

**COUNTRY PROFILE  
ON  
ENVIRONMENT**

**JORDAN**

**November 1998**

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## USERS GUIDE: Contents of the Report

This report consisted of the following Chapters on environmental information of the country.

### 1. Keywords of the Environment

Various features and principal environmental issues and their related matters of the country are schematized within 1 page to easily understand the country's natural and social environmental issues on the whole.

### 2. Fact Sheet

Principal indices and natural and social environmental characteristics of the country such as economy, demographic statistics, socio-economic conditions, various important resources available in the country are described.

### 3. Institutional Context

#### 3.1 Environmental Agency

Matrix table on governmental agencies related to the environmental issues in the Chapter 4 is described to grasp the role of the agencies easily. Responsibilities and organizational structure of the principal responsible agency for the environment, and responsibilities of related agencies are explained. Main activities of the various environmental non-governmental organizations are described in the table.

#### 3.2 National Environmental Policy

Environmental policy of the country such as national environmental action plan is explained.

#### 3.3 Environmental Laws and Regulations

Environmental laws and regulations of the country including their status of applications are described.

### 4. State of the Environment

In this Chapter, status of the various environmental issues as follows are covered with information on related agencies, related standards, laws and regulations, examples of the issue are explained. In the section 4.3, other kind of considerable environmental issues in the country are described based on the report which local consultant prepared.

4.1 Air Pollution	4.7 Waste Water Management
4.2 Water Pollution	4.8 Forest Conservation/Desertification
4.3 Other Pollution	4.9 Biodiversity
4.4 Waste Management	4.10 Natural Resource Management
4.5 Energy Conservation and Alternative Energy	4.11 Natural Disaster
4.6 Water Supply	4.12 Environmental Education

### 5. International Relationship

Status of the implementation of the economic and technical assistance projects in the country are outlined. International conventions and agreements on environment which the country agreed and ratified are listed up in section 5.1, and environmental projects which are funded and/or implemented in the country by donor countries and international organization in the section 5.2. In addition, location map of the project funded and implemented by using the Official Development Assistance (ODA) of Japanese government are showed.

### 6. Sources of Information

Governmental environmental agencies related institutions and NGOs are listed with the some information such as contact address and e-mail address.

### 7. References

References used in the report are listed.



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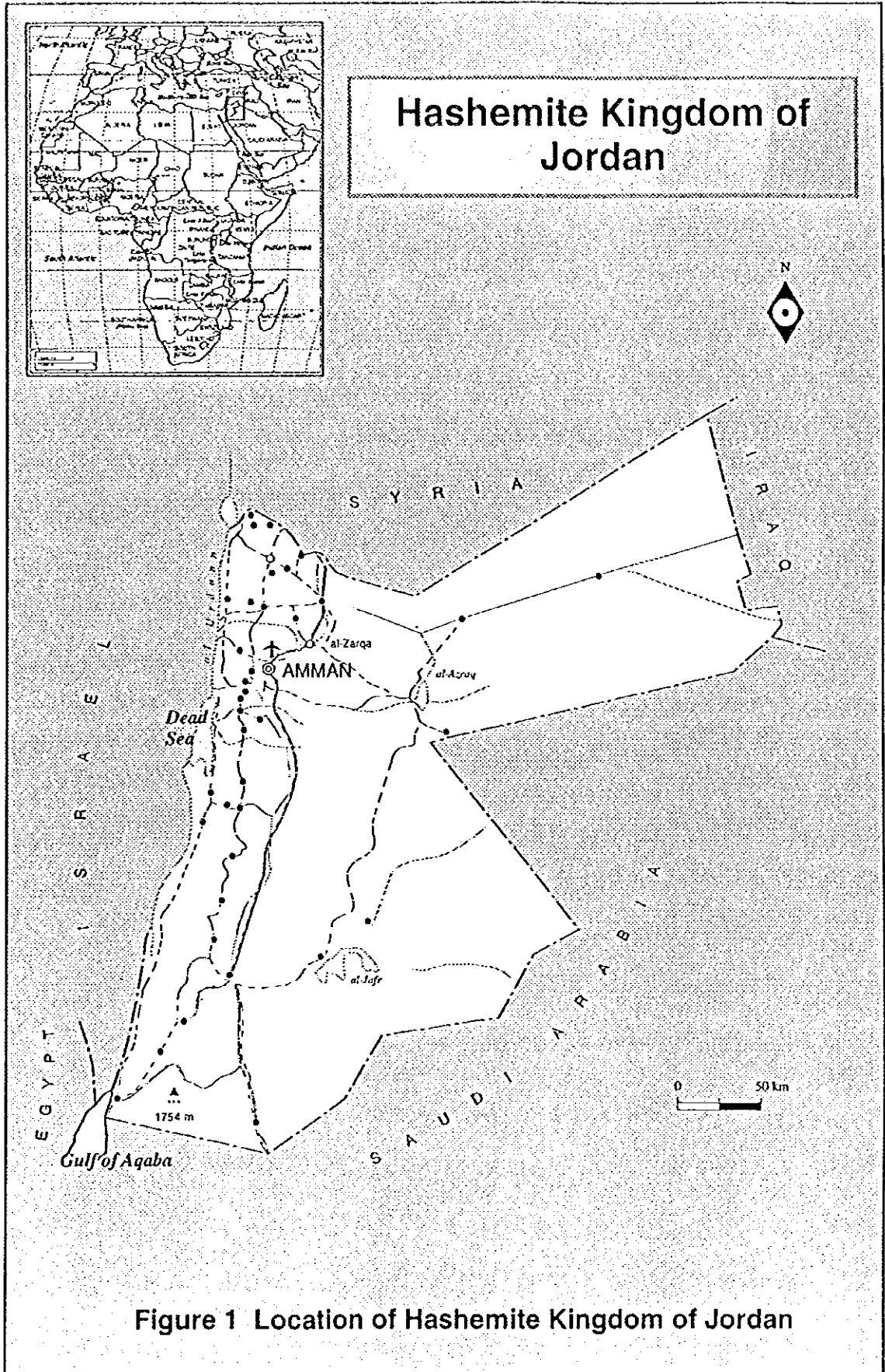
## 1. KEYWORDS OF THE ENVIRONMENT

### 1.1 Features of the Country

	Related pages
<p>① <b>Gross Domestic Production(GDP)</b>                      US\$1,265 per capita (Japan : US\$33,857, China : US\$361)                      Total : US\$5.2 billion</p>	<ul style="list-style-type: none"> <li>· 2. Fact Sheet p.3</li> </ul>
<p>② <b>High-concentrated Urban Population</b>                      Urban population rate: 71%                      Total population: 5.4 million, Urban population: 3.9 million</p>	<ul style="list-style-type: none"> <li>· 2. Fact Sheet p.3</li> <li>· 4.1, 4.2, 4.4</li> </ul>
<p>③ <b>Semi-arid country</b>                      Desert area: 75% of the country</p>	<ul style="list-style-type: none"> <li>· 2. Fact Sheet p.3</li> </ul>

### 1.2 Keyword of Environmental Issues

	Related page
① Air pollution	4.1 Air pollution p. 8
② Water pollution	4.2 Water pollution p. 10
③ Waste management	4.4 Waste management p. 13
④ Water resources	
· Over exploitation of groundwater	4.2 Water pollution p. 10
⑤ Agriculture and land	
· Soil degradation	4.3 Other pollution p. 10
· Desertification	4.8 Desertification p. 10



Source: Data Atlas 1994 - 1997

## 2. FACT SHEET

## 2.1 Socio-economic Index

Index	Data	Data year	Reference
Population	5.44 million (annual average incremental rate : 24.9% (1990~95))	1995	b)
Race	Arabian and Palestinian (60% of total population)	no information	f)
Religion	Islam (national religion) 93%, Christianity and others 7%	no information	f)
Literacy rate	Adult female : 73% Adult male : 91%	1990	b)
Urban Population rate	71% (3.89 million)	1995	b)
Life expectancy	68 (1990~1995 average)	1990-95	b)
Under-5 mortality rate	27 (per 1,000)	1993	b)
GNP <sup>1</sup>	\$4,881 million (\$1,190/person)	1993	b)
GDP <sup>1</sup>	\$5,190 million (\$1,265/person)	1993	b)
GDP structure	Agriculture : 8% Industry : 26% Service industry & others : 66%	1993	b)
Prime industry	Textiles, cement, food processing, chemical fertilizer	1996	f)
Prime resource	Phosphorus ore, potassium, wheat, barley, corn, olive, vegetables, grape	1996	f)
Safe water (% of population with access) <sup>2</sup>	Urban : 92% Rural : 83%	1980-1995	b)
% of sewerage population <sup>3</sup>	Urban : 41% Rural : 2%	1980-1995	b)
Human Development Index (HDI)	0.730 (World rank 84, GDP per capita rank 81 in same year)	1994	e)

\*1 : The estimated value of the GNP was exchanged and adjusted from local currency into US\$ by means of 3-year average of exchange rates. The estimated value of the GDP was presented in US\$ of 1993 based on the exchange rate.

\*2 : "Safe water" includes treated surface water, and untreated water which is pumped up from protected spring / excavated well and sanitary well.

\*3 : "Sewered population" should be met conditions that the population in urban area can use public sewerage and indoor facility such as dug hole outdoor toilet, pouring water toilet, private sewerage system, public community toilet, and similar facilities, and that the population in rural area can use dug hole outdoor toilet, pouring water toilet, or other proper treatment methods.

## 2.2 Geographical Characteristics

Area : 98,000 km <sup>2</sup> (about 1.2 times as Hokkaido in Japan)
Geographical features : semi-arid land: 75% of land area is desert, 3 distinct geographic regions: 1) Jordan Valley Region, 2) Mountain Heights Region, 3) Desert Region
Highest place : (no information)

Source: a), f)

## 2.3 Meteorological Characteristics

Climate : 3 main types: 1) Arid, 2) Semi-arid, 3) Mediterranean
Average temperature : mean annual minimum: 5°C in Sharah ~ 20°C in Aqaba, mean annual maximum: 30°C in Wadi ~ 20°C in mountain range.
Average annual rainfall : rainy season (October ~ May, heavy fall in January and February)
1) Eastern hill: 500~600 mm/year, 2) Ghor: 150~250mm/year, 3) Eastern Desert: less than 100 mm/year
Climatic classification : (no information)

Source: a)

## 2.4 Ecological Characteristics

Biogeographical feature: (no information)
Identified animals and plants : (no information)
Protected area : 7 natural reserves (total area: 1,290km <sup>2</sup> ), Grazing reserves

Source: a)

## 2.5 Hydrological Characteristics

Main river: al-Urdunn, Yermouk, Jordan
Lakes: al-Jafr, al-Azraq, Tiberias

Source: a)

## 2.6 Land Use

Type	% of Area
Arable land	4
Permanent crops	1
Permanent pastures	9
Forest and woodland	1
Others	85
Total	100

Source: a)



## 3. INSTITUTIONAL CONTEXT

## 3.1 Environmental Agency

## 3.1.1 Governmental Agency

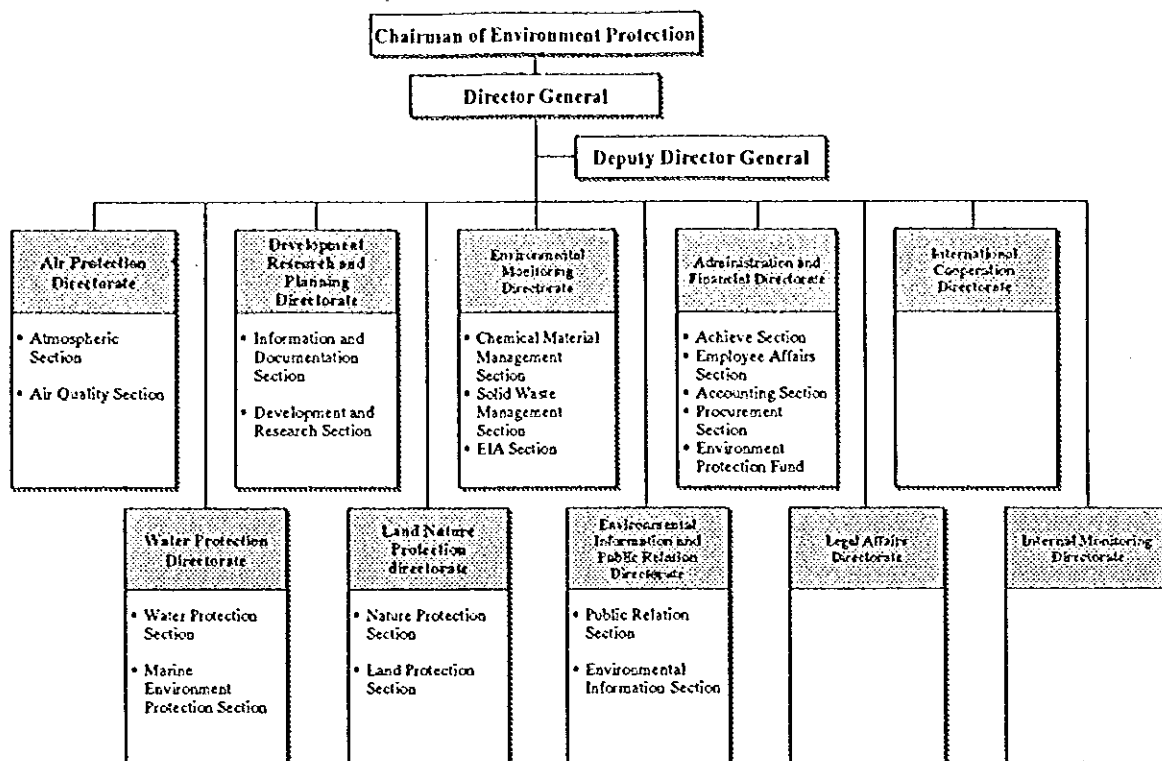
(see "6. SOURCES OF INFORMATION" on each agencies and its contact address.)

Governmental Agency	Environmental Issues (Each No. consist with Section No.)											
	4.1 Air pollution	4.2 Water pollution	4.3 (1) Soil Degradation	4.4 Waste	4.5 Energy	4.6 Water Supply	4.7 Waste Water	4.8 Forest	4.9 Biodiversity	4.10 Resources	4.11 Disaster	4.12 Education
General Corporation for Environment Protection (GCEP)	○	—	—	○	—	—	—	—	—	—	—	—
Royal Scientific Society (RSS)	○	○	—	—	○	—	○	—	○	—	—	—
Environmental Research Center (ERC)	○	—	—	—	—	—	—	—	—	—	—	—
Ministry of Health	○	○	—	○	—	—	—	—	—	—	—	—
Ministry of Energy and Mineral Resources	○	—	—	—	—	—	—	—	—	—	—	—
Meteorological Department	○	—	—	—	—	—	—	—	—	—	—	—
Ministry of Water and Irrigation	—	○	○	○	—	○	○	○	—	—	○	—
General Corporation for Environment Protection	—	○	○	—	○	—	○	—	○	—	—	—
Ministry of Agriculture	—	—	○	—	—	—	—	○	—	—	○	—
Ministry of Municipal, Rural Affairs and Environment	—	—	—	○	—	—	—	—	—	—	—	—
Greater Amman Municipality	—	—	—	○	—	—	—	—	—	—	—	—
Ministry of Energy and Mineral Resources	—	—	—	—	○	—	—	—	—	—	—	—
National Electric Power Company	—	—	—	—	○	—	—	—	—	—	—	—
Jordan Petroleum Refinery	—	—	—	—	○	—	—	—	—	—	—	—
Ministry of Interior	—	—	—	—	—	—	—	○	—	—	○	—
Royal Society for Conservation of Nature	—	—	—	—	—	—	—	—	○	—	—	—
Ministry of Energy and Mineral Resources-Natural Resources Authority (NRA)	—	—	—	—	—	—	—	—	—	—	—	—
Ministry of Education	—	—	—	—	—	—	—	—	—	—	—	—
Others	—	—	—	—	—	—	—	—	○	○	—	—

Note:1) : ○ → related — → No relation na → no information

2) : 4.3 other pollutions, 4.3(1) Soil Degradation,  
 4.5 Energy conservation and alternative energy, 4.7 Waste water management,  
 4.8 Forest conservation / desertification, 4.10 Natural resource management,  
 4.11 Natural disasters, 4.12 Environmental education

3) : Refer to each section related to other agencies when column "Others" is filled by ○.



Source: a)

### Organization Structure of the General Corporation for Production of Environment

#### (2) Governmental organization related to environmental issues

Organization / Outline of activities	Annual budget	Number of staff
• Ministry of Municipal, Rural Affairs and Environment	no information	no information
• Ministry of Agriculture		
• Ministry of Energy and Mineral Resources		
• Ministry of Health		
• Ministry of Interior		
• Ministry of Trade and Industry		
• Ministry of Labor		
• Ministry of Planning		
• Ministry of Tourism and Antiquities		
• Ministry of Water and Irrigation		
• Ministry of Public Work and Housing		
• Higher Council for Science & Technology	no information	no information
• Royal Scientific Society		
• Aqaba Regional Authority	no information	no information
• Jordan Valley Authority		
• National Electric Power Company (NEPCO)		
• Water Authority of Jordan		
• Municipality of Greater Amman		

Source: a)

## 3.1.2 Non-governmental Agency (NGO)

Name of NGO	Established year	Main activities
1. Royal Society for the Conservation of Nature (RSCN)	(no information)	RSCN was created in 1966 as an independent, voluntary organization devoted to conservation of Jordan's natural resources, and it has been given responsibility by the Government of Jordan for protecting the country's wild life and wild places. RSCN's activities is summarized by its mission to protect and manage the natural resources of Jordan by: <ul style="list-style-type: none"> <li>• Establishment of resources and national parks to protect species to save them from extinction.</li> <li>• Enforcement of Government Laws for the protection of wild life.</li> <li>• Controlling illegal hunting.</li> <li>• Raising awareness of environmental issues through education programs.</li> <li>• Promotion of sustainable use of natural resources.</li> <li>• Helping to fight pollution.</li> </ul>
2. Jordan Environmental Society (JES)	(no information)	JES was founded in 1988, as independent non-government organization and has more than 73 member organizations and 4000 individuals, joined together to promote the protection of the environment and the sustainable use of natural and living resources. It is concerned with environmental protection, pollution prevention, Law and administration, ecology, forestry, water and environmental awareness and education. JES objectives can be summarized as follows: <ul style="list-style-type: none"> <li>• Work towards the establishment and application of policies, standards and actions for the protection and improvement of the Jordanian environment.</li> <li>• Identify local problems and participate in finding solutions to such problems.</li> <li>• Raise the level of environmental awareness among all strata of the Jordanian society.</li> </ul>

Source: a)

## 3.2 National Environmental Policy

Policy/Project Name and Contents	Funding or Implementing Agency
(no information)	

Source:

## 3.3 Environmental Laws &amp; Regulations

Laws & Regulations	Status	Related Pages
Constitutional Provision Law of Protection of Environment No. 12, 1995. GCEP in the process of issuing standards and specification for: <ul style="list-style-type: none"> <li>• Noise.</li> <li>• Air protection.</li> <li>• Chemical material management.</li> <li>• Solid waste management.</li> <li>• Environmental Impact Assessment.</li> </ul>	(no information)	
Atmospheric Pollution <ul style="list-style-type: none"> <li>• Law of Protection of Environment No. 12, 1995.</li> <li>• Traffic Law No. 14, 1984.</li> <li>• Public Health Law No. 21, 1971.</li> <li>• Quarries Law No. 8, 1971.</li> </ul>	(no information)	
Solid Waste <ul style="list-style-type: none"> <li>• Law of Protection of Environment No. 12, 1995.</li> <li>• Public Health Law No. 21, 1971.</li> <li>• Organization of Cities, Villages and Building Law No. 79, 1966.</li> </ul>	(no information)	
Water Resources <ul style="list-style-type: none"> <li>• Law of Protection of Environment No. 12, 1995.</li> <li>• Public Health Law no. 21, 1971.</li> <li>• Organization of Cities, Villages and Building Law No. 79, 1966.</li> <li>• Jordan Valley Authority Law No. 19, 1988.</li> <li>• Water Authority Law No. 18, 1988.</li> </ul>	(no information)	

Laws & Regulations	Status	Related Pages
<b>Wastewater Management</b> <ul style="list-style-type: none"> <li>• Law of Protection of Environment No. 12, 1995.</li> <li>• Jordan Valley Authority Law No. 19, 1988.</li> <li>• Water Authority Law No. 18, 1988.</li> <li>• Organization of Cities, Villages and Building Law No. 79, 1966.</li> </ul>	(no information)	
<b>Land &amp; Agriculture. (Forest Conservation &amp; Desertification)</b> <ul style="list-style-type: none"> <li>• Law of Protection of Environment No. 12, 1995.</li> <li>• Agriculture Law No. 20, 1973.</li> <li>• Organization of Natural Resources Law No. 21, 1968.</li> <li>• Municipalities Law No. 29, 1955.</li> <li>• Civil Defense Law No. 12, 1973.</li> <li>• Jordan Valley Authority Law No. 19, 1988.</li> </ul>	(no information)	
<b>Biological Diversity</b> <ul style="list-style-type: none"> <li>• Law of Protection of Environment No. 12, 1995.</li> <li>• Agriculture Law No. 20, 1973.</li> <li>• Bird and Wild Animals Protection Law No. 112, 1973.</li> <li>• Marine Establishment of Aqaba Port, Law No. 4, 1969.</li> <li>• Aqaba Region Law No. 7, 1987.</li> <li>• Jordan Valley Authority Law No. 19, 1988.</li> </ul>	(no information)	
<b>Energy</b> <ul style="list-style-type: none"> <li>• Law of Protection of Environment No. 12, 1995.</li> <li>• Electricity Authority Law No. 8, 1976.</li> <li>• Nuclear Energy &amp; Radiation Protection Law No. 14, 1987.</li> </ul>	(no information)	
<b>Natural Resources</b> <ul style="list-style-type: none"> <li>• Law of Protection of Environment No. 12, 1995.</li> <li>• Quarries Law No. 8, 1971.</li> <li>• All Laws related to Water Resources mentioned above.</li> </ul>	(no information)	
<b>Other Pollution (fertilizers, pesticides &amp; plastic waste)</b> <ul style="list-style-type: none"> <li>• Law of Protection of Environment No. 12, 1995.</li> <li>• Agriculture Law No. 20, 1973.</li> <li>• Public Health Law No. 21, 1971.</li> <li>• Organization of Cities, Villages and Building Law No. 79, 1966.</li> </ul>	(no information)	

Source: a)

## 4. STATE OF THE ENVIRONMENT

### 4.1 Atmospheric Pollution

**Stationary Sources.** Industrial pollution in the areas around industrial complexes cause degradation of air quality. Degraded air quality has been observed in the industrial areas of Zarqa Basin (Hashimiya, Russeifa, Zarqa City, the port of Aqaba, and Fuheis). The area north of Zarqa City is affected by air pollution from oil refinery and power generating plant. Oil refinery emission have been measured at 30-40 tons of sulfur dioxide per day. High levels of suspended particulate are generated by phosphate mining in Russeifa area. The Hashimiya area is subjected to relatively high air pollution and sewerage problems from Khirbet Samra treatment plant. Dust and air pollution from some of the industries like the Cement Industry which is close to urban surroundings and agricultural land has become a problem. The Cement factory in Fuheis, north of Amman emits high levels of dust and gases. The fertilizer complex in Aqaba includes plants producing sulfuric acid, phosphoric acid, fertilizers and aluminum fluoride.

**Mobile Sources.** Excessive fuel consumption, use of leaded petrol or high sulfur content diesel oil are principal sources of mobile sources of air pollution. There are around 300,000 vehicles registered in the country mostly in Amman district. Amman Consumes a lot of high -sulfur content diesel oil for heating purposes, which causes emission of Pb, PM, NO<sub>x</sub>, CO, CO<sub>2</sub> and SO<sub>4</sub>. The down town Amman due to its topography and hilly surrounding suffers from air quality problem. Air quality in the port of Aqaba is affected by the activities of the port, and by heavy trucks carrying phosphate, potash, cement, fertilizers, oil and other cargoes emitting exhaust fumes and dust.

**Natural Sources.** The principle sources of natural air pollution are sand and dust storms resulting from Khamasini depressions coming across the north African Coast. Statistics of the Meteorological Department indicate that 5-6 depressions occur annually, and the quantity of dust resulting from them reach 1.8 million tons / year.

Air quality measurement are just starting and a through assessment of the situation will only be possible, when data is correlated with an epidemiological indicator.

Source: a)

Related Agency
① General Corporation for Environment Protection (GCEP) - Air Protection Directorate
② Royal Scientific Society (RSS) - Environmental Research Center (ERC)
③ Ministry of Health - Environmental Health Division
④ Ministry of Energy and Mineral Resources
⑤ Meteorological Department

Source: a)

#### Principal Stationary Sources of Air Pollution & Contaminants

Type of Source	Types of Air Contaminants
Petroleum Refinery (Zarqa)	CO, CO <sub>2</sub> , H <sub>2</sub> S, SO <sub>2</sub> , and Hydrocarbons
Thermal Power Plant (Zarqa, Aqaba)	CO, CO <sub>2</sub> , SO <sub>2</sub> , NO <sub>x</sub>
Cement factories (Fuheis, Qadisiya, Dhuleil)	Dust
Phosphate mines (Russeifa, Hasa, Shadyia, Abyad)	Dust
Industrial estates in E. Amman, Russeifa, Awajan, Zarqa, Sahab; and plants for iron and steel, tanning leather, chemical detergents, and batteries.	Cl <sub>2</sub> , F <sub>2</sub> , Pb, SO <sub>2</sub> , CO
Quarries and asphalt mixing.	Dust, CO, CO <sub>2</sub> , SiO <sub>2</sub>
Fires, waste burning, grass burning, tyre burning.	CO, CO
Phosphate and Potash loading (Aqaba).	Dust
Fertilizer Plant (Aqaba).	F <sub>2</sub> , NH <sub>3</sub> , SO <sub>2</sub>
Glass factory (Ma'an).	SO <sub>2</sub> , CO, CO <sub>2</sub>
Loading and discharging at crop silos in Aqaba.	Dust
Treatment Plants (most important one at Khirbet Samra).	Odour, H <sub>2</sub> S, NH <sub>3</sub> , CH <sub>4</sub>
Potash Plant (Ghor Safi).	Dust, SO <sub>2</sub> , CO <sub>2</sub>
Crude oil loading (Aqaba).	Hydrocarbons
Gas stations.	Hydrocarbons
Bakeries in all areas.	CO, CO <sub>2</sub> , SO <sub>2</sub>
Power plants (Marka).	CO, CO <sub>2</sub> , SO <sub>2</sub>
Domestic activities: cooking, heating, cleaning, using insecticides.	Propane, SO <sub>2</sub> , components of insecticides particles.

Source: NES, 1991.

## Main Issues of Air Pollution

- Lack of comprehensive standards and specifications establishing allowable threshold limit for emissions affecting air quality.
- Increased urbanization and industrialization may result in urban pollution becoming a major concern.
- Exhaust gas from automobiles and fuel quality in terms of the level of toxic materials such as sulfur and lead.
- Emissions from industrial factories, Refinery, Thermal power plant, Cement factories, Phosphate mines together with the transport, shipping and export of raw materials such as phosphate and cement
- Natural factors related to the climate.

Source: a)

## Proposed air Quality Standards

Pollutant	Measuring Time	Ambient Micro-gram/m <sup>3</sup>	C-value micro-gram/m <sup>3</sup>
Sulfur dioxide (SO <sub>2</sub> )	1 hour	350	250
	24 hours	125	
	1 year	50	
Nitrogen dioxide (NO <sub>2</sub> )	1 hour	400	125
	24 hours	150	
	1 year	100	
Particulate (TSP)	1 hour	350	100
	24 hours	200	
	1 year	100	
Total fluorides (as F)	1 hour		2
Hydrogen Chloride (HCl)	1 hour		50
Hydrogen Sulfide (H <sub>2</sub> S)	1 hour		1
Ammonia (NH <sub>3</sub> )	1 hour		300

Source: Source: Jordanian Standard Specifications for "Drinking Water" No. (286), 1993

## Examples of Ambient Measurement Method

Pollutant	Analysis Method	Equipment for Analysis	Sampling Equipment
Sulfur dioxide	Colourmetric	Spectrometric	Gas
Carbon monoxide	NDIR	NDIR analyzer	CO Analyzer
Nitrogen	Colourmetric	Spectrophotometer	Gas Sampler
Oxidant as O <sub>3</sub>	Colourmetric	Spectrophotometer	Gas Sampler
Suspended Particulates	Gravimetric	Scale	Hi-Vol
Lead	- Gravimetric Scale - Destruction AA	Scale AA	Hi-Vol

Explanations: NDIR = Non Dispersiv Infrared  
Hi-Vol = High Volume Sampler  
AA = Atomic Absorption

Source: Source: Jordanian Standard Specifications for "Drinking Water" No. (286), 1993

## Principal Strategy Sources of Air Pollution &amp; Contaminants

Type of Source	Types of Air Contaminants
Petroleum Refinery (Zarqa)	CO, CO <sub>2</sub> , H <sub>2</sub> S, SO <sub>2</sub> , and Hydrocarbons
Hussein Thermal Power Plant (Zarqa)	CO, CO <sub>2</sub> , SO <sub>2</sub> , NO <sub>x</sub>
Cement factories (Fuheis, Qadisiya, Dhuleil)	Dust
Phosphate mines (Russeifa, Hasa, Shadiya, Abyad)	Dust
Industrial estates in E. Amman, Russeifa, Awajan, Zarqa, Sahab; and plants for iron and steel, tanning leather, chemical detergents, and batteries.	Cl <sub>2</sub> , F <sub>2</sub> , Pb, SO <sub>2</sub> , CO
Quarries and asphalt mixing	Dust, CO, CO <sub>2</sub> , SiO <sub>2</sub>
Fires, waste burning, grass burning, tyre burning	CO <sub>2</sub> , CO
Phosphate and potash loading (Aqaba)	Dust
Fertilizer Plant (Aqaba)	F <sub>2</sub> , NH <sub>3</sub> , SO <sub>2</sub>
Glass factory (Ma'an)	SO <sub>2</sub> , CO, CO <sub>2</sub>
Loading and discharging at crop silos in Aqaba	Dust
Treatment plants (most important one a Khirbet Samra)	Odour, H <sub>2</sub> S, NH <sub>3</sub> , CH <sub>4</sub>
Potash Plant (Ghor Safi)	Dust, SO <sub>2</sub> , CO <sub>2</sub>
Crude oil loading (Aqaba)	Hydrocarbons
Gas stations	Hydrocarbons
Bakeries in all areas	CO, CO <sub>2</sub> , SO <sub>2</sub>
Power plants (Marka)	CO, CO <sub>2</sub> , SO <sub>2</sub>
Domestic activities: cooking, heating, cleaning, using insecticides	Propane, SO <sub>2</sub> , components of insecticides particles

Source: c)

Laws and Regulations	Presence	Name of Laws or Regulations (Reference)
① Law on air pollution	○	• Law of Protection of Environment No. 12, 1995
② Ambient air quality standard	?	• Traffic Law No.14, 1984
③ Emission standard (stationary and/or mobile sources)	?	• Public Health Law No.21, 1971
④ Environmental monitoring results	?	• Quarries Law No.8, 1971

Note: ○ : Issued, × : None, △ : Under planning, ? : Unknown

## 4.2 Water Pollution

Water pollution results from depletion and degradation of water resources. Surface and groundwater in some basins in the country has been subject to pollution from different sources. The main potential sources of contamination includes industrial and municipal wastes, leachate at solid waste disposal sites and at wastewater stabilization ponds, use of pesticides and chemical fertilizers in agriculture and salinization as result of over extraction from groundwater basins.

### Scarcity of Water Resources.

Supply of water is limited, whereas the demand for it is growing rapidly.

**Over Extraction Of Groundwater.** The majority of groundwater reservoirs are being utilized at rates exceeding their sustainable yield leading to the intrusion of saline water. Over extraction is estimated in 1995 at 222 MCM per year. The combined abstraction rate of all renewable groundwater approaches 437 MCM per year, a rate equal to 159%, of their sustainable yield. The over pumping rates varies from 146% in minor aquifers to 235% in major ones. Therefore with continuous over extraction the problem of salinization of groundwater will increase.

**Pollution From Domestic Waste.** Most of the effluent from wastewater treatment plants is used for irrigation mainly in the Jordan Valley. The water Authority of Jordan operates 14 treatment plant and the present annual effluent quantity is about 60 MCM which is expected to rise rapidly in the future. Total dissolved solids (TDS) and fecal coliform are main causes of concern for its reuse in agriculture. The land fill in Amman which is the largest in the country, serving a population of about 2.3 million in Amman and Zarqa receives industrial, commercial, hospital as well as household solid waste. The land fill site is a potential source of contamination to groundwater aquifer from leachate from the solid wastes.

**Pollution From Industrial Wastewater.** There are a total of 110 industries located in the Amman-Zarqa area of which about 60 percent are connected to the public sewer system, other wastewater effluent's generated by the industry are discharged directly into the Zarqa River and consequently to King Talal Reservoir, or hauled by tanker trucks to remote location. The water quality in King Talal Dam reservoir is of high concern due to its effect to irrigated crops in the Jordan valley.

**Others.** The Jordan River is highly saline mainly because of the diversion of brackish springs around lake Tiberias in Israel to the Jordan River and due to irrigation return flows discharging into the river.

Source: a)

Related Agency
① Ministry of Water and Irrigation • Water Authority • Jordan Valley Authority
② General Corporation for Environment Protection-Water Protection Directorate
③ Ministry of Health
④ Royal Scientific Society-Environmental Research Center

Source: a)

Main Issues of Water Pollution
• The need to complete sewerage networks and treatments plants and upgrade overloaded treatment plants to preserve surface and groundwater and the environment.
• Completing establishment of treatment plants for factories and enforce regulations to ensure compliance of effluent with standards.
• Setting standards of quality according to intended use of water produced by wastewater treatment plants.
• Over-pumping of groundwater that may lead to the saline water intrusion in certain aquifers.
• Leachate from solid and liquid waste dumping sites and waste stabilization ponds.

Source: a)

**Biological Characteristics for Drinking Water must be free from the following**

Organism	Guideline - Value
a. PROTOZOA	0
b. HELMINTHS (PATHOGENIC)	0
c. FREE LIVING ORGANISM	0

Source: Jordanian Standard Specifications for "Drinking Water" No. (286), 1993

**Physical Characteristics**

Characteristic	Limit Permitted	Max. Acceptable Limit if no other source could be available
TASTE	Acceptable to most consumers	-
ODOR	Acceptable to most consumers	-
COLOR	10 units "Platinum - Cobalt Standard"	15 units
TURBIDITY	1 unit "Jakson Candle Turbidimeter"	5 units
PH LEVEL	Not less than 6.5 Not more than 9.00	-
TEMPERATURE	Between 8°C to 25°C	-

Source: Jordanian Standard Specifications for "Drinking Water" No. (286), 1993

**Poisonous Material in Water**

Constituent	Max. Limit mg/l
LEAD "Pb"	0.05
SELENIUM "Se"	0.01
ARSENIC "As"	0.05
CROMIUM "Cr"	0.05
CYANIDE "CN"	0.1
CADMIUM "Cd"	0.005
MERCURRY "Hg"	0.001
ANTIMONY "sb"	0.01
SILVER "Ag"	0.01

Source: Jordanian Standard Specifications for "Drinking Water" No. (286), 1993

**Constituents of Health Significance**

Constituent	Limit Permitted (ug/l)	Max. acceptable limit if no other source could be available (ug/l)
Total Dissolved Solids (TDS)	500	1500
Total Hardness TH (Ca Co3)	100	500
Detergents (ABS)	0.5	1.0
Aluminum (AL)	0.2	0.3
Iron (FE)	0.3	1.0
Manganese (Mn)	0.1	0.2
Copper (Cu)	1.0	1.5
Zinc (Zn)	5	15
Sodium (Na)	200	400
Nickel (Ni)	0.05	0.1
Chloride (CL)	200	500
Fluoride (F)	1.0	1.5
Sulfate (SO <sub>4</sub> )	200	500
Nitrate (NO <sub>3</sub> )	45	70

Source: Jordanian Standard Specifications for "Drinking Water" No. (286), 1993

**Factories Wastewater Effluent Characteristics**

Characteristics	Minimum Allowable Limit			
	Re-use for Irrigation Purposes	Recharged Underground Water	Effluent Discharge to	
			Sea	Rivers, Wades & Reservoirs
BOD	-	50	-	50
COD	-	150	200	100
Dissolved Oxygen	1	1	5	1
Total Dissolved Solids	2,000	1,500	-	3,000
Suspended Solids	100	-	-	50
PH	6.5-8.4	6.5-9.0	5.5-9.0	6.5-9.0
Colour	-	15	75	15
Change in Temperature	-	-	4	-
Fat and Oil contents	5	-	10	15
Vinyl	0.002	0.002	1	0.002
Detergents (ABS)	-	15	-	25
Nitrate- (Nitrogen)	30	12	-	12
Ammonia	5	5	12	5
Total Nitrogen	50	-	125	-
Phosphate	-	-	-	15
Chloride	350	500	-	500
Sulfate	400	500	-	500
Fluoride	-	1.5	-	1.5
Bi-Carbonate	500	-	-	-
Sodium	-	400	-	-
Magnesium	-	-	-	-
Calcium	-	-	-	-
Sodium Absorption %	9	-	-	-
Aluminum	5	0.3	-	5
Aysemic	0.1	0.05	0.1	0.05
Boron	1	1	-	1
Chromium	0.1	0.05	0.3	0.1
Copper	0.2	2	0.1	2
Iron	5	1	2	1
Manganese	0.2	0.2	0.2	0.2
Nickel	0.2	0.1	0.02	0.2
Lead	1.0	0.1	0.1	0.1
Selenium	0.02	0.05	0.02	0.02
Cadmium	0.01	0.02	0.07	0.01



Characteristics	Minimum Allowable Limit			
	Re-use for Irrigation Purposes	Recharged Underground Water	Effluent Discharge to	
			Sea	Rivers, Wades & Reservoirs
Zinc	2	15	-	15
Cyanide	0.1	0.1	1.0	0.1
Mercury	0.001	0.001	0.001	0.001
Most Probable Number (MPN) of Coliform Organism (in 100mm)	-	-	5,000	-
Fecal Coliforms (in 100mm)	1,000	1,000	-	1,000
Intestinal Nematodes (Number/Liter)	<1	-	-	<1

Source: Jordanian Standard Specifications for "Drinking Water" No. (286), 1993

Laws and Regulations	Presence	Name of Laws or Regulations (Reference)
① Law on water pollution	?	
② Water quality standard	?	
③ Effluent standard	?	
④ Drinking water standard	?	
⑤ Water quality monitoring	?	
⑥ Guidelines on water quality	?	

Note: ○ : Issued, × : None, △ : Under planning, ? : Unknown

### 4.3 Other Pollution

#### (1) Soil Degradation

Excess Agrochemicals and Plastics. Agricultural activities in Jordan Valley is considered a significant source of pollution, where plastic covers and plastic sheets are discarded at random. Over use of fertilizers, insecticides and pesticides are a serious environment concern.

Soil Salinization. Utilization of irrigation water with high salinity, over cropping and over use of land are causes of salinization of land, recently the quality of irrigation water has deteriorated in some areas due to over abstraction of groundwater and contamination of surface water. The salinity of water and salinization of land have become a major environmental issue.

Source: a)

Related Agency
① Ministry of Water & Irrigation, Jordan Valley Authority
② Ministry of Agriculture
③ General Corporation for Environment Protection - Land Protection Division/Chemical Materials Management Division

Source: a)

Laws and Regulations	Presence	Name of Laws or Regulations (Reference)
① Law on soil degradation	○	<ul style="list-style-type: none"> <li>• Law of Protection of Environment No. 12, 1995.</li> <li>• Agriculture Law No. 20, 1973.</li> <li>• Public Health Law No. 21, 1971.</li> <li>• Organization of Cities, Villages and Building Law No. 79, 1966.</li> </ul>

Note: ○ : Issued, × : None, △ : Under planning, ? : Unknown

#### 4.4 Waste Management

Municipal solid waste in Jordan contains about 70 percent organic waste. Solid waste is usually disposed in dumping sites. There are about 23 existing land fills in Jordan, and some of them is used as dumping sites for both wastewater and solid waste. However in addition to Amman, 10 sites in the major cities recently received garbage collection and transport equipment which improved the waste management in those cities. In Amman waste collection system is adequate, however in some smaller towns and rural areas there is no proper organized collection systems. The Akaidir disposal site near Irbid causes odour problems due to dumping of sewerage waste, recently the Water Authority of Jordan undertakes to expand the Irbid sewerage treatment plant which is expected to resolve this problem. Municipalities in certain small urban areas lack proper and adequate transporting vehicles, compactors and adequate containers for waste collection.

Hazardous waste in Jordan requiring appropriate disposal is composed mostly of inorganic waste with heavy metals or cyanide, slags, pesticides waste and organic chemical waste. Quantities of hazardous waste to be disposed are estimated of 17,400 tons and 26,200 tons in the year 2000 and 2015 respectively. There is not enough local experience in handling industrial waste or to prepare and execute industrial waste minimization projects.

Source: a)

Related Agency
① General Corporation for Environment Protection (GCEP) - Monitoring Environmental Directorate
② Ministry of Municipal, Rural Affairs and Environment - Cooperative Services Council
③ Ministry of Health
④ Greater Amman Municipality
⑤ Ministry of Water and Irrigation

Sources: a)

Main Issues of Waste Management
<ul style="list-style-type: none"> <li>Plant loading and the characteristics of influent are major factors that effect efficiency.</li> <li>Land fill sites, their location, design and management should be addressed to minimize possible hazards and any negative environmental impact.</li> <li>Handling, storing, transporting, importing and disposing of hazardous material, including medical waste.</li> </ul>

Source: a)

Laws and Regulations	Presence	Name of Laws or Regulations (Reference)
① Laws on waste	○	<ul style="list-style-type: none"> <li>Law of Protection of Environment No.12, 1995</li> <li>Public Health Law No.21, 1971</li> <li>Organization of Cities, Villages and Building Law No.79, 1966</li> </ul>
② Laws on hazardous waste	?	

Note: ○ : Issued, × : None, △ : Under planning, ? : Unknown

## 4.5 Energy

Environment aspects of the energy sector addresses problems associated with the use of fossil fuels which include oil, natural gas, oil shale and tar sands and renewable sources of energy which includes geothermal energy.

### 1. Environmental issues associated with fossil fuels.

Refinery Pollution as with other heavy industries, refining crude oil, storing, importing and distributing petroleum products results in producing some pollutants in gas, liquid and solid forms. Noise from heavy equipment and rotating machinery is another pollution problem. The main environment concern with regards pollution from refinery are:-

- Air pollution
- Spent lobe oil
- Tetra Ethyl lead
- Wastewater pollution
- Solid Waste
- Spent Soda
- Noise

**Thermal Power Plants Pollution.** In Hussein thermal power station and Aqaba thermal power station the sources of air pollution are SO<sub>x</sub>, H<sub>2</sub>S, CO, CO<sub>2</sub>, NO<sub>x</sub> and particular emission in addition, the possible groundwater pollutants are sulfates and chlorides from acids, and sodium from caustic soda used for regeneration.

**Natural Gas.** The natural gas in Risha area has been utilized for the production of electricity. The environmental concerns are (I) flue gas emissions, CO, CO<sub>2</sub>, NO<sub>x</sub> (II) CO content, which causes corrosion when it reaches water. But, compared with fuel oil natural gas is clean energy.

**Oil Shale and Tar Sands.** The possible use of oil shale in the future as source of energy might have the following major environmental effects:-

- Air and water pollution
- Potentially hazardous health effects
- Solid and liquid waste
- Alteration of land

The possible use of Tar Sand in the future might lead to negative effects on the environment due to SO and nitrogen - bearing emissions during combustion. The residual (Tailings) and ashes might cause groundwater contamination if not disposed of in safe places.

### 2. Renewable sources of energy.

**Geothermal Energy.** The utilization of geothermal energy from thermal spring and bore holes offers environmental advantages in terms of land areas requirements and use and in terms of effluent management. The potential exist in many areas in Jordan which could be considered for industrial, agriculture and tourist development. However geothermal energy has a number of negative environmental effects that are site specific. Hydrogen sulfide is the main problem encountered in its objectionable smell, but it tends to concentrate around geothermal plants with no health problems.

**Solar Energy.** Solar energy in Jordan is mainly used for water heating for domestic purposes and it is receiving increased attention as it has a number of positive environmental impact leading to conservation of non- renewable sources of energy and to a reduction in amounts of pollutants emitted by burning such fuels.

**Wind Energy.** Interest in wind energy started in 1979. Research carried by the Royal Scientific Society showed that Jordan has a moderate wind energy potential and presently used in the Aqaba and Mudawwara area for pumping groundwater. Environmental concerns about wind energy involve such factors as the risk of accident, noise, interference with telecommunication.

Source: a)

Related Agency
① Ministry of Energy and Mineral Resources
② National Electric Power Company
③ Jordan Petroleum Refinery
④ General Corporation for environmental Protection
⑤ Royal Scientific Society

Source: a)

Laws and Regulations	Presence	Name of Laws or Regulations (Reference)
① Laws on energy use and conservation	○	<ul style="list-style-type: none"> <li>• Law of Protection of Environment No. 12, 1995.</li> <li>• Electricity Authority Law No. 8, 1976.</li> <li>• Nuclear Energy &amp; Radiation Protection Law No. 14, 1987.</li> </ul>

Note: ○ : Issued, × : None, △ : Under planning, ? : Unknown

## 4.6 Water Supply

Jordan is facing a future of very limited water resources that is among the lowest in the world on a per capita basis. As a result of population growth, the per capita share from renewable water resources is projected to fall from the current rate of less than 200 m<sup>3</sup>/cap/year to 90 m<sup>3</sup>/cap/year by 2025 placing Jordan in the category of absolute water scarcity.

Water resources consist of surface and groundwater resources, with treated wastewater being increasingly reused for irrigation, mostly in the Jordan Valley. Renewable water resources are estimated at about 939 million cubic meters (MCM) per annum, including under groundwater of (277 MCM/year distributed among twelve basins) and surface water (662 MCM distributed among fifteen catchments). An additional 143 MCM/year is available from fossil aquifers. Brackish aquifers are not yet fully explored but at least 80 MCM/year is expected to be accessible.

Treated wastewater from fourteen existing wastewater treatment plants constitute an important sources of water resources in Jordan. Approximately 60 MCM per annum of wastewater is treated and discharged into various water courses or used directly for irrigation, mostly in the Jordan Valley.

**Over-Extraction Of Groundwater.** The future projected water supply availability from all sources has shown that the water deficit is increasing with time, for example the water deficit will grow from about 222 MCM in 1995 to 251 MCM by the year 2011 despite the huge investment in the water sector. Currently the deficit are being covered by the mining groundwater at approximately 200% of the safe yield and in some cases by exploitation of non renewable groundwater.

**Water Losses.** A significant portion of water used in Municipal, Industrial and Agriculture is lost in the distribution system. Unaccounted for water in Municipal and Industrial networks is about 54% while water losses in the irrigation sector in Jordan Valley is around 32%. The ongoing projects for network rehabilitation in major cities in Jordan and planned rehabilitation projects together with management improvement of the operation and maintenance are expected to reduce the municipal unaccounted for water. Furthermore the conversion from open surface conveyance to pressurized systems which was completed just recently in the Jordan Valley together with the expansion of the use of modern irrigation techniques such as drip irrigation will also contribute in the reduction of irrigation water losses in the Jordan Valley.

**Non-Conventional Water Resources.** The effluent of wastewater treatment plants is the main source of non-conventional water. This water is not properly treated and highly saline. Which limits its use even for agriculture.

The Jordan Valley in particular contains many sources of brackish water which is not presently utilized.

Source: a)

Related Agency	
① Ministry of Water and Irrigation	
• Water Authority of Jordan	
• Jordan Valley Authority	

Source: a)

Water sources in Jordan (1998)	
Shallow underground water	280 million t/year
Deep underground water	118 million t/year (100 years)
Surface water	755 million t/year
Treated water	32 million t/year
<b>Total</b>	<b>1,185 million t/year</b>

Note: Shallow underground water is circulated every year  
Source: National Environment Strategy for Jordan (1991)

	Water use in 1989 (million Ton)		
	Irrigation	Domestic & Industry	Total
Shallow underground water	220	155	375
Deep underground water	45	11	56
Surface water	500	30	530
<b>Total</b>	<b>765</b>	<b>196</b>	<b>961</b>

Source: National Environment Strategy for Jordan (1991)

### Existing water supply projects

Water Supply Facilities		Volume of Water (million ton/year)	Water Supply Facilities	Volume of Water (million ton/year)
Domestic water			Irrigation water	
① Azraq	Amman	20	Dams	
② Duilara	Amman	45	Kingtara Dam	89
③ Wadi Araba	Irbid	20	Wadi Elaraba Dam	20
④ Suwaka/Kastal	Amman	15	Jickrab Dam	4.3
⑤ Zatari	Mafraq	30	Shueib Dam	2.3
⑥ Surutani	Kerak	17	Kaffein Dam	3.8
⑦ Zatari	Dhuleil	30	<b>Total</b>	<b>119.4</b>
<b>Total</b>		<b>157</b>		

Source: Water Resources of Jordan Present Status and Future Potential

## Status of Water Supply (1993)

( ) : % of total, [ ] : average

Area	Total population	Supplied household	Annual increase rate of population (%) (1988-93)	Quantity of supplied water (m <sup>3</sup> /year)	Unit value (l/d)	UFW (%)
Amman	1,777,000 (41)	346,000 (45)	7.3	98,564,000 (45)	114	58
Zarqa	669,000 (15)	74,000 (14)	9.0	25,557,000 (12)	95	54
Irbid	1,041,000 (24)	110,000 (21)	7.4	34,512,000 (16)	86	54
Mafraq	176,000 (4)	20,000 (4)	10.9	13,298,000 (6)	182	72
Barqa	258,000 (6)	34,000 (6)	4.4	19,380,000 (9)	155	68
Karak	178,000 (4)	23,000 (4)	6.8	7,000,000 (3)	85	54
Tafilah	69,000 (2)	8,000 (1)	9.4	2,454,000 (1)	86	52
Ma'an	160,000 (4)	24,000 (5)	8.8	17,734,000 (8)	205	49
<b>Total</b>	<b>4,328,000 (100)</b>	<b>639,000 (100)</b>	<b>[8.0]</b>	<b>218,499,000 (100)</b>	<b>[126]</b>	<b>[58]</b>

Source: WAJ

Distribution of Supplied Water Unit: million m<sup>3</sup>/year

Area	Supplied volume	Paid volume	Treated sewage volume	Used volume of treated water for irrigation
Amman	98.3	37.0	40.2	34.2
Zarqa	22.7	10.2	*1	*
Irbid	31.5	13.3	3.5	1.9
Mafraq	14.2	3.2	0.4	0
Barqa	15.5	5.7	3.0	2.6
Karak	7.0	2.8	0.3	0.3
Tafilah	2.4	0.8	0.2	0.1
Ma'an	16.5	8.4	1.0	0.9
	208.2	81.5	48.7	40.0

Source: WAJ

\* included in amman area due to inflow into same treatment facility in Amman area

## Access to Water (% of total houses)

Slum and squatter housing sites	Camps	East Bank	Method of Access
95.3	66.7	89.2%	Houses connected to the public network.
-	13.4	2.3%	Houses using public sources of water (public taps).
2.0	17.9	4.4%	Houses using water from tanks.
2.7	2.0	4.2%	Houses using water from other sources.

Source: c)

## Potable Water Sources

Source	Greater Amman	Other urban areas	Rural areas	East Bank	East Bank 1979
Public network	95.2	88.7	82.8	89.2	69.6
Public tap	-	4.7	2.0	2.3	7.0
Tank	2.6	6.0	4.6	4.4	13.2
Well	1.5	-	7.1	2.6	1.9
Stream	-	0.1	2.0	0.7	2.6
Others	0.7	0.4	1.5	0.9	5.6

Source: c)

Laws and Regulations	Presence	Name of Laws or Regulations (Reference)
① Laws on water resources and supply	○	<ul style="list-style-type: none"> <li>• Law of Protection of Environment No. 12, 1995</li> <li>• Public Health Law no. 21, 1971</li> <li>• Organization of Cities, Villages and Building Law No. 79, 1966</li> <li>• Jordan Valley Authority Law No. 19, 1988</li> <li>• Water Authority Law No. 18, 1988</li> </ul>
② Laws on use of water resources	?	

Note: ○ : Issued, × : None, △ : Under planning, ? : Unknown

## 4.7 Wastewater Management

The environmental problems related to handling of wastewater is of increasing concern in Jordan. There are a number of issues which relate to performance of sewerage treatment plants, the system networks and the types of influent and effluent. Plant loading and the characteristics of influent are major factor that affect efficiency. Over loading (hydraulic / biological) deteriorate the quality of the wastewater effluent and produces objectionable odours. Khirbet Samra plant is biologically and hydraulically over loaded and produces objectionable odours in its neighborhood.

Sewerage coverage is a round 70% in urban areas and there are (14) sewage treatment plants. Houses not connected to sewers, including rural areas, are serviced by cesspits and septic tanks. To replace septic tanks, the water Authority of Jordan is currently implementing various wastewater projects for the main towns. However, regulations on proper disposal of waste sludge are lacking. Local municipalities which are in charge of regulating cesspits and septic tanks needs support to regulate on site-sanitation.

Source: a)

Related Agency
① Ministry of Water and Irrigation • Water Authority of Jordan
② General Corporation for Environment Protection.- Water Protection Directorate
③ Royal Scientific Society - Environmental Research Center

Source: a)

Average Municipal Wastewater Influent/effluent Quality, by Treatment Plan, 1991 (files of WAJ)

Treatment Plant	Flow m <sup>3</sup> /d	BOD-In mg/l	BOD-Out mg/l	COD-In mg/l	COD-Out mg/l	TSS-In mg/l	TSS-Out mg/l	Type of Treatment
As Samra	97,471	703	104	1574	316	640	172	S
Mafraq	1,394	960	225	1246	592	540	251	S
Aqaba	3,883	330	68	698	127	330	140	S
Ramtha	671	919	162	2000	505	931	262	S
Abu Nuseir	1,316	713	24	1172	79	709	25	A
Baqa'a	4,998	1,080	100	2087	382	1029	100	T
Salt	3,322	859	14	1755	78	974	23	E
Irbid	6,175	1,139	25	3622	101	1585	30	TA
Jarash	1,316	1,128	9	2285	90	1064	17	O
Karak	718	624	62	1427	208	661	89	TI
Tafila	537	1,014	49	1939	163	1100	42	TI
Madaba	1,234	1,290	212	2422	602	1231	229	S
Ma'an	914	798	79	1520	283	703	191	S
Koufranja	316	1,115	25	1956	125	1321	32	TI

Note: S = Stabilization ponds      T = Tricking filter      O = Oxidation ditch  
E = Extended Aeration      A = Activated sludge      I = Imhof tank

Source: Water Resources of Jordan Present Status and Future Potential (1993)

### Diffusion of sewer (1993)

( ): % of total

[ ]: average

Area	Population (person)	No. of sewer household	Diffusion rate (%)
Amman	1,777,441 (41)	173,094 (45)	73.2
Zarqa	668,928 (15)	40,249 (11)	54.5
Irbid	1,041,399 (24)	16,731 (15)	15.3
Mafraq	176,275 (4) (6)	2,095 (8)	10.5
Barqa	257,509 (4) (2)	14,174 (10)	41.4
Karak	178,000 (4)	2,275 (3)	10.1
Tafilah	69,008	1,212 (1)	15.6
Ma'an	159,972	6,833 (7)	28.8
合計	4,328,532 (100)	256,663 (100)	[31.2]

Source: WAI

## Status of Sewage Treatment Plant

	Name of plant	Region	Established year	Treatment method	Designed volume m <sup>3</sup> /d	Inflow volume m <sup>3</sup> /d	Designed BOD mg/l	Observed BOD mg/l	Designed BOD load kg/d	Observed BOD load kg/d	Over load	Rehabilitation	Recycle use of treated water	Need of co-operation
1	As-Samra	Amman, Zarqa	1985	W.S.P	68,000	128,010	525	504	35,700	64,517	over	Under study	used	no need
2	Aqaba	Ma'an	1987	W.S.P	9,000	4,202	400	289	3,536	1,214		no need	planned	no need
3	Mafraq	Mafraq	1988	W.S.P	1,800	1,340	830	694	1,500	930		no need	planned	no need
4	Ramtha	Irbid	1987	W.S.P	1,920	1,107	1,000	1,053	2,405	1,166		no need	planned	no need
5	Abu-Nuseir	Irbid	1986	R.B.C+E.A	4,000	1,431	1,100	735	4,400	1,052		Under study	used	no need
6	Salt	Barqa	1981	E.A	2,442	3,916	1,000	815	2,667	3,192	over	under implementation	used	no need
7	Baqa	Barqa	1988	T.F	6,000	5,000	900	1,200	5,400	6,000	over	Under study	used	no need
8	Jerash	Irbid	1983	O.D	1,155	1,510	800	1,213	929	1,832	over	under implementation	used	no need
9	Irbid	Irbid	1987	T.F+A.S	11,023	6,543	80	1,283	8,874	8,395		no need	used	no need
10	Karak	Karak	1988	T.F	786	750	1,000	410	852	308		no need	planned	no need
11	Tafiteh	Tafiteh	1988	T.F	800	625	1,000	837	845	523		no need	used	no need
12	Madaba	Amman	1989	W.S.P	2,000	1,748	850	1,440	1,700	2,517	over	under implementation	planned	no need
13	Ma'an	Ma'an	1989	W.S.P	1,590	1,174	1,000	1,006	1,304	1,181		no need	planned	no need
14	Koufranja	Irbid	1989	T.F	1,800	888	900	759	1,736	674		no need	planned	no need

Treatment method: W.S.P. : Waste Stabilization Pond      T.F : Trickling Filter  
 R.B.C : Rotating Biological Contractor      O.D : Oxidation Ditch  
 E.A : Extended Airation      A.S : Activated Sludge

Source: WAJ

## Access to Sewerage System (% of total houses)

Slum and squatter housing sites	Camps	East Bank	Method of Access
83.2	27.1	29.6%	Houses connected to public sewerage network
14.1	68.4	64.8%	Houses using cesspools
2.7	4.4	5.6%	Houses using other means for waste disposal

Source: c)

## Type of Sewage System Available in Houses

Source	Greater Amman	Other urban areas	Rural areas	East Bank	East Bank 1979
Public network	79.6	4.5	1.7	29.6	11.8
Cesspools	19.0	92.1	85.2	64.8	85.6
Others	0.7	1.7	0.8	1.1	0.4
Nothing	0.7	1.7	12.3	4.5	2.2

Source: c)

Laws and Regulations	Presence	Name of Laws or Regulations (Reference)
① Laws on sewerage system	○	• Law of Protection of Environment No. 12, 1995 • Jordan Valley Authority Law No. 19, 1988 • Water Authority Law No. 18, 1988 • Organization of Cities, Villages and Building Law No. 79, 1966
② Laws and regulations on industrial effluent	?	
③ Effluent standard	?	
④ Results of monitoring	?	

Note: ○ : Issued, × : None, △ : Under planning, ? : Unknown

## 4.8 Forest Conservation and Desertification

Jordan is mostly arid and semi-arid country. Almost 90% of the land area receives less than 200 mm of rainfall annually. This is reflected in its soil, in the land cover of range grasses and forest.

**Soil Erosion.** Land resources in Jordan are threatened by soil erosion, salination and Desertification. About 57% of approximately 200,000 ha. of rain fed agricultural land occurs in terrain with gradients steeper than 9%. About one fourth of all rain fed land under cultivation was used to produce cereals and vegetables in sloping areas which are subject to soil erosion. Also, semi-arid range lands have been converted to unsuitable forms of agriculture. In these regions, low rainfall and cultivation preparation which strips the vegetation cover, thus leading to loss of soil. Jordan lacks a national soil conservation policy, however only a few soil conservation measures have been implemented.

**Deforestation.** Vegetation cover in Jordan has deteriorated due to cutting of forests, fires, misuse of forests and transfer to other uses. Afforestation plans are implemented slowly due to lack of finance. Other threats facing forests are urban encroachment, grazing within forests and legal cuttings and other factors such as insects, diseases, drought, wind and snow, pollution in the form of smoke and gases from factories and vehicles and dust caused by mining and quarrying.

**Range Land Deterioration.** The range land suffers from land misuse, over-grazing and cutting of grazing bushes. As a result of over-grazing and land misuse, the area suffers from Desertification and loss of land cover.

**Desertification.** In the eastern part of Jordan (The *Bardia*) Desertification is prevailing. The natural causes of desertification are : droughts causing degradation of environmental elements and the depletion of natural resources, fluctuation and scarcity of rainfall resulting in weakening of ecosystems, vegetation destruction and loss of biodiversity. Other causes of desertification are overgrazing, bush cutting, fires, soil erosion, ploughing the marginal (steppe) and human development activities.

The Jordan *Bardia* development program at Safawi is a practical model under implementation in the north eastern part of Jordan to arrest desertification where substantial scientific research and planning activities are taking place within the project area.

Source: a)

Related Agency	
① Ministry of Agriculture	<ul style="list-style-type: none"> <li>• Department of Afforestation and Forests</li> <li>• Department of Plant Protection</li> </ul>
② Ministry of Interior	<ul style="list-style-type: none"> <li>• Civil Defense Directorate-Disaster Department</li> </ul>
③ Ministry of Water & Irrigation	<ul style="list-style-type: none"> <li>• Jordan Valley Authority</li> </ul>

Source: a)

Laws and Regulations	Presence	Name of Laws or Regulations (Reference)
① Laws on forest conservation	?	
② Laws and regulation on protection area	?	
③ Laws on desertification	?	

Note: ○ : Issued, × : None, △ : Under planning, ? : Unknown



## 4.9 Biological Diversity

Jordan has a diversity of habitats ranging from deserts to wetlands and including coastal and marine ecosystems. The number of plant species in Jordan is more than 2,500 and over 1,500 species of animals are known to occur. Fish diversity in the Gulf of Aqaba exceeds 1,000 species.

Under the management of the Royal Society for the Conservation of Nature which is an NGO, Jordan has established 7 natural reserves, with a total area of 129,000 hectares. The establishment of grazing reserves also serves to protect ecosystem from overgrazing.

**Loss of Habitat and Biodiversity.** Despite the establishment of nature reserves and grazing reserves, many non-protected habitats, and animal and plant species are lost, degraded, or threatened due to urbanization; drying of wetlands; over-grazing; forest fires; plowing of marginal land; hunting; and pollution.

The Azraq Oasis is subject to severe degradation due to over pumping of the Azraq aquifer. The Dana Wild reserve which is home to diverse ecosystems and habitats are threatened by urbanization, grazing and uncontrolled hunting. Mining and ore processing also effect this valuable resource.

**Marine Resources.** The Gulf of Aqaba is an important economic resource as a port and tourist site known world wide for its Coral reefs. Urban growth, tourist development and pollution from industry and shipping currently threaten this fragile coastal zone. Marine life such as the Coral reefs, sea grasses, turtles, dolphins and sea cows are currently under threat from pollution, fishing and shipping traffic.

The Dead Sea is the only large surface water in Jordan and its the world's saltiest natural lake and the lowest place in earth (400 meters below sea level). Due to the diversion of the Jordan River that feeds the Dead Sea, the level of Dead Sea is dropping by 80 centimeters per year. In addition, planned activities in the area of the Dead Sea might have a negative effect on the ecological properties of the sea.

Source: a)

Related Agency
① General Corporation for Environment Protection - Marine Environmental Protection Division and Natural Protection Division
② Aqaba Region Authority - Aqaba
③ Marine Science Station - Aqaba
④ Ports Corporation - Aqaba
⑤ Jordan Valley Authority - Dead Sea
⑥ Royal Society for Conservation of Nature
⑦ Royal Scientific Society

Source: a)

Main Issues of Biodiversity
<ul style="list-style-type: none"> <li>• Urbanization, drying of wet lands, overgrazing; forest fire, hunting and pollution are threats to habitat and biodiversity.</li> <li>• Coastal zones are very limited and the protection of these zones and the marine resources from industrial pollution and urban developments is of high priority.</li> </ul>

Source: a)

Classified Areas Used in Wild Land Management
Category I: Scientific Reserve/Strict Nature Reserve
Category II: National Park
Category III: Natural Monument/National Landmark
Category IV: Managed Nature Conservation Reserve/Wildlife Sanctuary
Category V: Protected Landscape or Seascape
Category VI: Resource Reserve (interim conservation unit)
Category VII: Natural Biotic Area/Anthropological Reserve
Category VIII: Multiple-Use Management Area
Category IX: Biosphere Reserve
Category X: World Heritage Site (natural)

Source: National Environment Strategy for Jordan, 1991

### Grazing Reserves Established by the Ministry of Agriculture (Excludes Azraq Desert Grazing Reserve, established jointly by the RSCN and Department of Forests)

Name of Reserve	Location	Year Established	Area in Dunums*	Annual Rainfall (mm)
Twaneh	Tafila	1981	20,000	150
Ae'sheyeh	Ma'an	1983	20,000	100-120
Eira	Balqa	1986	20,000	200
Adasiya	Amman	1983	20,000	200
Ma'in	Madaba	1983	20,000	200
Wadi Butum	Zarqa	1986	15,000	75
Ras Naqab	Ma'an	1986	12,000	120
Lajoun	Karak	1981	11,000	150
Sabha	Mafraq	1979	10,539	150
Fujeij	Ma'an	1958	10,000	200
Mujib	Karak	1981	9,763	150
Nekhil	Karak	1987	7,000	180-200
Khanasiri	Mafraq	1946	4,545	220
Rajib	Ajioun	1983	4,500	200
Surra	Mafraq	1946	3,961	180
Dab'a	Amman	1968	3,000	120
Mansheieh	Ma'an	1968	3,000	150

\*One dunum = 1,000 square meters, or 10 ares, or 0.1 hectare, or 0.247 acres.

Source: National Environment Strategy for Jordan (1991)

Nature Reserves Established by the RSCN				
Name of Reserve	Location	Year Established	Area in Dunums*	Annual Rainfall (mm)
Wadi Rum	Aqaba	1989	560,000	50-100
Azraq Desert Reserve	Azraq	1987	310,000	50-100
Wadi Mujib	Madaba-Karak	1987	212,000	150
Dana	Tafila	1989	150,000	350
Shaumari	Azraq	1975	22,000	50-100
Zubia	Ajloun	1988	13,000	500
Azraq (wetland)	Azraq	1977	12,000	50-100

\*One dunum = 1,000 square meters, or 10 ares, or 0.1 hectare, or 0.247 acres.

Source: National Environment Strategy for Jordan (1991)

Fauna	
Mammals	7 families 24 genera 70 species
Birds	350 species (mainly migratory bird)
Reptiles	73 species
Amphibian	4 species
Fishes	18-20 species (freshwater fish) 1,000 species (seawater fish)

Flora	
Endemic species	100 species
Rare species	200~250 species
Endangered species	100~150 species
Extinct species	10~20 species

Source: National Environment Strategy for Jordan (1991)

Source: National Environment Strategy for Jordan (1991)

### Aquatic fauna and flora in Aqaba bay

Type of species	No. of species
Algae	71 species
Seaweed	3 species
Sponge	37 species
Coelenterate	263 species
Sector, Annelid	60 species
Mollusk	637 species
棘皮動物	56 species
Arthropod	200 species
Fishes	340 species
Turtle	2 species (rare species, to be protected)
Marine mammal	5 species (rare species, to be protected)

Source: National Environment Strategy for Jordan (1991)

Laws and Regulations	Presence	Name of Laws or Regulations (Reference)
① Laws on protection for fauna and flora	○	• Law of Protection of Environment No.12, 1995 • Agriculture Law No. 20, 1973
② Laws and regulations for protection for specific species	○	• Bird and Wild Animals Protection Law No.112, 1973
③ Laws and regulations on hunting	?	
④ Laws and regulations on protection area	?	
⑤ Listed species in the Red Data Book	?	
⑥ Others		• Marine Establishment of Aqaba Port, Law No.4, 1969 • Aqaba Region Law No.7, 1987 • Jordan Valley Authority Law No.19, 1988

Note: ○ : Issued, × : None, △ : Under planning, ? : Unknown

### 4.10 Natural Resources Management

Natural resources mainly consist of water and mineral resources. The environmental aspects related to water was addressed in the previous sections. As for mineral resources, the main environmental problems are associated from mining and related processing operation of phosphate, potash, cement, glass and ceramic. Mining is from open quarries as well as from the Dead Sea (production of potash and other minerals). Most of the mined products are processed in country (fertilizers and cement) or exported. Exploitation of some of these sources is a major source of dust and air pollution. Most of the production of phosphate and potassium occurs in remote areas where the effects are limited, however cement and other quarrying activities occur near population centers. The situation is clear in Aqaba port, where the handling and export of minerals causes air pollution which can be contained by modern loading methods.

Source: a)

Related Agency	
①	Ministry of Energy and Mineral Resources-Natural Resources Authority (NRA)
②	Phosphate Company
③	Arab Potash Company
④	Cement Factories

Source: a)

Laws and Regulations	Presence	Name of Laws or Regulations (Reference)
① Laws on conservation of natural resources	?	
② Laws on use and conservation of mining resources	?	
③ Laws on underground resources	?	

Note: ○ : Issued, × : None, △ : Under planning, ? : Unknown

### 4.11 Natural Disasters

The two major causes of natural disasters in Jordan are winter floods and earth quakes.

Floods. During the period 1987-1998, 31 flood of significant magnitude occurred in various location in the country, of which four major floods caused injury for 39 persons and death for 71 persons.

Earthquakes. Jordan is classified in terms of seismic hazard into three zones:

- . High Risk Zone - Jordan Rift Valley.
- . Medium Risk Zone - Middle Region.
- . Low Risk Zone - Desert and Badia Region.

The two major earthquakes in the period 1900 - 1998 with a magnitude of approximately 6 degrees on Richter Scale were the 1927 earth quake in the Jordan Valley region caused 500 deaths and 360 injury and many land slides. and the 1995 earthquake in the Aqaba region with no death or injury cases. Other earthquakes were of minor magnitude between 4-5 degrees on Richter scale.

In addition to natural disasters stated above. fires due to negligence and recreation are the main threats to Jordan's forests as they destroy almost 30.000 trees each year.

To alleviate the potential threats from natural disasters its recommended to formulate / activate a national response and rescue plan for disasters management.

Source: a)

Related Agency	
①	Ministry of Water and Irrigation
②	Ministry of Interior / Civil Defense Directorate
③	Ministry of Agriculture

Source: a)

Laws and Regulations	Presence	Name of Laws or Regulations (Reference)
① Laws on natural disaster	?	

Note: ○ : Issued, × : None, △ : Under planning, ? : Unknown

## 4.12 Environmental Education

Environmental education is increasingly becoming crucial at all levels for all people as it plays an important role in the creation of awareness of environmental issues and concerns among the public both at individual and community levels.

In Jordan Government agencies and NGOs realized the importance of environmental education to implement long term environmental strategies. One of the directions for action which were recommended in the National Environment Strategy for Jordan was bringing environment to the people which includes programs on environmental health awareness, public participation in Environmental Impact Assessment. In this regards, the General Corporation for Environmental Protection is implementing an environmental information and public awareness project with the objective of:-

- Promote public awareness and environmental education among all sectors of the society and encourage them to participate positively in protecting their environment.
- Activate the role of different mass media to spread the environmental information mission to people.
- Acquaint the people with the proper behavior to deal with the environment.
- Introduce environmental concepts in school education and encourage students participation in environmental issues and protection of the environment.

At the level of NGOs, RSCN in cooperation with the Ministry of Education has succeeded in setting up 350 nature conservation clubs in schools with over 12,000 members. These help teachers and students to understand environment issues and become involved with their communities in practical conservation projects.

Source: a)

Related Agency
① Ministry of Education

Laws and Regulations	Presence	Name of Laws or Regulations (Reference)
① Laws on education	?	
② Guidelines on environmental education	?	

Note: ○ : Issued, × : None, △ : Under planning, ? : Unknown

## 5. INTERNATIONAL RELATIONSHIP

### (1) Trans.-Boundary Issues

#### 1) Water Sharing.

Jordan shares both surface and groundwater resources with its neighbors. The Jordan River originates from Lebanon and Syria and flows to Lake Tiberias before most of its water is transferred for municipal and irrigation use in Israel via the Israeli National Water carrier. The Yermouk River is shared with Syria, where most of the catchment area is located, before it joins with the Jordan River. The major fossil Qai El Disi Aquifer is shared with Saudi Arabia. The shared nature of these resources and regional and political considerations have limited Jordan's ability to use this water to its full riparian share.

In 1994, Jordan and Israel signed the Peace Treaty which addressed the water sharing between the two countries with special focus on environmental issues of the Jordan River and preservation of healthy environment in the Jordan Rift Valley.

#### 2) Marine and Coastal Environment.

The coastal environment in the Gulf of Aqaba is closely linked with that of Israel, Egypt and Saudi Arabia. Regional environmental cooperation exists but is still limited. The countries sharing the Gulf of Aqaba are cooperating in executing a Global Environmental Fund project to protect the Gulf from pollution and preserve marine life. Furthermore, the oil spill combat project funded by the government of Japan is considered to be part of the regional cooperation to protect the Gulf of Aqaba from oil pollution.

### (2) International Cooperation

Jordan relies on international assistance in the field of environment. The water sector receives most of the international assistance mainly from: Arab Fund, Japan, Canada, France, Germany, Islamic Bank, Korea. Other environmental areas are receiving donor assistance as well. Germany, The United Kingdom, USAID and the World Bank are assisting with natural resources development projects. The United States is involved in a major program in sewerage. Germany and Japan are both assisting Jordan in urban projects, including projects in solid waste management, industrial pollution control and oil pollution prevention.

The multi-lateral talks on the environment under the Middle East peace process aim at enhancing regional cooperation on environmental issues. Development projects are proposed in the Jordan Rift Valley to be jointly implemented by Jordan, Israel and the West Bank. Donors also expressed increased interest in regional projects. Promotion of regional collaboration on environmental issues is on the World Bank action Agenda for the near East, and the World Bank is currently funding a project to control Desertification which involves Jordan, Egypt, Israel, Palestine and Tunisia. Other donors, including Japan, the European Union, Canada and the United States have also expressed interest in regional environmental project.

Source: a)

### 5.1 International Convention

Name of international Convention	Year
1) Regional Convention for the Conservation of the Red Sea and the Gulf of Aden Environment (Jeddah Convention)	1982
2) International Convention for the Prevention of Pollution of the Sea by Oil	1954
3) Convention of the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention)	1973
4) Convention for the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal (Basel Convention)	1989
5) International Convention for the Prevention of Pollution from Ships (MARPOL 73/78)	1994
6) Peace Treaty between The State of Israel and The Hashemite Kingdom of Jordan	1994
7) Agreement between the Government of The Hashemite Kingdom of Jordan and the Government of the State of Israel on Cooperation In Environmental Protection and Nature Conservation	1995
8) Special Arrangements for Aqaba and Eilat Between the Government of the State of Israel and the Government of the Hashemite Kingdom of Jordan	1996

Source: d)

### 5.2 International Cooperation Project

Name of Project (Project cost: million dollars)	Period	Donor/South African lead agency
(no information)		

Source:

## 6. INFORMATION SOURCE

## 6.1 Governmental Agency

Name of Organization	Contact Address
<b>1) Environmental &amp; Planning Institution</b>	
a) General Corporation for Environment Protection (GCEP) B Ministry of Planning.	<ul style="list-style-type: none"> <li>• Tel. 5350791, Fax 5350084 P.O.Box 1408 Amman 11941- Jordan</li> <li>• Tel. 4644466 Ext.406, Fax. 4649341 P.O.Box 2555, Amman11118-Jordan.</li> </ul>
<b>2) Water Resources.</b>	
a) Ministry of Water & Irrigation b) Ministry of Water & Irrigation / Jordan Valley Authority c) Ministry of Water & Irrigation / Water Authority d) Ministry of Water & Irrigation / Jordan valley Authority e) Ministry of Health f) Ministry of Health / Environmental Health Directorate g) Royal Scientific Society, Environmental Research Center (ERC) h) Royal Scientific Society, Environmental Research Center (ERC) i) University of Jordan / Water Research and Studies j) The Hashemite University	<ul style="list-style-type: none"> <li>• Tel.5680100, Fax 679143 P.O.Box2412, Amman11193-Jordan</li> <li>• Tel. 5689400, Fax 5689916 P.O.Box 2769</li> <li>• Tel. 5680100, Fax 679143 P.O.Box2412, Amman11193-Jordan</li> <li>• Tel.5689400, Fax 5689400 P.O.Box2769, Amman11193-Jordan</li> <li>• Tel. 5665131 P.O.Box 182210, Amman</li> <li>• Tel. 5685396, Fax. 5666147 P.O.Box 86 Amman 11193, Jordan</li> <li>• Tel. 5344701, Fax 5344806 P.O.Box624 Amman,11941, Jordan</li> <li>• Tel. 5340373, Fax 5344806 P.O.Box 6354, Amman 11183-Jordan</li> <li>• Tel. 5343555, Ext. 2332, Fax. 5355560</li> <li>• Tel. 09/91661, Fax 09/916613. P.O.Box 150459 Zarqa 13115-Jordan e-mail hunive@amra.nic.gov.jo</li> </ul>
<b>3) Air Pollution</b>	
a) Ministry of Health / Environmental Health Directorate b) Royal Scientific Society, Environmental Research Center (ERC) c) Royal Scientific Society, Environmental Research Center (ERC)	<ul style="list-style-type: none"> <li>• Tel. 5685396, Fax. 5666147 P.O.Box 86 Amman 11193, Jordan.</li> <li>• Tel. 5340373, Fax 5344806 P.O.Box 1438 Amman 11941-Jordan email : ayman@rss.gov.jo</li> <li>• Tel. 5344701, Fax 5344806 P.O.Box 1438 Amman 11941-Jordan</li> </ul>
<b>4) Agriculture and Lands</b>	
a) Ministry of Agriculture b) Ministry of Water & Irrigation / Jordan Valley Authority c) Lands and Survey Dept d) University of Jordan, Faculty of Agriculture. e) Higher Council for Science & Technology	<ul style="list-style-type: none"> <li>• Tel. 5686151, Fax 5686310 P.O.Box 961044 Amman-Jordan</li> <li>• Tel. 5689400, Fax 5689916 P.O.Box 2769</li> <li>• Tel. 5686151</li> <li>• Tel. 5343555, Fax. 5355577</li> <li>• Tel. 840401, Fax 840589 P.O.Box 925967 Amman 11941- Jordan.</li> </ul>
<b>5) Wildlife &amp; Habitat</b>	
a) Royal Society for the Conservation of Nature. b) Ministry of Tourism. c) Ministry of Agriculture / NCARTT d) University of Jordan e) University of Jordan f) University of Jordan	<ul style="list-style-type: none"> <li>• Tel.837931. Fax 847411 P.O.Box 6354, Amman 11183, Jordan e-mail : irani@ncls.com.jo</li> <li>• Tel. 4642311, Fax 46144567 P.O.Box 224, Amman 11118-Jordan. e-mail: mota@amra.nic.gov.jo</li> <li>• Tel. 4725071, Fax 726099 P.O.Box 639 Al Baqa, Jordan</li> <li>• Tel. 5343555, Fax. 5355577</li> <li>• Tel. 5343555</li> <li>• Tel. 5343555, Fax. 5355577</li> </ul>
<b>6) Energy &amp; Mineral Resources</b>	
a) Ministry of Energy & Mineral Resources	<ul style="list-style-type: none"> <li>• Tel. 5857600, Fax 5865714 P.O.Box 140027, Amman11118-Jordan</li> </ul>

<b>7) Solid Waste</b>	
a) Grater Amman Municipality	• Tel. 4636111, Fax. 4649420 P.O.Box 132, Amman, Jordan.
b) Ministry of Health / Environmental Health Directorate	• Tel. 5685396, Fax. 5666147 P.O.Box 86 Amman 11193, Jordan.

Source: a)

## 6.2 Embassy

Name of Organization	Person in Charge	Contact Address
Embassy of Japan	• no information	• Between 4th and 5th circles, Al-Aqsa Street, Jabal Amman, Amman, The Hashemite Kingdom of Jordan
Embassy of Jordan	• no information	• 4 <sup>th</sup> fl. Chiyoda House, 2-17-8 Nagata-cho, Chiyoda-ku, Tokyo, 100-0014 Tel: 03-3580-5856

Source: d)

List of Abbreviations			
ARA	Aqaba Region Authority	MSS	Marine Science Station
CIDA	Canadian International Development Agency	NCARTT	National Center for Agriculture Research & Technology Transfer
CZM	Coastal Zone Management	NEAP	National Environment Action Plan
EAP	Environmental Action Plan	NEPA	National Environment Protection Agency
EIA	Environment Impact Assessment	NEPCO	National Electric Power Company
EIS	Environmental Impact Study	NES	National Environment Strategy
ERC	Environmental Research Center / Royal Scientific Society	NGO	Non Governmental Organization
EU	European Union	NRA	Natural Resources Authority.
GAEAP	Gulf of Aqaba Environmental Action Plan	PERSGA	Programme on the Environment of the Red Sea and Gulf of Aden
GCEP	General Corporation for Environment Protection.	RJGC	Royal Jordanian Geographic Center.
GEF	Global Environment Facility	RSCN	Royal Society for the Conservation of Nature.
GIS	Geographical Information System	RSS	Royal Scientific Society.
GOJ	Government of Jordan	SOE	Statement of Expenditures
GTZ	Gesellschaft fuer Technische Zusammenarbeit	TDS	Total Dissolved Solids.
HCST	Higher Council of Science & Technology.	TOR	Terms of Reference
IMO	International Marine Organization	UGAOSCP	Upper Gulf of Aqaba Oil Spill Contingency Project
IUCN	International Union for Conservation of Nature	UNDP	United Nations Development Programme
JEA	Jordan Electricity Authority	UNEP	United Nations Environmental Protection Agency
JES	Jordan Environment Society	USAID	United States Agency for International Development
JPMC	Jordan Phosphate Mine Company, Ltd.	WAJ	Water Authority of Jordan
JSS	Jordan Standard Specifications	WGE	Multilateral Working Group on Environment of the Middle East Peace Process
MARPOL	International Convention for the Prevention of Pollution from Ships		Durum = 0.1 hectare, or 0.247 acres
MCM	Million Cubic Meter.		
MEPA	Meteorological & Environmental Protection Agency		
MP	Marine Park		
MSL	Mean Sea Level		

Source: a), d)



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