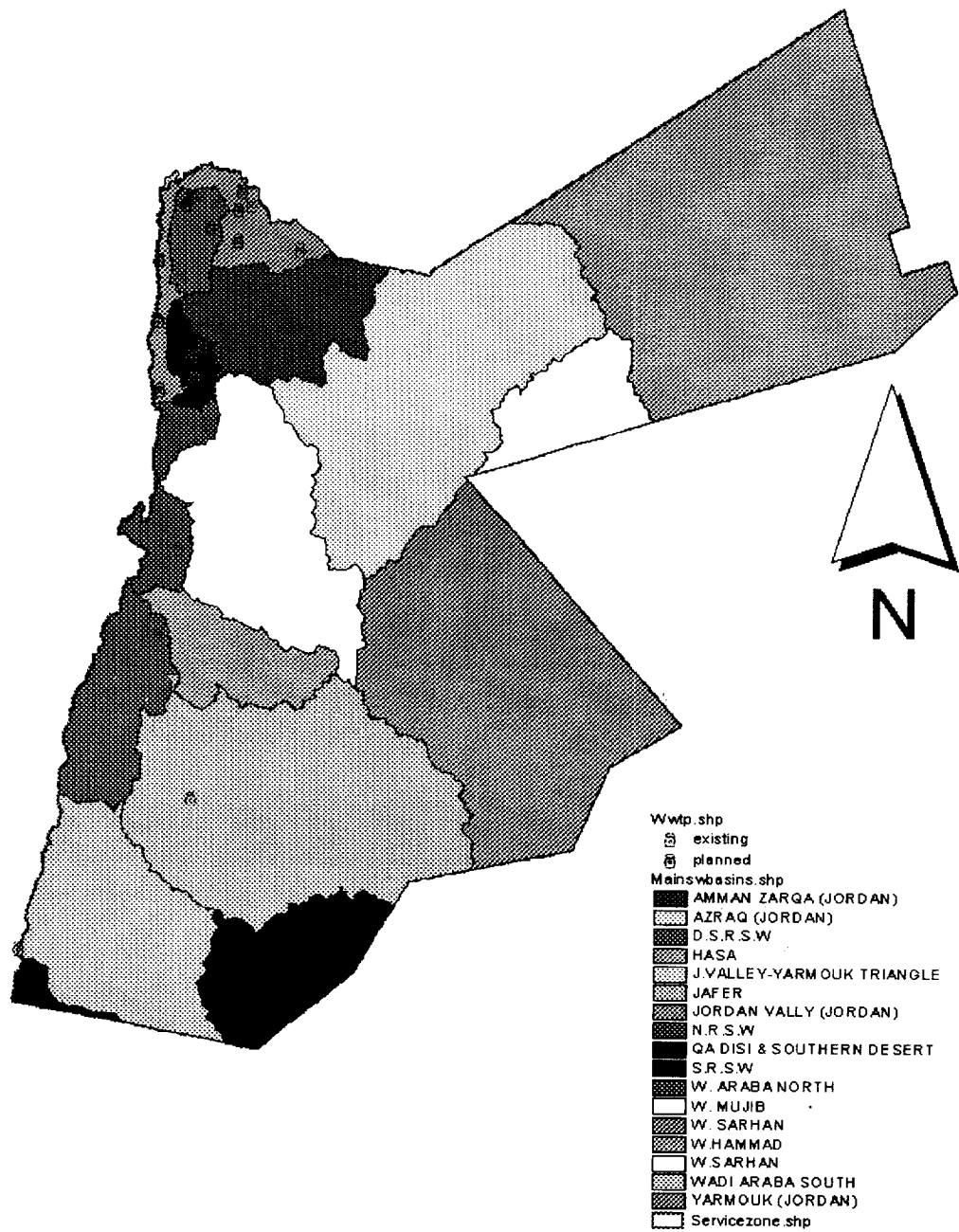
Annex A  
JORDANIAN STANDARD 893/1995 FOR TREATED DOMESTIC  
WASTEWATER

Parameter	Cooked vegetables (2)	Fruit & forestry trees, crops & industrial products	Discharge to streams, wadis & reservoirs	Groundwater recharge	Fish ponds (3)	Irrigation of lawns and parks	Irrigation of fodder crops
BOD <sub>5</sub> (1)	150	150	50	50	-	50	250
COD	500	500	200	200	-	200	700
DO	>2	>2	>2	>2	>5	>2	>1
TDS	2000	2000	2000	1500	2000	2000	2000
TSS	200	200	50	50	25	50	250
PH	6.0-9.0	6.0-9.0	6.0-9.0	6.0-9.0	6.0-9.0	6.0-9.0	6.0-9.0
Color (PCU)	-	-	75	75	-	75	-
FOG	8	8	8	None	0.001	8	12
Phenol	0.002	0.002	0.002	0.002	0.2	0.002	0.002
MBAS	50	50	25	15	-	15	50
NO <sub>3</sub> <sup>-</sup> -N	50	50	25	25	0.5	25	50
NH <sub>4</sub> <sup>+</sup> -N	-	-	15	15	-	50	-
Total-N	100	100	50	50	-	100	-
PO <sub>4</sub> -P	-	-	15	15	-	15	-
Cl <sup>-</sup>	350	350	350	350	-	350	350
SO <sub>4</sub> <sup>-</sup>	1000	1000	1000	1000	-	1000	1000
CO <sub>3</sub> <sup>-</sup>	6	6	6	6	-	6	6
HCO <sub>3</sub> <sup>-</sup>	520	520	520	520	-	520	520
Na <sup>+</sup>	230	230	230	230	-	230	230
Mg <sup>+2</sup>	60	60	60	60	-	60	60
Ca <sup>+2</sup>	400	400	400	400	-	400	400
SAR	9	9	9	9	-	12	9
Residual Cl <sub>2</sub> (4)	0.5	0.5	-	-	-	0.5	-
Al	5	5	5	1	-	5	5
As	0.1	0.1	0.05	0.05	0.05	0.1	0.1
Be	0.1	0.1	0.1	0.1	1.1	0.1	0.1
Cu	0.2	0.2	0.2	0.2	0.04	0.2	0.2
F	1	1	1	1	1.5	1	1
Fe	5	5	2	1	0.5	5	5
Li	2.5	2.5	1	1	-	3	5
Mn	0.2	0.2	0.2	0.2	1	0.2	0.2
Ni	0.2	0.2	0.2	0.2	0.4	0.2	0.2
Pb	5	5	0.1	0.1	0.15	0.1	5
Se	0.02	0.02	0.02	0.02	0.05	0.02	0.02
Cd	0.01	0.01	0.01	0.01	0.015	0.01	0.01
Zn	2	2	15	15	0.6	2	2
CN	0.1	0.1	0.1	0.1	0.005	0.1	0.1
Cr	0.1	0.1	0.05	0.05	0.1	0.1	0.1
Hg	0.001	0.001	0.001	0.001	0.00005	0.001	0.001
V	0.1	0.1	0.1	0.1	-	0.1	0.1
Co	0.05	0.05	0.05	0.05	0.05	0.05	0.05
B	1	1	2	1	-	3	3
Mo	0.01	0.01	0.01	0.01	-	0.01	0.01
TFCC MPN/100 ml) (5)	1000	-	1000	1000	10000	200	-
Pathogens #/100ml	-	-	-	-	10 <sup>5</sup> (6)	None	-

**Annex B**  
**JORDANIAN DRINKING WATER STANDARD JS 286/1997**

TYPE OF CONTAMINANT	CONTAMINANT	ALLOWABLE LEVEL	MAXIMUM ALLOWABLE LEVEL
PHYSICAL	TURBIDITY TASTE ODOUR COLOUR TEMP. PH	1 (NTU) ACCEPTABLE ACCEPTABLE 10 COLOUR UNIT 8 – 25 °C 6.5 – 8.5	5 (NTU)   15 COLOUR UNIT (Pt-Co)
INORGANIC	Pb Se As Cr CN Cd Hg Sb Ag TDS TH (CaCO <sub>3</sub> ) MBAS Al Fe Mn Cu Zn Na Ni Cl F SO <sub>4</sub> NO <sub>3</sub> NO <sub>2</sub> Res. Cl <sub>2</sub> (after 15 min cont. time) NH <sub>4</sub> Ba B TTHM	         500 mg/l 100 mg/l 0.2 mg/l 0.1 mg/l 0.3 mg/l 0.1 mg/l 1.0 mg/l 3.0 mg/l 200 mg/l  200 mg/l  200 mg/l 50 mg/l 0.2 mg/l 0.5 mg/l	0.01 mg/l 0.01 mg/l 0.01 mg/l 0.05 mg/l 0.07 mg/l 0.003mg/l 0.002 mg/l 0.005 mg/l 0.1 mg/l 1500 mg/l 500 mg/l 0.5 mg/l 0.2 mg/l 1.0 mg/l 0.5 mg/l 1.5 mg/l 5 mg/l 400 mg/l 0.02 mg/l 500 mg/l 1.5 mg/l 500 mg/l 70 mg/l 2 mg/l 1 mg/l  0.7 mg/l 0.3 mg/l 150 microgram/l
MICROBIOLOGICAL	Total coliform Thermotolerant coliform Protozoa Nematodes Microbes and pathogenic intestinal viruses Free living microorganisms Fungi	<1.1 MPN/100 ml; 0/100 by MT 0/100 ml free free free 0/100 ml free free	
RADIOLOGICAL	ALPHA EMITTERS BETA EMITTERS	<0.1 picourel/l <1.0 picourel/l	

The Main Surfacewater Basins with the Existing and Planned WWTPs in each Basin.



The Service Zones of Each Existing and Planned WWTP.

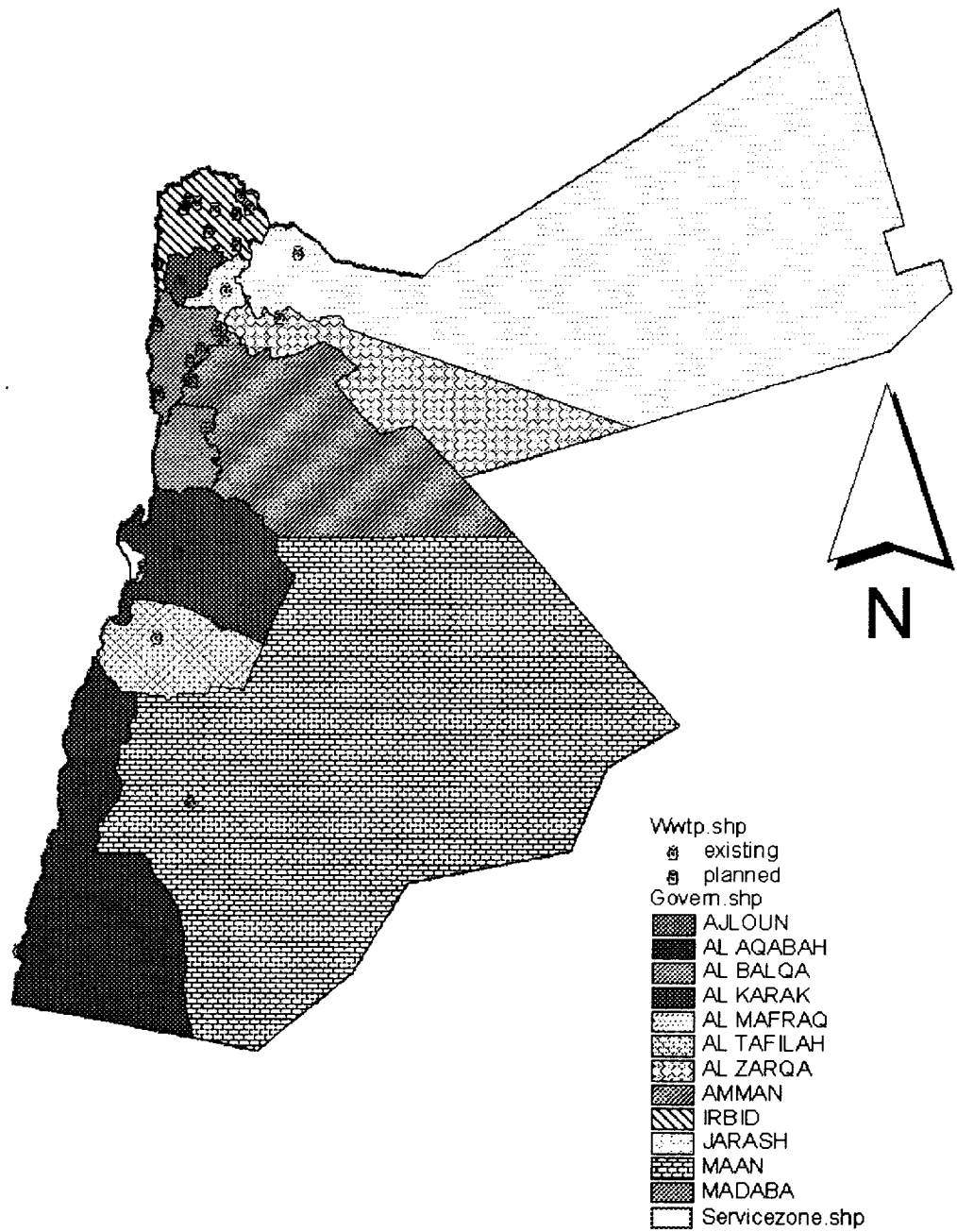


Wwtp.shp  
existing  
planned  
Servicezone.shp

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# The Jordan's Governorates with the Existing and Planned WWTPs.



<b>Parameter</b>	<b>Organic Pollutant *Maximum allowable (mg/l)</b>
Parathion	0.035
Endrin	0.0002
Lindane	0.004
Methoxichlor	0.1
Toxaphene	0.005
Melathion	0.19
Permethrine	0.002
Dimethoate	0.02
Diazinon	0.02
Hexa Chlor Cyclo Hexane	0.04
Chloro Phenoxy Organics	
2,4 D	0.1
2, 4, 5 TP	0.01

\*Total shall be not more than 0.1 mg/l.

Parameter	Cooked vegetables (2)	Fruit and Forestry Trees, Crops & Indust. Products	Discharge to streams, wadis and Reservoirs	Groundwater Recharge	Fish Ponds (3)	Irrigation of Lawns & Parks	Irrigation of Fodder Crops
Amoebae & Giardia (Cyst/L)	<1	-	-	-	(3)	None	-
Nematodes (eggs/L)	<1	-	<1	-	-	<1	<1

(-): Not Determined

(1): BOD in effluent from Waste Stabilization Ponds (Filtered), and from Mechanical Treatment Plant – (Not Filtered).

(2): Values for trace elements and heavy metals are calculated based on the quantity of water of 1000 m<sup>3</sup>/ 1000 m<sup>2</sup>/ yr., these concentrations should be reduced in case more irrigation water is used.

(3): These figures depend on the type of fish, pH, TDS and temperature.

(4): Contact period should not be less than 30 minutes.

(5): The Most Probable Number per 100 ml.

(6): Salmonella per 100 ml.

# Annexes

## **8. National Supporting Facilities**

### **Institutional arrangements**

Several public agencies are vested with primary responsibility for the water sector in Jordan such as the Ministry of Water and Irrigation, the Water Authority of Jordan and the Jordan Valley Authority.

The Ministry of Water and Irrigation, having been empowered by a by-law No. 54 of 1992, is responsible for the formulation and implementation of water and wastewater development programs. Its main function, according to its mandate, are to formulate policy and strategy, plan water resources development, carry out research and development, conduct socio-economic and environmental studies, procure financial resources, monitor water and wastewater projects, implement human resources development and public awareness programs, and establish information systems.

The Water Authority, which was created by the law 18/1988 as a national government agency, has two principal functions: - the provision of water and sewerage services; and water resources management. Jordan Valley development is governed by Law 19/1988, as an extension of the temporary law No. 18/1977 that created the JVA as a responsible organization for the Jordan Valley development. Under its mandate, it is responsible for the development of water resources for irrigation use, design and construction of roads and provide electricity in addition to other infrastructure facilities.

The Ministry of Health, under the Public Health law No.21/1971, is empowered to monitor water resources and treated effluents discharged or reused for irrigation as well as ensuring its safety.

The General Corporation for Environmental Protection formed by the Law No. 12/1995 is responsible for setting general policy, preparation of national strategy for environmental protection, preparing general standards and regulations,

may endanger the public health. The Public Health Law No. 21 for the year 1971 is the legislative tool through which the Ministry undertakes all actions to safeguard the health of the people.

Other agencies and organizations however, participate in the monitoring programs at varying levels. Of these agencies, Water Authority is a major body. Others include the General Corporation for Environmental Protection (GCEP). Details of each monitoring program are following.

## **8. Responsibility**

### **Ministry of Health**

The Ministry of Health has the most intensive and comprehensive monitoring program among other agencies. This program consists of:

1. Periodic and regular inspection of the water resources, and the treatment plants to make sure that no adverse health effects are resulting from any source regardless of the owner of the plant, public or private sectors.
2. Analyzing medical health examination records of the people conducted in private and public clinics to discover any symptoms or ill effects of the exposed people.
3. Health education of the workers in the water sector as well as to the farmers and the public.
4. Sampling and testing of both raw water and treated effluents, with emphasis on the latter. Laboratory analysis includes the following parameters:
  - Microbiological content of the water; TCC and Thermo-tolerant Coliforms.
  - Pathogenic enteric bacteria: Cholera, Salmonella, and Shigella.
  - Intestinal parasites including nematodes and protozoa. Screening is conducted to discover the presence of any pathogens. Emphasis is made on Ascaris, Enclystoma, Giardia and Entamoeba.
  - Chemical analysis. The major items, which are tested regularly, include THMs, TDS, BOD, COD, TSS, pH ; Heavy metals are monitored irregularly.

The results of testing are compared for compliance with the Jordanian standards.

1. Field visits to the farms where the treated effluent is expected to be used for irrigation. According to the Jordanian standard, it is not allowed to:

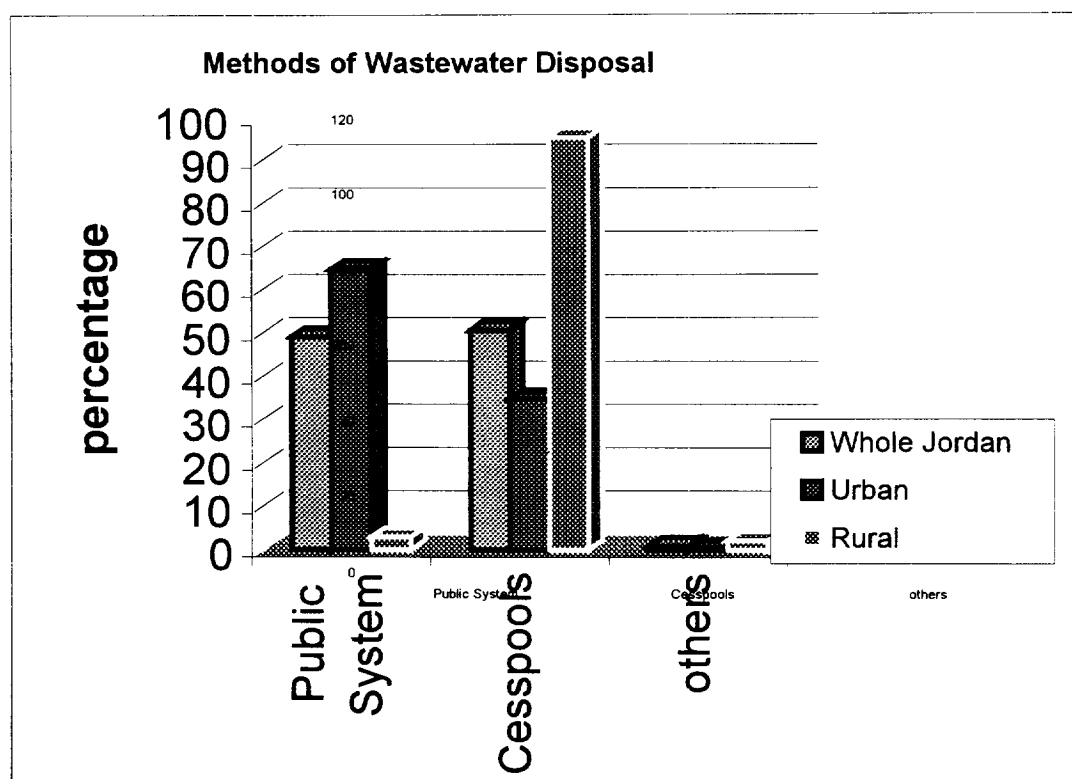
3. The General Corporation for Environmental Protection (GCEP) is another environmental organization that also carries out inspection and has powerful enforcement responsibilities.

Other organizations such as the Royal Scientific Society (RSS) carry monitoring programs under special contracts with the concerned governmental institutions. The ongoing monitoring program performed by the RSS aims at studying the surface and ground water quality, treatment efficiency, effect of treated wastewater on the receiving bodies, design criteria and the suitability of treated wastewater for agricultural reuse. All relevant parameters and recommendations are reported yearly to WAJ and JVA. The RSS carried a ten-year monitoring program for some plants under a contract with GCEP. The results were reported and shared between the concerned ministries.

## **5. Reuse**

Treated wastewater effluent is considered a valuable water resource for irrigation. This is deemed by the supply-demand imbalance of drinking water, the arid climatic conditions of the country and the deficit in the trade of food commodities. Therefore the Government of Jordan has imposed that all new wastewater treatment projects must include feasibility and design aspects for wastewater reuse. Jordanian Standards JS 893/1995 for treated domestic wastewater effluent (Appendix A) is based on reuse categories. **Untreated wastewater is prohibited to be discharged to the watercourses or to be used for irrigation by the Jordanian law.** Houses and industries that are not connected to the sewerage network and use the cesspools, haul the septage to existing wastewater treatment plants or to a special dump area. The septage haulers are not closely regulated, and the origins of much of the septage are not precisely known.

The amounts of wastewater treated constitute around 12% of the water used for irrigation (1998). 15700 donums have been irrigated with 15.7 MCM of treated effluent for restricted irrigation and the rest blended with surface water where it is



**Figure 4**

The characteristics of wastewater in Jordan are somewhat different from other countries. The average salinity of municipal water supply is 580 ppm of TDS, and the average domestic water consumption is low. This results in very high organic loads and in a higher than normal salinity in wastewater especially those treated in waste stabilization ponds (85% of the total generated wastewater), where part of the water is lost through evaporation, thus increasing salinity levels in the effluents.

Wastewater in Jordan is comparatively low in toxic pollutants such as heavy metals and toxic organic compounds given the low level of industrial discharges to sewage treatment plants. It is estimated that 10% of the biological load comes from industrial discharges.

The major receiving streams for wastewater have very low flow with wastewater comprising a significant portion of stream flow. These streams are not used for bathing or fishing. Much of Amman's wastewater treated effluent is discharged in the Zarqa River and is impounded by the King Talal Dam where it gets blended with fresh floodwater and is subsequently released for irrigation use in the Jordan Valley. It is worth mentioning that the increased supply of water to Jordan's cities came about at the expense of spring flows discharging into such streams as the Zarqa River, Wadi Shueib, Wadi Karak, Wadi Kufrinja and Wadi Arab. The flow of

The monthly reports of the Ministry of Health and Ministry of Water and Irrigation indicates that above 95% of the samples collected from the water sources and distribution system comply with the microbiological standards in the absence of coliforms.

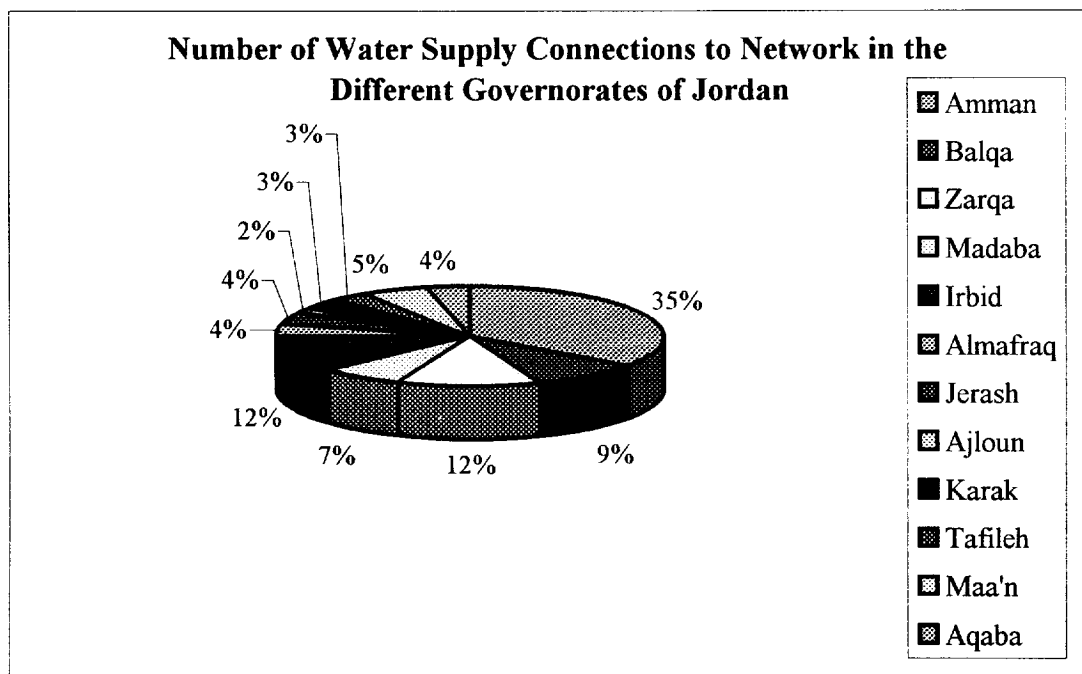
The chemical drinking water quality complies with the Jordanian standards. **However, some chemical parameters such as nitrates, total salinity and alkalinity violate the Jordanian standards and guideline values at sources.** The Water Authority adopts the strategy of blending water of different resources to control these parameters and bringing them to standard levels. Additionally, treatment units are installed at some sources to ensure the quality of the water derived from these sources.

### **2.5. Water Quality Standard**

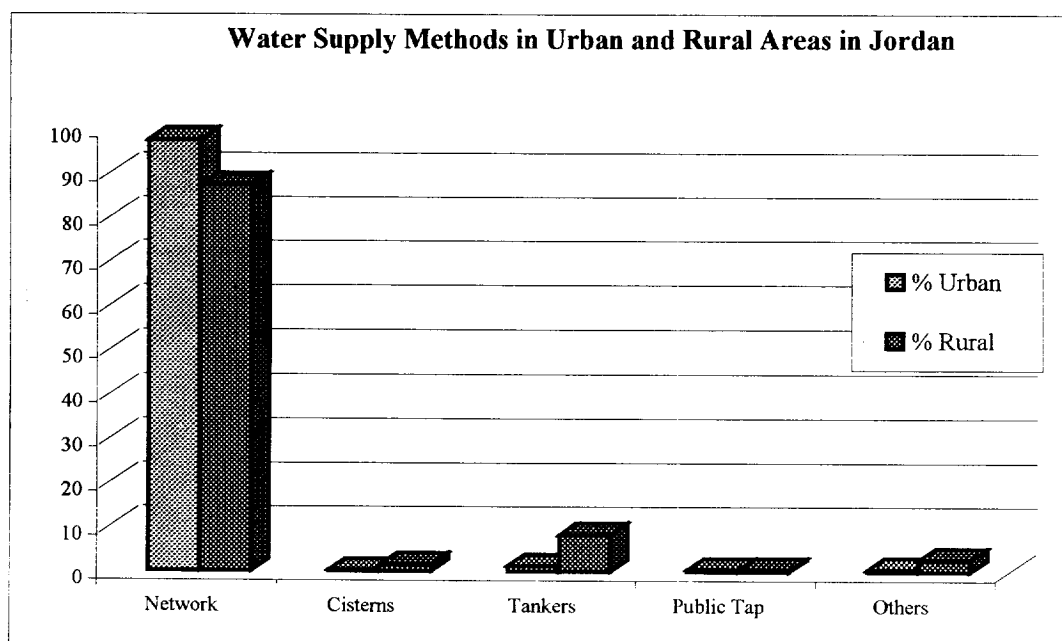
Jordan, as well as many other countries, has adapted international water quality standards or guidelines values developed by the World Health Organization (WHO), the United States Environmental Protection Agency (USEPA), and others. This acceptance has been a simple and safe way of setting water quality standards policy. However, these standards are often stringent, based on “the worst case assumptions” or conditions, which may not be relevant to local conditions, or even affordable in some cases. However, water standards are carefully examined to assure that available resources are fully and efficiently utilized with diligence and care of public health. These standards are included in Annex B.

## **3. Sewage and Sanitation**

Before the introduction of the modern collection and treatment technologies, septic tanks and cesspits were used with grey water often discharged to gardens. This practice resulted in major environmental problems, especially groundwater pollution. The pollution problems were complicated by the rapid urban growth. The population in the capital city of Amman, for example, increased from 50,000 in 1940 to 1,567,908 in 1994.



**Figure 2**



**Figure 3**

Table 1. The amount of water supplied per capita per day in the 12 Governorates

<b>Governorates</b>	<b>L/C/D</b>	<b>Population</b>	<b>Supply quantity(MCM)</b>
Amman	138.9	1751680	88.776
Balqa	168.5	306820	18.867
Zarqa	121.3	710700	31.455
Madaba	275.5	119140	11.981
Irbid	97.2	835360	29.641
Al-mafraq	253.9	198720	18.416
Jerash	74.1	137080	3.705
Ajloun	108.3	104880	4.146
Karak	126.8	188600	8.728
Tafleh	90.2	69920	2.303
Ma'an	210	88320	6.769
Aqaba	465.3	88780	15.077
<b>Total</b>		<b>4600000</b>	<b>239.864</b>

It is worth mentioning that, the real water consumption is far below the figures contained in Table 1. The average unaccounted for water in the municipal network in different governorates was estimated to be 55% of the quantity supplied in 1997, which suggests that the distribution systems are far from optimal.

Water resources consist primarily of surface and ground water resources, with treated wastewater being used on an increasing scale for irrigation, mostly in the Jordan Valley. Renewable water resources are estimated at about 750 MCM per year. Treated wastewater generated at sixteen existing wastewater treatment plants is an important component of Jordan's water resources. About 70 MCM per year (1998) of treated wastewater are effectively discharged into the watercourses or used for irrigation, 76% is generated from the biggest waste stabilization pond Al-Samra treatment plant serving a population of 1.65 million (approximately 72% the total served population) in 1998. By the year 2020, when the population is projected to be about 9.9 million, about 240 MCM per year of wastewater are expected to be generated.

Brackish aquifers are not yet fully explored. But at least 50 MCM per year is expected to be accessible for urban uses. The Ministry of Water and Irrigation strategy is to fully use the wastewater effluent for restricted irrigated agriculture. Implementing this strategy necessitates that the qualities of the wastewater effluents meet the Jordanian standards and WHO guidelines for irrigation water quality (Appendix A). The Ministry has adopted a new overall water strategy and new policy statements in four water sub-sectors: utilities, irrigated agriculture, wastewater management, and ground water management. Taken together these five documents strongly suggest that the government is committed to:

- maximize the integrated socio-economic returns to water,
- sustain irrigated agriculture in the Jordan Valley,
- increase wastewater services and manage wastewater so that it can be available for irrigated agriculture,
- protect the quality of ground water and,
- Limit the abstraction of ground water to sustainable yield.

In this regard the highest priorities are given for protecting the surface and ground water resources from deteriorating and for the expansion of wastewater services in terms of collection and treatment to meet the standards for agricultural reuse.