JORDAN ENVIRONMENTAL PROFILE
STATUS AND ABATEMENT

ABDULLAH A. AHMAD

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262	15	privided	provided
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264	21	occurence	occurrence
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عَمِلُوا لَعَلَّهُمْ يَرْجِعُونَ)

صدق الله العظيم

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List of Abbreviation

AACS	Azraq Agricultural cooperative Society
ACOR	American Center of Oriental Research
AID	American Agency for International Development
ASOR	American School of Oriental Research
BOD	Biochemical Oxygen Demand
BOD_5	Biochemical Oxygen Demand for 5 days
CEHA	Center for Environmental Health Activities
COD	Chemical Oxygen Demand
DA	Department of Antiquity
DSP	Dam Safety Program
EPA	Environmental Protection Agency
GDP	Gross Domestic Product
GNP	Gross National Product
gr	Gram
ha	Hectare
IUCN	International Union for conservation of Nature
JEA	Jordan Electricity Authority
JPMC	Jordan Phosphate Mines company
JVA	Jordan Valley Authority
KTR	King Talal Reservoir
M^3	Cubic Meter
MCM	Million Cubic Meter
Mg / l	Milligram /Liter
MM	Millimeter
MMRAE	Ministry of Municipal and Rural Affairs and Envoironment
MSW	Municipal Solid waste

MT	Metric Ton
MWI	Ministry of Water and Irrigation
NRA	Natural Resources Authority
OSHI	Occupational Safety and Health Institute
PMC	Public Mining Company
RSCN	Royal Society for the Conservation of Nature
SS	Suspended Solids
TCP	Tri Calcium Phosphate
TDS	Total Dissolved Solids
WHO	World Health Organization
WWF	World Wildlife Fund

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PREFACE

Worldwide, the natural resources base is deteriorating in quality and quantity, as resources are utilized at an unsustainable rate. For instance,water is being consumed at a rate that exceeds the groundwater replenishment rate.

Domestic wastewater (sewage), industrial waste, municipal solid waste and toxic waste are contaminating water resources and rendering some of them unsuitable for use.

Deterioration of the natural resources is caused by unwise development policies, deficient project design and unrealistic project goals. The need for linking development with resource conservation should be emphasized in development plans with the objective of minimizing the deterioration of the natural resource base and mitigating any negative environmental impact. Development techniques that are detrimental to natural resources should be abandoned.

Survival of mankind is much dependent on the conservation of nature and preservation of various resources unpolluted. Therefore, protection of the global environment by every woman and man is a moral obligation towards future generations.

Nature conservation should be visioned as an optimum formula for economic growth and short-sighted economic policies should be ignored.

The Bhopal disaster, the Chernobyl accident and the openings in the ozone layer are the outcome of the misuse of natural resources.

The Hashemite Kingdom of Jordan (Jordan) has limited resources and it is highly important that these resources are wisely utilized. So far, Jordan is on the safe side, but future development activities are complicated and thus require the use of appropriate technology, resource conservation strategies and more attention towards environmental protection.

May 23,1989

INTRODUCTION

In these days of accelerating destruction and degradation of the environment , characterized by burning of the Amazonian rain forest,destruction of the earth's natural atmospheric barrier of ozone and the Valdez oil spill, anything that can be done to heighten our awareness of the fragility of our ecosphere and to help protect it is badly needed, Abdallah Ahmad's Jordan Environmental Profile-Status and Abatement is a welcome addition to the literature of environmental protection.

Jordan, as a developing country, has pursued both a course of exploitation of its natural resources and, growingly, of attempting to protect its unique envoironment . Poor countries, of necessity, need to utilize every possible resource to grow and develop. Poor, sensible countries realize that, ultimately, environmental degradation, through ignoring the ongoing problems of pollution , will have far greater economic and social costs than they have foreseen. Amelioration of the ravages caused by untrammeled and unwise actions on the earth, the waters, the air and of the visual esthetic of a country along with concomitant problems of human and animal health can be an expensive proposition . Thus , the old adage, "An ounce of prevention is worth a pound of cure" makes

great and good sense for nations as for people.

Mr. Ahmad had approached his self-directed and self- motivated task with a breath of experience in the environmental field and a deep practical knowledge of his country. He has covered the range of resources that need to be conserved and the ways and means to affect such actions. And he has approached the issues from the legal, institutional and operational viewpoints as well as the technical side. One can hardly think of anything that Mr.Ahmad has missed . Nor is he merely concerned with the natural physical world for he covers Accident Prevention and Occuptional Safety and Health as well. Truly , Mr.Ahmed has produced a groundbreaking work, both a compendium of facts, and a guidebook for future actions within the Kingdom.

As someone who is deeply concerned with the quality of the Jordanian environment, I commend Mr. Ahmad for his foresight, and his hard work in preparing this volume. His countrymen will thank him for this endeavor.

L.P. Reade
Director
USAID/JORDAN

Chapter 1

Climatology

The Western part of Jordan has a typical Mediterranean climate which changes to a semi-arid and arid type, while moving eastward. This climate is characterized by a fairly hot and dry summer and a moderately cold winter. The areas with a higher altitude experience cool summers and cold wet winters with occasional snowfall.

Rainfall

Like most Mediterranean countries, Jordan experiences six months of a rainy season (November through April) which is caused by depressions coming out from the west. Occasionally , rain might fall during the months of October and May. The summers are long, hot and dry without precipitation . The rainfall varies in amount from west to east and from north to south being affected also by the physical features of the country. The precipitation on the higher western heights is considerably higher than on the flat eastern plains. Climatically, Jordan can be divided into the following regions with reference to its rainfall, as shown in Table 1:

Table 1*

Climatic Regions

Region	Annual Rainfall MM	Area Hectares
1. Dry desert	Less than 200	8,460,000
2. Marginal	200-300	530,000
3. Semi-arid	300-500	170,000
4. Semi-humid	500-800	100,000

* Environmental Assessment, Jordan Valley Irrigation Project- Stage II , by Arthur D. Little , Inc. 1980.

Wind

The wind Pattern is predominantly westerly to south westerly throughout the year. Winds are generally westerly in summer,changing to south westerly during the winter . Winds are occasionally easterly in winner and spring.

Precipitation

The volume of precipitation during 1986-1987 compared with the long-term average is shown in Table 2:

Temperature

Generally, July and August are the hottest months of the year, while December and January are the coldest. Aqaba and the Jordan Valley are the hottest areas in Jordan throughout the year. Mean monthly temperatures are shown in Table 3.

Table 2*

Precipitation

Water Basin	Precipitation Volume MCM 1986-1987	Long Term Average
Yarmouk Basin	500	440
Zarqa Basin	890	910
Eastern Basins Adjacent to the Jordan River	870	860
Azraq Basin	790	830
Mujib Basin	770	890
Al-Hasa Basin	200	290
Al-Jafr Basin	410	480
Eastern Basins Adjacent to the Dead Sea	340	330
North wadi Araba Basin	250	490
South wadi Araba and Red Sea Basins	250	350
South Desert Basin	90	80
Wadi Serhan Basin	250	250
Hammad Basin	1090	900
Total	6700	7100

* The Annual Report, 1987 - Water Authority of Jordan.

Table 3

Mean Monthly Temperatures

Month	Rift Valley Temperature (0C)	Uplands Temperature (0C)	Eastern Deserts Temperature (0C)
January	14	4 - 8	10
February	14 - 16	4 - 8	10 - 12
March	16 - 2	8 - 10	12 - 14
April	20 - 24	12 - 14	16 - 18
May	26 - 28	14 - 20	20 - 26
June	28 - 32	18 - 22	22 - 28
July	30 - 32	20 - 24	26 - 30
August	30 - 32	20 - 24	26 - 30
September	28 - 30	24 - 28	18 - 22
October	26	16 - 20	20 - 22
November	20 - 22	12 - 14	16 - 18
December	14 - 16	6 - 10	10 - 12

Source: " Climatic Atlas of Jordan," Meteorological Department, Ministry of Transport, 1971.

CHAPTER 2

Water Resources

Overview

Water is considered one of the most valuable resources in Jordan. As population in Jordan continues to grow and industrial and agricultural developments are moving at a high rate, demand will exceed availability of water in the near future. This phenomenon, coupled with the inefficient use of the available water resources has produced a situation where sources of water are being utilized regardless of the cost and negative environmental impact of such utilization.

Projections of water demand beyond the year 2000 reveal great discrepancies between possible available supply and anticipated demand. If these discrepancies are not corrected by augmenting local water resources, available water will become insufficient for drinking purposes, regardless of the great need for agricultural and industrial development.

Provided the Maqarin Dam (Al-Wehdeh) is built, the National Water Master Plan of Jordan anticipates that the water supply through the year 2000 will be just equal

to the water use. However, there is another school of thought that believes that Jordan is already experiencing a water shortage which is not likely to be satisfactorily rectified.

Accordingly, Jordan has to resolve the different strategies of obtaining additional water. These strategies may include regional cooperation or water desalination.

Surface Water

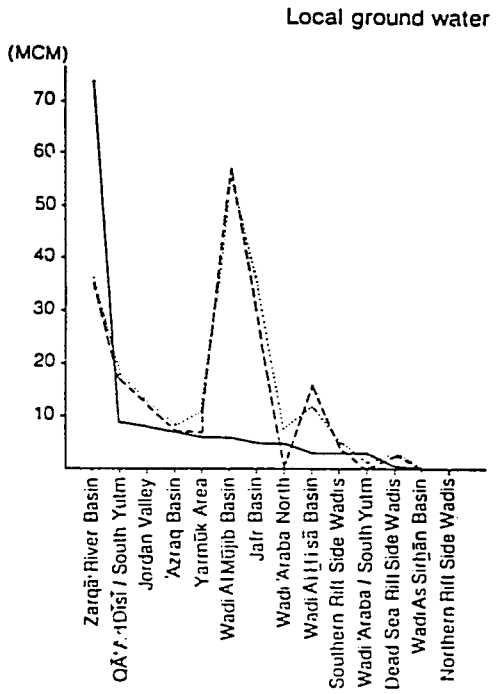
Surface water in Jordan occurs in rivers and in wadis, which are seasonal water courses. The main rivers are the Yarmouk and Zarka and the main Wadis are : Wadi El-Arab, Wadi El-Jurum, Wadi El-Yabis, Wadi Kufrinjeh, Wadi Shu'eib, Wadi Kafrein, Wadi Hisban, Wadi Zarka/Ma'in, Wadi Haidan, Wadi Mujib, Wadi Ibn Hammad, Wadi El-Karak, Wadi El-Thra'a, Wadi Assal, Wadi El-Hasa, Wadi Faifa, and Wadi Khneisirah. The annual stream flow in these water courses is about 620 MCM/Yr. The flow of the Jordan river is not included in this estimate because the waters of the Jordan river are too saline to be used.

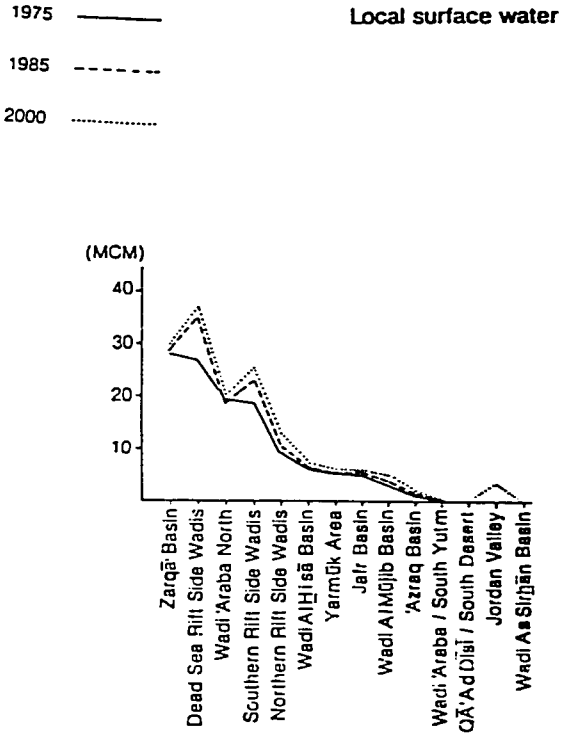
Table 4 indicates estimated annual flows of each river and wadi.

Groundwater

The available volume of stored groundwater is estimated to be about 14,412 MCM (inclusive of fossil wa-

WATER POTENTIAL OF DIFFERENT HYDROLOGICAL REGIONS OF JORDAN *





* National Atlas of Jordan, 1986.

ter), according to the 1977 National Water Master Plan of Jordan. Most of the groundwater resources that store the above mentioned volume are replenishable and are adequate for drinking purposes.

Storage Reservoirs

Jordan has 13 reservoirs. These are King Talal Reservoir, Wadi Arab Reservoir, Ziglab Reservoir, Shu'eib Reservoir, Kafrein Reservoir, Hisban Reservoir, Sultani Reservoir, Qatrana Reservoir, Bowayda Reservoir, Allakafi Reservoir, Sama' Sdud Reservoir, Um Jimal Reservoir, and Ghadeer Abyad Reservoir. Their storage capacity and function are shown in Table 5.

Table 4

Surface Water

River	Average* Annual Flows MCM/YR	River	Average Annual Flows MCM/YR
Jordan (at King Hussein Bridge)	1013.5	Wadi Zarka / Ma'in	20.3**
Yarmouk (at Adasıya)	393.3	Wadi Haidan	
		Wadi Mujib	34.70***
Wadi Arab	28.8	Wadı Ibn Hammad	8.8
Wadi Ziglab	9.5	Wadi El Karak	4.4
Wadi Jurum	11.2	Wadi El Thra'a	1.5
Wadi Yabis	3.3	Wadi Assal	0.9
Wadi Khneizirah	1.5	Wadi El Hasa	24.9
Wadi Rajib	7.1	Wadi Fefa	3.3
Zarka (at Deir Alla)	67.3	Wadi Kufrinjeh	6.1
Wadi Shu'eib	7.9		
Wadi Kafrein	14.3		
Wadi Hisban	5.0		

Source: * Harza Stage II Feasibility Study - 1978
** Hunting 1965
*** Jordan Valley Authority

Table 5

Summary of existing Reservoirs

Name of Reservoir	River/Wadi	Storage Capacity MCM	Uses
King Talal	Zarka River	85	Irrigation
Arab	Wadi Arab	20	Irrigation
Ziglab	Wadi Ziglab	4.3	Irrigation
Shu'eib	Wadi Shu'eib	2.3	Groundwater Recharge
Kafrein	Wadi Kafrein	4.8	Irrigation
Hisban	Wadi Hisban	not known	Diversion - Kafrein
Sultani		1.2	Irrigation - Recharge Domestic Supply
Qatrana		4.2	Irrigation - Recharge - Domestic Supply
Bowayda		0.7	Irrigation
Al-Lakafi		0.7	Irrigation - Groundwater Recharge
Sama Sudud		1.7	Irrigation - Domestic Supply
Um Jimal		1.8	Irrigation - Domestic Supply
Ghadeer Abyad		0.7	Irrigation

Source: National Water Master Plan of Jordan, Volume II, Annex III - A - 6.1 Information upgraded.

Water Demand

The World Bank Report No. 7099-JO projected the water demand for the years 1995, 2005, and 2015 to be 830, 936, and 1068 MCM respectively. This amount of

water is assumed to be provided by groundwater and surface water. Table 6 shows projected water demand based on WAJ, JVA, and World Bank Mission estimates.

Table 6*

Water Consumption in Jordan 1986 - 2015
(MCM Per Year)

	Y 1986	E 1995	A 2005	R 2015
Municipal & Industrial (M & I)	160	235	335	466
Irrigation	511	595	601	602
Grand Total	671	830	936	1068

* World Bank Report No. 7099-JO, March 1988.

Key Issues

The following key issues are significant and should be addressed as early as possible. These issues are :

1. Re-examining and prioritising current water uses and allocations. Decisions concerning water allocations should be based on the requirements for water conservation and the necessities for water uses. A National Review Panel should be involved in dealing with this issue.

2. Rehabilitation of old conveyance systems to minimise current water losses.

3. Creation of a training policy that ensures effective training in the field of operation and maintenance

and produces technical personnel who are capable of operating and maintaining Jordan's water and wastewater facilities.

Dam Safety

Jordan has about 13 earth/rockfill dams with storage capacity ranging from 85 MCM to 0.7 MCM. Most of these dams are fairly new compared with the life span for which they have been designed. The older dams that are 30 years or more are, in general, a matter of great concern. However, our dams are going to age and will become a potential hazard with the probability of faliure. Dam faliure is a potential source of adverse impact on human life, property, and environment. The magnitude of destruction associated with dam faliure is dependant on the size of the dam, the down stream habitat, the availability of human settlement and the terrain topography.

Dam safety is an important concern that should be considered by Jordan, taking in mind the virtues of starting early compared with starting late or not starting at all. Therefore, Jordan should develop a Dam Safety Program (DSP) with concentration on conducting periodical evaluation of all existing dams, inclusive of stability and hydrologies parameters, defective foundation, leakage, piping and overtopping. The program should identify those dams that might become a potential hazard and establish guidelines for mitigating defects encountered inclusive of rehabilitation if required. The program should develop standard proceedures applicable for dam safety investigation. These standard proceedures should cover

maintenance inspection, review of design data, construction data, and visual and practical site examination. A Dam Safety Program should include preparation of an inventory of settlements existing downstream, number of inhabitants who have to be evacuated in case of dam faliure and warning system to be used in case of emergency.

Table 7 shows types of earth dam faliures, causes, and preventative corrective measures applicable to earth dams.

Table 7*

Earth Dam Faliures

Form	General Characteristics	Causes	Preventive or Corrective measures
		Hydraulic Faliures (30% of all faliures)	
Overtopping	Flow over embankment, washing out dam.	Inadequate spillway capacity	Spillway designed for maximum flood.
		Clogging of spillway with debris.	Maintenance, trash booms, clean design.
		Insufficient freeboard due to settlement, skimpy design	Allowance for freeboard and settlement in design; increase crest height or add flood parapet.
Wave erosion	Notching of upstream face by waves, currents.	Lack of riprap, too small riprap.	Properly designed riprap.
Toe erosion	Erosion of toe by outlet discharge.	Spillway too close to dam. Inadequate riprap.	Training walls. Properly riprap.
Gullying	Rainfall erosion of dam face.	Lack of sod or poor surface drainage.	Sod, fine riprap; surface drains.

Table 7* continued

			Seepage Faliures (40 % of all faliures)
Loss of water	Exsessive loss of water from reservoir and / or occasionally increased seepage or increased groundwater levels near reservoir	Perviuos reservoir or bottom.	Blanket reservoir with compacted clay or chemical admix; grout seams cavities.
		Pervious dam foundation.	Use foundation cutoff; grout; upstream.
		Pervious dam.	Impervious core.
		Leaking conduits.	Watertight joints; waterstops; grouting.
		Settlement cracks in dam.	Remove compressible foundation, avoid sharp changes in abutment slope, compact soils at high moisture.
		Shrinkage cracks in dam.	Use low plasticity clays for core, adequate compaction.
Seepage erosion or piping	Progressive internal erosion of soil from downstream side of dam or foundation backward toward the upstream side to form an open conduit or "pipe." Often leads to a washout of a section of the dam.	Settlement cracks in dam.	Remove compressible foundation, avoid sharp changes, internal drainage with protective filters
		Shrinkage cracks in dam	Low-plasitcity soil; compaction; internal drainage with protective filters.

Table 7* continued

Pervious seams in foundation.	Foundation relief drain with filter; cutoff.
Pervious seams, roots, etc., in dam	Construction control; core; internal drainage with protective filter.
Concentration of seepage at face.	Toe drain; internal drainage with filter.
Boundary seepage along conduits, walls.	Stub cutoff walls, collars; good soil compaction.
Leaking conduits.	Watertight joints; waterstops; materials.
Animal burrows.	Riprap, wire mesh.

* The Use and Misuse of Earth Dams by Sowers G.F. (1961). As reported in Saftey of Existing Dams - Evaluation and Improvement, 1983.

Wastewater Treatment

By 1989, considerable progress had been made in the field of wastewater treatment. About 60 percent of the urban population have been provided with sewerage and wastewater treatment facilities. When these facilities are operated with full capacity about 53 MCM/annum will be treated of which about 30 MCM/annum will be available for irrigation.

Currently, Jordan has 15 wastewater treatment plants

serving 19 cities: Amman, Ruseifa, Zarka, Irbid, Mafraq, Ramtha, Ain Jenneh, Ajloun, Anjara, Kufrinjeh, Jerash, Baq'a, Salt, Madaba, Karak, Tafila, Ma'an, Aqaba, and Abu Nuseir. Six of these plants use the waste stabilization ponds system. The capacity and treatment process of each of these plants are shown in table 8.

Table 8*

Wastewater Treatment Plants

Plant	Design Capacity M^3 / Day	Type of Treatment
1. Kherbit As-Samra	68,000	Waste Stabilization Ponds
2. Amman (inactive)	60,000	Activated Sludge Process
3. Irbid	12,000	Trickling filter - Activated Sludge
4. Aqaba	9,000	Waste Stabilization Ponds
5. Baq'a	6,000	Trickling filter - Solids Contact
6. Salt	2,442	Extended aeration
7. Ramtha	2,335	Waste Stabilization Ponds
8. Madaba	2,000	Waste Stabilization Ponds
9. Mafraq	1,800	Waste Stabilization Ponds
10. Kufrinjeh	1,800	Imhoff tank - two stage trickling filters.
11. Tafilah	1,600.	Imhoff tank - trickling filter - solids contact
12. Ma'an	1,200	Waste Stabilization Ponds
13. Karak	800	Imhoff tank - trickling filter
14. Jerash	1,155	Oxidation ditch
15. Abu Nusier	4,000	Rotating biological contact and activated sludge

* source : WAJ

Description of the plants included in table 8 follows :

Aqaba Wastewater Treatment Plant

The plant utilizes the waste stabilization process and is capable of achieving secondary treatment of up to 9000 cubic meters of raw sewage per day. The plant includes inlet works, two facultative ponds, one maturation pond, pumping stations and effluent disposal basins.

The facultative ponds are operated in parallel. Each pond is 450 meters long, 150 meters wide, and 1.5 meters deep. The bottom and the sides of the pond are lined with 10 cms. thick layer of cement stabilized soil to minimize seepage and protect the ponds sides from wave erosion.

The maturation pond is 450 meters long, 150 meters wide , and 1.5 meters deep. The bottom and the side slopes of the maturation pond are covered with 10 cms. thick layer of cement stabilized soil to minimize seepage, and protect its sides from wave erosion.

About 50 percent of the raw sewage is pumped from sea level to elevation of 25 meters. The remaining 50 percent of the sewage gravitates to elevation 25 meters where it meets the pumped sewage. Then, the total sewage gravitates to the treatment plant.

The plant was designed to produce effluent having BOD_5 of 10 mg/L and S.S. of 10 mg/L. The plant is operating satisfactorily. The effluent could be used in controlled agriculture.

The plant has been provided with a groundwater monitoring program which includes six wells installed in the vicinity of the plant. Baseline data representing the chemical and the biological qualities of the groundwater were established prior to the start-up operation of the plant. Samples of water are collected from those wells on a periodic basis and tested. Results are compared with the baseline data to discover any contamination.

Tafilah Wastewater Treatment Plant

Tafilah plant utilizes the Imhoff tank trickling filter solids contact process and is capable of achieving secondary treatment of up to 1,600 cubic meters of raw sewage per day. The plant comprises screens, splitter boxes, two trickling filters , two Imhoff tanks, recirculation pumping station, secondary clarifiers, septage facilities , sludge drying beds and chlorination system.

Karak Wastewater Treatment Plant

Karak plant utilizes the Imhoff tank-trickling filter process. The plant comprises on Imhoff tank, settling basin, two trickling filters, pumping station, effluent polishing lagoon, chlorination system, two sludge lagoons

and twelve sludge drying beds. The plant is capable of achieving secondary treatment of up to 800 cubic meters of raw sewage per day.

Madaba Wastewater Treatment Plant

Madaba plant utilizes the waste stabilization process and is capable of achieving a secondary treatment of up to 2,000 cubic meters of raw sewage per day. The plant comprises two anaerobic ponds, two facultative ponds, two maturation ponds, a recirculation pumping station and chlorination system.

Kufrinjeh Wastewater Treatment Plant

Kufrinjeh plant utilizes Imhoff tank-two stage trickling filters process and is capable of achieving a secondary treatment of up to 1,800 cubic meters of raw sewage per day. The plant comprises one Imhoff tank, bio filters, clarifiers, recirculation pumping station, polishing lagoons, drying beds and chlorination system.

Ain Ghazal Wastewater Treatment Plant - Amman

The plant utilizes activated sludge process and is capable of achieving secondary treatment of up to 60,000 cubic meters of raw sewage per day. The plant comprises, preaeration tanks, primary sedimentation tanks, final sedimentation tanks, thickening tanks, gas burners, four digestion tanks with a total capacity of 18,000 cubic meters, gas holder, two sludge holding/mixing tanks with a capacity of 1125 cubic meters each and belt filter presses and chlorine contact basin. The Ain Ghazal Wastewater Plant is not operational.

Irbid Wastewater Treatment Plant

This plant utilizes trickling filter and activated sludge process and is capable of achieving a secondary treatment of up to 12,000 cubic meters per day of raw sewage. It comprises bar screens, grit chambers, clarifiers, thickeners, anaerobic sludge digester, chlorine tanks and sludge drying beds.

Mafraq Wastewater Treatment Plant

Mafraq plant utilizes waste stabilization ponds and is capable of achieving secondary treatment of up to 1,800 cubic meters per day. The plant comprises anaerobic, facultative, and maturation ponds and a chlorination system.

As-Samra Wastewater Treatment Plant

As - Samra plant utilizes stabilization ponds and is capable of achieving secondary treatment of up to 68,000 cubic meters per day of raw sewage. This plant comprises 3 identical trains. Each train includes two anaerobic ponds, four facultative ponds and four maturation ponds.

Salt Wastewater Treatment Plant

The Salt plant utilizes extended aeration process and is capable of achieving secondary treatment of up to 2,442 cubic meters per day of raw sewage. The plant

comprises an aeration tank, sedimentation tank, chlorination system, and drying beds.

Abu Nuseir Wastewater Treatment Plant

The Abu Nuseir plant utilizes a combined system of rotating biological contactors (RBC) and activated sludge process and is capable of achieving secondary treatment of up to 4,000 cubic meters per day of raw sewage. The plant comprises two primary clarifiers, two aeration tanks, two secondary clarifiers and chlorination system.

Baq'a Wastewater Treatment Plant

The Baq'a plant utilizes trickling filter and solids contact process and is capable of achieving secondary treatment of up to 6,000 cubic meters per day of raw sewage. The plant comprises a bar screen unit, grit removal , three units for primary sedimentation , two trickling filters, two secondary clarifiers, two solids contact tanks, two chlorine contact basins maturation pond and two sludge thickeners.

Ramtha Wastewater Treatment Plant

The Ramtha plant utilizes the waste stabilization process and is capable of achieving secondary treatment of up to 1920 cubic meters of raw sewage per day. The plant comprises anaerobic, facultative and maturation ponds. It also includes a chlorination system.

Ma'an Wastewater Treatment Plant

The Ma'an plant utilizes the waste stabilization process and is capable of achieving a secondary treatment of up to 1,200 cubic meters of raw sewage per day. The plant facilities include facultative and maturation ponds, a chlorination system and septage facilities.

Jerash Wastewater Treatment Plant

The Jerash plant utilizes the oxidation ditch process which is a modified form of activated sludge. The plant is capable of achieving secondary treatment of up to 1,155 cubic meters per day of raw sewage. It comprises an oxidation ditch, sedimentation tank, chlorination tank, sludge thickener and drying beds.

Water Treatment Plants

Even though most of drinking water in Jordan is groundwater, Jordan has two water treatment plants. These plants are:

Zai Water Treatment Plant

The Zai Plant utilizes coagulation, flocculation, sedimentation and filtration and is capable of treating 125,000 cubic meters per day of water. The plant receives water from King Abullah Canal originating from the Yarmouk River and the Mukheiba well field.

Irbid Water Treatment Plant

The Irbid water plant utilizes aeration, coagulation and filtration to remove hydrogen sulfide, iron and manganese and is capable of treating 20,000 cubic meters of water per day. The plant receives water from wells in the Wadi Arab watershed.

Issues/Problems Related To Wastewater Treatment

Wastewater treatment requires a particular level of skilled personnel who are familiar with the state of the art of efficiently plannning, designing , operating, maintaining and managing a successful wastewater system. Jordan has a significant number of qualified engineers who can form the base for the needed skills, but they lack the technique of team work methodology. Adequate training in the field of appropriate technology of operation and maintenance is a feasible solution to the problem of skills required for operating an maintaining the systems.

WAJ has a training center which could play a significant role in providing the required technical personnel, if it is given the resources needed for training. The Management of Wastewater System should promote the spirit of team work and eliminate dependency on individuals without retarding their personal inspiration.

Plant loadings and the characteristics of influent are major factors that affect efficiency. Overloading (hydraulical/biological) deteriorates the quality of the waste-

water effluent and produces objectionable odor. Jerash, Salt and Es-Samra Plants are biologically and /or hydraulically overloaded. Es-Samra Plant produces objectionable odors to its neighborhood.

Most of the detergents that are used in Jordan are hard and thus reduce the efficiency of wastewater treatment plants. The effect of such detergents are: Toxicity, environmental impact and process interference*. Hard detergents may hinder the aerobic function of the ponds by a factor of three and sludge digestion in the anaerobic ponds could be reduced by detergents*. The ideal solution to the hard detergents problem is to use soft detergent (biodegradable)*. To this effect, the Ministry of Trade and Industry is considering to ban the manufacture of hard detergents.

Water Quality

Numerous agencies have claimed direct or indirect responsibility for monitoring water and wastewater quality. This situation has had a negative impact and has led to a dilution of responsibility, inefficiency and duplication of effort. The assumption of responsibilities by irresponsible volunteers in this national matter has resulted in undeserved criticism of operating agencies. Therefore, monitoring of water and wastewater quality should be assumed by one central agency which should cooperate and coordinate with the various agencies that are involved in the field of environment and human health.

There are many potential sources of contamination

*Water Treatment and Water Resources Planning, Volume 1, by Thames water International, 1988.

of surface and groundwater. Some of these sources are: industrial and municipal wastes, excessive use of pesticides and chemical fertilizers in agriculture , and overpumping that may lead to the intrusion of saline water in certain aquifers.

Jordan groundwater resources are generally of good quality. This is attributed to the phenomenon that these resources have a high rate of annual recharge.

The Jordan River is highly saline because all on shore saline and brackish springs were diverted around the Lake Tiberias* to the Jordan River and it also receives return flows** from irrigated fields and is not suitable for any use in its present condition

The Zarqa River is contaminated by industrial waste that includes trace elements and heavy metals. Mercury, nickel,arsenic, lead, selenium and cadmium are the main pollutants of the Zarqa River and the King Talal Reservoir (KTR) which is constructed on it. Also , wastewater effluent from Kherbit As-Samra Treatment Plant is discharged to the Zarqa River. Industrial Wastwater eligible to be discharged in rivers must comply with the stringent Standard Specifications No. 202***. However, these specifications are not applied and subsequently, the Zarqa

* Survey of Water Resources Development, Utilization and Management in Israel, By M. Jacobs and Y. Litwin.

** Environmental Assessment, Jordan Valley Irrigation Project - Stage 2 by Arthur D Little, Inc.

*** Standard Specification 202.

River and King Talal Reservoir are heavily polluted. Based on experimental work carried out in London, it is advised that under no circumstances should KTR be used for drinking water, unless substantial improvement are made to upgrade the raw water quality****.

The quality of the Yarmouk River is acceptable at present. Due to the discharge of Ramtha Wastewater Treatment Plant effluent into the Yarmouk River, its water quality could change and thus should be monitored. Programmed monitoring of the water quality of all major rivers and wadis of Jordan is needed , because the effluent of 12 wastewater treatment plants is discharged in those rivers/wadis.

Water of the Dead Sea is highly saline and , therefore, is not suitable for irrigation or domestic use.

Standards

Recently , the Water Authority has prepared standards for drinking water which are similar to the World Health Organization (WHO) Guidelines and the U.S. Environmental Protection Agency (EPA) standards in many aspects. These standards are applied currently by WAJ. Concerning the use of reclaimed water for irrigation, WAJ is using the WHO's Guidelines.

**** Water Treatment and Water Resources Planning Volume 1, 1988 by Thames Water International.

Table 9

Jordan Standards No. 286 (1988)
For Drinking Water

Physical Properties	Permissible	Maximum Permissible
Turbidity	1 unit	5 units
Taste	Acceptable to most consumers	
Odor	Acceptable to most consumers	
Color	10 units	15 units
PH	6.5 - 9	
Temperature	Preferable 8 to 25 Centigrade	

Toxic Matters	Permissible Mg / 1	Maximum Permissible Mg / l
Lead		0.05
Selenium		0.01
Arsenic		0.05
Chromium		0.05
Cyanide		0.10
Cadmium		0.005
Mercury		0.001
Antimony		0.01
Silver		0.01

Matters that Affect Human health and Water Quality

	Permissible Mg / 1	Maximum Permissible Mg / 1
Total Dissolved Solids (TDS)	500	1,500
Total Hardness ($CaCO_3$)	100	500
Foaming Agents	0.5	1.0
Aluminium	0. 2	0.3
Iron	0.3	1.0
Manganese	0.1	0. 2
Copper	1	1.5
Zinc	5	15
Sodium	200	400
Nickel	0.05	0.1
Chloride	200	500
Floride	1	1.5
Sulphate (SO_4)	200	500
Nitrate (NO_3)	45	50

WAJ's Specifications Versus International Specifications:

For the purpose of comparison of WAJ's specifications with those of WHO and USEPA specifications for drinking water, the International Specifications are provided in table No.10.

Table No. 10

Drinking Water Criteria
(mg / 1 unless otherwise noted)

	WHO (1971)			USEPA (1977) Mximum Contaminant Levels	
Constituent	Highest Desirable	Maximum Permissible	Upper Limit	Primary	Secondary
Inorganic Chemicals					
Arsenic	-	-	0.05	0.05	-
Barium	-	-	-	1.0	-
Cadmium	-	-	0.01	0.01	-
Calcium	75	200	-	-	-
Chloride	200	600	-	-	250
Chromium	-	-	0.05	-	-
Copper	0.05	1.5	-	-	1
Cyanide	-	-	0.05	-	-
Hardness (as $CaCO_3$)	100	500	-	-	-
Hydrogin Sulfide	-	-	-	-	0.05
Iron	0.1	1.0	-	-	0.3
Lead	-	-	0.1	0.05	-
Magnesium	30	150	-	-	-
Manganese	0.05	0.5	-	-	0.05
Mercury	-	-	0.001	0.002	-
Nitrate(as N)	-	-	10	10	-
Selenium	-	-	0.01	0.01	-
Silver	-	-	-	0.05	-
Sulfate	200	400	-	-	250
TDS	500	1,500	-	-	500
Zinc	5	15	-	-	5

Table 10 Continued

Organic Chemicals					
Foaming Agents (MBAS)	0. 2	1.0	-	-	0.5
Endrin	-	-	-	0.0002	-
Lindane	-	-	-	0.004	-
Methoxychlor	-	-	-	0.1	-
Toxaphene	-	-	-	0.005	-
2, 4-D	-	-	-	0.1	-
2, 4, 5-TP (silvex)	-	-	-	0.01	-
Phenol	0.001	0.002	-	-	-
Mineral Oil	0.001	0.30	-	-	-
Physical					
Color, color units	5	50	-	-	15
PH	7.0-8.5	6.5-9. 2	-	-	6.5-8.5
Turbidity, tu	5	25	-	1	-
Microbiological					
Coliform, organisms/100 ml	1	-	-	1	-
Virus, pfu/l	-	1	-	-	-

Jordan Standard Specifications No. 202* for Industrial Wastewater

i. Field

These Jordanian standard specifications identify the properties which should be maintined in wastewater.

ii. Description

The wastewater coming from factories is that water resulting from water used in all or a part of industrial process, cleaning , cooling or other use and after

being treated prior to disposing it into wadi, rivers or cesspools and water collection facility.

iii. General Conditions

a. The wastewater shall be free of harmful bacteria and shall have a chlorine residual of not less than 0.1 mg/l.

b. The wastewater shall be free from mineral fats and petroleum products.

c. The wastewater shall be free from radioactive materials.

iv. Organic Constituents

a. Biochemical Oxygen Demand (B.O.D.) should not exceed 5 mg/l (5 days/20 C) as a weekly average and 30 mg/l (5 days/20 C) as a monthly average.

b. Chemical Oxygen Demand (C.O.D.) shall not exceed 100 mg/l.

c. Dissolved Oxygen (D.O.) should not be less than 6 mg/l.

d. Ammonia (NH3) should not exceed 2.5 mg/l.

v. Physical Properties

a.Total dissolved solids (TDS) should not exceed 1500 mg/l.

b.Total dissolved solids should not exceed 3000 mg/l for reclaimed water, (reused for industry).

c. (PH) should be in the range of 6.5 - 9.

d Suspended solid (SS) should not exceed 30 mg /l.

e. Settleable matters (SM) should not exceed 5 ml/l in two hours.

f. The wastewater shall not increase the temperature of the water into which it is disposed by more than 5C.

vi. Chemical Constituents

The following elements and compounds should not exceed the limits shown:

Cadmium	(Cd)	0.01 mg/l
Lead	(Pb)	0.1 mg/l
Copper	(Cu)	1.0 mg/l
Nickel	(Ni)	0.1 mg/l
Zinc	(Zn)	15.0 mg/l
Cyanide	(Cn)	0.05 mg/l
Chromium	(Cr)	0.05 mg/l
Arsenic	(As)	0.05 mg/l
Mercury	(Hg)	0.001 mg/l
Boron	(B)	1.0 mg/l
Iron	(Fe)	1.0 mg/l
Phenol		0.002mg/l
Alkyl Benzyl Sulfonate	(A.B.S.)	1.0 mg/l

* Source: Ministry of Water and Irrigation.

Operation and Maintenance of Water and Wastewater Facilities

Wastewater and water treatment are fairly new practices in Jordan. A wide range of skills is needed to operate and maintain these facilities. Such skills should include civil, electrical and mechanical engineers. Capable biologists, Chemists and environmentalists are also needed for successful operation of these plants.

During the last five years, the Water Authority had received an appreciable amount of international financial assistance to obtain suitable training for its technical, financial and managerial staff. Despite these efforts, "there are few trained staff capable of reliably operating these facilities and even fewer experienced engineers and technicians"*.

*WASH field Report No. 244,1988.

Inefficient Use of Water

Water is inefficiently used in Jordan by both the suppliers and the consumers. Although, the consumers are aware of the scarcity of water, they have not demonstrated any significant effort for water conservation. Cars are generally washed by water hoses where a lot of water is wasted. Leakage from water tanks of residences is noticed by keen observers. Many consumers complain that they are billed for water which they did not consume, perhaps it is lost through unobserved leakage.

Some lines of the old distribution network are old, rusty and defective and are thus vulnerable to frequent rapture which causes loss of water. In 1982 for the City of Amman, the water loss (unbilled) was 11.1MCM, equivalent to 43.9% of the domestic recorded water production for Amman, probably, a major amount of the above lost water was from distribution system leakage*. The level of unaccounted-for water in Jordan has increased from 38% in 1984 to 53% in 1986**. In 1987 the level of unaccounted for water in Jordan was 54%*** and 40% of which is leakage.

* Report on Methods to Achieve Financial Viability, 1984,by Eugene S. Churchill.

** The World Bank Report No. 7099 - JO, March 1988.

*** Dual Focus Project News Bulletin No. 10,March 28, 1989 by World Health Organization.

Industries use water inefficiently. The Phosphate Mining Company does not treat its wastewater. Treatment and recycling of this wastewater will help in water conservation and minimizing possible adverse impact on the groundwater by the untreated wastewater.

Several Jordanian industries use more water than equivalent international industries****, for example, paper industry uses 115 CM of water per ton of paper produced, whereas, a U.S. equivalent industry uses 41.7 CM. Breweries use 1.5 CM of water for each 100 liters of beer, whereas, U.S. breweries use 0.83 CM. Jordan Tannery uses 108 CM per ton of leather produced, whereas, U.S. Tanneries use 63 CM per ton.

The conveyance efficiency of the King Abdullah canal is very low and has an average of 64% for 1978-81 (keller) and 55% for 1984 and 1986 (JVA Records).

Water Supply Options

Based on the indicated magnitudes of the water resources that are available for use, Jordan has long-term and short-term options to remedy its possible water shortage that may exist beyond the year 2000. These long-term options include regional cooperation in the field of water supply or desalination of brackish water by reverse osmosis or electrodialysis. Iraq and Turkey have potential water resources that far exceed their future demands that could be pumped to Jordan. A proposed project for

**** Malcolm Pirnie - Feasibility Study for Zarqa-Ruseifa Wastewater Treatment.

water supply from the Euphrates was studied by Howard Humphreys in 1983 and proved feasible. The huge capital investments needed for the treatment and conveyance of such water over long distances could be shared by the regional beneficiaries. Regional cooperation in providing input and in sharing output could make such water supplies feasible.

Power cost needed for water desalination is not within Jordan's economical capabilities at the present energy situation. But if Jordan decides to use its available gas or develops an appropriate technology to use its oil shales, then water desalination may become feasible. Desalination of brackish water may be cheaper and more acceptable politically than bringing water from Turkey.

The short-term options are integral part of the overall operation and maintenance of the water system which will ultimately lead to the efficient use of water. These options are:

a. Development of a well-trained staff who are highly responsible and technically capable to operate and maintain the systems.

b. Application of a preventive maintenance program that will reduce the number of breakdowns of the distribution system.

c. Renovation of old water lines in order to prevent leakage and minimize water losses,

d. Utilization of the effluent of wastewater treatment plants in controlled agriculture,

e. Efficient use of water for irrigation which includes:

i. Improvement of conveyance efficiency of King Abdullah canal which has an average of 64% for 1978-81 (Keller) and 55% for 1984 and 1986 (JVA Records). JVA has cleaned canal and has a program to repair canal linings along the northern 60 km of the canal to reduce leakage.

ii. Improvement of on-farm irrigation efficiency by the application of appropriate irrigation practice of using drip irrigation system instead of surface irrigation. JVA is spending a lot of money to convert surface irrigation to a pressure pipe system.

f. Improvement of the efficiency of water use by industry.

Solid Waste

A potential source of environmental pollution is solid waste which includes municipal solid waste, industrial hazardous and non-hazardous waste, demolition materials and sludge produced by various wastewater treatment

plants. Municipal managers are faced with the problem of solid waste disposal in a manner that will provide long term environmental protection from any negative impact and in a manner that is cost effective and economically feasible.

Many municipalities claim to be using the sanitary landfill technology for solid waste disposal. Most probably, they are using the dump site method and not sanitary landfill. At present, there are 5 sanitary landfill dump sites in Jordan. These sites are at Aqaba, Al Humra/Salt, Mubis, Emlaih/Taibeh and Marka/Amman. More municipalities in Jordan are planning to use this technology in disposing their solid wastes. There are Municipalities that dispose of their solid wastes by burning. This method of disposal is environmentally unacceptable due to the emissions produced.

Factors Related to Landfill Design*

The following factors should be carefully examined in designing a landfill site.

1. Climatological data concerning wind direction, rainfall, temperature and evaporation that are pertinent to the site.

2. Topographical and hydrogeological characteristics of the site concerning:

* Sanitary Landfill Design Procedures by Phil O'Leary, Berrin Tansel and Rick Fero, Waste Age, July 1986.

a. Characteristics of groundwater - quality, hydraulic gradient, seasonal fluctuation, rate of flow, direction of flow and depth.

b. Classification, porosity, permeability, plastici ty, angle of repose and moisture content of the soils encountered.

3. Stratification, fractures, folds and faults of the bed rock encountered.

Options Available for Utilization of Municipal Solid Waste (MSW)

A. Composting

Jordan's MSW is quite rich in food content (nutirition) compared with the developed world's MSW. This is because Amman's garbage is lower in paper, plastics, glass and metal than the garbage of Western countries and a sizable amount of food is daily wasted and dumped in the garbage bins of many households. This phenomenon makes Jordan's MSW feasible for making compost. Amman's MSW is about 250,000 tons per year. Table 11 shows the composition of Amman's MSW.

A pre feasibility study prepared by the International

Executive Service Corps (IESC) indicated that composting from Amman's MSW is economically feasible provided quality compost approach is considered. This study proposed a plant capable of producing 31,000 tons of compost per year which could be locally marketed as fertilizers. Recovered paper, card board, metal and glass could be recycled.

Table 11*

Composition of Amman's Municipal Solid Waste

	Percent
Food	52
Paper	23
Cardboard & Plastic	11
Glass	2
Metal	2
Clothes	3
Miscellaneous	7
Total	100

* Recycling of Municipal Solid Waste by Leo H. Ellis, International Executive Service Corps (IESC), 1988.

B. Municipal Solid Waste for Electricity Generation

The concept of generating electricity from burning municipal solid waste has been practised in many developed countries. Huge investments have been made in this field with the objectives of making profits, reducing environmental pollution caused by solid waste and obtaining an optimum solution to

the problem of solid waste disposal. Electric generation plants from solid waste have been installed in accordance with the state of the art in the U.S. and Europe. However, limited success have been achieved, although these countries are pioneers in the technology and management of such business. It is advisable that Jordan should not venture to generate electricity from solid waste because it poses potential risks.

Legal and Institutional Framework

Water is a scarce resource in Jordan and is highly valued, unlike the situation prevailing in many other countries. Therefore, management of this resource requires the maximum amount of care and the utilization of the most capable talents. Feasible solutions for water problems are not enough and will not lead to efficient management of this valuable resource. Water planners should always struggle to obtain optimum solutions. The Ministry of Water and Irrigation (MWI) is responsible for developing, conserving, protecting and managing all water resources needed for the country. To carry out its reponsibilities, the MWI has the Water Authority of Jordan (WAJ) and the Jordan Valley Authority (JVA).

Legislation

The legal base provided to the MWI is strong and adequate to carry out its responsibilities. Law No. 18 of 1988 (WAJ Law) and Law No. 19 of 1988 (JVA Law) provide the legal framework for the Ministry of Water and Irrigation. These laws are contained in Appendix 1.

Chapter 3

Land Resources

The area of Jordan is about 9,250,000 hectares, of which 364,260* hectares are cultivatable. About 10 percent (35,790* hectares) of the total cultivatable area is irrigated and about 90 percent is rain fed.

The cultivatable land is rapidly decreasing due to human activities of urbanization and the devastating effect of desertification. Most of the recent reductions happened during the economic boom that took place in the area during 1975-1985 . Development activities in Greater Amman have destroyed an appreciable part of Jordan's fertile land which was used for wheat production and played an important role in providing Jordan with bread. Agricultural census of 1975 showed that the total cultivatable area was 390,403 hectares. The agricultural census of 1983 revealed that the cultivatable land has decreased by about 7 percent between 1975 and 1983. This reduction was caused by urbanization as most of the urban settlements are located on fertile land**.

Increased values of land, wide diversity of land uses and inappropriate exploitation of land have significantly contributed to the decrease of the cultivatable land area in Jordan.

* Agricultural Census, 1983.

**Wheat Subsidy Policies in the Hashemite Kingdom of Jordan by Dr. Steven C. Shepley, 1988.

Land Classfication

In the real sense of functional classification, land has not been classified in Jordan. In order to ensure optimal utilization of land in a manner that is environmentally sound, land should be throroughly classified, by taking into consideration soil suitability and fertility.

A National Land Classification Authority should be established to carry out appropriate soil surveys leading to land classification. This Authority should receive concrete support from the Natural Resources Authority, Ministry of Water and Irrigation, Ministry of Agriculture, Department of Land Surveys, Royal Geographic Society and Ministry of Municipal and Rural Affairs and the Environment.

Application of advance technology in the soil surveys is essential.

Land Destruction by Urbanization:

Urban development has encroached on large areas of fertile agricultural land. Rain-fed areas have suffered most. Use of agricultural land for building houses has the following disadvantages:

a) Construction of houses on agricultural land encounters foundation problems.

b) Construction of foundations on agricultural land costs much more than construction on

rocky land.

c) Use of agricultural land for building houses or for urban development reduces the total amount of arable land available to support present and future generations.

Soil Erosion:

Soils of certain regions are subjected to severe erosion. This erosion is caused by:

a) Farm ploughing practices which do not follow the contour lines.

b) Overgrazing by goats and sheep which results in loss of protective plant cover, and

c) Deforestation caused by man and by natural calamities.

Problems Resulting from Soil Erosion

Soil erosion causes the following problems:

1. Fertile top soil is washed downstream, leaving infertile subsoil.

2. Downstream transported soil which ultimately results in huge national losses.

Preventive Measures to Minimize Soil Erosion:

The Ministry of Agriculture is taking corrective measures to minimize soil erosion such as: terracing, contour ploughing and afforestation.

Type of Soils

Jordan's soils include the following types:

A. Red Mediterranean Soils

This type of soil covers intermittent and narrow stretches of plateau land, extending from the north boarders to Shubak generally west of the Hijaz Railway. It has a very low porosity and is capable of retaining a significant amount of moisture during the long and dry summers which makes it very fertile and suitable for dry farming such as growing tomatoes, melon, water melon and okra. In summer, this type of soil undergoes a tremendous amount of shrinkage cracks which penetrate upto 2.5 meters deep.

B. Gray Desert Soils

This type of soil covers a large part of the country which mainly lies to the east of the Hijaz Railway Line and it consists of gravelly/sandy silt and or silty clay. Most of these soils have a high porosity, therefore, their capability of retaining moisture is negligible. The surface of these soils is covered either by fragments of cherts or cobles of basalt.

C. Yellow Mediterranean Soils

This type of soil is found in the Ghor (Jordan Rift Valley) and in the highlands west of the Hijaz Railway Line.

D. Other soils such as gypsum, solachaks, regosols and lithosols are also available in Jordan. Please see soil map at the end of the book for locations.

Chapter 4

Mineral Resources

Numerous minerals have been found in Jordan. Some of them are being mined and extracted, while others have been surveyed and identified. These minerals are metallic and non-metallic.

Non-Metallic Minerals

Phosphate

Phosphate ores occur in horizons covering a large area of Jordan. The principal regions of phosphate ores are Ruseifa, El-Hasa/El-Abiad and Shidiya.

Phosphate lenses vary in thickness and size. They contain 60-72% of tricalcium phosphate (TCP). Phosphate ores are being exploited by the Jordan Phosphate Mines Co. (JPMC), which was formed in 1953.

Phosphate Ore Reserves

Table 12 shows major phosphate ore reserves as of December 1988. These reserves are in million metric tons (MT).

Table 12*

Phosphate Reserves in
Million Metric Tons

Area	Proved	Indicated	Inferred	Total
Ruseifa	65	3	-	68
El Hassa	110	9	11	130
Al Abiad	66	24	73	163
El Shidiya	790	246	150	1186
Total	1031	282	234	1547

* Mineral Occurrences in Jordan, Guide Book 1988 Natural Resources Authority.

Ore Mining and Processing

Phosphate ore is being exploited by using the open cast method (stripping process). Then phosphate ore is crushed, screened and dried for additional treatment.

Phosphate Production

Phosphate production during the last 16 years is shown in Table 13. The quantities are in thousand metric tons.

Why is Phosphate mined ?

The major amount of the phosphate produced is being exported in raw form and the remaining amount is used by the fertilizer-industrial complex at Aqaba to produce ammonium phosphate, phosphoric acid and aluminium fluoride. Sulfuric acid is produced as an intermediate chemical used to make phosphoric acid.

Table 13*

Year	Production	Year	Production
1972	694	1980	3907
1973	1115	1981	4244
1974	1600	1982	4390
1975	1362	1983	4748
1976	1683	1984	6260
1977	1771	1985	5920
1978	2490	1986	6250
1979	2845	1987	6800

* Source: (1) Jordan Phosphate Mines Company.
(2) Jordan Phosphate Mines Company - Annual Report 1987

Table 14 and Table 15 show the amount of exported raw phosphate and the amount of various chemical produced locally from raw phosphate.

Table 14*

Raw Phosphate Exported (1974-1987)

Year	Amount Exported - Million Tons
1974	1.47
1975	1.11
1976	1.65
1977	1.79
1978	2.16
1979	2.73
1980	3.61
1981	3.52
1982	3.56
1983	3.70
1984	4.69
1985	4.61
1986	5.20
1987	5.54

* Jordan Phosphate Mines Company - Annual Report 1987.

Chemicals produced locally from raw phosphate and amount exported 1982-1987.

Table 15*

Year	Di-Ammonium Phosphate In Thousand Tons		Phosphoric Acid In Thousand Tons		Aluminium Fluoride In Thousand Tons	
	Produced	Exported	Produced	Exported	Produced	Exported
1982	118	70	-	-	-	-
1983	337	365	24	18	-	-
1984	569	548	37	31	3	-
1985	495	509	29	32	6	6
1986	551	559	23	22	10	13
1987	605	563	5	5	11	11

* Jordan Phosphate Mines company- Annual Report 1987.

Adverse Effects of Phosphate

1. Phosphate dust emitted into the air while unloading and loading at Aqaba port, settles out over the gulf or along the coastline. Such dust can have adverse effects on the ecology of the gulf, including the degradation of coral reefs. JPMC is installing precipitators at its phosphate plants at the mines to eliminate dust from phosphate that will be exported.

2. The open cast mining method deteriorates the landscape and land topography.

Dead Sea Minerals

The Dead Sea, with 226 gr/liter of total dissolved solids, contains exploitable quantities of calcium, potassium, magnesium and bromine. Typical composition* of the brine is: 13.76% magnesium chloride, 7.65% of sodium chloride, 3.80% calcium chloride, 1.20% potassium chloride, 0.48% magnesium bromide and 73.11% of water.

Constituents of the Dead Sea brine are shown in Table 16. Salts available in the Dead Sea brine are estimated to be 43 billion tons.

* The Arab Potash Company Ltd. Brochure

Table 16*

Minerals of the Dead Sea

Minerals	concentration gr / /liter	Estimated** Reserves in Million Tons
Magnesium Chloride	109.5	22,000
Sodium Chloride	70.96	12,000
Calcium Chloride	31.00	6,000
Potassium Chloride	9.96	2,000
Magnesium Bromide	4.45	980
Lithium Chloride	-	175
Rubidium Chloride	-	96

* Ministry of Energy and Mineral Resources - Natural Resources Authority - Mineral Occurrence in Jordan, Guide Book, 1988.

** Revised by the Author

Potash Salt (KCl)

Production Process

Potassim chloride (KCl) is the main component that is now recovered from the Dead Sea brine. The brine which has a density of 1.225 gm/cm^3 is pumped from the Dead Sea and transferred to a salt pan. Evaporation of the brine is accomplished by solar heat until it has a density of 1.29 gm/cm^3. At this point most of the sodium chloride precipitates. Then the brine is transferred to pre-carnallite pans where additional sodium chloride precipitates due to evaporation and concentration. Then the brine is transferred to carnallite pans where additional

concentration is achieved and carnallite ($KCl. MgCl_2. 6H_2O$) is precipitated at a brine density of 1.335 gm/ cm^3.The carnallite is harvested and refined to produce crystalline potassium chloride (KCl).

Finally, the remaining brine is returned into the Dead Sea.

Potash Export

Almost all of the potash produced is exported. Table 17 shows the amount of potash exported during the last five years.

Table 17*

Year	Potash Production Ton	Amount of Potash Exported T	Value in Million JD	Percentage of GDP at Market Price	Percentage of GNP at Market Price
1983	280,000	216,459	0.087	Negligible	Negligible
1984	486,868	449,602	14.939	1.0	0.80
1985	908,000	932,999	30.887	2.0	1.6
1986	1,103,715	1,123,049	31.396	1.9	1.6
1987	1,203,355	1,222,373	28.003	1.6	1.5
			Average	1.6	1.4

Remark: Potash amount exported in 1985 through 1987 was greater than potash produced during the same years. The discrepancy came from the amount produced during 1983 and 1984.

* Computed from:

1. Arab Potash Company Ltd. - Annual Report 1987.
2. Arab Potash Company Ltd. - Annual Report 1984.
3. Central Bank of Jordan - Montly Statistical Bulletin, August 1988.

Values of raw phosphate exported during the year 1978 through 1987. Table 18 shows these values and their percentage of GDP and GNP.

Table 18*

Values of Exported Phosphate

Year	Values In Million J.D.	Percentage of GDP at Market Price	Percentage of GNP at Market Price
1978	19.460	3.0	2.5
1979	26.282	3.4	2.8
1980	47.199	4.7	3.9
1981	54.792	4.3	3.7
1982	57.145	4.3	3.4
1983	51.611	3.6	2.9
1984	69.613	4.6	3.7
1985	66.084	4.1	3.5
1986	64.805	3.9	3.3
1987	61.002	3.6	3.2
	Average	3.95	3.29

* Computed from Monthly Statistical Bulletin, August 1988 - Central Bank of Jordan.

Values of fertilizers manufactured from raw phosphate and exported during the year 1982, through the year 1987 are shown in Table 19.

Table 19*

Values of Exported Fertilizers

Year	Values In Million J.D.	Percentage of GDP at Market Price	Percentage of GNP at Market Price
1982	5.190	0.4	0.3
1983	20.669	1.4	1.1
1984	44.010	2.0	2.3
1985	30.593	1.9	1.6
1986	29.072	1.7	1.5
1987	30.143	1.8	1.6
	Average	1.5	1.4

* Computed from the Monthly Statistical Bulletin, August 1988 - Central Bank of Jordan.

Significance of Major Mineral Resources in the National Economy

Exported fertilizers originate from raw phosphate. Therefore, they are considered as processed minerals. Exported phosphate, potash and fertilizers have a significant role in Jordan economy. They constituted an average of 7.1 and 6.1 percent of the GDP and GNP respectively.

Salt

Dead Sea Salt (NaCl)

The Dead Sea brine contains about 12,000 million tons of sodium chloride (NaCl). Millions of tons of this salt are being produced annually as a by-product of the potash process and stockpiled without being used.

Rock Salt

Rock salt occurs in Azraq area in a natural underground brine. This salt is being refined and marketed for local consumption by the Azarq Agricultural Cooperative Society (AACS).

Gypsum

Gypsum occurs in three major areas which are Zarqa river, Wadi Mujib - Tafila area and Jabal Mulayah. The total amount of the indicated reserves of gypsum is about

13 million tons. The Public Mining Company is extracting gypsum by using open-pit-mining. Production was about 150,000* tons in 1987.

Glass Sand

Glass sand of good quality occurs in large quantities in Ras En-Naqab. A glass factory at Ma'an is exploiting Ras En-Naqab sand. In 1986 and 1987, the glass factory produced 90,000 and 121,000 cubic meters of sheet glass.*

Previous studies** have revealed that Ras En-Naqab glass sand contains about 0.5% of rutile (TiO_2). It is believed that the rutile present in a range of 0.09 to 0.2%, could be extracted as a by product, while preparing sand for glass manufacturing.

Kaolin and Bentonite Clays

Both types of clay are found in Mahis, Azraq, Ghor Kabid, Rashadiya, Fujaij and Batn El-Ghoul. Kaolin clays occur in Mahis and Bentonite clays occur in Azraq. the clay reserves are about 435 million tons distributed as shown in Table 20.

* Ministry of Energy and Mlnerai Resources
- Natural Resources Authority -
Mineral Occurrence in Jordan, Guide Book 1988

** Draft Environmental Report on Jordan prepared by the Science and Technology Division, Library of Congress, August 1979.

* Ministry of Energy and Mineral Resources - Natural Resource Authority, Mineral Occurrence in Jordan, Guide Book, 1988.

Table 20*

Clay Reserves

Area	Reserves in Million Tons
Mahis and Ghor Kabid	5
Rashadiya	10
Fujaij	20
Batn El-Ghoul	400

* Ministry of Energy and Mineral Resources - Natural Resource Authority, Mineral Occurrence in Jordan, Guide Book, 1988.

Exploitation of Clays

The Public Mining Company (PMC) is extracting clays which are locally used for the white cement and ceramic industries. The annual supply of clays to the above mentioned industries by PMC is about 14,000 tons*.

Feldspar

Feldspar is an important raw material for manufacturing ceramics and glass. Feldspar deposits have been found in grantie in the Aqaba area. Local industrial demand for feldspar does not economically justify its exploitation.

* Ministry of Energy and Mineral Resources - Natural Resources Authority, Mineral Occurrence in Jordan, 1988

Building Materials

Jordan has abundant building materials that include aggregates, natural sand, limestone, granite and cement raw materials. Table 21 shows the location and amounts of annual production of these materials.

Table 21*

Building Raw Materials

Material	Location	Annual Production
1. Limestone for building	Ma'an Azraq and Ajloun	2.4 million linear meters
2. Natural Sand	Balqa, Irbid and Tafilah	1.2 million cubic meters
3. Granite	Quweira	6,000 cubic meters
4. a. Limestone for Fuheis Portland Cement Factory	Fuheis	
b. Limestone for Salt white Cement Factory	Khalidiya and Salt	
c. Limestone for the South Cement Factory	Rashadiya	
5. Tuff for cement industry	H-5	200,000 tons
6. Marble	Ajloun and Delagha	

* Source: Natural Resources Authority

Problems Associated with Lime Stone Aggregates

Hardness of limestone in Jordan is not uniform and varies from one site to another. Stratification of limestone generally contains lenses of clay or chalky material.

Due to the difficulty of separating these soft materials from the limestone during quarrying, limestone, clay and chalk are crushed together to produce aggregates for concrete and asphalt mixes. Limestone aggregates produced contain a significant amount of filler. (Material passing sieve No. 200).

Excessive amount of fine material (filler) is harmful to concrete. It deteriorates its quality, reduces its crushing strength and causes shrinkage cracking. Excessive amount of filler is also detrimental to the quality of asphalt mixes and causes extensive raveling.

Option Available for Use

Granite from the south and basalt from the north east areas of Jordan are better sources of aggregates. Hauling these materials for long distances is an expensive operation. However, the excellent quality of concrete and asphalt pavement produced from these materials is worth the additional cost of transportation.

Metallic Minerals

Manganese

Surveys and exploration have revealed that manganese deposits are mainly found in Kherbit En-Nahas and Wadi Dana of the Feinan area. It is estimated that the manganese ore reserves are about 5 million* tons. Manganese ores have not yet been mined.

Iron

Iron ore is found in warda of Ajloun area, with total reserves of about 60,000* tons. The ores are not yet exploited.

Copper

Copper ore is found in wadi Dana and Keherbit En-Nahas of the Feinan area with reserves of about 60 million tons. Copper was mined, smelted and refined on a large scale for over 5,000 years in the area of Feinan in the wadi Araba.

Energy Resources

Oil Shale

Oil Shale is found in Jordan, mainly in the areas of the Yarmouk River, Ma'an and Karak (Sultani and El-Lajjun).

* Ministry of Energy and Mineral Resources - Natural Resource Authority, Mineral Occurrence in Jordan, 1988.

The average oil content of Jordan's oil shale varies from 6.8 to 11 percent by weight and the organic content ranges from 17-30 percent by weight. The total oil shale reserves at the Central area of Jordan is estimated at 30* billion tons.

Feasible Utilization of Oil shale

a. The Jordan Electricity Authority (JEA) is studying the feasibility of generating electricity from oil shale by direct combustion at a 400MW oil shale combustion plant at Sultani. JEA is also conducting another feasibility study for the use of oil shale at El-Lajjun to produce 50,000 barrels of oil per day.

Natural Gas

Natural gas has been discovered in Jordan. Explorations have revealed that a significant amount of gas reserves are available in the Risha area of the Jordan desert. Feasibility studies are being conducted to determine the optimum way to use this gas.

Adverse Environmental Effect of Processing Oil shale

The proposed plant (The 400 MW oil shale combustion plant.) technology may create the following adverse environmental effects:

* Ministry of Energy and Mineral Resources - Natural Resources Authority, Mineral Occurrence in Jordan, 1983.

1. The huge amount of fly ash produced may have an adverse effect on groundwater in particular and on the environment in general. Disposal of fly ash will be an environmental problem.

2. Emission of gases from the plant may adversely affect the air quality of the area.

3. Oil shale mining will significantly disturb the landscape and land topography.

4. Industrial wastewater would be difficult to treat and it may impose a disposal problem. Lacking an acceptable method of treatment, it could be conveyed to the Dead Sea after it is treated to an acceptable standard.

Environmental Pollution of Mines and Quarries

Dust and degradation of the landscape are the main negative environmental impacts of the mining and quarrying operations practised in Jordan. Stock piled soils and huge trenches and barren land without vegetation are the results of phosphate mining as seen in Jordan. Rocky mountains which have been vertically cut in quarrying operations are left unstable for other uses and ugly. Huge clouds of dusts which are health hazards at least to workers are seen in phosphate mines and other quarries.

Key Issues

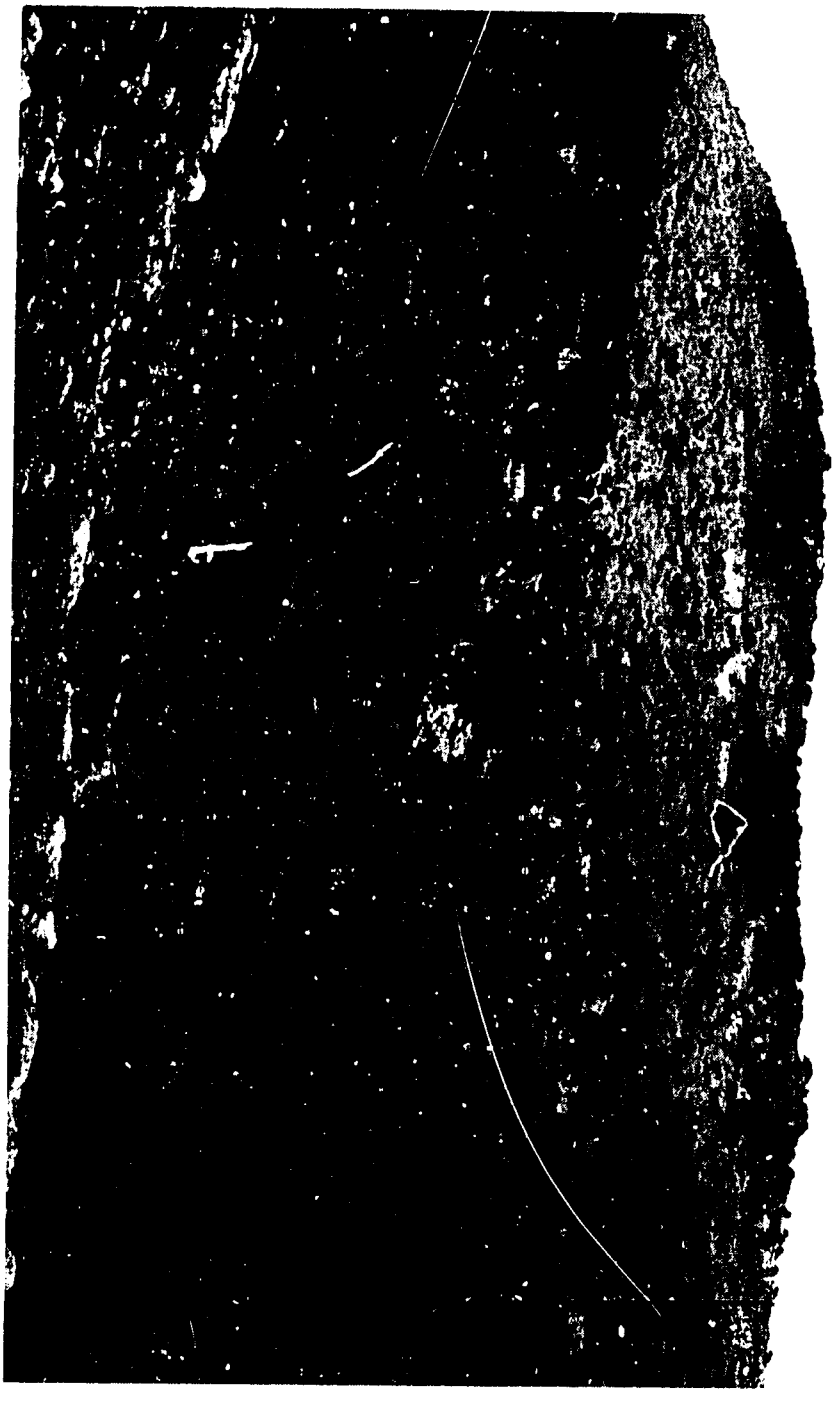
There are areas in Jordan which may be soon de-

clared as having high potentials for economic extraction of certain minerals. Commercial extraction of such minerals may lead to conflicts with other land uses.

Legal and Institutional Framwork

The Natural Resources Authority under the Ministry of Energy and Mineral Resources is responsible for the prospecting, exploration and development of mines in Jordan. Granting mining rights, issuing licenses for exploration and quarries and enforcement of all laws and regulations are within the NRA's reponsibilities.

Law No. (12) of 1968, Regulation No. (8) of 1971 (Quarries Regulation) and Mining Code No. 131 of 1966 are the legal base provided to NRA for the management of Jordan's mineral resources. This legal base is contained in Appendix 2.



Chapter 5

Nature Conservation

Overview

Jordan's natural heritage resources are as significant as any other resources. Natural heritage resources include wildlife - both animals and plants and their ecosystems. Thousands of gazelles of various species were living in Jordan in recent times.

The majority of these animals have been wiped out by wanton human acts, motorized hunting and automatic weapons. Overhunting and habitat deterioration by overgrazing are the basic factors that contributed to the decline of the wildlife both in numbers and types.

Today, only negligible numbers of these animals are struggling for survival in the most difficult environments of Jordan's inaccessible areas. Many important animals commonly present in Jordan have disappeared: the Arabian oryx, the Persian Fallow deer, the wolf, the brown bear, the Syrian wild ass, the cheetah and blue-necked ostrich. Some of these animals are considered to be endangered species on a world wide basis.

Continuous human activities during hundreds of generations have led to significant changes in the terrestial environment. The original ecosystems of indigenous

plants have been altered to the extent that new species have been formed. Jordan's flora system includes 2200 plant species out of which 14 are rare and threatened*.

Aware of the danger threatening the wildlife, the Royal Society for the Conservation of Nature (RSCN) has established five wildlife reserves. These reserves are: Azraq Wetland, Shaumari, Zubiya, Mujib and Dana. The Department of Environment is planning to establish the Wadi Rum Reserve. These reserves have been or are being established with the purpose of reintroducing locally extinct animals, protecting endangered species, restoring typical Jordanian ungulate fauna, restoring biological diversity and developing of self-sustaining wildlife habitat.

Plant Geographical Regions

Jordan is divided into three plant geographical regions. The rate of rainfall is the prime factor on which the division is based. Table 22 shows these regions.

* World Resources 1988-89

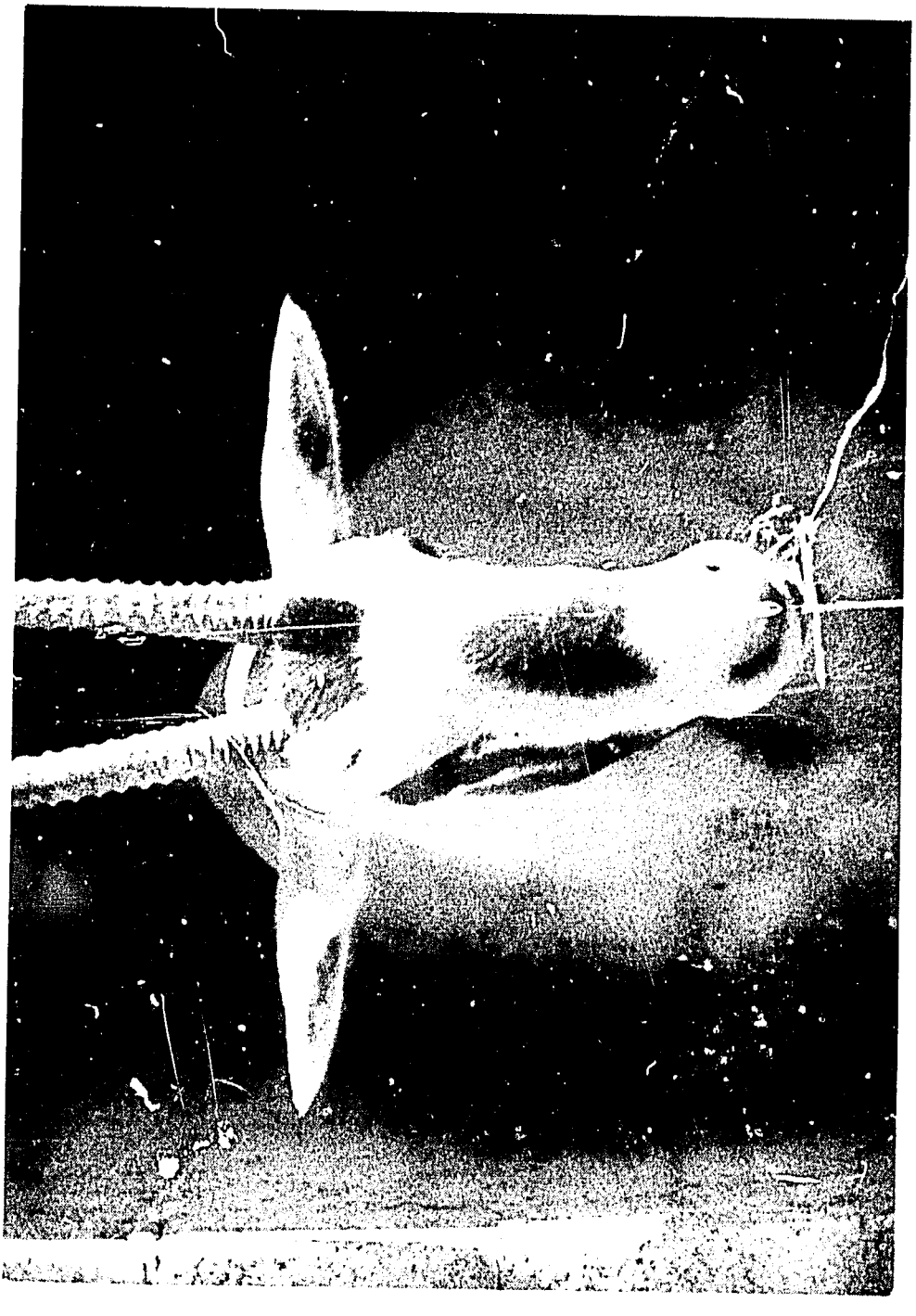


Table 22*

Jordan's Major Plantgeographical Regions

Region	Soil	Rainfall	Type of Vegetation	Representative Genus
Mediterranean	Terra rossa, rendzina, basalt and sandy soils	350-600	Forest, maquis1, and shrub	Ononidetum, Salvia-Ballota Association, Echnipos-Carlina Association
Irano-	Gary steppe soil and loess	200-350	Dwarf shrubs and herbaceous species	Zizyphetum-Association (Zizyphus, Ballota, Salvia, Echinops, etc.)
Saharo-Sindian	Hammada, saline soil sandy soil	25-200	Dwarf shrubs and herbaceous species	Salsoletum, Suaedetum, Arthrocnemum-Tamaris Association

1 Woodland composed of low trees and shrubs up to 4 meters tall.

* Source: M.Zohary, Plant Life of Plastine, 1962

Established Wildlife Reserves

Azraq Wetland Reserve

Azraq wetland reserve is about 12 sq. km. and is situated near the town of Azarq, at 31°50N, 36°40E. The wetland area harbcrs swamps and marshes containing sweet water. This reserve is of a significant international importance for bird migration. It provides an important

resting station for migratory birds in their annual journey from Europe to Africa and back during autumn and spring. About 300 species of birds, over 50% of which are migratory, have been seen at this reserve. Additionally, the Wetland contains a widely diversified ecosystem of flora and fauna. Azraq wetland has been recognized as an international station for migratory waterfowl by the Ramsar Convention.

Threat to Azraq Wetland Reserve

Overpumping of the Azraq aquifer has caused the Azraq wetland to dry up relatively speaking , during summer. This phenomenon poses a significant threat to the wildlife of Azraq Wetland. Pumping of water from the Azraq aquifer should be reduced. Other water resources should be used for domestic purposes instead of the Azraq aquifer, or the use of Azraq groundwater for agriculture should be reduced.

Shaumari wildlife Reserve (Azqraq Desert Reserve)

The Shaumari wildlife Reserve of about 320 sq. km. is situated south west of Azraq oasis. It was established by RSCN in 1975. With the assistance of the World Wildlife Fund (WWF) and the Arabian Oryx World Herd Trustees, the RSCN reintroduces 8 individuals of the Arabian Oryx to Shaumari Natural Habitat in 1978.

Now in 1988, the oryx population has grown to be -

come 94* individuals. The Shaumari Wildlife Reserve includes 11 species of mammals typical of the Jordanian desert, 134 of species of birds, most of them migratory, and about 130 species of plant.

Zubiya Wildlife Reserve

Zubiya Wildlife Reserve is situated north west of Ajloun. The reserve will include an area of 12 sq. km. of mountainous terrain covered with an open woodland of oak and pistachio trees. The reserve is designed to promote biological diversity with the prime objective of preventing extinction of the Persian Fallow deer and the Roe deer and starting development of a self sustaining viable population of the two deer species in a natural habitat. The Persian Fallow Deer is considered an endangered species with a world population of 200 animals. It is believed that the Persian Fallow deer used to occur in Ajloun area, but it has not been recorded there during the past 100 years.

Wildlife Conservation Programs

a. The Royal Society for the Conservation of Nature considers the following species at a priority level in its conservation activities:-

Arabian oryx, wolf, Syrian wild ass, Fallow deer, Ibex, Gazelles, cheetah, Asiatic lion, leopard, brown bear.

b. Vegetation improvement program

* Source: RSCN

The Royal Society is carrying out a program for improvement of range management in Azraq area, also, the Ministry of Agriculture is carrying out a range management program in Lajjoun area and the eastern desert.

Birds Observed in Jordan

Table 23 shows birds that are observed in Jordan

Table 23

Bird Species Observed in Jordan

Key: B -- breeding proved
(B) -- breeding presumed
NA -- status not ascertained
PM -- passage migrant
V -- vagrant

Little Grebe	Podiceps ruficollis	(B)
Little Bittern	Ixobrychus minutus	PM
Night Heron	Nycticorax nycticorax	PM
Squacco Heron	Ardeola ralloides	PM
Great White Egret	Egretta alba	PM
Yellow-billed Egret	Egretta intermedia	V
Little Egret	Egretta garzetta	PM
Grey Heron	Ardea cinerea	PM
Purple Heron	Ardea purpurea	NA
White Stork	Ciconia ciconia	PM
Black Stork	Ciconia nigra	PM
Shelduck	Tadorna tadorna	NA
Mallard	Anas Platyrhynchos	(B)
Teal	Anas crecca	NA
Pintail	Anas acuta	NA
Gargancy	Anas querquedula	PM
Shoveler	Anas clypeata	NA
Osprey	Pandion haliactus	PM
Honey Buzzard	Pernis apivours	PM
Black Kite	Milvus Migrans	PM

Table 23 continued

Goshawk	Accipiter gentilis	V
Levant Sparrowhawk	Accipiter brevipes	PM
Sparrowhawk	Accipiter nisus	PM
Long-legged Buzzard	Buteo rufinus	B
Buzzard	Buteo buteo	PM
P.D.		M
Booted Eagle	Hieraetus pennatus	NA
Bonelli's Eagle	Hieraetus fasciatus	B
Steppe Eagle	Aquila repax	PM
Spotted or Lesser Spotted Eagle	Aquila clanga or pomarina	PM
Golden Eagle	Aquila chrysaetos	NA
Short-toed Eagle	Circaetus gallicus	NA
Pallid Harrier	Circus macrourus	PM
Montagu's Harrier	Circus pygargus	PM
Marsh Harrier	Circus acruginosus	(B)
Egyptian vulture	Neophron pernopterus	B
Lammergeier	Gypactus barbatus	B
Lappet-faced vulture	Torgos tracheliotus	NA
Black vulture	Aegypius monachus	NA
Griffon Vulture	Gyps fulvus	(B)
Saker	Falco cherrug	PM
Lanner	Falco biarmicus	NA
Barbary Falcon	Falco pelegrinoides	(B)
Hobby	Falco subbuteo	PM
Red-footed Falcon	Falco vespertinus	PM
Lesser Kestrel	Falco naumanni	B
Kestrel	Falco tinnunculus	B
Chukar Partridge	Alectoris chukar	B
Sand Partridge	Ammoperdix heyi	B
Quail	Coturnix coturnix	PM
Water Rail	Rallus aquaticus	NA
Spotted Crake	Porzana porzana	NA
Baillon's Crake	Porzana pusilla	B
Corncrake	Crex crex	PM
Moorhen	Gallinula chloropus	(B)
Coot	Fulica atra	(B)
Houbara Bustard	Chlamydotis undulata	B
Oystercatcher	Haematopus ostralegus	PM
Ringed Plover	Charadrius hiaticula	PM
Kentish Plover	Charadrius alexandrinus	B
Lesser Sand Plover	Charadrius monogolus	B
Greater Sand Plover	Charadrius leschenaultii	PM
White-tailed Plover	Vanellus leucurus	(B)
Spur-winged Plover	Vanellus sponosus	B
Temminck's Stint	Calidris temminckii	PM
Dunlin	Calidris alpina	PM

Table 23 continued

Bar-tailed Desert Lark	Ammomanes cincturus	B
Hoopoe Lark	Alaemon alaudipes	B
Short-toed Lark	Calandrella cinerea	B
Lesser Short-toes Lark	Calandrella refescens	NA
Calandra Lark	Melanocorypha calandra	B
Bimaculated Lark	Melanocorypha bimaculata	PM
Thick-billed Lark	Rhamphocorys clot-bey	(B)
Temminck's Horned Lark	Eremophila bilopha	B
Crested Lark	Galerida cristata	B
Sand Martin	Riparia riparia	PM
Crag Martin	Hirundo rupestris	PM
Pale Crag Martin	Hirundo obsoleta	B
Swallow	Hirundo rustica	(B)
Red-rumped Swallow	Hirundo daurica	B
House Martin	Delichon urbica	PM
Tawny Pipit	Anthus campestris	PM
Long-billed Pipit	Anthus similis	B
Tree Pipit	Anthus trivialis	PM
Meadow Pipit	Anthus pratensis	PM
Red-throated Pipit	Anthus cervinus	PM
Water Pipit	Anthus spinoletta	PM
Yellow Wagtail	Motacilla flava	PM
White Wagtail	Motacilla alba	PM
Common Bulbul	Pyconotus barbatus	B
Red-backed Shrike	Lanius collurio	PM
Masked Shrike	Lanius nubicus	B
Woodchat Shrike	Lanius senator	NA
Lesser Grey Shrike	Lanius minor	PM
Great Grey shrike	Lanius excubitor	B
Cetti's Warbler	Cettia cetti	(B)
River Warbler	Locustella fluviatilis	PM
Moustached Warbler	Lusciniola melanopogon	(B)
Sedge Warbler	Acrocephalus schoeobaenus	PM
Reed Warbler	Acrocephalus scirpaccus	B
Clamorous Reed Warbler	Acrocephalus stentoreus	B
Icterine Warbler	Hippolais icterina	PM
Oliver-tree Warbler	Hippolais olivetorum	PM
Upcher's Warbler	Hippolais languida	PM
Olivaceous Warbler	Hippolais pallida	B
Booted Warbler	Hippolais caligata	PM
Barred Warbler	Sylvia nisoria	PM
Orphean Warbler	Sylvia hortensis	NA
Blackcap	Sylvia atricapilla	MM
Whitethroat	Sylvia communis	NA
Lesser Whitethroat	Sylvia curruca	NA
Sardinian Warbler	Sylvia melanocephala	(B)
Spectacles Warbler	Sylvia conspicillata	B

Table 23 continued

Curlew Sandpiper	Calidris ferruginea	PM
Ruff	Philomachus pugnax	PM
Spotted Redshank	Tringa erythropus	PM
Redshank	Tringa totanus	PM
Greenshank	Tringa nebularia	PM
Green Sanpiper	Tringa ochropus	PM
Wood Sandpiper	Tringa glareola	PM
Common Sandpiper	Tringa hypoleucos	PM
Curlew	Numenius arquata	PM
Snipe	Gallinago gallinago	PM
Jack Snope	Lymnocryptes minimus	PM
Black-winged Stilt	Himantopus himantopus	PM
Avocet	Recurvirostra avosetta	B
Stone Curlew	Burhinus oedicnemus	(B)
Cream-colored courser	Cursorius cursor	B
Pratincole	Glareola pratincola	(B)
White-eyed Gull	Larus leucopthalmus	V
Black-headed Gull	Larus ridibundus	PM
Slender-billed Gull	Larus genei	NA
Lesser Black-backed Gull	Larus fuscus	PM
Black Tern	Chlidonias niger	PM
Whiskered Tern	Chlidonias hybrida	PM
Gull-billed Tern	Gelochelidon nilotica	PM
Common Tern	Sterna hirundo	PM
Pin-tailed Sandgrouse	Pterocles alchata	(B)
Spotted or Black-bellied Sandgrouse	Pterocles senegallus or orientalis	(B)
Rock Dove	Columbia livia	B
Turtle Dove	Streptopelia turtur	PM
Cuckoo	Cuculus canorus	NA
Great Spotted Cuckoo	Clamator glandarius	NA
Burce's Scops Owl	Otus brucei	B
Little Owl	Athene noctua	B
Nubian Nighjar	Caprimulgus nubicus	NA
Egyptian Nighjar	Caprimulgus aegyptii	NA
White-rumped Swift	Apus affinis	(B)
Pallid Swift	Apus pallidus	(B)
Swift	Apus apus	NA
Alpine Swift	Apus melba	(B)
Smyrna Kingfisher	Halcyon smyrnensis	B
Kingfisher	Alcedo atthis	(B)
Bee-eater	Merops apiaster	B
Blue-cheeked Bee-eater	Merops superciliosus	(B)
Hoopoe	Upupa epops	(B)
Roller	Coracias garrulus	(B)
Wryneck	Jynx torquilla	PM
Desert Lakr	Ammomanes deserti	B

Table 23 continued

Willow warbler	Phylloscopus trochilus	PM
Chiffchaff	Phylloscopus collybita	PM
Bonelli's Warbler	Phylloscopus bonelli	PM
Wood Warbler	Phylloscopus sibilatrix	PM
Graceful Warbler	Prinia gracilis	B
Streaked Scrub Warbler	Scotocera inquieta	B
Fan-tailed Warbler	Cisticola juncidis	B
Pied Flycatcher	Ficedula hypoleuca	PM
Collard Flycatcher	Ficedula albicollis	PM
Spotted Flycatcher	Muscicapa strata	PM
Whinchat	Saxicola rubetra	PM
Stonechat	Saxicola torquata	NA
Wheatear	Oenanthe oenanthe	NA
Black-eared Wheatear	Oenanthe hispanica	B
Mourning Chat	Oenanthe lugeus	B
Desert wheatear	Oenanthe xanthoprymna	NA
Tristram's Chat	Oenanthe moesta	B
Red Tailed Wheatear	Oenanthe xanthoprymna	NA
Isabelline Wheatear	Oenanthe isabellina	B
Hooded Chat	Oenanthe monacha	(B)
White-crowned Black chat	Oenanthe leucopyga	B
Blackstart	Cercomela melanura	B
Rufous Bush Chat	Cercotrichas galactotes	B
Rock Thrush	Monticola saxitilis	PM
Blue Rock Thrush	Monticola solitarius	B
Black Redstart	Phoenicurus ochruros	NA
Redstart	Phoenicurus phoenicurus	PM
Nightingale	Luscinia megarhynchos	PM
Thrush Nightingale	Luscinia luscinia	PM
Bluethroat	Luscinia svecica	PM
Arabian Babbler	Turdoides squamiceps	B
Great Tit	Parus major	B
Palestine Sunbird	Nectarinia osea	B
Corn Bunting	Emberiza calandra	B
Ashy-head Bunting	Emberiza cineracea	NA
Ortolan Bunting	Emberiza hortulana	PM
Cretzschmar's Bunting	Emberiza Caesia	(B)
Striped Bunting	Emberiza striolata	NA
Black-headed Bunting	Emberiza melanocephala	PM
Tristram's Serin	Serinus Syriacus	(B)
Greenfinch	Carduelis chloris	B
Goldfinch	Carduelis carduelis	B
Linnet	Acanthis cannabina	B
Trumpeter Bullfinch	Rhodopechys githaginea	(B)
Sinai Rosefinch	Carpodacus sinoicus	B
House Sparrow	Passer domesticus	B

Table 23 continued

Spanish Sparrow	Passer hispaniolensis	B
Dead Sea Sparrow	Passer moabiticus	B
Pale Rock Sparrow	Petronia brachydactyla	B
Rock Sparrow	Petronia petronia	B
Tristram's Grackle	Onychognathus tristramii	B
Starling	Sturnus vulgaris	PM
Golden Oriole	Oriolus oriolus	NA
Jay	Garrulus glandarius	B
Hooded Crow	Corvus corone	(B)
Brown-necked Raven	Corvus ruficollis	B
Raven	Corvus corax	(B)
Fan-tailed Raven	Corvus rhidipurus	B

Analysis B Breeding proved or certainly taking place
(B) Breeding presumed or strongly suspected
PM Passage migrants only
V Vagrants
NA Status not ascertained (breeding often possible)

Source: Mountfort, G. Portrait of a Desert; The Study of an Expedition to Jordan, Houghton Mifflin, 1965.

As reported in Environmental Assessment - Jordan Valley Irrigation Project, Stage II, Volume II, by Arthur D. Little, Inc., 1980.

Table No. 24

Hunting Restrictions

Type of Hunt	Number Permitted per Trip	Times Permitted Per Year/Per Hunting Season	Hunting Period
Red Fox	No restriction	No restriction	Throughout the year
Wild Boar	No restriction	No restriction	Throughout the year
Arabian Hare	Two	No restriction	6/1-12/31
Chucker and Partridge	Three	No restriction	10/1-11/30
Skylark	Fifteen	No restriction	Throughout the year
Calandra Lark	Two	No restriction	Throughout the year
Starling	Two	No restriction	Throughout the year
Rock Dove	Ten	No restriction	10/1-11/30
Duck	Ten	Twice a week	11/1-3/31

Table No. 24* continued

Swan	One	Twice a week	11/1-3/31
Coot	Ten	Twice a week	1/11-3/31
Quail	Twenty	No restriction	2/15-5/31
Mistle Thrush	Twenty	No restriction	9/15-2/25
Black Cap	Twenty	No restriction	9/15-10/20
Snipe	Ten	No restriction	11/1-3/31
Wood Cock	Six	No restriction	10/1-2/25
Turtle Dove	Fiften	No restriction	6/1-9/30A 10/1-11/30B
Sand Grouse	Fiften	No restriction	9/15-3/31

A. In the Ghor Area
B. In all permitted areas

* Source: RSCN

Hunting Areas

Area No. 1: It extends from the Yarmouk River to the Zarqa River and reaches eastward to the Hijaz Railway Line.

Area No. 2: It extends from the Zarqa River to the Zarqa Ma'in River and reaches eastward to the Hijaz Railway line.

Area No. 3: It extends from Zarqa Ma'in River to Wadi Al-Hasa an reaches eastward to the Hijaz Railway line . It excludes Wadi Mujib Wildlife Reserve.

Area No. 4: It extends from wadi Al-Hasa to the southern borders of Jordan and reaches eastward to the Hijaz Railway Line.

Area No. 5: It extends from the northern borders of Jordan to Mafraq-Safawi road southward. It reaches eastward to the safawi - north borders dirt road and to the Hijaz Railway Line westward.

Area No. 6: Jordan Badia which lies east of the

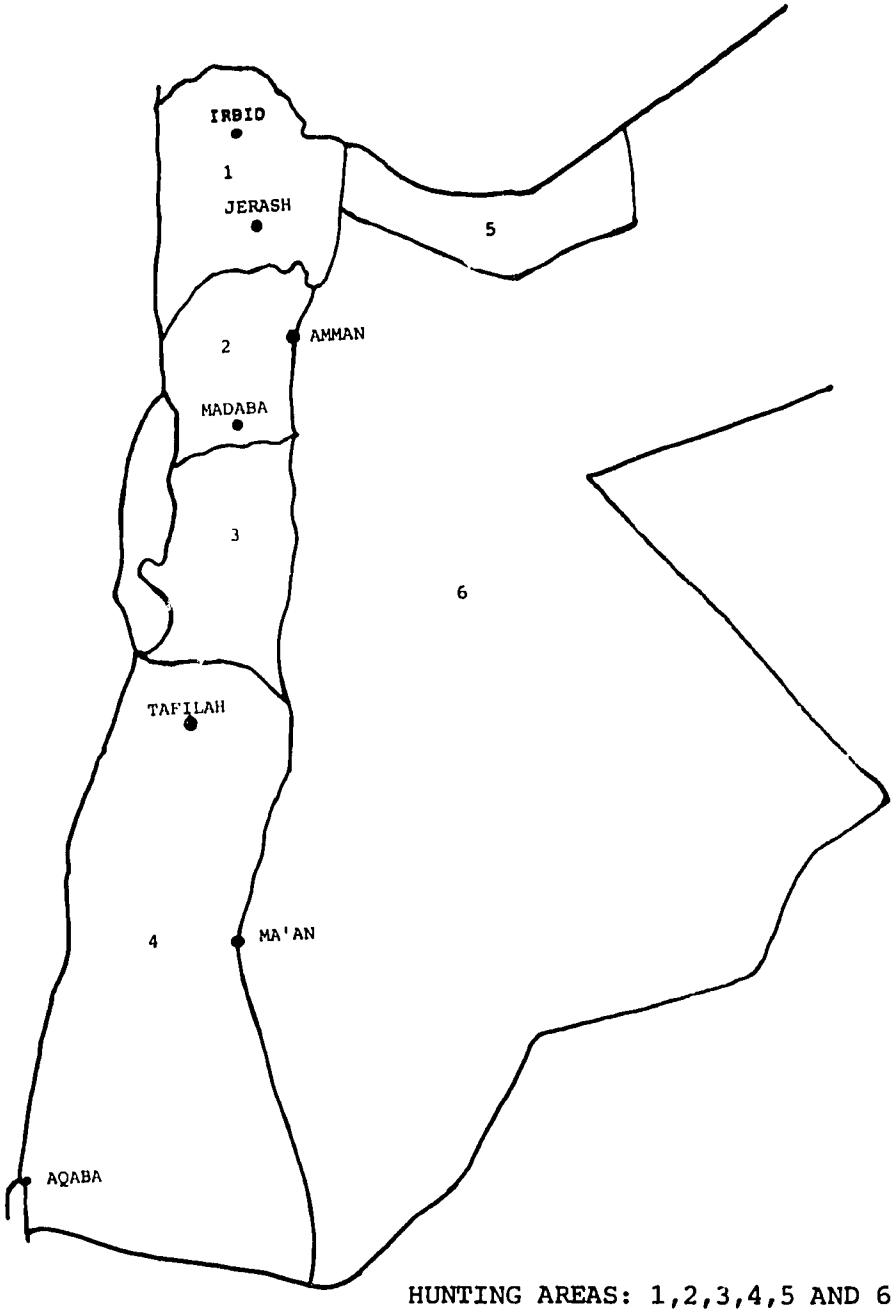
Hijaz Railway Line with the exception of Area No. 5. (the only hunting permitted in this area is waterfowl).

Legal and Institutional Framework

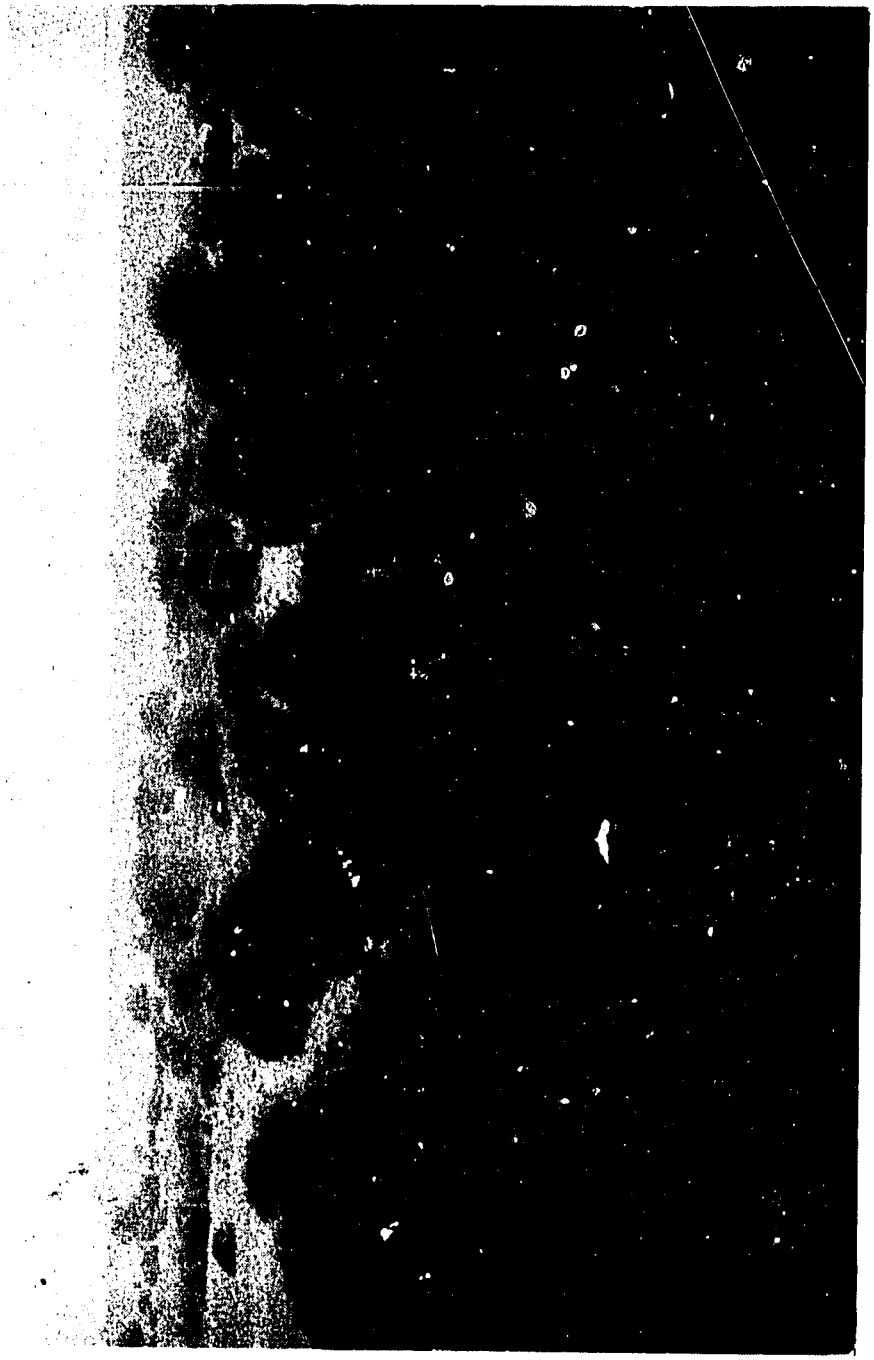
The Ministry of Agriculture is responsible for protecting, conserving and managing the wildlife in Jordan. Law No. 20 and Law No. 113 provide the legal tool for monitoring all hunting activities. Anti poaching measures provided by these laws are adequate to conserve wildlife and prevent further extinction of the endangered species.

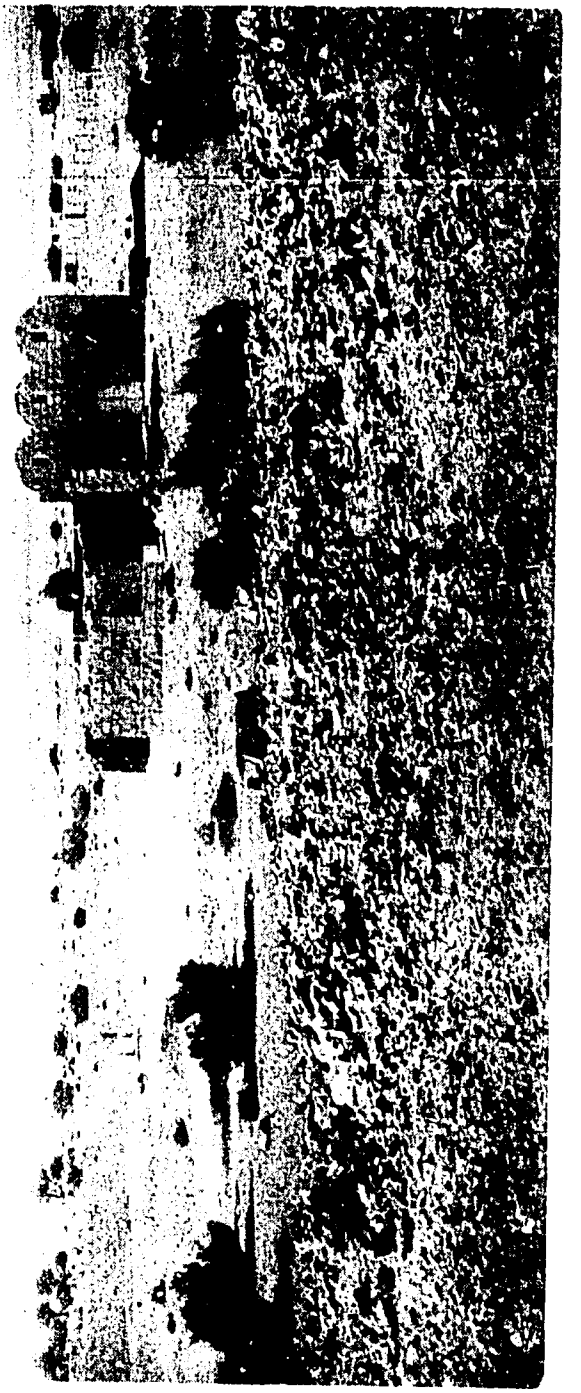
The Ministry of Agriculture delegated its authority of enforcing Law No. 20 and 113 to the RSCN. Law No. 20 prohibits all hunting in the region to the east of the Hijaz Railway which runs from North to South of Jordan, with the exception of Azraq Area. This prohibition is intended to increase the population of endangered species. Currently, hunting restrictions are outlined in Table No. 24. Size of hunt, limits and hunting areas are periodically revised as required. Law No. 20 and Law No. 113 are contained in Appendix No. 3.

Hunting Areas



HUNTING AREAS: 1,2,3,4,5 AND 6





Chapter 6

Cultural Resources

Overview

Archaeological and historical remains are the only tangible evidence that reveals man's advancement and his continuous struggle for a more civilized way of life throughout the span of his existence.

In this important part of the world, this evidence is deemed to be of significant importance to the spiritual values that enrich our national heritage and provide us with unlimited momentum for future achievement of our visions.

Archaeological conservation is a sacred duty that should be motivated by our moral ethics and enhanced by the international voice for the preservation of the marvellous achievement of all mankind. Exemplary conservation practices were demonstrated in Egypt during the construction of the Aswan Dam. Destruction of artifacts cannot be justified even for a very needed development. Therefore, development and conservation should be made compatible and mitigation of negative impacts of construction should be considered as part of the development itself.

Considering the values of the large number of ar-

chaeological sites that have been discovered in Jordan, we can easily consider Jordan to be the cradle of many old civilizations which flourished in the region.

Human Occupancy In Jordan

It has been revealed that more than 800 archaeological sites are found in Jordan. Even the desert includes some of these sites which indicates that this desert had supported an appreciable sector of the region's population. Archaeological sites in Jordan reveal that human presence in this area goes back to the paleolithic period. (100,000 - 14,000 B.C.). Mesolithic, Neolithic and Chalcolithic periods during which human beings went through significant cultural changes are well demonstrated at various archaeological sites discovered in Jordan.

The Bronze and the Iron age activities which show urban centers, trade development and establishment of kingdoms are found in many places in Jordan. Well preserved sites which represent successive civilizations, Roman, Islamic and Crusaders, are scattered all over Jordan. Table 25 shows major archaeological sites.

Table 25*

Jordanian Major Archaeological Sites

Period	Major Sites	Years
Paleolithic		100,000-14,000 B.C.
	Azraq	
Mesolithic		14,000- 8,000 B.C.
	Beidha	
	Ain Ghazal	
Neolithic		8000-4500 B.C.
	Beidha	Sha'ar ha Golan
	Ghannam	Tell Abu Habil
	Ghrubba	Tell Esh Shuna
Chalcolithic		4500-3300 B.C.
	Ghassul	
	Sahab	
Bronze Age		3300-1200 B.C.
Early Bronze Age		3300-2100 B.C.
Early Bronze Age IV- Middle Bronze Age I		2300-1950 B.C.
Middle Bronze Age II		1950-1550 B.C.
Late Bronze Age		1550-1200 B.C.
	Ader	Khirbet Iskander
	Amman Airport	Tell Esh-Shuna
	Bab Edh Dhra'	Tell Iktanu
	Deir 'Alla	Tell Um Hammad Esh Sharqi
Iron Age		1200- 539 B.C.
	Buseirah	Tell Es Sa'idiyeh
	Deir 'Alla	Tell Kheleifeh
	Dhibon	Tell Siran
	Heshbon	Um El Biyarah
	Tawilan	
Persian		539- 332 B.C.
Hellenistic Age		332- 63 B.C.
	Araq El Amir	
	Jerash	

Table 25* continued

Nabataean		350 B.C. - 106 A.D.
	Khirbet El Tannur	
	Petra	
Roman		63 B.C. - 324 A.D.
	Jerash	
	Pella	
	Philadelphia	
	Um Qeis	
Byzantine		324 - 624 A.D.
	Madaba	
	Um El Jamal	
Early Islamic		624 -1099 A.D.
	Khribet El Mafjar	Qasr El Kharanah
	Qasr El Araq	Qasr El Mashatta
	Qasr El Hallabat	Qasr El Tuba
	Qasr El Hir Esh Sharqi	Quseir Amra
Crusader and Arabic		1091 - 1291 A.D.
	Ajlun (Arabic)	
	Karak (Crusader)	Castles
	Shobak (Crusader)	
Mamluk		1291 - 1516 A.D.
Ottoman Turks		1516 - 1918 A.D.
	Qatraneh	Castle

* Arthur D. Little - Environmental Assessment - Jordan Valley Irrigation Project, 1980. Information Revised.

Cultural Resources Conservation

Preservation of cultural resources without hindering development is a requirement that could be fulfilled by public and private sector development. Short term and long term negative impact of rapid development on cultural resources should be identified and mitigated at early stages of project design. Mitigation plans should carefully be monitored during the implementation stages. Environmental assessment of development projects is an effective tool in exposing cultural resources that may be affected by development and provides a list of alternatives that may be followed to minimize negative impact. Most of the international donors link their financial assistance with the environmental soundness of their projects. Some of Bilateral Project Agreements include stringent conditions of environmental abatement as prerequisite to financing. Projects that are locally financed are generally not subjected to any type of environmental assessment.

Conservation of archaeological sites and artifacts is not necessarily accomplished by preserving them. In addition to preservation, development should be linked with complimenting and harmonizing the surrounding landscape. Establishment of conservation areas in old cities may enhance the human touch to development and prevent construction of undesirable and non-conforming buildings in such areas. Conservation areas should be designated and this will help architects in not losing sense of vision by not denying our past heritage in their development undertaking. Jordan should be inspired by

Morocco's achievement in the area of conservation of "old towns".

Measures Taken to Enhance Conservation

1. The Department of Antiquities (DA) is implementing a project in Cultural Resource Management (CRM) with the objective of reducing the impact of rapid economic development on archaeological and historical sites. The project is also intended to provide adequate training in cultural resource management. The American Center of Oriental Research (ACOR) is providing the technical services needed for the project in cooperation with USAID.

2. Amman Municipality has prepared a comprehensive plan for a conservation designated area in Amman/downtown, where the Roman Amphitheater will be linked with the Citadel by a series of activities. All downtown historical sites are integrated in the overall design, using a balanced attitude towards the modern and the past.

Legal and Institutional Framework

The Depatment of Antiquities is reponsible for administering, supervising, protecting and maintaining the antiquities in Jordan. The Government of Jordan is committed by Law to protect the antiquities. The legal base for the conservation of cultural resources is strong. Law

No. 21 for the year 1988 provides the Department of Antiquities with adequate legislation to protect Jordan's artifacts. Penalties for violation are stringent and acknowledged to be adequate. The Antiquities Law is shown in Appendix 4.

Chapter 7
Part One

Marine and Coastal Environment

The Gulf of Aqaba is the only sea outlet to Jordan. This outlet comprises a stretch of 25 kilometers of land along the northern part of the Gulf. This short coast line harbors tourist facilities, port activities, an industrial complex and the town of Aqaba.

Four major hotels are situated at the water front of the northern part of the Gulf, there are four others situated slightly away form the water front in the north. The seashore harbors port facilities which include: the main port of Aqaba, the anchorages for lighters dealing with general cargo and phosphates, the container terminal, oil jetty, cement terminal, passenger terminal and industrial port. The eastern stretch of coast has the fertilizer industrial complex, power station, marine science station and an experimental solar desalination plant.

The Gulf contains an estimate of "100 varieties of coral providing habitat for 1,000 identified species of sub-tropical fish (potential 1987)"*. The coral reefs of the Gulf, the warm climate of Aqaba Region and the fascinating topography of the area attract tourists form all over the world.

*As reported in Draft Environmental Report on Jordan prepared by the Science & Technology Division, Library of Congress, 1979.

Pollution in the Gulf of Aqaba

Phosphate Pollution: Phosphate dust emitted during the operation of loading at the phosphate terminal produces adverse impacts on the coral reefs and deteriorates the quality of air in the area. The Phosphate Mining Company is trying to eliminate this dust as far as possible by pelletizing the product at the mines. This will be best solution. It plans to provide precipitators at each plant at the Phosphate Mines. The precipitators extract the fine particles of phosphate leaving the final product free of dust.

Industrial Pollution: Thermal pollution of the Gulf caused by electrical generating plants is negligible in general but could be harmful to the coral reefs. Other pollution caused by the solar desalination plant is insignificant at this experimental stage. However, if desalination is increased to a commerical level, then pollution may become significant to the living coral reefs in the proximity of the brine effluent/outfall.

Sediment Pollution: Extension of port facilities have resulted in land-fill of certain areas along the coast which can obliterate the reefs. Fine sediments resulted from land-fill operation and found their way to the nearby coral reefs.

Marine Fisheries:

It has been reported that "the Gulf of Aqaba is poor in nutrients to support a large commercial fishing operation (Potential - 1978)"*. Despite efforts to promote the fishing industry in the Gulf of Aqaba, commercial fishing has not been developed and the estimate of the size of catches had been decreasing since 1955.

The marine science station is implementing a pilot project in aquaculture at the Aqaba Gulf by making use of French experience. It has constructed two concrete basins and several suspended cages for fish culture.

* As reported in Draft Environmental Report on Jordan prepared by the Science & Technology Division, Library of Congress, August 1979.

Chapter 7

Part Two

Inland Fisheries

Overview

In 1987, Jordan imported 9807* tons of frozen fish and 3632* tons of canned fish. In order to reduce Jordan's dependency on imported fish, the public and the private sectors have initiated efforts to encourge fish production by using fish farming process. To this effect, 15 fish farms of various sizes have been constructed by the private sector with a total annual capacity of about 500 tons. Reported production of these farms, during 1987, was 71* tons. Successful fish farming requires experience in the applications of appropriate technology which Jordan's public and private sectors still lack. In order to promote this industry, foreign experience should be invited to provide transfer of technology needed in this field. Contact has been initiated between the Department of Animal Production and Health of the Ministry of Agriculture and the Near East Foundation (NEF) concerning fish farming industry.

* Department of Animal Production and Health, Annual Report, 1987.

Reservoir Fisheries

Jordan's three major reservoirs (King Talal, Ziglab and Wadi Arab) have substantial fish production potential. Ziglab is free from pollution and its fish is suitable for human consumption and could produce 20* tons of fish per year.

Wadi Arab Reservoir's fish is currently suitable for human consumption and could support a production of 250* tons per year.

King Talal Reservoir is severly polluted and fish Produced there is unfit for human and/or animal consumption. Tests* conducted in 1988 on fish samples showed that the total bacteria count from carp muscle tissue average 23,833 cells per gram, while the maximum allowable count in the U.S. is 2.3 cell/gram and the U.K. is 15 cell/gram.

The water of the King Talal reservoir coantains arsenic in higher quantities than the maximum limits acceptable by the U.S.EPA Standards for water from which fish would be suitable for human consumption. KTR has the potential for producing 400* tons of tilapia fish per year, if the bacteria and the arsenic content of its water are reduced these fish would be suitable for human consumption.

* Water Quality and the potential for capture fisheries and Aquaculture in King Talal, Wadi Arab and Wadi Ziglab Dams, 1988, by Dr. R. E. Brummett, Near East Foundation.

Key Issues

1. With the existing condition of water in KTR, the Ministry of water and irrigation, the Ministry of Agriculture and the Ministry of Health should make sure that the fish of KTR reservoir is not used for human or animal consumption.

2. The Ministry of Water and Irrigation should apply the standard specifications No. 202 for industrial effluent to be discharged into the Zarqa River and into the sewage collection system feeding the Es-Samra Wastewater Treatment Plant. Application of this standard will reduce the arsenic content of KTR water.

Legal and Instituational Framework

The Ministry of Agriculture is responsible for the protection of marine and inland fisheries. Articles 180 through 186 of law No. 20 for the year 1973 provide the Ministry of Agriculture with the legal base for the protection of Jordan fisheries.

Chapter 8

Forest Resources

Forests of juniper, cypress, oak and pine are believed to have covered most of the highlands of Jordan Forests today cover less than 0.8% of Jordan's total area. The area of natural and man-made forests is about 68,500 ha (Jordan's Forest Resources 1989 - Ministry of Agriculture). These forests are mostly concentrated at the northern and the southern highlands. The rest are scattered in several places. The total area of natural forests is about 36,513 ha owned by the govrnment and privately. These natural forests comprise 25,465 ha of oak, 7,773 ha of juniper, 3,169 ha of pine and 106 ha of wild olive. The total area of the man-made forests is about 32,000 ha. Table 26 shows total areas of forests and forest lands in Jordan.

Significance of Forests

Jordan forests do not play any significant role in the national economy. However, they have an important function which assists in soil and water conservation. Trees are quite effective in soil stabilization in inclined areas and help in decreasing soil erosion and water run off, thus increasing aquifer recharges.

The Ministry of Agriculture through its Department of Forests and Soil Conservation has an established strat-

Table 26*

Classification of forest lands and forests of Jordan as in 1986
(Area in Hectares)

Ownership Category	Part of the Country	Evergreen Oak	Deciduous Oak	Mixed Pine + Oak	Coni-ferous	Wild Olive	Total Natural Forest	Planta-tions	Total Forest Areas	Bare Lands	Total Forest Land Forested & Non-Forested
Government Forest Lands	North	11,555.2	3,062.1	2,730.6	108.5	96.5	17,552.9	22,274.9	39,827.8	40,945.0	80,772.8
	South	1,056.1	-	-	291.9	-	1,348.0	6,659.3	8,007.3	33,186.3	41,193.6
	Total	12,611.3	3,062.1	2,730.6	400.4	96.5	18,900.9	28,934.2	47,835.1	74,131.3	121,966.0
Private Forest Lands	North	3,382.2	1,418.2	296.1	33.8	9.4	5,139.7	-	5,139.7	-	5,139.7
	South	244.6	-	-	20.9	-	265.5	-	265.5	-	265.5
	Total	3,626.8	1,418.2	296.1	54.7	9.4	5,405.2	-	5,405.2	-	5,405.2
Unsettled Forest Lands	South	4,746.4	-	-	7,460.2	-	12,206.6	-	12,206.6	-	12,206.6
Grand Total		20,984.5	4,480.3	3,026.7	7,915.3	105.9	36,512.7	28,934.2	65,446.9	74,131.3	139,578.2

* Computed from Forests and Forestry in Jordan 1986, by Department of Forests and Soil Conservation.

egy for reforestration. This strategy involved in raising various types of seedlings needed for reforestration over the last 30 years. The Ministry of Agriculture has 13 nurseries for raising the seedlings which are distributed at no cost to the public and private sector.

Annual Production of Seedlings

Table 27 shows the average annual production of seedlings from 1953 to 1986.

Table 27*

Average Annual Production of Forest Nurseries

Period	Average Number of Seedlings
1953-1956	1,887,500
1957-1960	1,648,750
1961-1964	2,968,265
1970-1974	3,712,092
1975-1979	4,817,958
1980-1981	3,655,564
1982-1983	5,521,730
1983-1984	6,185,676
1984-1985	6,815,473
1985-1986	6,900,170

* Forests and Forestry in Jordan 1986 by Department of Forests and Soil Conservation.

Rangelands

The rangelands of Jordan are situated in arid and semi arid areas where the annual precipitation is less than 200 mm. The rangelands are deteriorating due to unwise

human intervention, overgazing and climate conditions. Loss of the plant cover of the lands accelerates soil erosion and desertification. To restore the plant cover of the land and improve the rangelands, the Ministry of Agriculture has established 13* range reserves having the total area of 17,000 ha*, out of which 5,000 ha* have been planted with fodder shrubs.

Legal and Institutional Framework

The Ministry of Agriculture is reponsible for developing and protecting Jordan's forest resources and rangelands. Articles No. 89 through 132 of Law No. 20 for the year 1973 provide the Ministry of Agriculture with the legal base for developing and protecting Jordan's rangeland and forest resources. These articles are stated in Appendix No. 5.

* Source: Department of Forests and Soil Conservation

Chapter 9

Accident Prevention and Occupational Safety and Health

Overview

Work environment is a major factor that influences labor efficiency. An unhealthy work environment has negative impact on the employers, workers and the business itself. Performance of labor under substandard working conditions does not reach the output level achieved under standard conditions. Unhealthy work environment incurs direct and indirect costs to the business. It decreases labor efficiency, causes accidents and diseases that cost money to both labor and business. Occupational accidents and diseases are a source of fear that always imposes threats on the workers and their families. Everyday workers with dangerous jobs, leave home for work with the fear of not being able to come back home at the end of the day. The same fear is shared by their families. This sort of fear reduces workers' motivation for advancement and innovation. Accidents are generally caused by lack of illumination at work site, faulty ladders, elevated platforms with no protection. Crane and mobile equipment with no back-up alarms, walkways with obstacles, floor openings, belts and pulleys with no guard rail or protection, lack of fire warning system, non availability of personal protective equipment, explosive materials and negligence/ignorance of safety rules by workers and/or employers. Occupational diseases are

caused by dangerous emissions, toxic material and hazard wastes.

Occupational Accidents in Figures

Table 28 shows number of workers and number of occupational injuries for the year 1981 through 1987:

Table 28*

Occupational Injuries (1981-1987)

Year	Number of Injuries	Total Number of Workers
1981	6,215	106,354
1982	5,164	113,693
1983	5,580	162,461
1984	6,012	183,000
1985	7,439	342,135
1986	7,506	392,508
1987	7,625	367,275

*Source: OSHI

Legal and Institutional Framework

With industrial growth in Jordan, occupational eaccidents have caused significant concern. Subsequently, the Government of Jordan had established the Occupational Safety and Health Institute (OSHI) in 1983. The International Labor Organization (ILO) provided valuable advice regarding the establishment of the (OSHI) which operates under the auspices of the Ministry of Labor in conjunction with the Vocational Training Corporation. The

OSHI was established to provide advice and training to governmental and industrial organizations and to conduct research in the field of occupational safety.

Legal Base

Existing laws and regulations provide concerned government agencies with a strong base to ensure accident prevention and occupational safety and health of various types of workers in Jordan. Sub-standard conditions prevail in some industries, quarries and mines as a result of not enforcing the law by these agencies. The legislation base for occupational safety and health is strong and if enforced, the number of accidents will decrease.

A. The Ministry of labor is responsible for administering all legislation concerning occupational health and safety. Chpter 9 of Law No. 27 is applicable. Sections of this chapter are stated in Appendix 6.

B. The Natural Resources Authority (NRA) is responsible for administering the occupational safety and health of all mines and quarries' workers of Jordan. Article (23) through (90) of Code No. (131) of 1966 (Mining Code) issued in accordance with Article (68) of Law No. (12) of 1968 are applicable, along with Regulation No. (8) of 1971 (Quarries' Regulation). The Mines' Inspector General is responsible for administering occupational safety and health in all mine facilities and monitoring the application of the provisions of the Mining Law. Appen-

dix 2 contains articles of Law No. (12), Code No. (131) and Regulation No. (8) that are related to occupation, safety and health.

Table 29

Rates of Fatal Injuries by Industry *

Country : Jordan
Type of Statistics : Compensated accidents
Unit of Measure : Rates per 1,000 persons employed

Year	Major Division (a) TOTAL	1 Agric., Hunting, Forestry & Fishing	2 Mining Quarrying	3 Manufac-turing	4 Electri-city, gas	5 Construc-tion & Water	6 Trade Rest. & Hotels	7 Transports Storage, Communi-cation	8 Financing Insurance Real Est., Business Services	9 Community Social & Personal Services	0 Act-tivities not Adequately Defined
1975				0.166		0.391					
1976				0.2		0.181					
1977				0.12		0.66					
1978				0.133		0.2					
1979			0.08	0.346		0.812		0.312			
1980		0.035	0.265	0.37	0.036	0.167	0.037	0.029	0.052		
1981		0.034	0.222	0.417	0.026	0.188	0.028	0.034	0.051		
1982		0.031	0.199	0.353	0.032	0.173	0.338	0.056	0.046		
1983		-	-	-	-	-	-	-	-	-	-
1984		-	0.308	2.669	-	1.541	0.458	0.606	0.054	-	0.354
1985		0.123**	1.193	2.000	0.290	1.892	0.413	0.876	-	0.312	-
1986	-										
1987		0.186**	1.532	1.892	0.443	1.305	0.121	1.263	-	0.482	0.271

* OSHI (Occupational Saftey and Health Institute)
** By International Labor Organization (I L O) through OSHI

Chapter 10

Air Quality

Overview

This discussion of air quality focuses on anthropogenic sources of air pollution. The quality of air in any country depends, to a great extent, on the type of its existing industry, the type of the energy used, the quality and the quantity of emissions, the dispersion characteristics and the ground level concentration.

Jordan uses commerical energy which is produced by burning petroleum products and electricity generation utilizes oil-fuel process. Any facility that burns oil is liable to pollute the air and the nature of pollution is related to the type and the amount of the fuel burnt, the efficiency of combustion and the arrangements provided to reduce emissions. Plant installed precipitators and scrubbers provide significant reduction in the emitted pollutants, and stack heights improve the dispersion criteria.

Emissions are related to oil consumption, and in 1986, Jordan consumed 2,908,000* tons of oil equivalent (TOE). Industry consumed 11.96% (348,000 TOE)*, transport consumed 38.17% (1,110,000 TOE)*, household consumed 9.28% (270,000 TOE)* and the remaining bal-

*Report on Long Term Energy Policy and Investment by Meta Systems/Hagler, Bailly - Bechtel National, Inc. 1988.

ance was consumed by electricity generation, petroleum refinery and others. The above figures show that maximum percentage of consumption belongs to the transport sector. Table 30 shows the oil consumption by Jordan for the last seven years.

Table 30*
Oil Consumption

Year	Thousands TOE
1982	2,420
1983	2,587
1984	2,761
1985	2,819
1986	2,871
1987	3,001
1988	3,047

* Energy and Electricity in Jordan 1988 by the Ministry of Energy and Mineral Resources.

In 1983, an Environmental Assessment* of the Jordan Cement Factory - Fuheis showed that dust emissions from the cement works constituted significant detriments to neighbors and their property from air-borne and settled dusts. These dusts are nuisances and non-toxic and do not impose unique threats to health in the vicinity of the cement plant.

Key Issues

With the increasing rate of industrial growth, the blessing of having a clean air environment may not last. Therefore, Jordan should develop a National Program for

* Environmental Assessment of Jordan Cement Factory - Fuheis, 1983, by R.H. Herby and M.W. Black.

Air Quality Control (NPAQC). This program should cover all aspects needed for institution building, preparation of appropriate standards needed for acceptable air quality and legislation that provides a legal base for effective management and monitoring. Legislation should include provisions for promoting regional cooperation among neighboring Arab conuntries, to minimize air pollution on a regional basis.

The Ministry of Municipal and Rural Affairs and the Environment (MMRAE) and the Royal Scientific Society (RSS) have the basic capabilities needed for implementing the NPAQC. the MMRAE has the administrative experience and the RSS has the technical knowledge.

Like many developing countries, Jordan is still fortunate to have a clean air environment. With negligible health hazards, Jordan is blessed by having a comparatively healthier atmosphere because it is less industrialized than the developed world.

Jordan has several facilities that release a wide range of emissions. These facilities are: oil refinery, electricity generating plants, transportation systems, chemical and cement industries, open-pit mining and quarries. It is speculated that the concentration of pollutants in certain industrial zones and the city of Amman (down town) are higher than the concentrations accepted by international standards, because of topography and temperature inversion.

Jordan Air Pollutants

Emissions from various industries and the transport-sector include: sulfur dioxide (SO_2), hydrogen sulfide (H_2S), carbon monoxide (CO) nitrogen oxides (NO_x) and particulates.

In 1984, an Environmental Assessment* of the Jordan Petroleum Refinery Company showed that the maximum SO_2 ground level concentration at the refinery is near the maximum allowable limit of the U.S.A.

In this regard, the RSS is implementing projects of data collection and trend finding of pollutants in Amman/ downtown, Aqaba phosphate loading area and the petrolum refinery near Zarqa.

Legal and Institutional

The MMRAE is supposed to manage and monitor the quality of air in Jordan. However, there is no legislation that provides this responsibility to MMRAE.

* Enviromental Assessment of the Jordan Pertroleum Refinery Company, 1984 by Robert W. Hospodarec.

Chapter 11

Suggested Organizational Changes

The responsibilities of Protecting Jordan's Environment and promoting nature conservation are divided among several ministries and agencies. These responsiblities are shared by: the Water Authority and the Jordan Valley Authority under the auspices of the Ministry of Water and Irrigation, the Ministry of Agriculture, the Royal Society for the Conservation of Nature, the Ministry of Health, the Ministry of Energy and Mineral Resources, the Department of Antiquities and the Ministry of Municipal and Rural Affairs and the Environment. In addition to the above mentioned establishments, there are in some instances the well intended but ill informed uninvited volunteers who mostly provide non-constructive approaches for solving the emerging environmental problems. This scenario is not intended to exclude the significant role of non-governmental organizations and the general public from protecting the environment.

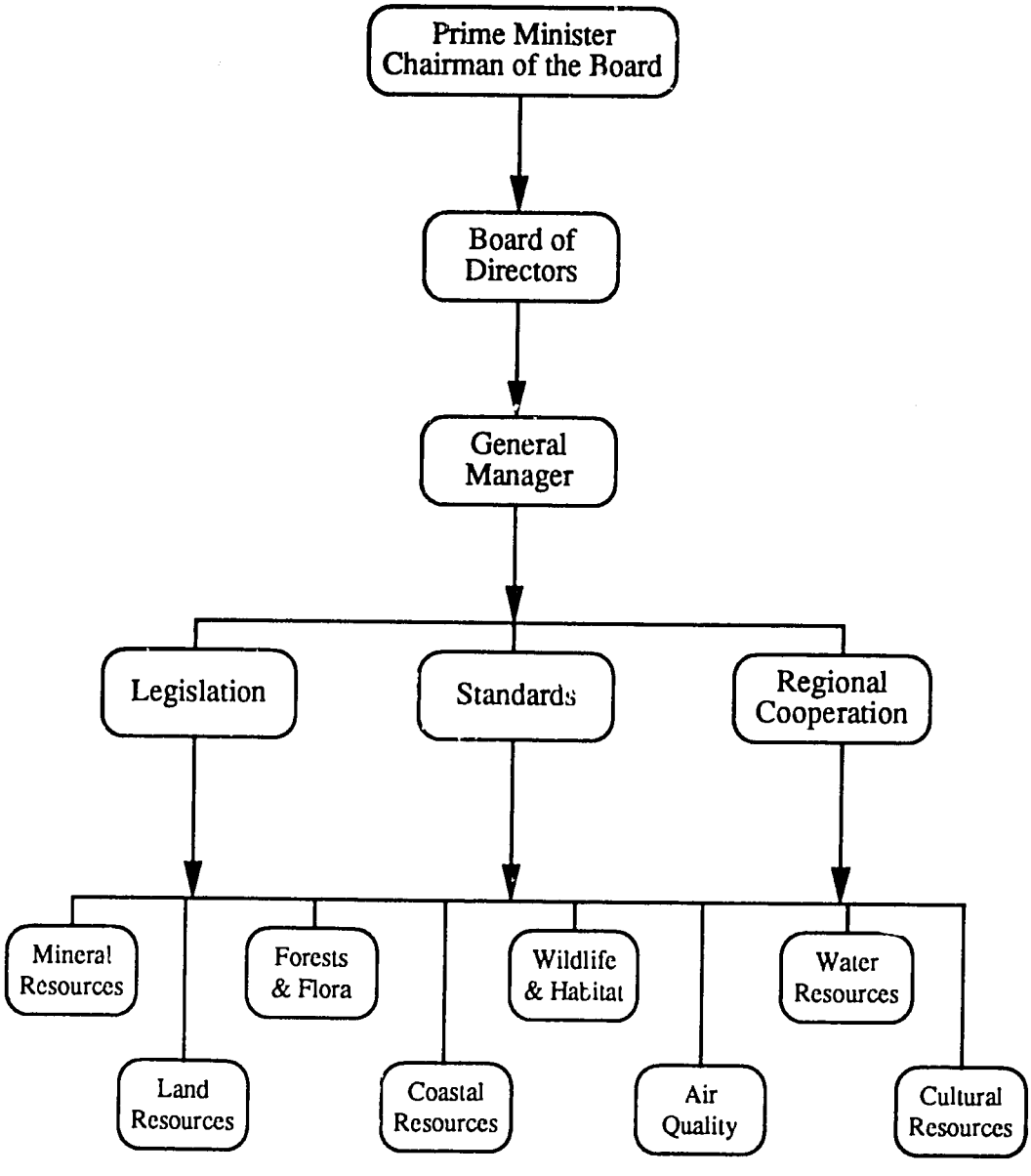
Additionally, environmental responsibilities are not as well defined as they could be and thus lead to duplication of efforts, negligence, dilution of responsibilities and promotion of tension among the various agencies, etc. charged with protecting the environment and nature. Utilization of any natural resource poses a potential risk

and possible sustainability issues. These risks and issues have to be mitigated by the implementing agency. In this respect, I do not advocate stripping any ministry or agency of its responsibilities, on the contrary, I believe that these ministries and agencies have achieved the basic level of skills needed for the management of our natural resources, however, through time, the level of skill should increase.

The foremost question in my mind is how to expediciously solve controversial environmental issues that are of the multi ministries/agencies nature. At present, Jordan does not have a high ranking agency that possesses the advanced technical capabilities with appropriate legislation to deal with such issues. Based on the present fragmented approach to the environment, I propose that the Government of Jordan creates a high level establishment under the name "Jordan Environmental Protection Agency (JEPA)". This agency should be directly connected to the Prime Minister's Office, in order to have the highest authoritative support. It should be entrusted with the reponsibility of eliminating disputes between ministries and agencies, etc., and seeing that Jordan's Natural Resources are protected and utilized at a sustainable rate without adverse environmental impacts. The structure of the JEPA could be similar to that which is shown on the next page.

STRUCTURAL FORMAT FOR JEPA

Jordan Environmental Protection Agency (JEPA)



Chapter 12

Indicators to Environmental Awareness

The Government of Jordan has taken certain measures that indicate its environmetal awarness. These measures are:

1. Preparation of a National Environmental Strategy (NES) in cooperation with MMRAE, the Agency for International Development (AID) and the International Union for the Conservation of Nature (IUCN). completion of the NES is expected by the end of 1990.

2. Issuance of Standard Specifications No. 286 (1988) by WAJ, for drinking water. These specifications are currently applied.

3. Application of antipoaching measures by RSCN.

4. Establishment of five wildlife reserves by RSCN.

5. Newly established Jordanian Society for the Control of Environmental Pollution, a non-governmental organization for the purpose of protecting the environment.

Chapter 13

Bibliography

The following environmental conferences, workshops and seminars were held in Jordan during 1983-1988:

1. The National Conference for Drinking Water and Environmental Abatement, held in Amman on May 2-4, 1983, in cooperation with the Ministry of Health and the World Health Organization (WHO).

2. Seminar on Environmental Pollution and Problems of the Arab World, held in Amman on October 16-18, 1983, in cooperation with the Arab League (AL) and the United Nations Environmental Program (UNEP).

3. Seminar on Environmental Engineering held in Amman 1985, in cooperation with the Jordan University and Dublin University.

4. First National Seminar on Drinking Water-Quality Standards, held in Amman on September 17-19, 1985 in cooperation with the Center for Environmental Health Activities (CEHA) and the Ministry of Health and the Water Authority.

5. Environmental Education workshop, held in Amman on October 10-14, 1987, in cooperation with

Yarmouk University and UNESCO.

6. Seminar on Occupation and Health Safety in Cement Use, held on March 26-28, 1988, in cooperation with the Canadian Institute for Occupational Health Safety.

7. Regional seminar on Water Resources and Water Quality Management, held in Amman on May 28 to June 2, 1988, in cooperation with CEHA.

8. Conference on the Red Sea and the Gulf of Aden's Environment, held on September 28-29,1988 at Aqaba.

9. Regional conference on the Environment and Health held in Amman on December 10-14, 1988 in cooperation with CEHA.

Appendix 1

Law No. 18 of 1988
Water Authority Law

.Article 1

This law shall be cited as the "Water Authority Law of 1988" and shall come into effect from the date of its publication in the Official Gazette.

Article 2

The following words and expressions whenever used in this Law shall have the meanings assigned hereunder unless the context indicates otherwise.

Ministry: The Ministry of Water and Irrigation.

Minister: The Minister of Water and Irrigation.

Authority: The Water Authority established under this Law.

The Board: Board of Directors of the Water Authority.

Secertary General: The Secretary General of the Water Authority.

Water Board: Board of Directors of the Water Department at any area specified by the Board.

Water: Surface and ground water from all sources :luding seas, lakes, rivers, springs, rain waters, dams, :lls, pools, and reservoirs. This word also includes neral water and hot water.

Water Basin: Any geographical zone in the kingdom that feeds a river or its tributaries, ground water, and valleys with seasonal or perennial flows. It also includes a zone as defined by a resolution of the Board.

Pollution: Any change that occurs to the natural, chemical or biological characteristics of water that restricts its suitability for the intended use.

Sewage: Refuse liquid, effluent, and wastes resulting from different water uses.

Water Project: Any canal, dam, ditch, channel of running water or dry channel, bank, bridge, culvert, any building for regulating or storing water, a spring, well or any means for extracting, lifting, pumping or distributing water, or any subsidiary work of any kind used to obtain water, lift it or transport it for different uses.

Sewerage Project: Construction of works for collecting, transporting and disposing of sewage including sewage collection systems, water transmission lines, inspection manholes, pumping stations and treatment plants within or outside residential areas.

Water Treatment: Elimination of harmful and polluting materials from water to make it conform to approved standards for its intended use.

Article 3

Under this Law, an authority known as the Water Authority is to be established as an autonomous corporate body, with financial and administrative independence. It is authorized to institute legal proceedings, own movable and real estate, acquire water rights by purchase or acquisition, conclude loans, accept grants or contributions, and sign contracts. It may appoint Attorney General to represent it in litigation as plaintiff or defendant.

Article 4

The Authority shall follow the Rules in effect that are binding on Ministries, Governmental Authorities, and Official Authorities.

Article 5

The Ministry shall carry the full responsibility for all water and sewage systems and related projects and shall

set forth a water policy and submit it to the Cabinet of Ministers for approval.

Article 6

In order to achieve all the objectives intended by this Law, the Authority shall exercise the following responsibilities and tasks:

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

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

c. Regualte, and advise on, the construction of public and private wells, investigate ground water resources, drill exploratory, reconnaissance, and production wells , and license well drilling rigs and drillers.

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

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

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

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

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

Article 7

The Authority shall be entitled to carry out any projects or responsibilities determined by the Cabinet of Ministers, upon the recommendation of the Minister, in addition to the tasks and duties it is entrusted with in accordance with the provisions of this Law.

Article 8

The Authority shall have a Board of Directors, which shall consist of the following members:

a. The Minister - Chairman

b. Secretary General of the Jordan Valley Authority - Vice-Chairman

c. Secretary General of the Ministry of Planning

d. Secretary General of the Ministry of Agriculture

e. Secretary General of the Ministry of Municipal, Rural and Environmental Affairs.

f. Secretary General of the Ministry of Health

g. Secretary General of the Ministry of Industry and Trade

h. General Manager of the Budget Department

i. The Secretary General

j. Representative of the Natural Resources Authority appointed by the Minister of Energy and Mineral Resources.

k. A Member with expertise and specialization appointed for two years by the Cabinet of Ministers upon the recommendation of the Minister.

Article 9

a. The Board shall meet when called by the Chairman. A quorum shall consist of at least seven members, one of whom shall be the Chairman, or the Vice-Chairman in the Chairman's absence. Decisions shall be taken by unanimous vote or by the simple majority of the members present. If the votes are equal, the Chairman shall cast the deciding vote.

b. Whenever necessary, the Minister may call for a joint meeting, under his chairmanship, of the Board of the Authority and the Board of Directors formed in accordance with the law of the Jordan Valley Authority then in effect or any substituted law. The legal quorum of both boards is necessary .

This joint meeting of the Boards shall study all matters presented by the Minister, such as the mutual tasks and duties assigned to both Authorities. The decisions taken shall be by unanimouns vote or by simple majority and shall be considered effective under this Law and the Jordan Valley Authority Law then in effect and shall be carried out by both Authorities in accordance with their specialization.

Article 10

The Board shall undertake the following duties and re-

sponsibilities:

a. Set forth a water policy that reserves the rights of the Kingdom in all its water resources, including the development, maintenance, and use of the resources.

b. Approve the water policy of the Kingdom and the plans for the development and conservation of water resources, specify water distribution and uses, provide additional water resources and approve plans regarding the construction of water and public sewerage networks.

c. Study the Authority's draft bylaws and regulations and submit them to the Cabinet of Ministers for approval.

d. Study the Authority's proposed annual budget.

e. Obtain foreign and local loans with the approval of the Cabinet of Ministers.

f. Recommend to the Cabinet of Ministers tariffs for connections, subscriptions, price rates and deposit fees that should be collected for various water and public sewerage uses.

g. Invest the Authority's funds and revenues with the approval of the Cabinet of Ministers.

h. Appoint members of Water Councils in the districts.

Article 11

a. No member of the Board of Directors or any employee of the Authority is permitted to participate for his own benefit in any tender, construction contract or procurement contract that the Authority may conclude, announce or award for the execution of its projects or works. He is not permitted to work on such projects or benefit financially from them, directly or inderictly, except for his earnings as salaries from the Authority or other remunerations for any mission he may perform in accordance with the provisions of this Law and within the limits specified explicitly in it or in any regulations issued accordingly.

b. Any member of the Board or any employee of the Authority who does not abide by the provisions of paragraph (a) of this Article shall be subject to legal penalties and procedures and be compelled to pay back all the amounts he received illegally and to compensate the Authority or any other person affected by his violation.

Article 12

The Secertary General shall be the executive manager of the Authority, responsible to the Minister. He shall implement the Authority's policy and plans and administer its affairs, and shall be entrusted with the following tasks and responsibilities:

a. Implement the Board's resolutions.

b. Prepare and submit to the Board the proposed annual budget.

c. Coordinate the performance of the Authority's projects and maintain efficiency , cooperation and harmony between its technical and administrative departments.

d. Administer the affairs of the Authority's officials and employees.

e. Supervise the Authority's administrative and financial affairs and control its supplies.

Article 13

a. The Authority shall have its own cadre of officials and employees. Conditions of employment, including appointment, termination of services or dismissal, definition of salaries, allowances, compensations, duties, rights and all other administrative matters related to them shall be set in accordance with the regulations issued under this Law and any modifications thereof, until the provisions of the Civil Service Law of 1988, or any substituted law, are applied.

b. Officials and employees working for other Governmental or Municipal Departments, Corporations

or Agencies shall be transferred in accordance with paragraph (a) of Article 23 of this law upon the decisions of the Minister and to the extent sufficient for the needs of the Authority. Upon their transfer, they shall retain all their rights and the obligations imposed on them. Their service with the governmental or municipal departments, corporations and agencies shall be counted as service with the Authority; but the provisions of the Civil Pension Law shall be applied only to the employees who were previously classified for pension and who choose to continue in the same rank and at the same salary in accordance with the Civil Service Law in effect. All pension deductions from their previous salaries before they were actually transferred to the Authority shall be transferred to the Pension Fund at the Ministry of Finance.

c. The services of officials and employees who are not to be transferred to the Authority shall be terminated upon resolutions issued by the Minister in accordance with the Personnel Provisions of the Civil Service Law in effect.

Article 14

The Capital of the Authority shall consist of:

a. Government contributions.

b. The movables and real estate transferred from the Government to the Authority.

c. The funds agreed by the Cabinet of Ministers to be added to the Capital of the Authority, according to recognized accounting methods.

d. Donations and subsidies to the Authority agreed by the Cabinet of Ministers to be added to its Capital.

Article 15

The Financial Resources of the Authority shall consist of :

a. Revenues from water prices, subscriptions, deposits and other fees the Authority may collect for its services.

b. The income from movables and real estate owned by the Authority and the income of its investment projects.

c. Loans, donations and subsidies to the Authority agreed by the Cabinet of Ministers.

d. Any other sources of income of the Authority.

Article 16

The Authority funds are considered Amerie Funds and shall be collected according to the Amerie Funds Collecting Act in effect. Consequently the Secretary General is entitled to act as an Administrative Governor and as the Amerie Funds Collecting Committee stipulated in the above act.

Article 17

a. The Authority, upon the resolution of the Board, may deposit its funds in one or more licensed banks in the Kingdom.

b. The Authority's financial affairs shall be regulated by a special regulation issued under this Law; and until then, all financial affairs shall be regulated in accordance with the instructions of the Board.

Article 18

The accounts and records of the Authority shall be organized according to recongnized accounting methods and shall be audited by qualified auditors. The Board shall appoint the said auditors and specify their fees. The Cabinet of Ministers may also entrust the Audit Bureau to check the Authority's accounts.

Article 19

The Authority, upon the recommendation of the Minister of Finance and the Governor of the Central Bank and with the approval of the Cabinet of Ministers, shall have the right to issue Debt Bonds or Loan Certificates or any other bonds according to the Laws in effect. The terms and rates of interest for such bonds shall be determined by the Cabinet of Ministers.

Article 20

The Authority shall enjoy the same exemptions and facilities enjoyed by other Ministries and governmental departments.

Article 21

Notwithstanding what is stated in any other legislation, no governmental depatment, official or private corporation, or any natural or judicial body is exempted from the Authority's fees or charges for supplying water or rendering services or from the costs of construction or pipelaying or from the contribution to the costs of any project or from the prices and fees charged for services rendered by the Authority, according to the provisions of this Law.

Article 22

The Authority shall:

a. Allocate an amount not less than 10 percent of its net profit per annum as a compulsory reserve, provided that the total of this reserve shall not exceed 20 precent of the Authority's Capital at the end of the fiscal year.

b. Allocate the balance of the net profit to finance the Authority's projects and transfer the excess to the Government Treasury, if the Cabinet of Ministers so decides.

Article 23

a) With regard to the contents of parargraph (b) of this Article, all duties responsibilities and obligations related to water and public sewerage , which were previously the responsibility of any governmental department, corporation or any public commission or municipality, shall be transferred to the Authority. To fulfil these duties and obligations, the Authority shall be responsible for the following:

1. Establish specialized departments responsible for implementing the Authority's duties, responsibilities and obligations.

2. Establish Water Departments in all parts of the Kingdom. Each Department shall have a Water Council composed of representatives from the governmental and private sectors concerned with water and public sewerage. This is to allow citizens and local authorities to participate in deciding priorities regarding water and sewerage projects and plan for their implementation.

3. Purchase, acquire or lease properties, land and the related easement rights and the water rights required for the various projects of the Authority , and provide a prohibited area as deemed necessary fot its water and sewerage networks and the related buildings and construction.

4. Manufacture and produce commodities needed for the Authority's water and sewerage works, and provide all the equipment necessary for water and public sewerage projects.

5. Take the necessary action to ensure technical control and supervision regarding the construction, operation and maintenance of all water projects and public or private sewers.

6. a. Obtain and continue ot obtain data and information regarding the needs of the Kingdom and the actual consumption of water for different uses, and utilize such data for future planning, to provide for the Kingdom's needs for water and to conserve its consumption,

b. Keep records, including detailed technical and financial information regarding the construction, maintenance and operation costs for all the Authority's projects.

b. All agencies described in paragraph (a) of this Article shall continue to fulfil the duties, responsibilities and obligations regarding water and public sewerage to which they were entitled under the existing laws and regulations until the Cabinet of Ministers decides to transfer such duties and responsibilities to the Authority, in accordance with the methods and stages deemed suitable to be practised under this Law, including the transfer to the Authority of all funds, movables and real estate,equipment, apparatus and instruments, managerial units and sections and

any other assets related to such agencies. The actual and legal existence of such agencies shall terminate upon the transfer of their function to the Authority.

c. The Authority is considered to be the actual and legal successor of the agencies, corporations, commissions and municipalities described in paragraph (a) of this Article after the completion of all procedures regarding the transfer of all their duties and responsibilities to the Authority. Upon such transfer, the Authority shall be responsible for all the rights and obligations possessed by them and shall perform and execute contracts and agreements previously concluded by such agencies and fulfil their obligations as if they were concluded with the Authority.

Article 24

The governmental land included within a strip of 1000 meters in width on each side of the center line of the water mains and the main irrigation canals is designated for the development of the governmental irrigation projects, socially and economically. This prohibited land shall not be disposed of or dispossessed or used in any way except with the approval of the Cabinet of Ministers upon the recommendation of the Minister.

Article 25

a. All water resources available within the boundaries of the Kingdom, whether they are surface or groundwaters, regional waters, rivers or internal seas

are considered State owned property and shall not be used or transported except in compliance with this Law.

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

c. All natural and judicial bodies are prohibited to sell water from any source, or grant or transport it, without obtaining in advance the written approval of the Authority and within the conditions and restrictions decided or included in the contracts or agreements concluded between them and the Authority.

d. All persons on whom the provisions of parapgraphs (b) and (c) of this Article are applicable, shall adjust their conditions to suit these provisions within a period of three months of the date this Law comes into effect. Otherwise, such persons will be subject to the legal and other penalties stated in these Articles.

Article 26

If any dispute occurs between the Authority and landlords concerning the amount of compensation to be

paid against the acquistion of properties, land and related rights, or the rights of water projects and public sewerage, then either party may appeal to the Court to specify the amount in accordance with the provisions of the Acquisition Law in effect. They may also agree to refer the case to arbitration in accordance with the Arbitration Law in effect.

Article 27

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

Article 28

The Cabinet of Ministers, upon the recommendation of the Minister, may assign part of the Authority's duties, projects or the execution of any stage or stages of such projects to any other governmental, local or municipal party.

Article 29

The Authority shall submit to the Cabinet of Ministers an annual report which shall include its works, general budget, accounts and the final balance sheet for the previous year.

Article 30

a. Any one may be sentenced to not less than six months, and not more than two years, imprisonment or may be fined not less than JD 1000 and not more than JD 5000, or both penalties if he has committed any of the following deeds:

1. Established any buildings or construction of any kind on State owned land within the prohibited land strip defined in Article 24 of this Law.

2. Caused damage to any of the Authority projects, or ruined or destroyed any water resources or the Authority's public sewers or acted in any way which may cause the damage or destruction of construction, equipment, vehicles or materials related to the Authority or any of its projects or public sewers.

3. Polluted any water resource, which is under the management or supervision of the Authority directly or indirectly, or caused its pollution and failed to remove the causes within the period fixed by the Authority.

4. Drilled unlicensed ground water wells or violated the conditions of the license issued to him.

b. Any one may be sentenced to not less than one

month, and not more than six months, imprisonment or may be fined not less than JD 100 and not more than JD 1000, if he has committed any of the following deeds:-

1. Any encroachment on State owned land within the prohibited areas defined in Article 24 of this Law without obtaining in advance the written permission of the Authority, even if such act did not cause any harm to the Authority or any damage to its water resources and public sewerage systems.

2. Carrying out works or duties which are considered the sole responsibility of the Authority under this Law, without obtaining in advance the written approval of the Authority.

3. The illegal usage of water, water resources, related projects or the public sewers, neglecting the provisions of this Law, including the selling , granting or transporting water, using or utilizing it or committing any act that may cause harm or damage to any of these resources or water related projects, or using the public sewers in a manner that conflicts with the provisions of this Law.

4. carrying out any works regarding water or sewerage without obtaining the licenses, permits or approvals required under this Law.

c. Those who commit or start to commit any of the deeds prohibited under this Law shall be subject to punishment.

d. If any person is found guilty of committing any of the deeds defined in paragaraphs (a) and (b) of this Article, the court shall convict him and make him pay the total of the damages caused by his violation and compel him to eliminate the damage caused and restore the conditions as they existed before the commitment of such deeds within the period specified by the court. If he fails to do so, the Authority shall have the right to carry out the necessary works and repairs and charge the convicted person with the total cost plus 50 percent.

Article 31

With regard to the provisions of Article 23 of this Law, all other legislation shall be repealed to the extent it conflicts with the provisions of this Law.

Article 32

The Cabinet of Ministers shall issue the necessary regulations to execute the provisions of this Law concerning employment, financial affairs, supplies and other works related to the Authority, and duties, fees and deposits which the Authority collects against the services it renders under this Law.

Article 33

The Prime Minister and the Ministers are responsible for the implementation of the provisions of this Law.

Law NO. 19 of 1988
Jordan Valley Development Law

Article 1

This Law shall be cited as the "Jordan Valley Development Law of 1988" and shall come into effect from the date of its publication in the Official Gazette.

Article 2

The following words and expressions whenever used in this Law shall have the meaning assigned hereunder unless the context indicates otherwise.

Jordan Valley
or the Valley: The area which lies below sea level, between the Jordanian boundary to the north and the northern edge of the Dead Sea to the South and the lower parts of the basins of the Yarmouk and Zarqa Rivers which lie below the 300 meters above sea level contour and any other area or areas the Cabinet of Ministers may decide to make a part of it.

Authority: The Jordan Valley Authority established under this Law.

Board of Directors
or the Board: Board of Directors of the Jordan Valley Authority

Ministry: The Ministry of Water and Irrigation

Minister: The Minister of Water and Irrigation.

Secretary General: The Secretary General of the Jordan Valley Authority.

Person: Any Jordanian of legal age (21 years old), who has a sound mind and enjoys his full civil rights. Also any judicial person, municipality, village, governmental depatment or any body of legal entity.

Land Classification: The official classification described in Volume III of the Master Plan Report of the Yarmouk and Jordan Valley Project of 1955 or any subsequent classification approved by the Authority.

Farm Unit: Any tract of land irrigated by the waters of an irrigation project which has had or will have its boundaries determined by the Authority as a single unit.

Housing Plot: Any tract of land which lies within

the boundary of town or a village and has had or will have its boundaries determined by the Authority as a single housing unit for the purpose of housing only.

Other lands: All other expropriated lands except the farm unit and the housing plot.

Family: All family members living in one household and jointly supported under the management of one head person whether they are his offsprings, descendants, or wives including the descendants' wives and any other person whom the individual is legally responsible for managing his affairs and supporting him.

Lessee: The Authority

Lessor: The person or persons in whose name(s) is registered in accordance with the provisions of this Law, a piece of land(s) or shares thereof irrigated by the waters of an irrigation project and leased in accordance with the provisions of this Law.

Sub-lessee: The professional farmer who rents a farm unit from others with the approval of the Authority and also the person(s) who rent from the Authority a farm unit in accordance with the provisions of this Law.

Holding: A holding of land or water or both in ac-

cordance with a registration deed.

Holder: 1. The person (s) in whose name (s) the land or water or both is/are registered in accordance with a registration deed , provided that in case there is more than one person jointly holding a registration deed, the Authority has the right for the purposes of this Law to consider all or any of them as one holder.

2. Lessee(s) of Government lands in accordance with a legal contract the duration of which is not less than three continuous years, on condition that for the purpose of farm unit allotment, the Authority is convinced that he has carried out constructional works which resulted in a noticeable increase in the annual production of the leased land.

3. The farmer(s) who planted trees in the lands of the person(s) in whose name(s) that land is registered in accordance with a registration deed, if the Authority is convinced that the cultivation was carried out with the written or implied approval of the landowner. In this case the Authority has the right, in the interest of production, to consider the farmer as having replaced the landowner in the share allotted to the farmer under the agreement. In case the trees are jointly owned by the landowner and farmer, both parties shall be considered as one holder.

4. Lessee or Lessees of land in accordance with a legal contract with a duration exceeding fifteen continuous years.

5. In all the above mentioned cases, legal settlement of the rights of the concerned parties shall be made as decided by the Board. The Board's decision shall be considered final.

Farmer: The holder who practices farming on his land as his main source of income. Also the person who works himself on lands belonging to others either as a lessee, sharecropper or against wages.

Jordan River

Tributary: River and stream whose course joins the Jordan River.

Tributary Basin: Watershed area on which the rain falling on it and the springs issuing in it will naturally flow into the bed of the tributary.

Valley Water Resources: Surface and ground waters flowing above the surface of the ground or beneath it within the Jordan Valley and the tributaries basins.

Article 3

Under this Law, an Authority known as the "Jordan

Valley Authority" shall be established and shall undertake the following:

a. The development of the water resources of the Valley and utilizing them for purposes of irrigated farming,domestic and municipal uses, industry, generating hydroelectric power and other beneficial uses; also their protection and conservation and the carrying out of all the works related to the development, utilization, protection and conservation of these resources, including:

1. The carrying out of studies required for the evaluation of the water resources including hydrological, hydrogeological and geological studies, drilling of exploratory wells and the establishment of observational stations.

2. The planning, design, construction, operation and maintenance of irrigation projects and related structures and works of all types and purposes including dams and related works, hydropower stations and related works, wells, pumping stations, reservoirs and water delivery and distribution networks; also surface and subsurface drainage works, flood protection works, and roads and buildings needed for operation and maintenance.

3. Soil surverys and classification and the definition and reclamation of lands suitable for irrigated farming and dividing them into farm units.

4. Settlement of disputes arising from the use of water resources.

5. Organize and direct the construction of private and public wells.

b. Develop and improve the environment and living conditions in the Valley and carry out related works including:

1. The development of towns and villages, the selection of their sites and the delineation of their boundaries. Also the preparation of skeleton and detailed plans of the cities and villages shown on these plans, the lands allotted to streets, squares, parking lots, public parks, places of worship, social services like schools, clinics and community centers, governmental and local administration centers, residential areas, markets , shops, industry, leisure places, lands restricted for the carrying out of certain crafts and industry, and the land allotted for any other purposes.

2. Implement the town and village plans; also impose rules and regulations concerning the area of land on which the construction of buildings is permitted, the space and setbacks to be kept around the buildings and the height and type of buildings permitted to be constructed in any area.

3. Planning, design and construction of streets,

squares, social services buidings and government buildings.

4. Development of lands allocated as residential areas and dividing them into housing plots, and planning, design and implementation of housing projects.

5. Planning, design and construction of domestic water supply, electricity and telecommunications projects including transmission and distribution networks.

c. Planning , design and construction of road networks including highways and village and farm roads.

d. Development of tourism in the valley, delineation of areas having special features which can be developed for touristic and recreational purposes and the development of these areas and the construction of touristic and recreational facilitities in these areas.

e. Development of the social status of the Valley inhabitants including the establishment of private local institutions to help them to actually contribute to the development of the Valley and the achievement of the objectives sought from its projects.

Article 4

The Authority shall follow the rules in effect that are binding on ministries, governmental authorities and official public Authorities.

Article 5

a. Notwithstanding what is stated in any other law or legislation, the Authority is fully authorized to implement all of the Valley development projects specified in Article 3 of this Law and to carry out all works required for their implementation in accordance with the provisions of this Law regardless of whether these projects, in accordance with the provisions of any law, resolution or other arrangement, are within the jurisdiction of a ministry or department or other governmental agency or located within the boundaries of a city, village or local council.

b. The Authority is considered a litigant in all commitments and claims resulting from the implementation, in accordance with the provisions of item (a) of this Article, of any of its projects, and shall hold title to all rights related to or resulting from it until the date specified by the Cabinet of Ministers to hand over the project to the appropriate agency in accordance with the provisions of this Law.

Article 6

a. With regard to the provisions of paragraph (b) of this Article, the Authority shall hand over the projects entrusted to it in accordance with the provisions of this Law, excluding the water resources development and irrigation projects, after completion, to the appropriate ministries, departments, governmental agencies and other organizations including municipal, local and village councils.

b. The handing over of completed projects specified in item (a) of this Article shall be based on a resolution to be issued by the Cabinet of Ministers upon the recommendation of the Minister; however, the handing over may be done for each project separately or for a number of projects or for all the projects together.

c. The Authority shall have right to operate and maintain any project completed partially or as a whole until the project is handed over in accordance with the provisions of item (b) of this Article.

Article 7

The headquarters of the Authority shall be in the Valley, and it will have the right to establish branch offices in Amman and at any other place within the Kingdom it deems necessary. Until the Authority builds its own offices in the Valley, its headquarters shall be in Amman.

Article 8

a. The Authority shall be composed of:

1. The Minister
2. The Board of Directors
3. The Secretary General
4. Executing Staff from the employees and Administrative Units.

b. The Authority shall have a Board of Directors which

shall consist of the following members:

1. The Minister - Chairman
2. Secretary General of the Water Authority - Vice-Chairman
3. Secretary General of the Ministry of Planning
4. Secretary General of the Ministry of Agriculture
5. Secretary General of the Ministry of Municipal, Rural Affair and the Environmental.
6. Secretary General of the Ministry of Industry and Trade
7. General Manager of the Department of Lands and Surveys
8. General Manager of the Budget Department
9. The Secretary General
10. A member with expertise and specialization appointed for two nonrenewable years by the Cabinet of Ministers upon the recommendation of the Minister.

c. The Board shall meet when called by the Chairman. A quorum shall consist of at least six members, one of whom shall be the Chairman, or the Vice-Chairman in the Chairman's absence. Decisions shall be taken by unanimous vote or by the simple majority of the members present. If the votes are equal, the Chairman shall cast the deciding vote.

d. The Board may invite any person with expertise to attend its meeting to seek his advice without allowing him the right to vote.

Article 9

a. The Ministry shall carry out the full responsibility for developing the social and economical status of the Valley and shall perform all necessary works to achieve this objective.

b. The Board shall undertake the following duties and responsiblilities:

1. Establish and approve the basic guidelines of the Valley development plan.
2. Study the Authority's proposed annual budget.
3. Study the Authority's draft bylaws and regulations and submit them to the Cabinet of Ministers.
4. Obtain foreign and local loans with the approval of the Cabinet of Ministers.

Article 10

Whenever necessary, the Minister may call for a joint meeting, under his Chairmanship, of the Board of the Authority and of the Board of Directors formed in accordance with the law of the Water Authority then in effect or any substituted law. The legal quorum of both Boards is necessary. This joint meeting of the Boards shall study all matters presented by the Minister, such as the mutual tasks and duties assigned to both Authorities. The decisions taken shall be unanimous vote or by simple majority and shall be considered effective under this

Law and the Water Authority law then in effect and shall be carried out by both Authorities in accordance with their specialization.

Article 11

The Secretary General shall be the executive manager of the Authority, responsible to the Minister. He shall implement the Authority's policy and plans and administer its affairs.

Article 12

The Secretary General shall be entrusted with the following tasks and responsibilities:

a. Implement the Board's resolution.

b. Prepare and submit to the Board the proposed annual budget and the proposed organizational structure for the Authority.

c. Coordinate the performance of the Authority's projects and maintain efficiency, cooperation and harmony between its technical and adimimistrative departments.

d. Administer the affairs of the Authority's workers and employees.

e. Supervise the Authority's administrative and financial affairs and control its supplies.

Article 13

The Authority shall be considered an autonomous

corporate body. It may lease, purchase and acquire movable and immovable properties, may conclude contracts and sue legal cases and prosecute action in its name. It may appoint the Attorney General to represent it in litigation in which the Authority is involved, or it may appoint its own attorney from within or outside the Authority.

Article 14

The Authority, upon the recommendation of the Minister and with the approval of the Cabinet of Ministers, shall have the right to benefit from donations, revenues, loans, credits and any other legal financial means that may become available for performing its works and projects. The Authority shall also have the right to borrow through mortgage, sale of financial bonds, or any other means which may become available from the anticipated revenues, for executing any of its projects.

Article 15

a. The Jordan Valley Commission (JVC), the Jordan River Tributaries Regional Corporation (JRTRC), the Natural Resources Authority (NRA) and the Water Supply Corporation (WSC) shall be administratively, financially, and legally replaced in the Valley by the Jordan Valley Authority.

b. All assets of JVC and JRTRC and all the assets and obligations of NRA and WSC in the Valley shall be transferred to the Authority.

Article 16

a. The Authority shall implement its works and projects, operate and maintain all its supplies, equipment and vehicles in accordance with the regulations issued by the Cabinet of Ministers for the implementation of the provisions of this Law.

b. Notwithstanding what is stated in this Law or in any other law, the projects which are totally or partially financed by another party, other than the Government of the Kingdom, shall be implemented in accordance with the agreements concluded for them.

Article 17

a. Expenditures from the Authority's budget shall be made in compliance with financial regulations to be issued in accordance with the provisions of this Law.

b. A Special Treasury shall be established for the Authority, and all Authority funds shall be deposited therein. Funds of the Treasury shall be deposited in a special account or accounts at the Central Bank. Money shall be withdrawn from this account or these accounts in the way specified in the financial regulations of the Authority. Until such regulations are issued, withdrawal shall be made as determined by the Minister.

c. The Authority shall benefit from all national grants and loans and shall accept grants and acquire loans from foreign governments, international organi

zations, agencies and corporations subject to the approval of the Cabinet of Ministers.

d. The Authority shall have the right to invest its surplus funds, and the Board shall determine, with the approval of the Cabinet of Ministers, the ways and means of such investment. The Authority shall have the right to provide loans to finance private projects and works which are closely related and are complementary to the projects and works of the Authority, and whose implementation assists in the achievement of its objectives and of the objectives sought from its projects.

e. The Authority's funds are considered Amerie funds and shall be collected according to the Amerie Funds Collecting Act in effect. Consequently the Authority is entitled to act as an administrative governer and as the Amerie funds collecting committee stipulated in the above act.

f. The Authority shall have privileged rights in all its debts and all its demands over the movable and immovable properties of the debtor and his guarantors, whether or not these have been mortgaged or not.

g. No member of the Board or any employee of the Authority is permitted to benefit financially from any of the Authority's projects or any project or source related to it. He is not permitted to work on such projects or benefit financially from them in any way except for his earnings as salaries from the Authoriy or other remunerations within the limits specified explicitly in this Law or any regulations issued in accordance with its provisions.

Article 18

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

b. The Authority shall have full authority in the allocations or usage of all surface or ground waters which are developed under the supervision of the Authority.

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

Article 19

All minerals within the Valley, whether on the surface or under ground or in waters, shall be considered Government property. No party is allowed to issue permits to search or explore, or certificates of discovery, or licenses to exploit minerals without the consent of the Authority. Mining rights issued prior to the effectiveness of this Law are excluded from the provisions of this Article.

Article 20

a. The Authority shall have its own cadre of employees. The classified employees shall be subject to the provisions of the Civil Pension Law No. 34 of 1959 and any modifications thereof and to the provisions of the Civil Service Law in effect or any substituted law. For unclassified employees and workers, the Authority shall have a special regulation to be issued in accordance with the provisions of this Law prescribing the procedure of their appointment, definition of rights, grades, dismissal, termination of services, compensation and all other administrative matters relating to them. Laws and regulations which were applied to them shall continue to be in effect until they are modified or substituted and until the provisions of the Civil Service Law of 1988 or any substituted Law are applied.

b. The Prime Minister, upon the recommendation of the Minister shall have the power to call on any employee from any ministry, council, department or official corporation to work for the Authority for the period specified in the order issued in this connection. The services of such classified employees shall be applicable to the pension plan. During the period of his assignment , the employee is subject to the Authority regulations issued in accordance with the provisions of this Law.

c. The Authority may keep the necessary employees of the JVC, JRTRC, NRA and WSC who are working in the Jordan Valley at the time this Law goes into effect. Their acquired rights in accordance with

the laws and regulations which were applied to them shall be presrved as well such as the rights of compensation, rewards and other rights of those whose services shall be terminated.

Article 21

The Authority, with the approval of the Cabinet of Ministers, has the right within the Jordan Valley or in the basins of the Jordan River Tributaries to the expropriation and immediate acquisition of lands, water shares or both as necessary for its projects, and any other benefits pertinent to land or water , either by absolute expropriation against compensation or by lease for any period it deems appropriate. The Authority shali have the right to specify the rent for any period or periods it may deem necessary. In execution thereof, the following arrangements shall be followed in estimating the values or rent of lands and waters and the structures thereon that are decided to be acquired.

a. Values of land or water shares or both or any other benefits related thereto or rent values shall be evaluated by a committee or committees called "Land Evaluation Committee", which shall be composed of a high ranking Government employee as Chairman, and two other experienced members appointed by the Cabinet of Ministers at the recommendation of the Minister. The Authority may issue regulations by which the committee or committees shall abide for evaluating lands, trees, waters, and any movable or immovable properties.

b. Any such committee shall inspect and estimate

values of the acquired lands or water shares and determine their values regardless of any rise in land prices resulting from the construction of any section or stage of any project implemented or under implementation or being planned, and for such evaluation the committee may consider the opinion of any person or committee to decide the value of lands and shall then issue evaluation decisions by majority.

c. The Chairman of the Evaluation Committee shall publish its evaluations in more than one local newspaper for two (2) successive days and shall display them for fifteen (15) days in a visible place in the village in which the acquired lands and water shares are located or in the concerned Registry Department. One copy of such decisions shall be handed over to the Secretary General and another to the Mukhtar of the village. Any holder or beneficiary has the right to contest the decisions of the committee concerning the evaluation, within fifteen (15) days from the date of expiry of the announcement. If no objection to the evaluation is made , the evaluation shall be considered final. All cases of differences in the estimated values of trees, seasonal crops and structures during the period falling between the first estimate and the time of handing over the farm units or housing plots to the new owners, shall be referred to the Minister. The Minister shall form a committee or committees for this purpose, and the Minister's decision shall be considered binding on all concerned.

d. Objections shall be submitted to an Appeals Committee composed of a judge as chairman, who shall

be delegated by the Judicial Council and whose grade shall not be lower than that of president of the Court of Appeals, and two other members appointed by the Cabinet of Ministers upon the recommendation of the Minister.

e. The Appeals Committee, if it deems appropriate, shall have the right, upon scrutinizing any objection submitted to it, to go and inspect the site of the lands or water shares, the evaluation of which was objected to. It may also seek the opinion of any person whose experience the committee considers to be of benefit and examine any documents for the purpose of determining the actual values of lands, water shares and other rights, provided that any rise in prices resulting from the construction of any section or stage of any project implemented or under implementation or being planned, shall not be taken into account. It shall issue the necessary deicions, which shall be final whether it was taken unanimously or by majority vote.

f. The objector, on submitting his objection, shall deposit as security the sum of JD 15 with the district accountant for each tract the evaluation of which has been objected to. If the objection is rejected, the deposit shall be considered as revenue to the Treasury.

If it appears that the objection is rightful, the amount of despoit shall be refunded to him. Non-payment of the deposit shall constitute a reason to reject the objection.

g. Estimated values of lands, water shares or other rights acquired shall be considered as permanent capital values of the Authority projects and such val-

ues shall be registered in special records at the Authority and shall be considered binding to all persons.

h. All debts, taxes, fees, the Amerie Funds and costs of any section or stage of any project undertaken by the Government, and other debts due on any land being expropriated before or after this Law comes into effect shall be deducted from the capital value of the debtor's or holder's lands and shall be paid by the Authority to the creditor in instalments during a period not exceeding ten (10) years at 4 precent interest. If the amount of debt exceeds that of the capital value, then the creditor may claim the differnce from the debtor.

i. No compensation shall be paid to the holder of the land for any improvement made after the date on which an expropriation decision was announced in two local newspaper.

j. The General Manager of the Lands and Survey Department shall, upon receiving a notice from the Authority, prepare cadastral maps for the expropriated areas showing the boundaries of farm units, roads, distribution systems of both irrigation and drainage, also housing plots, streets , buildings, parks and all private and public facilities as determined by the Auhtority. He shall cancel all previous registration records and issue new title deeds in the names of former landowners to whom farm units or housing plots have been allotted. These are exempted from fees and stamps and he shall issue title deeds exempt from taxes and stamps in the name of the Authority for all remaining units which have

been acquired in accordance with the provisions of this Law. The Authority shall be exempted from all fees on land registration transactions listed in the Annex attached to the Land Registration Law No. 26 for the year 1958 or any subsequent amendment. It shall also be exempted from revenue stamps that are affixed on such transactions. It shall also be exempted from objection fees and any other fees.

k. The Authority shall have the right to suspend all land registration transactions of the expropriated and immediately acquired lands except those transferred through inheritance until all new registration deeds have been issued in accordance to paragraph (j) of this Article.

Article 22

a. The Authority shall divide into farm units irrigable lands expropriated for purposes of reclamation and exploitation through irrigated agriculture. The minimum size of a unit shall be approximately 40 dunums of classes 1 and 2 and approximately 50 dunums of class 3 in accordance with the land classfication approved by the Authority. The maximum size of a farm unit shall be 200 dunums under irrigation. Under no circumstances may any farm unit be divided or parceled into several units the size of which is less than the minimum fixed in this paragraph.

b. The Authority shall allot to the holder, whose holding is not less than 40 dunums of lands which the Authority expropriated for purposes of reclama-

tion and exploitation in irrigated agriculture, land in accordance with the following proportions provided that the provisions of this Article are not applicable to allotment decisions taken before the effectiveness of this Law.

No. of Irrigable Dunums Held prior to Expropriation	No. of Irrigable Dunums to be Allotted to Holder
40 - 50	- to be allotted in full
51 - 100	- 50 dunums shall be allotted plus 25% of area exceeding 50 dunums
101 - 500	- 62 dunums shall be allotted plus 17% of area exceeding 100 dunums
501 - 1000	- 130 dunums shall be allotted plus 12% of area exceeding 500 dunums
1001 and above	- 200 dunums shall be allotted

c. With regard to lands which are wholly or partially planted with trees, the Authority, with the approval of the Cabinet of Ministers, may not be bound by the provisions of paragraph (b) above.

d. If the Holder was holding less than 40 dunums, the Authority, if possible, may allot or lease to him additional land provided that the area of the unit allotted to him shall not be less than 40 dunums approximately if the unit is from classes 1 or 2, and not less than 50 dunums approximately if it is from class 3.

e. The area of each unit sold or leased by the Authority to an individual or a family shall not exceed the 40 dunums approximately of land from classes 1 and 2, and 50 dunums approximately of lands from class 3. In case the classes of land in one single unit differ, a dunum of classes 1 and 2 shall be con-

sidered equivalent to a dunum and one quarter from class 3.

f. For the purpose of organizing farm units to conform with the distribution networks and to avoid establishment of small units or units of irregular shape or in difficult technical cases, the Minister may not adhere to the area limits prescribed in paragraph (a) of this Article.

g. In case of the death of a holder or sub-lessee, his rights in the farm unit shall revert to his heirs provided that the area of any unit , when parceled, shall not thereby the reduced to less than the minimum limit provided for under this Article.

h. Holders in whose names farm units are registered in accordance with the provisions of this Law, may lease to the Authority, if it so desires, units which they do not wish to utilize for a period of not more than 33 years (renewable upon Authority's request for any other period or periods it deems appropriate) and for a rent agreed upon between the Authority and the holder. The lessee shall be responsbile for the water costs. If the Authority does not take the unit on lease, the holder may, with the Authority's approval, lease the farm unit for a period of not less than 3 years and not more than 10 years to any farmer who does not own or hold a farm unit or units in the Jordan Valley and with conditions approved by the Authority. The Authority's decision, in case of rejection, shall be subject to contest before the High Court of Justice. The lessor may also sell to the Authority the leased land at any time during the period of the lease.

i. If it is proved to the Auhtority that a holder has leased a farm unit or units not in accordance with the provisions of paragraph (h) of this Article, then the Authority will stop water delivery to his farm unit from the irrigation water, without compensating for any damages caused thereby.

j. Notwithstanding the provisions of any other law or regulation, no lease contract may be prepared for farm units, and no approval thereof may be made except by the Authority, and any contract prepared contrary to this shall be considered null and void.

k. The Authority may lease farm units registered in its name or sublease farm units leased to it for a period not exceeding 33 years subject to renewal, and may annual lease contracts if the sub-lessee is not utilizing the farm unit leased to him to its satisfaction.

l. The holder shall not have the right at all in any way or under any circumstances to sell his rights in his farm unit to anyone except to the Authority, and any sale contract to the contrary shall be considered illegal and void. The Authority shall purchase from the holder who wishes to sell his rights in the farm units. The price to be paid by the Authority shall not exceed the value estimated for the unit by the Evaluation committee plus the value of improvement brought about through his special effort after the unit was allotted to him or minus the value of depreciation in the unit as a result of the holder's negligence or for any other reasons. The value of the improvement or depreciation on the unit shall be estimated by the special committee or committees in accor-

dance with provisions of paragraph (c) of Article 21. The holder, with the approval of the Board, shall be allowed to transfer his holding rights in the agricultural unit to his wife or wives and sons.

m. Notwithstanding what is mentioned in paragraph (1) above, holders of one or more farm units whose names are registered jointly shall have the right to sell their holding rights in a farm unit or units to each other with the Authority's approval provided that the area of irrigated land of the purchaser will not exceed the maximum allowed in accordance with this Law.

n. Persons whose names are registered in one registration deed have no right to divide the farm unit into smaller divisions for the purpose of exploitation of such division or divisions by one or some of them, separately from the rest of the unit and from the other holders of the unit .

o. The Authority shall have the right to take back any farm unit which is utilized in violation of the provisions of paragraph (n) above.

Article 23

a. The Authority shall improve and develop to the extent it sees fit the lands expropriated for housing purposes located within town and village boundaries whose plans have been approved by the Authority. The Authority shall divide these lands into housing plots, the minimum area of which shall not be less than 250 sq.m. and the maximum shall not exceed 300 sq.m.

b. The Minister upon the recommendation of the Secretary General may, in special cases and when it deems necessary, exceed the upper limits of housing plots specified in paragraph (a) above.

c. The following parts and precentages of lands within town and village boundaries shall be expropriated without compensation for purposes of the public interest:

1. No part of any holder's expropriated land whose area does not exceed 288 sq.m.

2. The part of the land in excess of 288 sq.m. from holders whose expropriated land does not exceed 384 sq.m.

3. 25% of the area in axcess of 384 sq.m. from holders whose expropriated land area is in excess of 384 sq.m.

d. The Authority shall allocate housing plots to the holder whose land it expropriated for purpose of village and town development and which lies within village and town boundaries in accordance with the following:

1. One housing unit for holders whose expropriated land area does not exceed 288 sq.m. , after deduction of the compensation-free expropriation.

2. If the area left to the holder after the compensation-free expropriation in square meters is less than the result of multiplying the figure 288 by the number of his family, a number of housing plots shall be allocated to such holder equivalent to the integer quotient of the area

left after dividing the compensation-free expropriation by the figure 288. If there is a remainder after the division, the Minister may allocate the additional area to the holder to avoid allocation of a fraction of a housing plot.

3. The following allocation shall apply to holders whose holding in sq.m. after compesation-free expropriation exceeds the number resulting from multiplying 288 by the number of his family members as follows:

i. Housing plots equal to the number of his family members if his net holding in sq.m. after compensation-free expropriation is less than double the number resulting from multiplying 288 by the number of his family members.

ii. Housing plots equal to twice the number of his family members if his net holding in sq.m. after compensation-free expropriation is between double and triple the number resulting from multiplying 288 by the number of his family members.

iii. Housing plots equal to three times the number of his family members if his net holding in sq.m. after compensation-free expropriation is between three times and four times the number resulting from multiplying 288 by the number of his family members.

iv. Housing plots equal to four times the number of his family members if his net holding in sq.m. after compensation-free

expropriation is in excess of four times the number resulting from multiplying 288 by the number of his family members.

Article 24

a. The Minister shall appoint a committee or committees called "farmers selection committee". Each committee shall be composed of an Authority employee as Chairman and two other members, one of whom is a farmer with experience in the region or town or village where farm units or housing plots are to be allocated. The committee shall assist the holders in selecting the farm units or housing plots that the Auhtority may allocate to them in accordance with this Law, and shall select the farmers for farm units and the persons desiring to settle in housing plots. The selections of the farmers selection committees shall be unanimous or by majority and shall then be submitted to the Board for decisions. The Board's decision in this regard shall be final. The publishing of an announcement in two local daily newspapers to call person(s) to appear before the farmers selection committee shall be considered full legal notice. The Board also has the right in case an error appeared in the allocation of farm units or housing plots, or if the public interest so requires, to reconsider, substitute or modify the allocation, provided that the Board's decision concerning allocation of farm units shall be ratified by a decision of the Cabinet of Ministers.

b. In all cases of allocation, whenever possible, the

holder has priority to the farm unit or housing plot 20% of whose area is from his expropriated land.

c. The holder to whom the Authority may allocate farm units or housing plots units in accordance with Articles 22 and 23 of this Law shall select such units that he desires to be allocated to him an shall notify the Authority in writing of his desire within 30 days from the date he received a notice from the Authority in this regard in accordance with paragraph (a) of this Article.

d. If the holder did not select his desired farm units or housing plots by a a written application to the Authority within the time period specified in paragraph (c) of this Article, the farmers selection committee has the right to allocate to him units or plots it sees fit or to refrain from allocating units or plots to him as specified in Article 22 and 23 of this Law. The committee's decision shall be final and binding on all concerned parties if approved by the Authority. The Authority also has the right, if the holder did not apply within the time period specified in paragraph (c) of this Article, not to abide by the requirements of paragraph (b) of this Article. It can also take whatever it sees as suitable actions with respect to allocation or otherwise and all decisions taken before the effectiveness of this Law are considered correct and final.

e. If it becomes evident to the Authority that any of the holders whose land has been expropriated for the purpose of irrigated agriculture development had registered in the name of his wife and his children ineligible under the holder's expression defined in Arti-

cle 2 of this Law before a year has passed since its effective date, the Authority has the right to consider the wife and children as members of the head of the household, and the collective total area of their ownership is considered as though it is owned by the head of the household. They shall collectively be allocated farm units in the amount allowed by this Law considering all of them as one farming family subject to the holder's expression defined in Article 2 of this law.

f. If an expropriated land came to be owned by individuals by means of inheritance, and is still in their collective ownership, such land shall be divided among them and the provisions of this law in connection with allocation shall apply to each of them considering each one of them as a holder.

g. The value of a farm or farm units and the value of housing plots allocated to a holder shall be deducted from the capital value of his lands registered in the records of the Authority in accordance with paragraph (g) of Article 21 of this Law. If the value of the allocated units exceeds the capital value of the holder's land, the holder as well as each farmer to whom a farm unit has been allocated and each individual to whom a housing plot or plots have been allocated and have no capital value, shall pay to the Authority the amount of money due to the Authority either by one instalment or by instalments not exceeding twenty annual instalments as decided by the Board of the Authority provided that each instalment for farm units is not less than JD 50 with an annual interest rate of 4 precent of the balance due. The

commencement date for collection of these instalments shall be fixed by the Board of the Authority.

h. The Authority shall pay to the holder the remainder amount due to him on account of the capital value of his lands that are registered in the Authority records in accordance with paragraph (g) of Article 21 of this Law, and it shall pay to the holder to whom no farm or housing units have been allocated the capital value of his land either by one instalment or by a number of instalments not exceeding ten annual instalments as decided by the Board and with an annual interest rate of 4 precent on the unpaid balance. The commencement date for payment of these instalments shall be fixed by the Board of the Authority.

i. The farmers selection committee shall select the farming family to settle in the farm units provided that the priority of selection shall be as follows:

In first priority: 1. To holders residing in the Kingdom who operate their lands by themselves, for areas that were irrigated at the time of expropriation.

2. To holders residing in the Kingdom, for unirrigated lands.

In second priority: 1. To holders residing in the Kingdom who exploit their lands through leasing or sharecropping.

2. Lessee or lessees of land in accordance with a legal contract with a duration exceeding fifteen continuous years.

In third priority: To professional farmers residing in the Jordan Valley.

In fourth priority: To professional farmers who are not from the Valley population.

In fifth priority: To holders residing ouside the Kingdom.

j. The Authority has the right to fix the upper limit of the amount of water it supplies to the holders in accordance with water availability and with the crops planted in the farm units. It also has the right to supervise the water and its supply and distribution and to fix its price and to stop supplying water to the farm units.

k. The Authority has the right to consider as expropriated for purposes of reclamation and use for irrigated agriculture any arable land suitable for irrigated agriculture or exploited by irrigated agriculture and included in the town and village planning and has been expropriated and designated by the Authority for purposes of town and village development or for irrigated agriculture. Accordingly these lands and their holders are subject to those provisions of this Law that deal with lands expropriated by the Authority for purposes of reclamation and use for irrigated agriculture with the exception of the provisions of paragraph (b) of Article 24 of this Law. The holding rights of these lands are automatically transferred to the Authority.

Article 25

Decision taken before the effectiveness of this Law by the Natural Resources Authority, the Jordan Valley Commission and the Jordan River Tributaries Regional

Corporation shall be considered as if they are decisions taken in accordance with this Law.

Article 26

The Authority has the right to allocate, sell or lease a farm unit or units or housing plots or any other land to any government agency or government corporation.

Article 27

a. The Authority has full authority in connection with the allocatioan, sale and leasing of other lands provided that the Authority's decisions are approved by the Cabinet of Ministers. The Authority can set the arrangements related to how the sale is made and to fixing the dates for payment of instalments, and to leasing and cancelation of leases and to recovery of farm units and housing plots and other lands in accordance with regulations to be issued for this purpose.

b. Taxes on farm units shall be paid by holders and sub-lessees in accordance with the effective laws in connection thereto. Taxes on housing plots and other lands shall be paid by holders.

Article 28

The Authority has the right to recover from holders and sub-lessees in case of irrigation projects and from beneficiaries and subscribers in connection with the other

projects, all or part of the capital costs and the operation and maintenance costs that are spent on its projects in accordance with the regulations that the Authority will request to be issued for this purpose.

Article 29

Decision and notices to be served by the Authority to concerned parties are served through the local newspapers. Each decision or notice published for three consecutive days in more than one local newspaper is considered a decision or a notice legally served to concerned parties.

Article 30

Any person authorized in accordance with this Law or the regulations issued under it may investigate and gather information or for any other operation may enter any land provided that a fair compensation must be paid to the holder for any damage caused by that person during the performance of his task.

Article 31

a. Every person who purposely sabotages or damages any of the Authority's projects shall be sentenced to not more then one year imprisonment or may be fined not less then JD 10 and not more than JD 100 or by both penalties. Moreover, the court must order that the said person pay all or part of the cost

incurred to repair the damage.

b. Every person who, without permission of the Authority, takes or arranges to obtain or benefit from any of the Valley's water resources other than his rightful share as evidenced by a water title deed legally recorded in the Water Register shall be sentenced to not more than one year imprisonment or may be fined not less than JD 50 and not more than 200 JD or by both penalties. Moreover, the court must order the removal at the expense of the convicted person of any arrangements or works by which the offense was committed.

c. Every person who commits any of the following acts shall be sentenced to not more than one month imprisonment or may be fined not less than JD 5 and not more than JD 50 or by both penalties. The person convicted shall pay, in addition to that, all or part of the cost incurred to repair the damage caused to the Authority's projects or any part thereof.

1. Causes by his negligence or carelessness a damage, change or obstruction to any project in any way.

2. Causes by his negligence or carelessness the flow of water to be interrupted resulting thereby in damages to roads, buildings, projects or property of any kind owned by the Authority or privately owned by individuals, societies or public organizations in the Valley.

3. Damages, harms, spoils or removes any sign, device or water gauge installed by the Authority or for its purposes.

4. Prevents from doing his job any of the Au-

thority employees or any of the persons who perform tasks for the Authority.

5. contradicts any provisions of any announcement published by the Authority in the Official Gazette preventing or organizing the passage of animals or carts across any part of its projects.

Article 32

No ministry or goverment or semi-government agency is allowed to perform any construction activities in the Valley without permission from the Authority except works of operation and maintenance.

Article 33

No person is allowed to establish in the Valley any private buidings or structures of any kind or for any purpose before obtaining a licence from the Authority. Excepted from this are the land irrigation works and the buildings and structures under construction at the time of effectiveness of the Law. As for buildings and structures within the municipal boundaries, they shall be licensed in coordination with the concerned municipality.

Article 34

An owner of a building or structure built in the valley in violation of Article 33 of this Law shall be sentenced to not more than three months imprisonment or may be fined not less than JD 50 and not more than JD

500 or by both penalties. Moreover, the court must order the removal of the buidings and structures established in violation of Article 33 of this Law at the expense of the convicted person.

Article 35

If it is not possible to identify the violator of Article 31 above, this violation shall be considered a crime within the meaning intended in the Unified Common Punishment Law whose provisions shall be applied to the violation considering the Minister the offended person in that crime despite any actions that can be taken in accordance with Article 31 above. And if any water has been illegally diverted and was used in violation of the provisions of this Law to benefit any land, The Secretary General may assess the value of this benefit and may reduce the quantity of water that this land is entitled to by virtue of the Water Register by an amount he views as equal to the benefit illegally obtained.

Article 36

The Authority has to submit to the Cabinet of Ministers the following reports and data:

a. A report on the works of the Authority for the previous fiscal year and their total costs including administration costs, planning and orgaizational costs and any other similar costs.

b. A report on the projects totally or partially executed during the previous fiscal year and their costs.

c. An annual report including the accounting audit report as prepared by a private accounting organization or the report of the Audit Bureau on the previous fiscal year including all assets.

d. A report on planning works and the projects included therein during the previous fiscal year.

e. Any other reports or data as may be requested by the Cabinet of Ministers.

Article 37

The Authority may fix the amount of awards to be given to the chairman and the members of committees mentioned in this Law.

Article 38

No person is allowed to pollute the water resources of the Valley or discharge, without the Minister's written permission, to these waters any polluting materials declared in the Official Gazette by the Minister as materials causing pollution.

Article 39

This Law does not cancel any international agreements or agreements of international character in effect before the effectiveness of this Law.

Article 40

a. The following laws shall be repealed:

1. The Jordan Valley Commission Law No. 2 for the year 1973

2. The Jordan River Tributaries Regional Corporation Law No. 11 for the year 1965,

3. The Natural Resources Authority Law No. 12 for the year 1968, in connection with the Jordan Valley,

4. The Water Supply Corporation Law No 56 for the year 1973, in connection with the Jordan Valley, and any amendments to the above laws. All regulations issued under the above laws shall remain effective until replaced by regulations issued in accordance with this Law.

b. This Law shall cancel the provisions of any other law to the extent it contradicts the provisions of this Law.

Article 41

The Cabinet Ministers shall issue the necessary regulations to execute the provisions of this law.

Article 42

The Prime Minister and the Ministers are responsible for the implementation of the provisions of this law.

Appendix 2

The Organization of Natural Resources Affairs Law

Law No. 12 for the Year 1968 (as Revised)
Applicable Articles are listed below.

Article 1

This law shall be called (The Organization of Natural Resources Affairs Law for the year 1968) and shall become effective from the date of its promulgation in the Official Gazette.

Article 2

The following words and expressions wherever stated in this law, shall have the meanings assigned to them herebelow, unless the context indicates otherwise:

1. "Kingdom" shall mean the Hashemite Kingdom of Jordan.

2. "Government" shall mean the Government of the Hashemite Kingdom of Jordan.

3. "Natural Resources" shall mean all inanimate resources of natural health whether metallic or non-metallic, existing on the surface of , or under ground

or in the territorial or inland waters or rivers. It shall also mean all surface and underground water resources, including rivers, streams, wadis, lakes, reservoirs, pools, water springs, rainfalls and natural vapors, as well as all minerals and pertinent ores, precious stones and similar others;and also soil, rock materials and their by-products used in constructional and paving works, including stones used for decoration purposes.

4. "Authority" shall mean the Natural Resources Authority established in accordance with this Law.

5. "Board or Board of Directors" shall mean the Board of Directors of the Natural Resources Authority.

6. "Vice President" shall mean the Vice President of the Natural Resources Authority who is appointed in accordance with the provisions of this law.

7. "Individual" shall mean any Jordanian individual who has reached his majority and is legally qualified. It shall also mean any commercial house, company, society, union, corporation, village, municipality, governmet administration, or organization with legal entity.

8. "Exploration" shall mean any investigation, aerial survey, or ground survey in any area determined with the approval of the Vice President with a view

to a ascertain the existence of minerals or rocky materials therein. Exploration also includes consultation as well as economic, technical and geological surveys.

9. "Prospecting" shall mean any work relating to investigation and exploration of minerals and rock materials for the purpose of ascertaining their existence and determining their quantities and qualities including drilling, excavation, assaying and necessary detailed examination.

10. "Discovery" shall mean the announcement of the existence of a mineral or minerals in exploitable quantities, to be submitted to the Vice President by the discoverer, at a site located on the set-technical maps after obtaining permits from the concerned authority for exploring or prospecting for minerals.

11. " Mine" shall mean any locality where underground mining operations take place for the purpose of extracting natural ores.

12. " Quarry" shall mean any locality where mining operations take place for the purpose of extracting rocks or associated materials.

13. "Minerals" shall mean all ores of economic value excluding petroleum, natural gas, rock materials or associates used in building construction, road construction or for ornamental purposes such as granite and marble.

14. " Mining Operations or Mining Facilities" shall mean any work necessary for the extraction or exploration of rock minerals or associated materials or any relative action. This includes drilling, pitting, driving of tunnels, construction of water canals, reservoirs, dams, main sewage outlets and tanks, in addition to the construction of railways, laying pipelines, installation of machinery and construction of buildings whether for mining operations or, housing of employees, as well as for the exploitation, dressing and marketing of minerals.

15. "Holder of Exploration Permit, Prospecting Licence or Certificate of Discovery or Mining Right", shall mean the person who is granted the permit, licence, certificate or right, whether in full or in part by inheritance, assignment, abdication or any other way.

16. " Antiquity sites" shall mean any historical site declared as such in accordance with the antiquity laws enacted from time to time.

Article 32

The right of mining minerals within the boundaries of any land for which an exploration permit, prospecting licence or mining right was granted shall not cover what extends of these minerals or their veins or ramifications beyond such boundaries.

Article 33

A. No exploration permit, prospecting licence or mining right may be granted for Miri, Mulk or Waqf lands unless approved by their owners. If the landowner or tenant does not permit exploration, prospecting or mining in his land, the Vice President may, with the approval of the Council of Ministers, grant permission for the same if public interest so demands. If the landowner or tenant does not agree to sell or rent his land to the holder of an exploration permit, prospecting licence or mining right against a price to be agreed upon between them, the Council of Ministers may decide giving him a fair compensation by the applicant for the price or rental of his land, or may decide its expropriation according to law.

B. No governemnt Official or employee, whether civil or military, may be granted, directly or indirectly, any exploration permit, prospecting licence, certificate of discovery or mining right.

C. No exploration permit, prospecting licence or mining right given in accordance with this law shall entitle the holder to explore, prospect or mine within the following areas without the prior approval of the concerned authorities supervising them:

1. Antiquity sites, or holy places.
2. Forest areas.
3. Railway lands.
4. Municipal areas.

5. Reservoirs, pipelines and sewage disposal areas.

Article 34

According to the provisions of this law, the exploration and exploitation of minerals and rock materials shall be divided into the following stages:

1. Exploration
2. Prospecting
3. Discovery
4. Mining

Article 35

A. The Vice President may grant an exploration permit or a prospecting licence to any person submitting an application to him after payment of fees. The following are excluded:

1. Any person under 25 years of age.

2. Any person who has been convicted of an offence under this law or has previously held any permit, licence or right which has been forfeited by reason of a breach of the terms or conditions thereof; except with the consent of the Cabinet.

3. Any person who is unable to give satisfactory evidence that he has sufficient technical

qualification in geology or mining engineering either personally or by employing specialists acceptable to the Authority and that he possess sufficient funds to enable him carry out the required work properly and pay any compensation which he should pay upon assuming the powers conferred on him in the permit.

B. Application for a permit to explore, or a licence to prospect for minerals should be submitted to the Vice President for his approval on the form prescribed by the Authority, in compliance with Para (A) of this Article .

Article 36

Foreigners may not be given exploration permits, prospecting licences or mining rights except according to special agreements the Authority Board concludes with them, on the approval of the Council of Ministers, in accordance with laws and regulations in force.

Article 37

Permits for exploring, licences for prospecting , or rights in exploiting, oil and natural gas may not be granted to applicants except according to special agreements the Authority Board concludes with them, on the approval of the Council of Ministers in compliance with laws and regulations in force.

Article 38

Certificate of discovery of minerals:

Any one whc carries out exploration according to a permit and discovers minerals in commecial quantities, and hence registers his discovery with the Vice President, shall be issued a certificate of discovery according to the form prescribed by the Authority, and shall have priority right in mining for a period of two years from the date of this certificate.

Article 39

Any person who provides the Authority with information leading to the discovery of minerals in commercial quantities shall be given a financial reward in accordance with regulations to be established by the Authority with the approval of the Council of Ministers.

Article 40

The Authority as it deems appropriate and with the approval of the Council of Ministers, is entitled to issue from time to time the regulations necessary for determining the fees for exploration permits, prospecting licences, certificates of discovery and mining rights and other dues relative to mineral production.

Article 41

A) The holder of a prospecting licence has the exclusive right to explore the area defined in his li-

cence. For accomplishing this he may carry out the following:

1. Obtain access to the area concerned together with his agents and laborers in order to establish the existence or otherwise of minerals therein or for topographical or geographical survey of the area.

2. Undertake such excavations as are necessary for prospecting purposes.

3. Take mineral specimens or samples for analysis or other laboratory tests.

4. Introduce and assemble any equipment required for prospecting purposes.

5. Open such roads as are necessary for prospecting operations.

3) 1. Construct and maintain houses and buildings necessary for his own use and that of his agents and workmen.

2. Storage of materials extracted subsequent to mining operations in places approved by the Vice President or his Deputy.

3. Laying water pipes, construction of drainage pools and tanks, and establishment and mainte-

nance of necessary transportation and communication means.

Article 42

A) The Authority with the approval of the Council of Ministers is entitled to issue a mining right to any person holding a certificate of discovery and who has applied for this right within the period of two years mentioned in (Article 38) according to the following terms:

1. The area of the field covered by the mining right should not exceed 24 square kilometers, and this field should be one unsegmented tract of rectangular boundaries.

2. The duration of the mining right should not exceed thirty years. The holder of this right has priority to renew it under conditions deemed fit by the Authority with the approval of the Council of Ministers.

3. The applicant should submit a topographical map of the field in which the mining right is applied for on a scale of 1/5000.

4. The applicant should submit a geological map of the same field detailed on a scale of 1/5000.

5. The applicant should submit accuarate estimates on the reserve quantities of ores proved to exist in the area by detailed prospecting.

6. Submit a report on the feasibility of the mineral intended to be exploited.

7. The applicant should prove his technical and financial capabilities.

B) If the holder of a certificate of discovery fails to apply for the mining right within two years from the date of the certificate as per para (A) of this Article, the Vice Presdient may give such mining right to any person who applies for it, provided that the holder of the certificate of discovery shall be rewarded under the provisions of Article (39) of this law.

1. If the owner of the mining right fails to comply with any of the conditions included in the right, the Vice President shall notify him of his failure in writing and shall give him a reasonable period of time to comply. If he still fails to comply with the conditions within the specified period, the Vice President with the approval of the Council of Ministers may cancel the mining right given to him.

2. If a mining right is cancelled, such cancellation shall be published in the Offical Gazette and such publication shall be considered a deci-

sive evidence for the cancellation. Then the Vice President with the approval of the Council of Ministers shall have the exclusive right to dispose of the area covered by the mining right in any manner he deems necessary for public interest.

3. In case of cancelling any mining right, its owner has no right to transfer or move or dispose any of the assets of the mine or open cut or make any changes to its condition in particlular what relates to the safety and maintenance of the work without the written permission of the Vice President.

Article 43

Only with the prior approval of the Councial of Ministers and the publication in the Official Gazette may the holder of a mining right assign, transfer or mortgage his right according to the established principles of the laws and regulations in force.

Article 44

The holder of a prospecting licence or mining right shall not appropriate or take water from any lake, river, source or flow of water or canal bordering or passing through licenced land nor change its course without the written permission of the Vice President after obtaining the agreement of the owners (if any). In case of their refusal, the provisions of Para (A) of Article (33) of this law, shall be applied.

Article 45

A) The holder of a mining right shall submit to the Vice President a detailed annual report during January of each year showing the following :

1. Value of the tonnage extracted during the preceding year.

2. Number of laborers and technical and administrative staff employed by him.

3. Work plan and program for the coming year.

B) The holder of a mining right shall submit to the Vice President once a year and within one month from the date of submission of the annual report, a copy of the financial report for the preceding financial year including the profit and loss account and detailed total cost per unit of production. The Vice President has the right to delegate one of his officials to examine the registers and other books relating to the technical, administrative and financial aspects of the project.

C) 1. The holder of a mining right shall submit to the Vice Presdient plans drawing and sections which illustrate the work procedure from the technical aspect before starting to open any mine or open cut.

2. If they concern a mining operation, the plans shall particularly show the following:

a. General mine plan.

b. Mining method.

c. Method of roof support and nature of supporters to be used.

d. Underground haulage and layout of roads.

e. System of mine ventilation (on a detailed board).

f. Tunnel widths, dimension of pillars and their methods of maintenance.

g. Type of machinery and equipment to be used underground.

h. Plans and vertical sections showing layout of major parts of the mine.

i. A special notice board for safety precaution and maintenance instructions required by the work in each part of the mine. They should be established in accordance with the provisions of this law and the regulations issued accordingly.

Article 46

The Vice President shall have the right to prohibit, in a notice issued by him and published in the Official Gazette, prospecting, exploration or mining in any area for a specified or unspecified period with the approval of the Council of Ministers.

Article 47

A) Any official or employee authorized by the Vice President to exercise the powers vested with him by this law, or delegated by him in accordance with the provisions of this law for achieving its objectives, shall have the right to carry out the works stated herebelow at all suitable times during the day or night:

1. To enter any place exploited or used for mining operations for examination or inspection.

2. To examine and make necessary investigations into the conditions and ventilation of the mine and all matters relating to the safety and health of the persons employed therein.

3. To inspect the explosive stores and issue instructions on how the explosives should be stored and used.

4. To inspect and examine the external parts of the machinery used in the mine and the state of all operation and roads.

5. To check books, accounts, maps and other documents dealing with the mining operations and take copies outlines of them and all other transactions.

6. To exercise all powers necessary for achieving the objects of this law.

B. In case the official or employee mentioned in the previous Article finds a defect in the mine, open cut or quarry, he should give notice in writing to the owner, agent or manager of the mine stating the particulars of the defect and requiring the same to be remedied within an appropriate and reasonable period. If the owner, agent or manager of the mine refuses to comply with the notice and has not lodged an objection with the Vice President within seven days from the date of the notice, the Vice President shall have the right to impose on him a fine of not less than 50 Dinars and not more than 200 Dinars.

Article 48

A) If an accident occurs due to mining operations in a mine, open cut, quarry or around it, whether at the surface or underground, and causes death, physical injury or material damage, the owner, agent or manager of the mine shall notify the Vice President in

writing of the accident within 24 hours after the occurrence of the same.

B) In case any bodily injury of which notice is required to be sent in accordance with this Article results in the death of the person injured, the owner, agent or manager of the mine shall, within 24 hours after being informed of such death, notify the Vice President accordingly.

C) The Vice President shall designate one of the officials, or employees of the Authority to make investigations into the accident and submit a detailed report on the same so that the Vice President will take the necessary action.

Article 49

A) Any person may open quarries and transport rock materials after obtaining a licence from the Vice President provided that he complies with the following:

1. If the land out of which it is proposed to get stones is owned by another, the owner of the quarry shall obtain the approvel of the landowner before starting his work therein.

2. If the area where it is proposed to open a quarry is of the areas excluded in accordance with Para (C) of Article (33) of this law or if it

is a state domain, then the quarry owner should obtain approval of the concerned authorities before starting his work therein.

3. The sites of the quarries shall be located by distinct marks or on a map, if possible, which should be attached to the application for a quarrying licence.

B) Quarries are considered as a mining operation and are subject to control and inspection in the same way as mines and open cuts. The owner of every quarry must abide with respect to the precautionary measures contained in the provisions of this law and the regulations issued accordingly.

Article 50

Any dispute arising between the Authority and the holder of an exploration permit, prospecting licence, certificate of discovery or mining right, and not provided for in this law, shall be settled by arbitration. The dispute shall be referred to a committee consisting of three arbitrators, one appointed by each of the two parties in dispute and the third by the Minister of Justice. Arbitration shall be made in accordance with the provisions of Arbiration Law in force.

Article 68

The Councils of Ministers, on the recommendation

of the Authority, shall be entitled to issue the regulations it deems necessary for enforcing the provisions of this law.

Code No. (131) for the Year 1966
Mining Code

Issued in Accordance with Article (68) of Law No. (12) for the Year 1968

Article 1

This Code shall be called (Mining Code for the Year 1966) and shall become effective as of its promulgation in the Official Gazette.

Article 2

Applications for acquiring prospecting permits, exploration licenses, mining rights and certificates of registration of discovery shall be submitted to the Vice President on the forms prescribed by N.R.A.

Article 3

The Vice President upon approval of the Board of Directors shall issue the prospecting permit or exploration license valid for one year.

Article 4

The area covered by the prospecting permit or exploration license shall not exceed (48) square kilometers and shall consit of one piece having right angles and its borders parallel to the longitude and latitude lines.

Article 5

The holder of a prospecting permit, exploration license or the mining right shall have the right to submit an application to the Vice President requesting renewal thereof. N.R.A. shall have the right to approve or to reject the application.

Article 6

The applicant for renewal of the prospecting permit, exploration license or the mining right shall specify in his application the number of the expiring permit, license or right and shall submit it if so requested. The new permit, license or right shall be given the same number as the old one.

Article 7

If the area or part thereof in which prospecting, exploration or mining is to be carried out is owned by third party, the applicant shall submit the documents which prove that he obtained the approval of the land owner, the person having the right of disposal or his agent as re-

quired under Article (33) of the law for the organization of the Natural Resources Affairs.

Article 8

a. The holder of a prospecting permit, exploration license or mining right shall submit every three months a statement to the Vice President about all operations conducted in the permit or license area or all the information he has reached to.

b. The Authority has the right to revoke the prospecting permit, exploration license or the mining right if the holder of such permit, license or right has failed to implement the requirements specified under paragraph (a) of this Article or if the Authority found out that the reports submitted by the holder of the permit or license are incorrect.

Article 9

If minerals are discovered in commercial quantities, the discoverer shall report this to the Vice President as soon as possible. At the same time, the discoverer shall provide him with the requested information and samples of rocks and minerals discovered. The Vice President may send a specialized employee to inspect the area and make sure that the information reported by the discoverer is correct.

Control and Inspection

Article 10

a. The Vice President shall appoint a specialized employee (to be called The Mines Inspector General) to supervise the general protection and safety in the mining facilities and to monitor the application of the provisions of the code herein and shall appoint assistants as may be needed called (mines inspectors); provided that all inspectors shall be mining engineers in accordance with the Law No. (18) for the year 1958 and any amendments thereto.

b. Special inspectors who are not mining engineers may be appointed in quarries provided that they hold adequate qualifications and experience.

Obligations of the Mining Right Owner

Article 11

A mining right owner shall carry out the following duties:

a. Provide efficient professional management capable of implementing mining operations and the proper maintenance of mining facilities.

b. Take the necessary precautions to ensure general protection and safety within the mining facilities.

Article 12

Should the holder of a prospecting permit, exploration license or a mining right subcontract the prospecting,exploration or mining operation to a subcontractor he shall remain responsible for the compliance of the subcontractor with all the requirements under the law for the Organization of the Natural Resources Affairs and the regulations and rules issued thereto.

Article 13

If no contract is concluded (made) with the subcontractor or if any of the clauses contained in this code is neglected, the said clauses shall be considered in all cases binding to the subcontractor.

Article 14

1. The owner of any mine or his agent shall submit to the Vice President the following information in writing:

a. Name, location and type of the mine.

b. Name and address of the supervisor. If the supervisor is a company, the articles of association and bylaws should be submitted.

c. Name and address of the mine's manager.

d. Any change in the mine's name and the address of its manager.

2. The owner of any quarry employing more than ten (10) persons shall provide the Vice President with the information specified in paragraph (1) of this Article .

Article 15

The owner of any quarry or mine shall provide all necessary facilities to the employees sent on inspection assignment by the Vice President.

Management

Article 16

A mine shall be administered by a Jordanian manager to be appointed upon approval of the Vice President and shall have the following qualifications:

a. He should be a mining and metallurgical engineer according to the law.

b. He should have at least three years practical experience in his field of specialization.

Article 17

One person may not be a manager for more than one mine except in accordance with the following conditions:

a. Approval in writing from the Vice President.

b. Total employees in all mines under his management should not be more than two thousands.

c. All entrances to these mines should be within an area that has a diameter of not more than four kilometers.

d. In each mine employing more than 300 workers under his management, he shall have an assistant holding the title "Mining and Metallurgical Engineer" according to the law.

e. If the employed workers in all mines under his management are more than 500, he shall appoint an assistant holding the title "Mining and Metallurgical Engineer" according to the law.

Article 18

If a mine manager is absent from his work for more than three days for any reason, the owner of the mine or his agent shall assign a deputy mine manager during the absence of the manager and shall inform in writing the Mines Inspector General.

Article 19

A mine manager should reside in an area which is within 20 kms from the location of the mine.

Article 20

a. The mine manager is responsible for supervising precisely the operations of the mine and to make sure that there is a daily control in accordance with Para (b) hereunder.

b. The assistant mine manager shall carry out daily inspection over all the mine sections and make sure that all technical requirements are available .

Article 21

The supervisors, superintendents and formans responsible for supervising the progress of work shall inspect the site of work at the begining of every shift before allowing anybody to enter therein.

Article 22

Each company engaged in mining opeations shall, after obtaining the approval of the Vice President, appoint a special engineer to monitor protection and maintenance operations in its mining facilities. In case of failing to do so, the Vice President may, upon recommendation by the Mines Inspector General, assign a specialized engineer to carry out the protection , maintenance and technical control work in the company and shall be paid a monthly fee as decided by the Vice President.

Rescue, Relief and Health

Article 23

Each mine or group of mines having one manager shall be provided by a rescue team of not less than eight trained persons along with the mine's doctor to undertake the following:

a. Rescue activities and removing of debris in case of an accident in the mine due to destruction, collapse or suffocation, etc.

b. First aid operations including artificial breathing, dressing, inspections by tranquilizers.

Article 24

a. Each mine or group of mines under the control of one manager shall have a health clinic and an ambulance supplied with the necessary drugs and articles needed for first aid in case of the occurrence of an accident.

b. If the mine is 50 km far from the nearest health center having a doctor and the mine's workers are over 200, an inspector doctor should be appointed in the mine's area to provide health protection and relief to workers in emergency cases.

c. If the workers of a mine are more than 3000 there shall be a full time doctor whose site of work shall be in the mine area.

d. A doctor shall be appointed for each mine and shall visit the mine at least twice a week.

Article 25

The following shall be available at each mine:

a. A restaurant in which the workers have their main meals.

b. Suitable underground places for meals to be taken by workers if they are obliged to.

c. Main water closet including bathrooms, washing basins and lavatories.

Article 26

The mine manager in cooperation with the doctor concerned shall take the necessary arrangements to preserve public health in the mine.

Workers

Article 27

a. Any person under 18 years of age shall not be

employed to work under the ground surface.

b. Females shall not be at all employed in mining activities.

Article 28

a. Workers shall be employed to work underground only after receiving training for a period not less than three months under the supervision of a specialized engineer excluding those workers who enter the mine for training purposes.

b. The mine manager shall make sure that all workers and employees in his mine are adequately informed of safety measures required by the work in a mine.

Article 29

It is exclusively prohibited for anybody to enter the mine unless he is putting on a mine helmet and wearing protective shoes. Linen or light shoes should not be used for this purpose.

Article 30

Entry into a mine is forbidden unless adequate light is available to see the road in front for a distance not less than ten meters.

Article 31

According to special instructions, the mine manager shall determine the time of going in and coming out of the mine so that the number of workers is known at the beginning and end of each shift and consequently those who failed to go out can be determined.

Explosives

Article 32

Explosives should be stored in places far from residence or working areas. Approval of N.R.A. and public security should be obtained with respect to such stores.

Article 33

Explosives stores should have a special design to provide storage of primers and fuses, and each type of explosives in a separate place. All such stores should have adequate ventilation and the ambient temperature should not exceed 28°C in any season of the year.

Article 34

Explosives stores should be surrounded by a fence not less than two meters high. If the store is above the ground surface the surrounding wall (fence) should be of stone and reinforced concrete at least 30 cm thick. If the store is underground surface the fence may be made of

barbed wire. In all cases the distance between the surrounding wall and the exterior walls of the store shall not be less than (30) meters.

Article 35

The stores should be provided with 24-hours guards and access is allowed only by a special permit from the mine manager. Sign boards should be placed in a conspicuous place around the stores warning passers-by from approaching.

Article 36

Smoking, putting on fire, carrying matches, lighters, cigarettes or any other inflammable materials shall not be permitted inside the walled area of the explosives store.

Article 37

a. Special places in the mining areas shall be prepared for use as substores for explosives.

b. The maximum quantity of explosives to be kept in the substores should not exceed the quantity needed for one day use of the mine or quarry.

c. Delivery of explosives from the substores shall be only to licensed persons authorized by the Mines Inspector General.

Article 38

a. Special wooden boxes painted in red color shall b. provided to carry the explosives to work places. The word "Explosives" shall be written in board and clear letters.

b. Dynamite and fuses or primers shall not be put together in one box.

Article 39

The explosives used in mines and wells shall be of the type made for mining purposes and shall be free of gases and poisonous and suffocating fumes.

Article 40

By the end of each day unused explosives shall be returned to the stores.

Article 41

Lamps and inflammable materials should be moved to a safe place during the charging of mines. No lamps should be placed on the explosives box or in any place near thereto.

Persons Engaged in Blasting of Mines

Article 42

a. Detonating of mines shall be undertaken only by persons licensed by the Mines Inspector General.

b. The inspector shall grant a license for mines blasting after conducting an examination for the persons willing to engage in blasting work and after making sure that they have satisfactory experience in blasting.

Article 43

Persons carrying out blasting of mines may not ignite more than ten mine fuses in one explosion cycle. Should it be necessary to ignite more than the said number in any cycle, an ignition fuse should be used or the assistance of another person called.

Article 44

No less than five minutes before the fuse is ignited or the primer battery connected, the person blasting the mines should warn all those present in or around the blasting area and make sure that all passages leading thereto are closed.

Article 45

The person who is plasting the mines shall obtain the approval of the Superintendent of the area five minutes before starting the detonation of the mines.

Article 46

No detonation of mines shall be carried out simultaneously in two areas of one mine if the distance between the two locations is less than 200 meters.

Article 47

a. If the explosion is in a location less then 150 meters from the area of retreat or sensing, those areas should be evacuated from all workers before ignition of the primer or connecting the battery.

b. If the detonation of mines is to be carried out in a tunnel having one entrance only, all the sections between the location of explosion and the end of the tunnel should be evacuated from all persons whatever the distance between the two said locations is.

Article 48

Approach to the location of the explosion may take place only after the elapse of at least 10 minutes from hearing the sound of the last explosion if the ignition is complete. If the ignition of mines is not complete the

waiting time should not be less than 15 minutes.

Article 49

Blasting of mines within municipal or village areas shall be carried out in accordance with special instructions to be issued by the Vice President in agreement with municipal and village councils and Security Authorities.

Ventilation

Article 50

In each time there should be available a suitable atmosphere for breathing for the persons working therein. Adequate means should be available to allow fresh air to pass continuously throughout the parts of the mine.

Article 51

The Mine Manager should continuously ensure that the proportion of dust, poisonous gases and fumes within the mine atmosphere is less than the minium considered harmful to the health of the workers.

Article 52

Workers engaged in places full of dust, gases and fumes should be provided with protective masks.

Article 53

It is exclusively forbidden to use diesel or any other machinery which may result in increasing the ratio of carbon monoxide or poisonous gases in the atmosphere of the mine unless such equipment is provided with gas absorbing equipment.

Article 54

Kerosene or diesel lamps are not to be used at all for lighting in a mine.

Article 55

Putting up a fire for heating purposes or for any other purpose is prohibited in a mine.

Article 56

Before authorizing anybody to enter abandoned areas in a mine, the mine manager should make sure that the atmosphere of such areas is suitable for public health.

Lighting

Article 57

The mine should be provided with adequate lighting so that workers can move easily without injuring their

eyes or exposing themselves to danger.

Article 58

The following main parts of a mine should have good and continuous lighting throughout the working hours:

a. Work places, main routes, transport lines, belts and workers paths.

b.Points of loading and unloading of minerals and stone materials, supplies and articles.

c. Intersection points for two main tunnels or any two transportation lines.

d. Any place in the mine containing a motor, electric generator, compressor, fan, pump, pulling machines or water pool or any other place in which heavy or medium size machines are used whether fixed or portable.

e. Any place underground used for workers gathering.

f. Places and annexes thereto used for storage of explosives or boxes of explosives for use during work.

Article 59

Each moving machine used for mining purposes shall have a fixed conspicuous light in front and another in the back.

Signals

Article 60

Each mine or quarry shall have signals system for machinery operating therein to organize its movements on roads and routes of transport.

Article 61

a. Special instructions shall be prepared to regulate signalling for each pulling or dragging machine used in mining purposes.

b. A copy of signalling instructions shall be placed in a conspicuous place in the pulling or dragging machine room and at the entrance of the mine.
The signalling instructions shall be kept in good condition and shall be written in the language or languages of the concerned persons.
Signal instructions shall be explained to those who are illiterate.

Maintenance and Protection

Article 62

A detailed geological, physical and hydrological study should be carried out for the area in which mining shall take place to include the following :

a. Thickness of the mineral to be extracted, its distribution, gradient, distance from the surface and hardness.

b. Vertical cross sections every 200 meters showing the type of rocks, thickness, hardness and gradient over and under the minerals to be extracted.

c. Carcks and folds which may affect the nature of mining in the area.

d. The highest underground water table which may be found in the area and how far from ground surface.

e. Main water course in the area and the highest level to which the water table may rise in these courses calculated on basis that the rate of annual rainfall is 1000 mm.

Article 63

Before mining commences in any area, a written statement should be submitted to the Vice President

showing the following:

1. Size of mineral reserves available in the area, the mining plan, the expected annual rate of production and the estimated age of the mine.

2. Master plan for the mine showing the following:

a. The process to be used in mining.

b. Volume of pillars and width of tunnels showing the reasons for selecting such measurements.

c. Plan and means of ventilating the mine.

d. Network and interval means of transportation showing the main points of loading and unloading.

e. Type of machinery to be used underground, its horse power, type of driving power and locations of usage.

f. Distribution of lighting network and any other electrical network inside the mine.

g. Organization chart for the staff of the mine showing the hierarchical order of the technical and administrative responsibility starting from the manager and downforth.

h. Protection instructins for each of the main parts of the mine.

Article 64

The mining plan approved by the Vice President may be amended only by approval of the Vice President.

Article 65

All main passage ways, roads and transport lines inside the mine should be supported in a way to avoid being collapsed.

Article 66

Any tunnel more than 2 meters wide should be adequately reinforced through one of the methods usually used in mining.

Article 67

a. A plan should be set up for the process of supporting retreat and sensing areas in each mine so as to suit the nature of work therein provided that a written approval of the inspector general should be obtained before its implementation.

b. The following should be taken into consideration when setting up retreat or sensing plan.

1. The last five meters of the tunnel leading to the retreat area should be supported.
2. Strengthing the supporters in the line near the ore pillar so that the edge of the headers in this line are adjacent to the pillar.
3. The maximum distance between one supporter and the next in one line should not be more than one meter.
4. The maximum distance between one line of supporters and the next line should not be more

than one meter.

5. The edges of headers in each line should exceed the edges of headers opposite to them by not less than 10 cm.

6. To reinforce retreat or sensing areas blasted by dynamite before commencing to carry the ore material therefrom.

7. To consider the falling area behind the last supporters line, a prohibited area, and entry thereto is forbidden for any reason whatsoever.

Article 68

The following arrangements should be observed in all openings for mining wells:

a. Excavation works in the openings of mining wells, on the sides, surface and earth covering the minerals should be undertaken in a way to prevent sand or others from falling in a dangerous way.

b. A fence shall be constructed around the well opening in case there is any hazard to workers operating in or around the well.

Article 69

Shelters should be constructed to protect workers during blasting operations. Such shelters will not be needed if the workers can reach a safe place far from the location of blasting.

Article 70

Before starting work or during the work, especially after blasting , each worker shall inspect the place in which he works and shall remove any rock, stone or earth which may fall.

Article 71

A worker shall not throw rocks, stones, earth or any other material which may endanger others.

Article 72

Entrances to wells, boreholes, holes and ponds and any other neglected place in the mine or around it should be tightly walled.

Article 73

The sides of mine wells from which minerals are extracted or which are used as passages for workers or to carry supplies shall be supported and lined with wood.

Article 74

Nobody is allowed to operate a pulling or dragging machine unless he has a permission from the mine manager.

Article 75

Wire ropes for pulling shall be used in all mines more than 15 meters deep. Such ropes should be of good manufacture and clear from any defect and of adequate strength.

Article 76

The pulling rope used in lifting and lowering the workers should have a safety factor not less than 200%.

Article 77

The mine manager shall keep a record in which the following details shall be registered with respect to the pulling rope:

a. Maximum grade of endurance.
b. Manufacturer's name, address, date of production and purchase.
c. Rope length and weight per each meter (Kg).
d. Starting date of use.
e. Dates of shortening.
f. Date of changing the ends.
g. Dates of testing.
h. Date of discontinuation of use.
i. Maximum of loads lifted.

The person who registers such information shall sign the record.

Article 78

The mine managr shall appoint a specialist to carry out the following:

a. To inspect at least once every week the status of the pulling ropes, joints to buckets, cylinders, other transportation means, pulling wheels and all exterior parts of the pulling equipment whose deterioration may endanger the safety of workers.

b. To inspect weekly the parts of the pulling equipment in general and to monitor the signalling relating to its operation. Prepare a complete report on the results.

Article 79

Each mine should have at least two exits, one to be used in ordinary conditions and the other in emergencies when the main exit cannot be used.

Article 80

All parts of the mine should be maintained in a way to ensure protection to workers.

Article 81

a. Along the dragging roads there shall be provided a network for giving clear signals to the driver carrying out the dragging activities.

b. If dragging is effected by gravity or if the length of the gradient surface is over (40) meters, a system for giving clear signals between stopping stations should be provided.

c. If carts may get off the line because of the dragging means used. necessary measures should be taken to avoid accidents.

Article 82

If the routes and movements of workers are on the same raods used for transport, such routes should be wide enough to permit easy passage of workers without being subjected to dangers of the transportation means.

Article 83

Tunnels or wells connected to abandoned work places shall not be excavated unless adequate measures are taken to ensure the safety of persons working in the areas adjacent thereto.

Article 84

If excavations approach places in which water is collected in a dangerous way, excavations shall be confirmed only after making sure that such water is not dangerous to the safety of workers.

Article 85

If the power of any machine is more than 40 H.P. it shall be entrusted to a contractor for supervising it. If its power is less, supervision shall be entrusted to a capable person provided that a written approval of the Mines Inspector General is obtained.

Article 86

All moving wheels and all exposed parts of the machines used in mining facilitites should be enclosed within a tight fence.

Article 87

Electric machinery and wiring shall be installed and maintained in a way to safeguard workers from danger.

Special to Quarries

Article 88

It is absolutely forbidden to open caves or tunnels in quarries for any reason. A quarry in which a cave or

tunnel is opened shall be closed unless the regulations for mines are applied thereto.

Article 89

a. Walls in quarry shall not be more than (30) meters high. If the need requires that the height of wall be more than that, then the wall should be made in the form of steps or terraces.

b. If the height of any wall in a quarry is more than (10) meters the facades of the wall should be inclined in comparison with the vertical level at an angle not less than ten degrees.

Abrogations

Article 90

The Mining Regulations No. (63) for the year 1964 and the provisions of any regulations in contradiction with the Regulations shall be abrogated.

Regulations No. (8) for the Year 1971
(Quarries Regulations)

Issued in Accordance with Article (68) of
Law No. (12) for 1968
"The Organization of Natural Resources Affairs Law"

Article 1

These Regulations shall be called (The Quarries Regulations for the Year 1971) and shall become effective as of the date of its promulgation in the Official Gazette.

Article 2

Quarries of rock materials are classified into four categories:

Category I: Quarries in which crushers are used:
- a. Fixed crushers
- b. Portable crushers

Category II: Quarries for rubble stone

Category III: Quarries for masonry stone

Category IV: Sand Quarries
- a. Fine rock sand
- b. River sand

Article 3:

a. Three months after the effective date of these Regulations nobody is allowed to quarry, crush or transport rock materials from any place in Jordan unless he has a valid license issued by the Vice Presdient of the Natural Resources Authority.

b. License application for one category or more of quarries under Article (2) herein shall meet the following:

1. The application shall be accompanied by a site plan (certifide by the Department of Lands and Survey), specifying boundaries of the quarry to be licensed . The area of the Quarry shall not be less than one dunum and not more than five dunums.

2.The area in which the quarry is to be established should not contain an archaeological or sacred location.

3. If the site in which the quarry is to be established is owned by a third party or subject to rights of way or within the rights of way of a railroad or reservoirs or water pipelines or sewers, the application should be accompanied by the approval of the concerned party.

4. A permission from the police officer of the area on which the quarry intended to be established should be attached to the application.

Article 4

The license to establish a quarry shall be granted or renewed only if:

a. The site of the quarry to be licensed is located outside the municipality or village borders, provided that the license issued before the date of adding the site of quarry within the boundaries of such borders shall not be invalidated provided also that operating quarries within such borders may be licensed on the effective date of these Regulations for a maximum period of (18) months with respect to Category I (a) Quarries, and nine months for Category I (b) and six months for the other categories as of the above mentioned date.

b. The distance between a quarry and the nearest main highway or secondary rural road is not less than 300 meters for quarries under Categories I, II and III and 50 meters for quarries under Catogory IV.

c. The distance between a quarry and the nearest public place such as tourist locations , forests and public parks is not less than one kilometer in flat and open areas. Half this distance is needed in case there is a natural barrier which conceals the quarry; provided this will not adversely affect the sight see-

ing of the adjacent area.

d. The type of rock in the quarry is suitable for producing rock materials according to the specifications decided by the Ministry of Public Works for use in constructions and engineering works.

For this purpose, a technical inspection shall be undertaken by one of the authorized mine inspectors, as well as carrying out an analysis of the different rock samples by the Ministry of Public Works or by a recognized laboratory. The licensee or renewal applicant shall bear the costs of laboratory analysis.

Article 5

a. The quarry license shall be vaild for one year and shall be renewable. This license may be revoked by the Vice President in one of the following cases:

1. If he is convinced that the quality of the rock in the quarry is no more in conformity with the specifications prescribed by the Ministry of Public Works. The Inspector General may for this purpose organize inspection rounds to all quarries in the Kingdom and take samples representing the different types of rocks to be tested to ensure that they are suitable for use.

2. Upon recommendation by the Mines Inspector General because of technical violations in

the quarry causing hazards to the safety and health of workers or the neighbors.

b. A third party may claim compensation for the damage caused by quarry operations.

Article 6

The owner of a quarry, his agent or his manager shall:

a. Open a private road to his quarry.

b. Put in a conspicuous location at the entrance of the quarry a sign board showing clearly his name, address and a copy of the quarry license.

c. Inform the Vice President in writing within 24 hours of any labor accident or destruction in the quarry stating how and when the accident occurred, name of the injured worker (s) and the injuries they are suffering.

d. Take the necessary steps to arrange for a medical examination of all his employees in the quarry at least once every year, and shall provide the Inspector General with a copy of the results of the examination within a period not exceeding three weeks from the date of examination.

e.Shall cover and level the quarry site after completing the work and shall plant trees thereon in cooperation with the Ministry of Agriculture under the supervision of N.R.A.

Article 7

The following shall be excluded from the provisions of these regulations:

a. Quarries of the cement and marble industries and any other quarry which the Vice President considers as having direct relationship with the industry; provided that this shall not exempt the owners of quarries from licensing their quarries according to the Organization of Natural Resources Affairs Law.

b. Temporary rock quarrying operations opened for the purpose of levelling buildings and construction sites for which licenses are issued by the authorities concerned; provided that such operations do not include the operation of any type of crushers.

Article 8

a. No contracts are to be concluded to supply stone materials to any public or semi public official department, armed forces, and public security before submitting a document certifying that the quarry(ies) from which the stone materials are to be extracted are duly licensed.

b. No license is to be issued from the public security offices for using explosives in quarries before submitting the document referred to in para (a) of this Article .

Article 9

The Mines Inspector General shall, to the extent deemed necessary, apply any of the provisions of the Mining Code No. 131 for 1966 especially in relation to the protection and safeguarding workers from hazards and to ensure their safety.

APPENDIX 3

Agriculture Law No. (20) of 1973

Chapter III - Protection of Wildlife and Birds. Regulations for their hunting.

Article 144

Hunting of wildlife and birds without permission from the Ministry of Agriculture is prohibited. The charges for Hunting Licences shall be determined by the Minister of Agriculture.

Article 145 amended by Act No. 14, 1974

a) The hunting of useful birds for agriculture, or killing or catching of games birds is prohibited. Further, it is forbidden to possess them, transfer them, or sell them alive or dead.

b) The hunting of predatory birds and animals, or catching them in any way, or poisoning them is prohibited without special permission from the Minister of Agricultue.

c) The Minister will issue decrees identifying birds which are protected by this law. Also, he will specify the conditions under which they may be hunted for scientific purposes.

Article 146

The destruction of birds' nests is forbidden as is the collection of their eggs, damaging their eggs, and /or injuring their young.

Article 147

The Minister will be responsible for determining hunting areas and periods and the type of wildlife and birds which may be hunted.

Article 148

a) It is forbidden to use vehicles and flash lights or automatic guns in connection with the hunting of birds and wildlife.

b) It is forbidden to use military rifles in hunting wild animals with the exception of the animals specified by the Minister

Article 149

It is prohibited for foreign hunters who are normally resident outside the Kingdom to hunt birds and wild animals inside the Kingdom without permission from the Ministry of Agriculture.

Article 150

Cruelty to animals is forbidden. The Minister will issue decrees to specify the conditons under which these decrees are applicable.

Article 151

a) The importation of sticking materials or glue (which are used to catch birds) is prohibited as is selling it or keeping it or using it.

b) It is prohibited to use any sort of traps to catch birds.

c) It is prohibited to hunt birds by using camouflage instruments - banner, animai skin, calling instruments or a bird blind e.g., hut and shanty.

d) Anaesthetics are prohibited for hunting birds and wild animals.

e) Waterfowl designated by the Minister are excluded from these by-laws.

Article 152

The Minister shall appoint a committee called the Hunting Committee to advise on the regions and seasons for hunting and the kind of birds and animals to be hunted and any other affairs which concern wildlife.

Article 153

Anyone who violates the rules set out in this chapter is liable to a fine which will not be less than:

a. 100 Jordanian Dinar for every mountain or desert Gazelle or Ibex.

b. 25 Jordanian Dinar for every Hobara Bustard.

c. 10 Jordanian Dinar for every animal or bird with the exception of Wild Boar.

Article 154

a) The usage of a vehicle contrary to Article 148 or any other decrees, the driver shall be fined an amount not less than 15 Jordanian Dinar and the owner of the vehicle shall be fined the same amount if he is aware of the infringement, in addition to the penalties stated in Article 153.

b) If the violation is repeated within one year the penalty shall be doubled and the weapons will be confiscated.

c) In addition to penalties stated in Articles 153, 154, the weapons used will be confiscated under the following conditions:

1. Hunting without valid license
2. Hunting in prohibited regions
3. Hunting at prohibited times

Article 155

Officials of the Ministry of Agriculture , members of general security, members of Armed Forces and the personnel appointed by the Minister outside the staff of the Ministry are empowered to arrest all those who violate the rules of this chapter and hand them over to the neaest police station after preparing a report.

Regulation No. 113 (1973)*

Regulation for Protection of Birds and Wildlife and Rules Governing their Hunting

Issued in Accordance with Article 199
of Agricultural Law No. 20 for 1973

Article 1

This Regulation is called (Regulation for Protection of Birds and Wildlife and Rules Governing their Hunting, 1973) and it shall come into force from the day it is published in the Official Gazette.

Article 2

Hunting licenses are issued to Jordanian and foreign residents upon the payment of twenty Jordanian Dinar according to the following rules:

a) The license should bear the hunter's photograph.

b) The license is not transferable.

c) The license is valid for one year from the date of issue.

d) The license must be presented on request to any official or person delegated authority to do so under the Agricultural Law.

* Translation is provided by RSCN and revised by the Author.

Article 3

Foreign hunters, who are not resident in the Kingdom, may be issued temporary hunting licenses valid for three days, upon payment of the sum of twenty Jordanian Dinar.

Article 4

The hunting of wildlife and birds is only permitted in those areas and at those seasons specified by the Minister, from time to time, in the Official Gazette.

Article 5

All hunting is forbidden in the desert region east of Hijaz Railway Line with the exception of the Azraq region and any other regions specified by the Minister in the Official Gazette on the recommendation of the Hunting Committee.

Article 6

Hunting of Ibex and Mountain Gazelle in the regions west of Hijaz Railway Line shall be controlled according to the rules specified by the Minister in the Official Gazette on the recommendation of the Hunting Committee.

Article 7

Permission is given to hunters who carry licensed weapons and valid hunting licenses to hunt the wildlife and birds listed below* in the seasons and regions per-

* See Table 24.

mitted for hunting at times specified under Article 4 of this Regulation on condition that the number of animals shot and the frequency of hunting does not exceed the specified limits.

Article 8

The hunting Law No. 47 for 1972 and any other Law the contents of which is contrary to the content of this Regulation is hereby rescinded.

Appendix 4

The Antiquities Law
Law No. 21 for the Year 1988

Definitions and General Provisions

Article 1

This law shall be cited as the Antiquities Law, 1988, and shall come into force from the date of its publication in the Official Gazette.

Article 2

The following words and expressions shall have the meanings hereinafter assigned to them, unless the context

otherwise requires:

1. Minister : The Minister of Culture and National Heritage.
2. Department : The Department of Antiquities
3. Director : The Director General of Antiquities
4. Antiquity :

A- Any object, whether movable or immovable, which has been constructed, shaped, inscribed, erected, excavated, or otherwise produced or modified by humankind earlier than the year 1700 A.D. including caves, sculpture, coins, pottery, manuscripts and all sorts of artefact that indicate the rise and development of sciences, art, manufactures, religions, and traditions relating to pervious cultures or any part added thereto, reconstructed or restored at a later date.

B- Any object, movable or immovable, as defined in the previous subsection referring to a date subsequent to the year 1700 A.D., which the Minister may declare to be antique by order published in the Official Gazette.

C- Human, plant and animal remains going back to a date earlier than the year 600 A.D.

5. Archaeological Site:

A- Any area in the Kingdom which has been held as a historical site in accordance with pre-

vious laws.

B- Any other area which the Minister decides contains antiquities, or is associated with important historical events; provided such decision is published in the Official Gazette.

6. Immovable Antiquities:Are the stable antiquities which are connected to the earth, whether constructed thereon or buried therein including those under inland and territorial waters.

7. Movable Antiquities:

Are the antiquities which are disconnected from the earth or from immovable antiquities and can be displaced without damaging it or damaging the antiquities linked therewith or the place where it was discovered.

8. Excavating:

Is the act of digging, exploring, and investigating with the aim of finding movable or immovable antiquities. Accidental finding of antiquities does not constitute excavation.

9. Dealer:

Any person, whether natural or legal, who trades with antiquities.

10. The Season:

A certain period of the year within which it is conditional that excavations should proceed and terminate in accordance with the provisions of this law.

Article 3

A. The Department shall assume the following missions and responsibilities:

1. To execute the archaeological policy of the State.

2. To estimate the archaeological value of antiquities and sites and to evaluate the importance of each antiquity.

3. To administer antiquities in the Kingdom, supervise, protect, maintain, record, beautify the vicinities thereof and exhibit them.

4. To propagate archaeological culture and establish archaeological institutes and museums.

5. To excavate for antiquities in the Kingdom.

6. To assist in the organization of the various museums attached to governmental activities in the Kingdom; including historical, technical and folkloric museums.

7. To cooperate with local, Arab and foreign archaeological institutions for the service of national archaeological culture and consciousness; in accordance with the provisions of this law, and the regulations, decisions, and instructions which are issued in accordance therewith.

B. The Director may decide that an antiquity is an immovable antiquity, if it is part of an immovable antiquity , or complementry thereto, connected with it, or ornamental to it.

Article 4

A. The Minister may, upon the recommendation of

the Director, and in cooperation with the Department of Lands and Survey, decide on the names and boundaries of archaeological sites, which are to be registered in the archaeological register for immovable antiquities; including the limitation of servitudes pertaining thereto.

B. Such decisions shall be notified to all authorities and governmental departments concerned and the archaeological sites shall be marked and their relative servitudes shall be recorded in the registers and maps of the Department of Lands and Survey.

Article 5

A. The Government shall be the sole owner of immovable antiquities and no other authority shall be by any means whatsoever, appropriate these antiquities or raise any defences against the State by way of right of ownership, prescription or other defences.

B. Ownership of any movable antiquities, possession and dispossession thereof shall be governed by the provisions of this law.

C. Amateurs shall have the right to own and collect antiquities from outside the Kingdom provided they register them with the Department.

D. Ownership of the land does not vest its owner with the right to ownership of the antiquities existing thereon and therein, or disposing with it, and does not entitle him to excavate for antiquities therein.

E. The Government may expropriate or buy any land

or antiquity if it is in the interest of the Department to expropriate or buy it.

F. All the archaeological sites, hitherto registered in the name of the Treasury alone, shall be registered in the name of the Treasury/Antiquities. Likewise shall all unregistered archaeological sites which may be expropriated, or purchased, be registered.

Article 6

The Minister shall, upon the recommendation of the Director, publish in the Official Gazette a list of the names and boundaries of the archaeological sites in the Kingdom. This list is to be exhibited at the office of the destrict, region, subdistrict, or village in which the archaeological site is situated. No land on such sites shall be sold, let or delegated to any authority without the approval of the Minister.

Article 7

Any person who is in possession of any antique objects shall submit to the department, a list containing the number and other details connected therewith and a short description of each of them.

Article 8

A. The Department may with the approval of the Minister buy all, or any, of the antique objects referred to in the previous article, provided that their

prices are all estimated according to the provisions of this law. The remaining antiquities, which have not been bought by the Department , shall remain in the possession of the owner who shall have no right to dispose of them by any means whatsoever, except with the approval of the Minister and the recommendation of the Director.

B. Any person may donate to the Department any antique objects in his possession, and such shall be preserved by the Department in its museums in the names of the persons who donated them.

Article 9

It is forbidden to destory, damage, disfigure or cause any harm to antiquities, including causing change in features, disconnecting any part thereof, altering it, sticking advertisements or attaching any plates to them.

Article 10

The Council of Ministers upon the recommendation of the Minister shall have the right to lend, exchange or donate antiquities to official, educational, or archaeological institutions and museums provided the Department of Antiquities has similar antiquites.

Article 11

The Director may determine the prices of books,

publications, photos, maps, reproductions, or casts which are issued by the Department or which fall under its control or within its scope.

Article 12

The Minister may, upon the recommendation of the Director, exempt any person, institution or organization from all fees or prices provided for in this law.

Article 13

No permit should be granted for any construction project, including buildings and fences, unless a distance of 5-25 meters is left between them and any antiquity against fair compensation.

Article 14

Nowithstanding the provisions of any previous law, it is forbidden for a rectory person, legal or natural, to excavate in any archaeological site; in search of gold or other objects buried therein.

Article 15

A. Any person, who discovers or finds any antiquity without being granted a license to excavate, or has knowledge of such discovery or finding, must give notice to the Director or the nearest General Security Center within 10 days from the date of the discov-

ery, finding, or having knowledge of it.

B. The Director may, with the approval of the Minister, grant a reasonable compensation to any person who discovers or finds any antiquity, according to the provisions of this law.

Article 16

A. Only the Department may excavate for antiquities in the Kingdom, and allow, with the approval of the Minister by a special permission organizations, committees, scientific societies, and archaeological missions to excavate; according to the provisions of this law, and after ascertaining their abilities and qualfications; provided the excavation is carried out according to conditions set by the Director.

B. Subject to the provisions of item (A) of this article , it is forbidden for any person, whether natural or legal, to excavate for antiquities in any location in the Kingdom, even if it were his own private property.

Article 17

A. The Department , or any party licensed to excavate, may excavate in government property or any other; on condition that the property is to be restored to the state in which it was before the excavation commenced, and the excavators shall be bound to

compensate the owners of thses properties for any damage caused to their property as a result thereof, and the Department shall guarantee such compensation and shall be made to stand security for it.

B. The compensation referred to in the previous subsection of this article , shall be estimated by a committee consisting of three specialized officials, appointed by the Minister upon the recommendation of the Director.

Article 18

The Institution which has been licensed to excavate as well as the committees and missions delegated by them, shall be bound by the excavating instructions issued by the Minister, and shall execute their work according to the arrangements and procedure specified by the said instructions.

Article 19

A. If an organization, licensed to excavate, or designated group delegated by it , violates the instructions issued in accordance with the provisions of this law, the Department may, in addition to the procedure determined by the law, stop the excavation immediately until the violation of the regulation is removed. The Minister may upon the recommendation of the Director,cancel the permit.

B. The Minister may, upon the recommendation of the Director, stop the excavation if he considers that the safety of the excavating mission or normal safety measures so demand.

Article 20

If the excavations do not start within one year from the date of the permit, or are stopped during two seasons within two consecutive years without reason; the Minister may, upon the recommendation of the Director, cancel the permit and may grant an excavation permit in the same area to any other organization without violating , by so doing, any rights to the first party whose permit is cancelled.

Article 21

All antiquities discovered during excavations carried out by any party shall be considered the property of the State. The Minister may grant any licensed party some of the movable antiquities found in the excavation, in cases where other similar objects are found in the excavation where these were discovered, subject to the conditions and obligation imposed by the Minister.

Article 22

The Department may exclusively, or in cooperation with any scientific party, excavate in any Arab or foreign

country, if the Council of Ministers, upon the recommendation of the Minister, finds it necessary to do so in the public interest.

Article 23

Trading in antiquities is forbidden in the Kingdom, and all trading licences are considered cancelled with the coming into force of this law.

Article 24

Subject to the provisions of article (23) of this law, it is forbidden to export movable antiquities abroad except with the consent of the Department , subject to the approval of the Minister allowing such sale or export.

Article 25

A. The Department may buy some or all of the antiquities in the possession of the holder thereof , the price of which can be agreed upon with the Minister. If no agreement is reached , the price would be estimated by two experts; one of whom to be appointed by the Department and the other by the owner of the antiquities. If the two experts do not reach an agreement, they then should appoint a third expert as an Umpire.

B. If the Department refrains from buying the antiquities, the owner may transfer its ownership to other; provided that such transfer takes place with the

knowledge of the Department and under its own supervision.

Article 26

A punishment by imprisonment of not less than one year and not more than three years plus a penalty of 200 Dinars shall be imposed on:

A. Anyone who excavates without obtaining an excavation permit according to the provisions of this law.

B. Anyone who trades with antiquities.

Article 27

A punishment by imrisonemnt of not less than two months and not more than two years and a penalty of not less than fifty Dinars and not more than two hundred dinars shall be imposed on:

A. Anyone who fails to submit to the Department a list of the antiquities in his possession on the execution of the provisions of this law, or fails to present a record of the antiquities in his possession.

B. Destroys, damages, disfigures any antiquity, including the changing of its features, or separating a part thereof, or changing its figure or sticking any advertisement thereon, or placing plates thereon, or adding anything to its surface.

C. Falisfies any antique or attempts to forge it.

D. Forges an antique or deals with forged antiques without the permission of the Department.

E. Makes casts, or reproductions of antiques and makes use of them without the permission of the Department.

F. Discovers or finds any antique, or has knowledge of the discovery or the finding thereof without reporting it according to the previsions of this law.

G. Presents any false record, or information, or incorrect documents or vouchers for the purpose of obtaining any license or permit according to the provisions of this law.

H.Refuses, or detains to deliver to the Department the antiquities which he has discovered or found; whether he is in possession of an excavation license, or not.

I. Exports or deals with any antique contrary to the provisions of this law; including hiding it or smuggling it.

Article 28

In addition to the penalties provided for in articles (26) and (27) of this law:

1. Any antiquities shall be confiscated, if the contravention is committed in connection therewith, and they become the property of the Department.

2. Any construction, building, or other things which have been constructed, made or planted, contrary to the provisions of this law, or any regulation issued thereunder, shall be destroyed and removed at the expense of the offender, including the cost of repairing any damage caused to the antiquity.

Article 29

For the purposes of fulfilling the provisions of this law and all regulations issued thereunder, the Director, his assistants, heads of sections, inspectors of antiquites, and the directors of museums in the Department shall be vested with the powers pertaining to prosecutors as provided for in the Code of Criminal Procedure in force.

Article 30

A reasonable pecuniary reward shall be granted to any person who :

A. Helps in the confiscation of any antique found or in circulation contrary to the provisions of this law, rules, regulations, instructions and decisions, issued thereunder.

B. Offers information which leads to the discovery of a violation to the provisions of this law, rules, regulations, and instruction, and decisions issued thereunder.

Article 31

A. The rewards provided for in this law shall be granted in the following manner:

1. By virtue of a decision by the Director if it does not exceed 100 Dinars, or by virtue of a decision of the Minister, upon the recommendation of the Director, if it exceeds 100 Dinars,

but does not exceed 200 Dinars.

2. The rewards shall, in all cases, be estimated by the committee provided for in article (17) of this law or by any other committee which the Minister may appoint for the purpose.

Article 32

The Council of Ministers may issue any necessary rules for the execution of the provisions of this law including conditions and fees for excavation, and any entry fees to museums and archaeological sites, museum guide permits, and the constitution of councils and advisory committees.

Article 33

The antiquity law No. 26 for the year 1968 is hereby repealed as well as any other law or legislation to the extent to which its provisions may be contradictory to this law; provided that regulations, decisions, schedules, and proceeding which were issued or taken under any law or previous legislation, shall remain in force until they are amended, repealed, or substituted, according to the provisions of this law.

Appendix No. 5

Agricultural Law No. 20 of 1973*

Section 10

Article 89

The following words and expressions shall have the meanings assigned to them hereunder unless the context indicates otherwise:

A. Forest Trees: Trees and shrubs that grow in the forest whether suitable for grafting or not.

B. Government Forest Lands: Lands titled to states as forests or lands registered to the treasury of the government of the Hashemite Kingdom of Jordan or right of roads or streets which are partially or totally covered with forest trees.

C. Private Forests: All trees or shrubs which naturally grow on lands owned by natural or legal persons whether suitable for grafting or not.

D. Forest Material: Any material which exists on forest lands.

* Translation is made by the Author.

Article 90

A.1 It is forbidden to cut wood from government or private forests and manufacture charcoal prior to obtaining an investment license.

A.2 It is forbidden to transport any forest material from one place to another prior to obtaining a transportation ticket.

A.3 It is forbidden to cut , collect, manufacture, lift or transport any forest material prior to paying the specified price.

A.4 It is forbidden to cut, burn, trim any tree or shrub or forest seedling or plant from government or private forests. It is also forbidden to bark, remove the leaves or to manually or mechanically cut any branch of such trees.

A.5 It is forbidden to possess or store any unlicensed forest material.

B. The Minister will issue regulations in the Official Gazette identifying conditions and measures concerning obtaining investment licenses, transportation tickets, prices of forest material and fees to be paid.

Article 91

1. Anyone who violates Article 90 is subject to a punishment by imprisonment ranging from two

weeks to one month and a penalty ranging from five to twenty five Dinars for each tree or shrub or seedling or any part thereof or for every 300 kgs of forest material or any part thereof if identifying the number of the trees that are cut is impossible. Forest materials and cutting tools are confiscated.

2. The same punishment provided in paragraph 1 of Article 91 will be imposed on the vehicle driver who is caught with the forest material for which the owner does not possess a transportation ticket.

Article 92

A. It is forbidden to dwell, construct houses, buildings and structures, dig wells and caves in government forests.

B. It is forbidden to set fire or commit acts that may set government forests on fire up to a distance of 500 meters therefrom.

Article 93

A. When forests catch fire, the Minister of Agriculture shall have the right to acquire the needed machines. materials, means of transport for use in fighting the fire, provided the owners are compensated.

B. Anyone who sets fire in the forests will be subjected to a punishment by imprisonment ranging from one month to three months plus a penalty not

exceeding five Dinars and the cost of extinguishing the fire for each damaged tree or bush.

C. The Administrative Governor has the right to remove people who are residing or dwelling in government forest lands or adjacent thereto. If they disobey, the disobeyer will be punished by imprisonment ranging from two weeks to one month plus enforcement of removal.

Article 94

1. Encroachment upon govrnment forest land is forbidden whether by farming and reconditioning it or by digging wells or caves therein or any other type of encroachment.

2. Encroachment upon the signs or the boundary fence of forest land is forbidden.

Article 95

The Administrative Governor shall take necessary actions to prevent anyone who violates paragraph 1 and 2 of Article 94 from encroachment on forest land. Any violator will be subjected to a penalty of five Dinars for each dunum of land or a part thereof and he will cease to opearate the land. The structures built thereon by the violator will be taken over by the Ministry of Agriculture. The violator will be punished by imprisonment ranging from two weeks to one month and a penalty of ten Dinars for each sign or angle of boundary fence.

Appendix 6

Chapter 9 of Law No. 27 of 1986

Health, Safety and Welfare

Section 29 - Health and Safety

1. An organized establishment shall be clean and all health requirements shall be carried out and provided therein.

2. Where gas, dust fumes, dirt, refuse or any other harmful materials are generated during work, suitable measures shall be taken to prevent injury to the health of the workmen.

3. Work rooms in orgainized establishments shall be well ventilated and shall comply with health requirements.

4. An organized establishment shall be privided with adequate light during working hours.

5. One water-closet for every fifteen workmen or less shall be provided in an easly accessible place in the courtyard of every organized establishment. Separate water-closets must be provided for female workers.

6. An adequate supply of suitable drinking water for

workmen shall be provided in convenient places in every organized establishment.

Establishments in which dirt results from the operations carried out therein (of which notice shall be sent to the establishment concerned) shall also provide an adequate water supply for use by the workers for washing themselves.

Section 30 - Dangerous Operations

If the Minister of Social Welfare and Labor is satisfied that any operation carried out in an organized establishment exposes any person employed in that establishment to a grave risk of bodily injury, poisoning, or disease, he must issue an order declaring such an operation as dangerous and shall specify the measures to be adopted for the protection of the employees. He may order the suspension of work until the cause of danger is removed. The security authorities shall enforce such orders.

Section 31

1. Effective maintenance shall be carried out on all moving parts of a main engine, and transport and transmission equipment, and on all parts of mechanically driven machines which are a source of danger.

2. All openings in walls, floors attics or other places which may expose the workmen to the danger of falling shall be suitably fenced

3. An employer must furnish protecting eye glasses, gloves, shoes or boots where the nature of the work exposes the workman to danger and effects the safety of his eyes, hands and feet.

Section 32 - First Aid and Medical Assistance

All organized establishments shall be provided with first-aid and medical assistance equipment in accordance with the prescribed requirements.

Section 33 - Protection Against Fire

The necessary precautionary measures for fire fighting shall be adopted in every organized establishment, including the provision of means of escape which must be free from any obstructions at all times.

Section 34 - Notification of Bodily Injuries

The manager of an organized establisment to which this Law applies must notify the Labor Department on the form prescribed by the special regulations to be enacted, of any accident which occurs in the establishment and which causes death or bodily injury which prevents a workman from continuing his work in that establishment, within 48 hours of the occurence of such accident.

Section 35 - Welfare

1. No person shall be allowed to take a meal in any work room, or to use it as a living or sleeping room.

2. The Minister of Social Welfare and Labor may issue orders requiring the provision of suitable facilities for rest and the taking of meals, as he may deem necessary.

3. Establishments employing more than 30 women shall provide a suitable room for the use of the children under 6 years of age of such female workers.

Section 36 - Penalties

The employer and the manager of an organized establishment (who are deemed to be jointly responsible) shall be liable to a fine not exceeding twenty Dinars for every case of violation of any of the provisions of this Chapter or any regulations enacted thereunder.

References:

1. Arthur D. Little, Inc. 1980, Environmental Assessment, Jordan Valley Irrigation Project - Stage II.

2. National Atlas of Jordan, 1986.

3. The Annual Report, 1987 - Water Authority of Jordan

4. "Climatic Atlas of Jordan", Meteorological Department, Ministry of Transport, 1971.

5. Harza Stage II Feasibility Study, 1978.

6. National Water Master Plan of Jordan, Volume II, Annex III A-6.1

7. World Bank Report No. 7099 - JO, March 1988.

8. Safety of Existing Dams - Evaluation and Improvement, 1983, National Academy Press.

9. Water Treatment and Water Resources Planning Volume 1, by Tames Water International, 1988.

10. Survey of Water Resources, Utilization and Management in Israel, by M. Jacobs and Y. Litwin.

11. Wash Field Report No. 244, 1988.

12. Report on Methods to Achieve Financial Viability,

1984, by Eugene S. Churchill.

13. Feasibility Study Zarqa-Ruseifa, Water Distribution , Sewerage and Stormwater Systems (Industrial Effluents Treatment Report), by Malcolm Pirnie, Inc, in association with Jouzy and Partners, 1980.

14. Sanitary Landfill Design Procedures by Phil O'Leary, Berrin Tansel and Rick Fero, Waste Age, July 1986.

15. Recycling of Municipal Solid Waste by Leo. H. Ellis International Executive Services Corps (IESC), 1988.

16. Mineral Occurrence in Jordan, Guide Book 1988, Natural Resources Authority.

17. Jordan Phosphate Mines Company, Annual Report 1987.

18. The Arab Potash Company Ltd, Brochure.

19. Arab Potash Company Ltd, Annual Report, 1984.

20. Arab Potash Company Ltd, Annual Report, 1987

21. Central Bank of Jordan, Monthly Statistical Bulletin, August 1988.

22. Draft Environmental Report on Jordan prepared by the Science and Technology Division, Library of Congress, August 1979.

23. World Resources 1988 - 89

24. Plantlife of Palestine, 1962 by M. Zohary.

25. Mountfort G. Portrait of a Desert; the Study of an Expedition to Jordan, Houghton Mifflin, 1965.

26. Department of Animal Producation and Health, Annual Report 1987.

27. Water Quality and the Potential of Capture Fisheries and Aquaculture in King Talal, Wadi Arab and Ziglab Dams, 1988, by Dr. R.E. Brummett, Near East Foundation.

28. Forests and Forestry in Jordan, 1986, by Department of Forests and Soil Conservation .

29. OSHI (Occupational Safety and Health Institute) Reports.

30. Report on Long Term Energy and Policy Investment by Meta System/Hagler, Baily - Bechtel National, Inc. 1988.

31. Energy and Electricity in Jordan, 1988, by the Minis try of Energy and Mineral Resources.

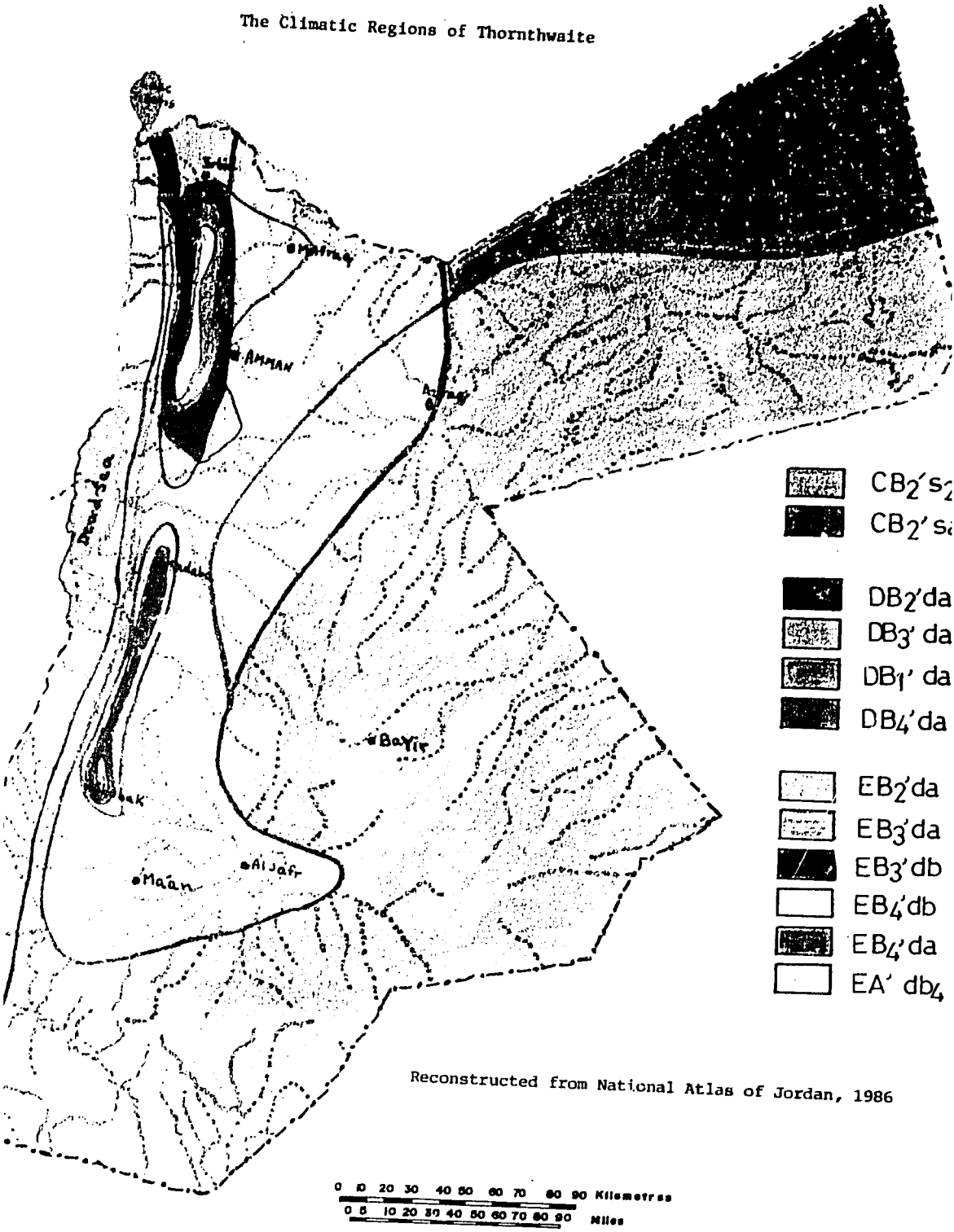
32. Environmental Assessment of Jordan Cement Factory, Fuheis, 1983, by R.H. Herby and M.W. Black.

33. Environmental Assessment of Jordan Petroleum Refinery Co., 1984, by Robert W. Hospodarec.

34. Jordan Constitution.

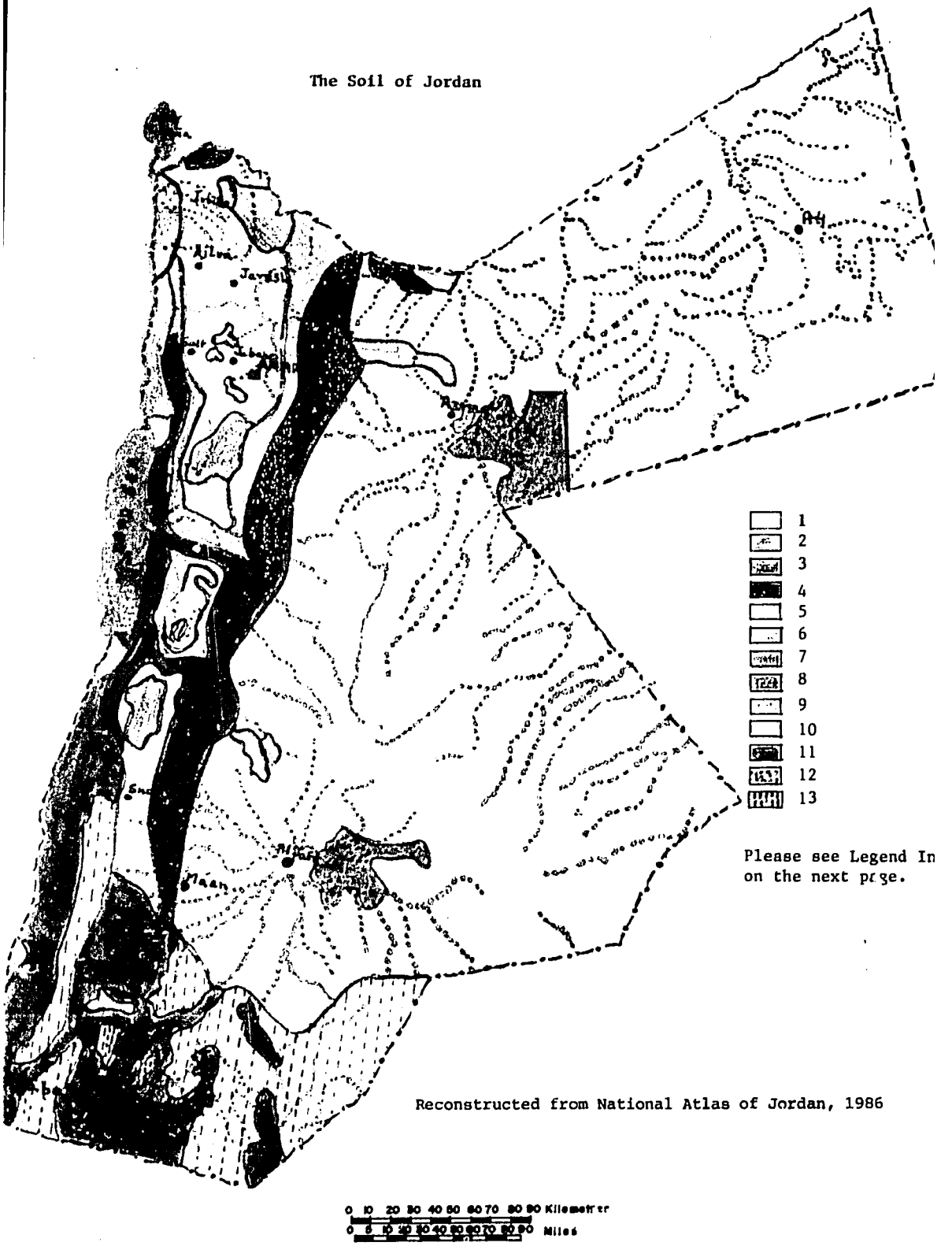
35. Pertinent Laws translated by WAJ, JVA, and NRA.

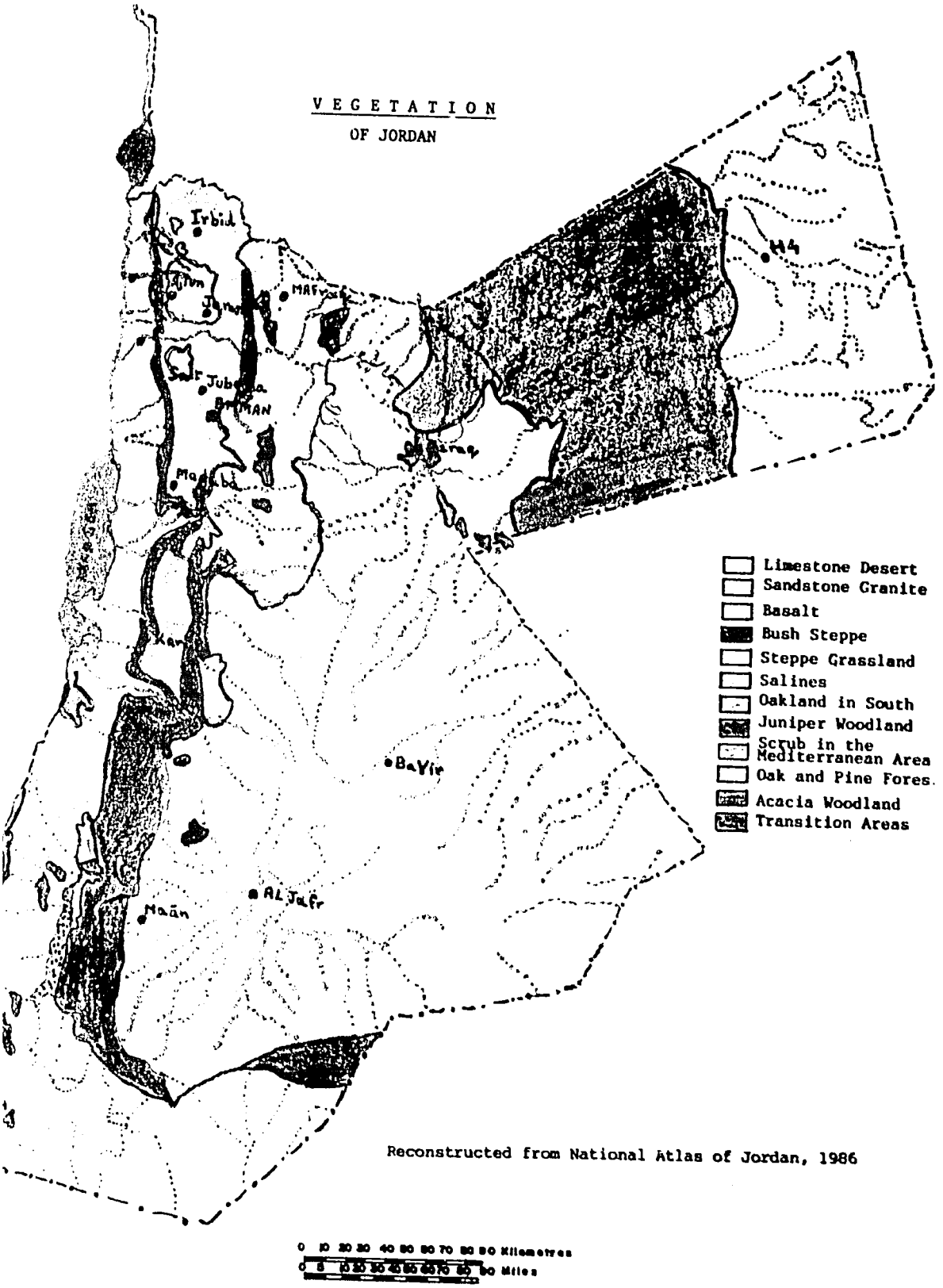
The Climatic Regions of Thornthwaite



Reconstructed from National Atlas of Jordan, 1986

The Soil of Jordan




VEGETATION
OF JORDAN
Irbid
Ajlun
Jerash
Mafraq
Salt
Jubeiha
AMMAN
Madaba
Karak
Ba'Ir
AL Jafr
Ma'an
H4
Limestone Desert
Sandstone Granite
Basalt
Bush Steppe
Steppe Grassland
Salines
Oakland in South
Juniper Woodland
Scrub in the Mediterranean Area
Oak and Pine Fores.
Acacia Woodland
Transition Areas
Reconstructed from National Atlas of Jordan, 1986
0 10 20 30 40 50 60 70 80 90 Kilometres
0 5 10 15 20 25 30 35 40 45 50 55 60 Miles

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12. Regosols on Friable Quaternary Sediments
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