INTRODUCTION TO THE TABLES

1 AREA, CLIMATE AND ENVIRONMENT

AREA

The area figures relate to districts, sub-districts, natural regions, and lakes.

The districts and the sub-districts were defined according to the official administrative division of the State of Israel. According to this division, Israel has six districts, which are divided into 15 sub-districts.

As of 1967, the area of East Jerusalem has been included in the Jerusalem District. In 1982, the Golan sub-district was attached to the Northern District.

This chapter also presents data on the natural region areas within each sub-district as well as on the areas of the lakes.

A natural region can be part of one sub-district or, in some cases, an entire sub-district or entire district (see the Map of Israel - Districts, Sub-districts and Natural Regions, 1995).

In the 1995 Census, the system of natural regions was updated and their number increased from 45 (in the 1983 Census) to 50.

The data were received from a computerized measurement of areas conducted by the Computerized Mapping (GIS) Unit of the CBS.

Data on the area of East Jerusalem were received from the Ministry of the Interior.

CLIMATE

Israel's climate has unique characteristics.

Israel's geographic location, between 29^{0}-33^{0} north of the equator, makes it a subtropical region, which is a transitional area between the temperate zone and the tropical zone. Israel, therefore, is on a "climatic crossroads": its southern and eastern areas are characterized by an arid climate, while the rest of its areas are characterized by a Mediterranean climate. One of the main characteristics of this kind of climatic formation is the high variability in quantities of precipitation from year to year and between different areas. In addition, there is a clear division into two seasons: a hot summer with hardly any rain, and a cool, rainy winter.

The rainy season in Israel usually begins in October and ends in May. Precipitation data are presented for rain years, i.e., from September to August of the next year.

Temperature data are presented by calendar years (January to December). Multi-annual averages of temperature refer in most stations to the period from 1964 to 1979. These data were not specified for stations where measurements were not taken over most of the period, or where there were considerable changes in the conditions of measurement.

Averages of precipitation quantities were reduced and adjusted to the normal standard period (1961-1990).

The multi-annual averages of the number of rainy days refer to the period from 1961 to 1990.

Climate data are received from the Meteorological Service in Bet Dagan.

NAME OF STATION, GEOGRAPHICAL LOCATION, AND RELATIVE ALTITUDE

COASTAL REGION

Haifa, Bay: 35^{0}02'E; 32^{0}51'N; 5 m.
Even Yizhaq (Gal'ed) 35^{0}04'E; 32^{0}33'N; 180 m.
Tel Aviv, Sede Dov: 34^{0}47'E; 32^{0}06'N; 4 m.
Bet Dagan, meteorological station: 34^{0}49'E; 32^{0}00'N; 30 m.
Negba: 34^{0}39'E; 31^{0}40'N; 90 m.

HILL REGION AND INLAND VALLEYS

Har Kena'an: 35^{0}30'E; 32^{0}58'N; 934 m.
Ramat Dawid: 35^{0}11'E; 32^{0}40'N; 50 m.
Ari'el: 35^{0}11'E; 32^{0}06'N; 560 m.
Jerusalem, Center: 35^{0}13'E; 31^{0}47'N; 785 m.
Be'er Sheva: 34^{0}48'E; 31^{0}15'N; 280 m.

JORDAN RIFT AND ARAVA

Kefar Blum: 35^{0}36'E; 33^{0}10'N; 75 m.
Sede Eliyyahu: 35^{0}31'E; 32^{0}26'N; -190 m.
Elat: 34^{0}57'E; 29^{0}33'N; 12 m.

ENVIRONMENT

EXPENDITURE FOR PUBLIC ENVIRONMENTAL PROTECTION SERVICES

(Financial Data)

DEFINITIONS AND EXPLANATIONS

Environmental protection services were generally defined according to the guidelines of the statistical offices of the UN and the European Union (EUROSTAT) for classification of activities aimed at protecting the environment. Based on this classification, expenditure for environmental protection included the following items:

1. Protection of ambient air and climate.
2. Sewage and waste treatment.
3. Protection of soil and ground water.
4. Noise and vibration abatement.
5. Biosphere and landscape protection.
6. Protection against radiation.

CLASSIFICATION OF EXPENDITURE

Expenditure for public environmental protection services was classified according to the implementing sector - the government, government companies, local authorities, and non-profit institutions. There are five types of public services for environmental protection:

1. ***Treatment of sewage***, which includes planning, upkeep, development of sewage and drainage systems, construction and operation of pumping and purification plants, and treatment of rain water.
2. ***Treatment of waste***, which includes collection, disposal, and incineration of domestic and industrial waste, treatment of solid refuse and dangerous materials, sweeping of streets, and cleaning of market places.
3. ***Protection of the biosphere, landscape, and atmosphere***, which includes construction, maintenance, and beautification of parks, preservation of forests and afforestation, fire fighting, maintenance of beaches and nature reserves, maintenance and reclamation of land, and prevention of air and water pollution.
4. ***General administration***, which includes general management as well as planning and supervision related to environmental protection in government ministries, local authorities, and conurbations.
5. ***Other services***, which mainly include activities that do not fall within the categories of services specified above. For example: urban planning and construction, and activities of environmental protection units in local authorities.

Expenditure for public environmental protection services was classified in the following categories:

1. ***Current expenditure***, which includes labour expenses (i.e., imputed government expenditures, which reflect the government's commitment to pay funded pensions to employees upon retirement), current purchases of commodities, and other services in addition to a calculated estimate of expenditures for depreciation of buildings and equipment.
2. ***Investment in fixed capital***, which includes expenses for constructing installations, buildings, other construction projects, and purchase of machinery and equipment for the purpose of environmental protection.

AIR

(Tables 1.7-1.12)

Air pollutants typically include gases added to the atmosphere as a result of human activity. When these gases exceed a certain level of concentration over given periods, they cause damage to the environment and are hazardous to humans.

POLLUTANTS

CO_2 (carbon dioxide). An important greenhouse gas originating from complete combustion of various fuel materials. This pollutant causes climatic changes on earth and global warming. Greenhouse gases endanger the environment of humans and other forms of life - not by poisoning, but rather by global warming (i.e., a "greenhouse" effect).

SO_2 (sulfur dioxide). Sulfur oxides originating mainly from emissions of power and industrial plants. The absolute standard permitted for 24 hours is 280 micrograms per cubic meter of air. This pollutant can cause respiratory problems, acid rain, and direct damage to plants. SO_s is a corrosive gas that also acts on steel.

NOx (Nitrogen Oxides): Gaseous compounds consisting of nitrogen and oxygen. The absolute standard permitted for half an hour is 940 micrograms per cubic meter. The daily standard (for 24 hours) is 560 micrograms per cubic meter of air. The pollutant can cause respiratory difficulties and increase the incidence of respiratory tract diseases as well damaging plant life, and acid rain.

O_3 (Ozone): This gas is produced by chemical reactions between hydrocarbons, nitrogen oxides, and solar radiation. The absolute standard permitted for a maximum of half an hour is 230 micrograms per cubic meter. The standard for eight hours is 160 micrograms per cubic meter of air. The pollutant can cause irritation in the respiratory system and damage to plant life.

SPM (Suspended Particulate Matter). These particles can be produced by natural sources such as sand storms or by human activity such as quarrying, manufacturing cement, etc. The absolute standard for 3 hours is 300 micrograms per cubic meter of air. The daily standard (for 24 hours) is 200 micrograms per cubic meter of air. Currently, a distinction is made between general particles (SPM) and particles that can be inhaled (PM10) - which are 10 microns or less in size. These particles may cause irritation of the respiratory system. The daily standard (for 24 hours) is 150 micrograms per cubic meter of air, and the yearly standard is 60 micrograms per cubic meter of air.

CO (carbon monoxide): A gas produced by incomplete combustion of hydrocarbon fuels. This gas replaces oxygen in the hemoglobin, and obstructs the supply of oxygen to the body, which results in choking. The standard permitted for a maximum of half an hour is 60 milligram per cubic meter. The standard for a maximum value of eight hours is 11 milligram per cubic meter of air.

EMISSION OF POLLUTANTS INTO THE ATMOSPHERE

The pollutants emitted into the atmosphere by human activity are mainly derived from industry (stationary sources) or from motor vehicles (mobile sources). Pollutants also include gases emitted into the atmosphere during incomplete combustion of hydrocarbon fuel.

DEFINITIONS AND EXPLANATIONS

Air pollutants include gases which are emitted into the atmosphere when there is complete combustion of hydrocarbon fuels (petrol, kerosene, distillate fuel oil, liquefied petroleum gas, coal, etc.) such as carbon dioxide.

SOURCES OF DATA AND METHODS OF CALCULATION

Quantities of air pollution emissions are calculated on the basis of:

1. Annual quantities of various types of fuel consumed by industry and motor vehicles. Quantities of fuel consumption were obtained from the Energy Division at the Central Bureau of Statistics.
2. Annual kilometrage of the various types of vehicles, by age of vehicle. Data on kilometrage were obtained from the Transportation Division of the Central Bureau of Statistics.
3. Emission factors of air pollutants from stationary sources (industry) prepared by the United States Environmental Protection Agency (USEPA) were updated to reflect the conditions in Israel as of 1997. The emission factors were obtained from the air quality division (stationary sources) of the Ministry of the Environment.
4. Emission factors of air pollutants from different types of mobile sources (vehicles) according to the age of the vehicle are based on the latest study conducted at the Technion on the topic “Evaluation of Emission Factors from Vehicles in Israel” (Tartakovski et al., June 1997). These Emission Factors were calculated only for private motor vehicles running on petrol. The emission factors represent average emissions of pollutants from private vehicles travelling in urban and rural areas, at an average speed. Emission factors for other types of vehicles and other fuel types were based on data from The Netherlands, Britain, and the U.S.A. (AP42). The Emission Factors were obtained from the Air Quality Division (mobile sources) of the Ministry of the Environment.
5. Changes in the calculation of CO_2: In the past, the emissions were calculated for Carbon only (C). All of the data from previous year were multiplied by 3.666. As a result, data on emissions now refer to CO_2. This change was introduced in order to facilitate comparison with emission values from Europe and the United States.

The data were processed and the model was designed at the Central Bureau of Statistics in full cooperation with the Ministry of the Environment. The database, which includes information presented in sections 1 through 4, has been constructed and is available at the Central Bureau of Statistics.

LIMITATIONS OF THE DATA

1. The data do not refer to all air pollutants emitted into the atmosphere, and include only those emitted due to combustion of fuels. Nor do the data include quantities of greenhouse gases emitted into the atmosphere in other ways, e.g., as a result of natural processes or as a result of human activities other than fuel combustion. It should be noted, however, that the main cause of air pollution is fuel combustion.
2. Some of the emission factors were derived

from Europe or the United States and are not completely adapted to the conditions in Israel.

CONCENTRATIONS OF AIR POLLUTANTS

DEFINITIONS AND EXPLANATIONS

Concentrations of air pollutants measured in Israel are divided into gases proven to be poisonous to humans (e.g., Sulfur Oxides - SO_x) and greenhouse gases that do not have a direct impact on humans, but contribute toward global warming. Other pollutants are not emitted as a direct result of human activity, but as a secondary result of human activity. For example, Ozone derives from chemical reactions between (manmade) hydrocarbons, Nitrogen Oxides (also from human emissions), and solar radiation.

STATISTICAL STANDARD

There are regulations for permissible concentrations of air pollutants, known as "air quality standards" (1992). There are two kinds of standards for air quality:

1. Statistical standard (or a standard of 99.75%). This standard applies to the pollutant Sulfur Dioxide (SO_2), and defines the maximum permitted concentration of a pollutant 99.75% of the time.
2. Absolute standard (or a standard of 100%). This standard applies to all pollutants and defines the maximum concentration of a pollutant permitted at all times.

SOURCES AND METHODS OF CALCULATION

The source of this data is the network of monitoring stations in conurbations, local authorities, a national Network for Monitoring Environmental quality (NME), and the Israel Electric Corporation. These stations use appropriate instruments to measure concentrations of air pollutants. Not all of the monitoring stations are mentioned in the table. Rather, representative monitoring stations were selected for various types of environments: residential suburbs, commercial centres, industrial areas, etc.

Data were obtained from the Ministry of the Environment, based on records received at the stations every five minutes. Means were calculated per half-hour, per day, and per annum.

Maximum value for 24 hours: The maximum daily value recorded during the year.

Maximum half-hour value: The maximum half-hour value recorded during the year.

Anomalies: number of records exceeding the standards during the year.

As of 1998, the table also includes monitoring stations for motor vehicles, which are located next to major highways. Measurements were taken at an altitude of three meters above the road.

LIMITATIONS OF THE DATA

1. The data do not refer to all air pollutants that endanger plant and animal life and do not include greenhouse gases.
2. The tables display data on concentrations of pollutants from only a few monitoring stations in Israel. Data from the rest of the stations are available at the Central Bureau of Statistics.
3. Not all of the stations measure all of the pollutants. Therefore, there may be missing data at certain stations.
4. Some of the monitoring stations operated only partially during certain periods. Data from monitoring stations that operated less than 35% of the time are presented in parentheses, and should be considered with reservation.

WATER

(Tables 1.13-1.16)

WATER CONSUMPTION

For data on water consumption according to sources and various uses, see chapter on "Energy and Water".

QUALITY OF DRINKING WATER

The data presented in this section refer solely to the microbiological quality of drinking water, based on the results of tests conducted by the Ministry of Health.

Microbiological analyses of potable water (i.e., drinking water) produced by the "Meqorot" Company are usually conducted outside of localities at water sources and supply lines of the company, before consumers are connected to the supply. Microbiological analyses of water sources controlled by localities and within the local supply lines of those localities are conducted by the local authorities under the supervision of the Ministry of Health.

DEFINITIONS AND EXPLANATIONS

Microbiological Analysis: A test to reveal coliform bacteria. The Ministry of Health conducts the analysis in the water distribution networks (pipes and reservoirs).

Regulations: (Ordinance for Health of the Population (Health Quality of Drinking Water), 1974, amended in 1988). The regulations for determining the quality of water define, inter alia, the type of bacteria and their concentrations in potable water, as well as the sampling and testing methods, the frequency of tests, and the responsible bodies.

According to the regulations, water is undrinkable if samples in a microbiological test reveal over 3 coliform bacteria per 100 ml of water. Samples with up to 3 coliform bacteria also require testing for faecal coliform. There is no obligation to repeat the tests if the appropriate measures are taken to improve the water quality according to the test results.

Microbiological analyses with sub-standard results: Microbiological tests of water samples in which the proportion of bacteria is found to exceed the level permitted in the regulations.

***The percent of analyses with sub-standard results*:** This is an indicator of the water's microbiological quality. It does not always reveal the proportion of water rejected for drinking in any given region, owing to limitations in sampling and testing procedures.

Chemical analysis: Intended for early detection of changes in the chemical composition of drinking water sources, where the quantity of components may indicate pollution as defined by the regulations.

LIMITATIONS OF THE DATA

1. Some of the sub-standard results revealed in the analyses may not be attributed to water pollution, but to failure to conform to the sampling regulations (e.g., conditions for delivery to the laboratory, conditions for implementation of the analysis, and "false positive" results). Some of these cases are revealed at the time when the analyses are repeated.
2. The more analyses conducted, the greater the likelihood of obtaining sub-standard results. This percent does not necessarily reflect the percent of non-potable water in the total amount of water supplied. Apparently, in small localities which are found to have more pollution, more analyses are conducted (in relation to the quantity of the water supplied) than in large localities. Thus, the "Meqorot" Company often conducts analyses more frequently in "suspicious" locations (points-at-risk).
3. The percent of sub-standard microbiological test results refers only to routine and repeated tests, and not to special tests conducted as a result of pollution in the system.
4. Data on microbiological and chemical analyses performed by "Meqorot" indicate the quality of the water in the water sources (surface and ground water) and in the water networks (pipes and reservoirs), and do not indicate the quality of water supplied to consumers. Before water is supplied to consumers, it receives various treatments in order to become potable.
5. It should be noted that the sub-standard test results obtained by the "Meqorot" Company, were calculated on the basis of the new regulations, which are stricter than the earlier ones and have not yet been approved. In contrast, sub-standard test results obtained by the Ministry of Health (using samples taken from local authorities) were based on the previous regulations.

WATER LEVEL IN AQUIFERS

(Table 1.14)

The aquifers in Israel are: Aquifer Hof, Aquifer Yarqon Taninim (Yarqtan), Western Galilee basin, Carmel basin, Kinneret basin, Eastern Hill basin, Negev and Arava basin. In 1998/99, nearly 2,144 million cubic meters of water were produced by the aquifers. About 1,550 million cubic meters were pumped from drills, and the rest flowed from springs. Two-thirds of all pumping in 1998/99 (1078 million cubic meters) were produced from the Hof and Yarqon-Taninim aquifers, which are connected with the national system (according to the Report of the Hydrological Service, May 2000).

PRESENTATION OF DATA

The data presented in the tables focus on the two major aquifers, in terms of the overall amount of water pumped through drills: Aquifer Hof, and Aquifer Yarqon Taninim. The tables present specific data on a limited number of drills (out of hundreds), in accordance with the recommendations of the Hydrological Service in Israel.

The variables published for the drills are the water level in meters, in relation to Mean Sea Level (MSL), during two typical months. In addition, the data indicate the height of the drilling point above MSL, in order to provide an idea of the depth of the drilling that must be carried out when water is pumped.

The typical months for which water level values were published in relation to MSL were: May (Spring), which provides an estimate of the largest amount of water (maximal water level), and November (Fall), which indicates the lowest level of the aquifer (minimal water level).

DEFINITIONS AND EXPLANATIONS

Amount of water: Amount of water pumped, amount of water flowing from springs, through recovery or refilling of water to aquifers. Data are presented in units of million cubic meters (MCM) per annum.

Water salinity: One of the most important parameters in classification of water based on quality and determining the use of water is salinity. The parameter typically used to measure salinity is the concentration of chlorides measured by milligrams of chlorides per liter (mg/l). Brackish water (in contrast to saline water) can be used in ponds or for differential irrigation (of specific crops).

Water with up to 600 mg/liter of chloride is still considered potable and falls within the standard permitted for drinking water in Israel.

Water pollution: Another parameter of water quality is the concentration of nitrogen measured in mg/l of water. The quality of water in various drillings (several hundred throughout Israel) is usually categorized as follows:

Good quality water: Concentration of chlorides below 250 mg/l, and concentration of nitrogen below 45 mg/l.

Satisfactory quality water: Concentration of chlorides between 250 and 600 mg/l and concentration of nitrogen below 70 mg/l.

Low quality water: Concentration of chlorides exceeding 600 mg/l, or concentration of nitrogen exceeding 70 mg/l.

Hydrological year: Summary of hydrological data for the year beginning in October and ending in September of the following calendar year (rather than from January to the end of December, as is customary in other calendars).

DESCRIPTION OF AQUIFERS

Aquifer Hof - Coastal aquifer: The aquifer spans from Binyamina in the north to Nir Am in the south. The total area of the aquifer is 1,900 square kilometers. In certain sections, there is direct contact with the Yarqon-Taninim Aquifer. Therefore, the exchange of water between them is possible. In the west, the aquifer is right next to the sea, which enables water to flow from the aquifer into the sea, and vice versa. The aquifer receives water from precipitation, as well as from recharging (see section on wastewater and treated wastewater below), and from leakage from water consumption systems, irrigation, and sewage and drainage above the surface.

The Hof Aquifer produced about 505 million cubic meters of water per annum from pumping and drilling in 1999. This constitutes over one-fifth of the overall national production. Of this amount, about 18 million cubic meters per annum are brackish water. In addition, the aquifer is a reservoir of water from the National Water Carrier in years of abundant rain.

Excess agricultural irrigation flowing back to the aquifer contains salts that remained in the upper of layer of ground, after the water that carried them evaporates. It also contains remains of fertilizers and pesticides. Additional pollution of aquifer water derives from the flow of industrial waste, oil, and waste from excess irrigation and rain water. The Dan Region Reclamation Project is limited to two sections of the aquifer - by Rishon LeZion and Yavne - and can contribute toward environmental pollution.

Yarqon-Taninim Aquifer: The basin extends along the ridge of the Judea and Samaria hills to the east and the Mediterranean coast to the west. To the north, the aquifer is bordered by the southern slopes of the Carmel and Nahal Taninim. To the south, it is bordered by the Be'er Sheva Valley.

In the coastal region (the western part of the basin), the Yarqon-Taninim Aquifer is situated underneath the Hof Aquifer. The aquifers are usually divided by impermeable rocks, except for points where they have contact, and where it is possible for water to transfer from one aquifer to another.

About 573 million cubic meters of water were pumped from the aquifer in 1999, of which about 3 million cubic meters of water were brackish.

The brackish water sources of the Yarqon-Taninim Aquifer are Aynot Hataninim (which has a high level of salinity from rain water). Another salinity source is sea water and brine which flow into the aquifer. The amount of water recharged from the National Water Carrier into the aquifer is small compared with the amount of water pumped.

LIMITATIONS OF THE DATA

There are hundreds of drills in the seven aquifers. Each aquifer is being monitored, and there are detailed reports at Israel's Hydrological Service. The table presents data only for the two main aquifers in Israel in terms of the amount of water production. For each aquifer, only a small number of the drills are presented.

Four drills were chosen to represent the Hof Aquifer upon the recommendation of the Hydrological Service of Israel.

Observation drills at Beit Shiqma 6/3, Holon 27/1, Glil Yam 36/2, Hadera B2/53. Observation drills are not pumped. Therefore, the water levels measured are more reliable than those derived from active drills.

The minimal height for pumping at Aquifer Hof is sea level (0 meters).

Three drills were chosen to represent the Yarqon-Taninim Aquifer, upon the

recommendation of the Hydrological Service of Israel: Observation drilling in Be'er Sheva (by Meqorot), private drill and oil drilling and exploratory drilling at Menashe T1.
The exploratory drilling at Menashe T-1 constituted an absolute minimum level. The red-line water level is 9 meters above sea level.
Exploratory drilling has a narrow diameter, without pumping. Therefore, the water level is more reliable than in drillings that involve active pumping. If there is no way of measuring the water level during a certain month, there are methods of interpolation and imputation of data from neighbouring drillings. In addition, a hydrological model is used to complete the data. This adjustment is carried out in only a small percent of all measurements.

SOURCES OF DATA

The Hydrological Service of Israel provided raw data (number of water level measurements and the exact date they were taken every month of the year), as well as data on the height of the drilling points above sea level.
The staff members of the Israel Central Bureau of Statistics thank the Hydrological Service of Israel for their professional guidance in preparing the new series on the water level of aquifers in Israel.
Statistical processing of the raw data has been carried out at the Central Bureau of Statistics, Environment and Natural Resources Statistics Division.

LAKE WATER

(Table 1.15)

WATER LEVEL FOR LAKE KINNERET AND THE DEAD SEA AND SALINITY OF LAKE KINNERET

The Hydrological Service of Israel measures and reports on the water balance and salinity in aquifers, Lake Kinneret water, Dead Sea water and spring water.
The table on the water level of the lakes (in meters, by height above sea level) presents seasonal data from the 1920's for the Lake Kinneret and from the 1970's for the Dead Sea. For Lake Kinneret, the average salinity for each year of measurement was calculated.
Water from Lake Kinneret is used for drinking, and piped to consumers (after treatment) by the National Water Carrier. Therefore, information on the water level of Lake Kinneret is essential, and indicates the water reserves of the country. Diversion of water to the National Water Carrier (rather than to the Jordan river) has a strong impact on the water level of the Dead Sea. It is also important to measure the water level of the Dead Sea, due to the diversion of water to the O'ur Canal in Jordan as well as to reservoirs in Syria and Lebanon.
Information on the water level of lakes in these seasonal series may provide an indication of short-term as well as long-term problems. These series constitute a basis for understanding the physical processes and environmental changes caused by human intervention in the ecosystem. In addition, the seasonal series provide important information on natural fluctuations in availability of water.

PRESENTATION OF DATA

Lake Kinneret and the Dead Sea are both water bodies located below sea level in the Syrian-African Rift. Water level measurements are carried out regularly, several times a month. There are raw data series containing all of the measurements and dates of sampling. The values presented for water level data of the two lakes are in meters. All of the values appear with a minus sign, since the lakes are below sea level.
The Hydrological Service recommended presenting the May and November measurements for Lake Kinneret, and May and December measurements for the Dead Sea.
The Spring months (April, May) are natural estimates of the maximum water level for a given year, whereas the Fall months (November-December) are estimates of the minimal water level (after the dry season when there is no rainfall).
It is important to provide reports on chloride content, since the concentration of chlorides in water is indicative of salinity, whereas the presence of nitrogen in water is indicative of pollution.

DEFINITIONS AND EXPLANATIONS

Dead Sea: A saline lake, the lowest in the world, which does not belong to the drinking water reserves (or water for irrigation). The environmental interest in the Dead Sea derives from the need to measure indirect effects of human activity in the drainage area, which runs through four countries (Israel, Jordan, Syria, and Lebanon) and the changes that have taken place following human intervention in natural processes. In addition, this saline lake is an important economic resource (for tourism and industry), and the changes there should be followed.
Lake Kinneret: The largest fresh water lake in Israel. Environmental interest in Lake Kinneret derives from the fact that it is the potential reservoir of drinking water in the country. Therefore, the water level of the lake is of

considerable importance.

Salinity (expressed by measures of chlorides in milligrams per liter (mg/l).

Water with up to 600 mg of chlorides per liter is defined as potable.

Water with over 600 mg of chlorides per liter is defined as brackish and considered low quality water.

There is still no standard for lake water quality in Israel.

LIMITATIONS OF THE DATA

If no measure was taken during a certain month, hydrologists at the Hydrological Survey of Israel use nearest neighbour imputation methods or other accepted models to fill in the missing data. These models take into account seasonal and hydrological information that has accumulated over the years. Today, the water level of Lake Kinneret is measured regularly and updated every 15 minutes.

SOURCES OF THE DATA

Raw data on the water level and salinity measurements of Lake Kinneret and water level measurements of the Dead Sea were obtained from the Hydrological Service of Israel.

Processing and preparation for publication were conducted at the Division of Environmental Statistics at the Central Bureau of Statistics.

SEAS AND BEACHES

(Table 1.16)

QUALITY OF SEA WATER AT BEACHES

Israel has four coasts: The Mediterranean Coast (188 kilometers long), Lake Kinneret, the Red Sea, and the Dead Sea. At each coast, there are 103, 27, 17, and 4 stations, respectively, at declared beaches. The total number of declared beaches in 1999 was 151. A declared beach is one with a lifeguard, which has been recognized as appropriate for the public to swim in (there must be a lifeguard's post and a flagpole).

Along the coasts there are sections declared by the Ministry of the Interior as public beaches, but which are closed due to health hazards or other dangers. At 125 beaches, a total of 3,695 measurements are conducted during the swimming season.

Most sea water pollution comes from the land. The farther the source of pollution is from the sea, the cleaner the sea water.

STANDARD FOR WATER QUALITY AT DECLARED BEACHES

The Ministry of health follows the MEDPOL Accords for preservation of the Mediterranean Sea.

The Ministry of Health (Public Health Department) has published a standard for water quality at declared beaches. Permits to open beaches to the public must conform to every aspect of this standard.

There are five criteria for forbidding public use of a beach:

- Epidemiological evidence of infectious diseases associated with swimming at that beach.
- Presence of a source of wastewater or treated wastewater near the beach.
- Discovery of secretion particles on the beach or in the sea water.
- Presence of factors which the Ministry of Health believes are hazardous to public health.
- The sea water does not meet the numerical standards of laboratory tests.

The first four criteria are difficult to enforce, since there is no definition of the events that lead to closure of a public beach. The last criterion allows for statistical follow-up of sea water quality.

SEA WATER SAMPLING STANDARDS, TESTING, AND RESULTS

Frequency of samples: During swimming season (from May to October), at least one sample must be taken per week. During the Winter (from November to April) one sample must be taken per month, at every declared beach. If the beach also operates during the Winter, it shall be tested according to Summer standards. Every beach must conduct at least 32 tests per year. More tests may be conducted, as requested by the Ministry of Health.

Type of testing: Counting faecal coliforms per 100 ml of sea water.

NUMERICAL STANDARD:

- The geometric average of sea water tests from the beach during the swimming season shall not exceed 200 faecal coliforms per 100 ml of sea water.
- Results of individual tests shall not exceed 400 faecal coliforms per 100 ml of sea water in over 20% of the samples.

There are about 26 weeks in a season. Accordingly, there cannot be more than five individual tests with a coliform count exceeding 400.

DESCRIPTION OF THE DATA

The data include 4,910 laboratory tests for 125 beaches on the Mediterranean coast, Lake Kinneret, and the Red Sea (during the swimming season, 3,695 samples were taken at these beaches).

In the northern region, 687 tests were carried out at 36 beaches; in the Haifa district, 808 tests were taken at 15 beaches; in the central region, 637 tests were taken at 18 beaches; in the Tel Aviv region, 931 tests were taken at 32 beaches; and in the southern district, 630 tests were taken from 32 beaches.

In 1999, the Hof Dugit beach (both sections) and the "Betoch Hakint" beach exceeded the limit of 20% tests with over 400 faecal coliforms per 100 ml of sea water. The number of measurements at these beaches did not conform with the standard.

Additional data on every beach are available at the Division of Environmental Statistics, the Central Bureau of Statistics.

The table "Microbiological Sample Tests from Sea Water at Beaches, by District and Sub-district" presents the distribution of tests at a number of beaches (including the name of the beach), by groups of faecal coliforms. Only beaches with at least one irregularity (<100) during the swimming season appear in the table. The rest of the beaches are included in the summaries of the sub-districts and districts.

SOURCE OF THE DATA

The raw data were obtained from the Ministry of Health, laboratory department. The public health laboratories in Haifa, Tel Aviv, and Be'er Sheva took the water samples and carried out the tests.

The data were processed and analyzed at the Central Bureau of Statistics, Environment and Natural Resources Statistics Department.

WASTEWATER AND TREATED WASTEWATER

(Tables 1.17-1.18)

Wastewater is the inevitable result of water use. Much of the wastewater in Israel is treated in treatment plants and then flows back to the environment as effluents for use in agricultural irrigation and industry. In some cases it is recharged into ground water, and can also be used for stream restoration.

SURVEY OF TREATMENT PLANTS

The Ministry of the Environment and the Ministry of National Infrastructures conduct a survey of treatment plants under the auspices of the Nature Reserves and National Parks Authority. The survey deals with treatment plants (which use advanced technology, without domestic recharging pits). The sample used in 1999 encompassed 56 treatment plants, which cover **about 80% of all** wastewater in the country. Most of the sewage content (over 99 percent) is water, and the rest is waste.

DEFINITIONS AND EXPLANATIONS

The objective of treating **raw sewage (RS, waste water, and influents)** is to separate and break down the components of pollution from water. This process should be as natural as possible, and should not be hazardous to the environment.

Treatment of sewage using advanced technologies began in Haifa in the early 1970s. The wastewater treatment plant from the Dan Region Reclamation Project (Shafdan) began operating in the early 1980s.

The Water Commission has been conducting "surveys of collection, treatment, and reuse of wastewater" since 1963. The latest survey was published in 1994, and the summary tables for the survey appear in the Statistical Abstracts of the Central Bureau of Statistics, 1995-1997.

The main processes implemented for treatment of wastewater are as follows:

1. **Mechanical Treatment (Preliminary Treatment)**
   Mechanical treatment removes solids from the sewage.
2. **Sedimentation ponds - preliminary sedimentation**
   Sedimentation of pollutants can be natural, but may also be catalyzed by chemicals.
3. **Biological Treatment (Secondary Treatment)**
   Oxidation Ponds
   Ponds where biological breakdown of organic pollutants takes place, through algae and bacteria without using mechanical means for aeration.
   Aerated Lagoons
   Ponds where biological breakdown takes place through bacteria, using mechanical aeration.
   Polishing Ponds
   Following biological treatment, the wastewater remains in the ponds in order to improve the quality of the effluents.
   Activated Sludge
   Growth of microorganisms that feed on organic matter and reduce organic water pollution.
   The secondary sludge that consists of all of the microorganisms that feed on organic load in the water is used again as an active substance in the process of treating sewage. It forms a bed for active bacteria that multiply

and concomitantly reduce the organic load. This process is therefore called "activated sludge". Water after treatment to reduce the organic load is referred to as effluents or treated water, and is reused.

4. **Tertiary Effluents**

Tertiary effluent treatment is carried out in order to purify secondary effluents, and usually involves sterilization, filtering, flocculation, adsorption, and chemical or other treatments to eliminate suspended solids. Tertiary treatment is usually carried out after biological treatment. Nowadays, however, it is understood that tertiary treatment can be carried out without primary or secondary (biological) treatment. The following is a specific example of tertiary treatment: In the Shafdan wastewater treatment plant, the process of filtering and purifying secondary effluents involves recharging the treated wastewater into ground water, and then pumping it out after it has remained in the ground for an average of 400 days. Concomitantly, biological processes aimed at removing organic matter and physical processes of filtering sand continue to take place. The Meqorot Company recharging project has several important advantages: The relatively long period in the aquifer ensures efficient removal of faecal bacteria, as well as removal of resistant forms of life such as viruses and pathogens. The recharging process enables use of the aquifer rather than surface reservoirs. In this way, the area is utilized to maximum potential and it is possible to prevent loss of water through evaporation. In addition, recharging allows for seasonal and multi-year collection and utilization of water to meet the demands of farmers during various seasons. Another problem that is alleviated by the project is the danger of salinating of the Hof Aquifer. Excessive pumping allows for entry of sea water, which increases the salinity of the aquifer. Recharging prevents this, by blocking the entry of sea water into the aquifer.

5. **Method of Soil Aquifer Treatment (SAT) - only in Shafdan**

After treatment of the activated sludge, the treated wastewater is recharged into the aquifer. Treated wastewater recharged into the aquifer through recharging fields is referred to as Recharged Effluents (RE). The flow of treated water to the aquifer is monitored. The water flows to the point where the water collects underground and continues to be purified. After a certain period (about a year), the water is pumped from drills. This water, known as Reclaimed Water (RW), is used for unlimited agricultural irrigation.

DEFINITIONS AND EXPLANATIONS FOR TABLE 1.17 - PRESENTATION OF THE VARIABLES AND STANDARDS FOR TREATED WASTEWATER

The following variables are presented in Table 1.17, "Amount of Raw Sewage and Quality of Effluents from Treatment Plants, by District and Sub-district":

a. **Geographic location, number of observations, and quantity of sewage**

The quantity of raw sewage is measured in Million Cubic Meters (MCM).

b. **Quality of effluents**

All of the units are in milligrams per liter of water, unless otherwise specified.

BOD (Biochemical Oxygen Demand) refers to the amount of dissolved oxygen consumed by organisms for aerobic decomposition of organic matter. This variable is usually measured at a temperature of 20ºC for five days.

Suspended Solids (measured in mg/l).

Chlorides Indicate the salinity of water. If the water contains a concentration of over 600 mg/L of chlorides, it is considered saline.

The quality of treated wastewater is determined according to chemical and physical parameters.

The Water Law stipulates that any producer of wastewater (i.e., local authorities) must treat it and arrange for remove of the wastewater without emitting hazardous smells or endangering public health. The basic requirements of the Public Health Law are 20/30, i.e., 20 milligrams of Biochemical Oxygen Demand (BOD) per liter, and 30 milligrams of suspended solids per liter. In addition, the Ministry of Health has published the Halperin Commission Report, "Principles for Issuing Permits to Irrigate using Treated Wastewater" (August 1999).

LIMITATIONS OF THE DATA

In 1999, 56 treatment plants were surveyed that use the above-mentioned methods 1-4 to treat wastewater. The CBS combined data from treatment plants where the amount of wastewater per annum was less than 2 million cubic meters. Out of the 56 plants sampled, 20 fell into this category. The largest plants that use advanced technologies were chosen. The fact that some small plants using modern technologies were not included in the sample was not corrected. The researchers estimate that the sample covers about 80% of the raw sewage flowing to modern plants.

The number of observations (n) measured in all of the sewage treatment plants during the course of one year to evaluate quality of effluents ranges from 1 to 3. This small number of observations does not provide a sufficient basis for drawing conclusions or statistical processing. For lack of another source of data on quality of effluents, the table presents estimates that are not statistically significant and the report gives a general picture of the situation. However, the data on **amount of raw sewage** were obtained from a different source, and did not use laboratory measures. For these data, the lack of statistical validity of the estimates is not relevant.

DEFINITIONS AND EXPLANATIONS FOR TABLE 1.18 "YEARLY AMOUNT OF RAW SEWAGE, RECHARGED EFFLUENTS, AND RECLAIMED WATER - "SHAFDAN"

Dan Regional Plant for reclamation of sewage from the Dan Region and recharging urban effluents to ground water

The Dan Region Plant treats wastewater from the Dan Region, which includes some of the localities in the Tel Aviv district, and some localities from the Central district. The large cities that channel raw sewage into the Dan Region Plant are: Tel Aviv, Ramat Gan, Givatayim, Benei Brak, Bat-Yam, Holon (Tel Aviv District), Petah Tiqwa, Rehovot, Rishon LeZiyyon (Central District), and nine smaller localities.

The amount of raw sewage treated at the Dan Region Plant constitutes about 30% of the total amount of sewage treated at all of the plants in Israel.

Table 1.18, "Yearly Amount of Sewage, Effluents, and Reclaimed Water in the Dan Region Reclamation Project" presents a yearly series of amounts of wastewater and effluents per year as of 1970, including an estimate of effluents from polishing ponds.

Since 1975, the Dan Region Reclamation Project has been treating tertiary effluents (TE) by recharging the treated water into ground water.

In 1987, the Mechanical Biological Treatment Plant (MBTP) (phase 2) began operation. As of that year, MBTP has also channeled excess sludge from the MBTP plant to the sea (DE-MBTP). The table presents the amounts of recharge effluents (RE) as well as amounts of Reclaimed Water (RW). Since mid 1999 Shafdan has not used oxidation ponds.

DEFINITIONS AND EXPLANATIONS FOR THE DAN REGION RECLAMATION PROJECT

The ratio of amount of Reclaimed Water (RW) to the amounts of Raw Sewage (RS) was calculated in percents. A percentage exceeding 100% meant that the amount of water pumped was greater than the amount of water recharged from the aquifer.

Estimates of the Amount of Sewage in the Country

The wastewater treatment plants include only treatment plants that use modern technology to treat 221.5 million cubic meters of wastewater in 1999.

In 1999, the Shafdan project treated 115.4 million cubic meters of wastewater.

The Ministry of the Environment (Department of Water and Streams) estimates that about 15 million cubic meters of wastewater is treated in Septic tanks, and about 76 million cubic meters are channeled into the sea and streams (about 42 million cubic meters of that sewage are channeled to the streams).

The national estimate available to the CBS is provided by the Water Commission and the Ministry of the Environment (i.e., 405 million cubic meters).

The total amount of sewage treated in treatment plants, the Shafdan Project, and septic tanks or channeled into the sea and streams is 428 million cubic meters.

SOURCES OF DATA

The data on quality of effluents in treatment plants throughout the country were obtained from the Natural Reserves and National Parks Authority, which implements the survey for the Ministry of the Environment and the Water Commission.

Data on amounts of raw sewage for the 56 treatment plants sampled in the survey were obtained directly from the Ministry of the Environment.

The data presented in the tables on the quantity of wastewater and effluents in the Dan Region Reclamation Project were obtained from the Shafdan treatment plant (operated by the Meqorot Company).

Analysis, processing, and preparation of material for publication was carried out by the Central Bureau of Statistics, Department for Environmental Statistics.

STREAM WATER

(Table 1.19)

This section presents data on 10 major streams in Israel, based on the decision of the Nature Reserves Authority as well as data on the Yarqon River provided by the Yarqon River Authority (a total of 11 rivers).

The table refers to the chemical and biological quality of the stream water based on measurements taken by the Nature Reserves Authority and the Yarqon River Authority.

To date there is no broad-based standard for assessing the quality of stream water. Every stream has its own conditions - both in terms of water flowing to the stream (e.g., treated effluents, untreated waste water, sea water, etc.), as well as in terms of the stream's sources (e.g., natural springs, affluence of water), and in terms of animal life (e.g., with fish, without fish). Consequently, each stream is discussed separately, without general reference to all streams in Israel.

DEFINITIONS AND EXPLANATIONS

The quality of stream water depends on numerous factors - waste flowing to the stream, pumping from stream sources, erosion from polluted areas, etc. There are two types of measurements: chemical and biological.

Chemical Quality

The chemical quality of stream water is represented by:

Tests providing information on salinity of water and presence of poisons. Electrical conductivity (EC). Values of conductivity exceeding 5 millimho per centimeter indicate saline water. Chloride (Cl) is also a measure of salinity. According to international standards, 250 milligrams of chlorides per liter (mg/l) is the upper limit for fresh water. In Israel, owing to the quality of the water, the standard is higher (upper limit for fresh water is 600 mg/l). Boron (B) is extremely toxic for plants even in low concentrations. Chemical Oxygen Demand (COD) measures the quantities of hydrocarbons in water (including those that are not easily dissolved). These substances serve as good indicators of the impact of wastewater and pollution on stream water.

Biological Quality

In order to obtain a complete picture of the state of the streams, biological measures are also necessary. Today, biological indicators are not tested, although the outcomes of biological activity are assessed by measures of Biochemical Oxygen Demand (BOD).

Biochemical Oxygen Demand is important because of the conditions that accompany it, i.e., increased consumption of oxygen as a result of a high organic load and of a large amount of nutrients in the water. A high bioproduction can cause temporary or permanent lack of oxygen (anaerobic conditions). An example of temporary anaerobic conditions is growth of algae, which causes intensified production of oxygen during the day and intensified oxygen demand during the night.

The oxygen condition in the stream is measured by the oxygen saturation of water. This measurement indicates the percent of saturation (in relation to temperature and elevation above sea level) of the stream. Excess oxygen is indicative of intensified photosynthetic activity (numerous algae) which is caused by an excess of organic material in the water (deriving from sources such as wastewater and organic fertilizers). Lack of oxygen may indicate excessive utilization of oxygen by bacteria due to water pollution. Oxygen saturation of less than 20% causes respiratory problems for fish.

General Quality

Other parameters for measuring general water quality, which are not chemical or biological are physical or calculated measurements. These measurements include Total Suspended Solids (TSS) which derive from various sources such as wastewater, industrial activity, or natural sources (soil erosion, etc.). An example of a calculated measurement is the "mark" (for a detailed explanation, see the section on "Quality Indicators" below).

Quality Indicators

In order to evaluate the general quality of the water, a calculated measure was designed using a scale of marks for ranking the quality of the water, based on the biochemical oxygen demand (BOD) in milligrams of oxygen per liter (mg/l).

BOD Values (mg/l)	Type of water	Representative Mark
BOD≤5	Natural water	1
5<BOD≤20	Water enriched by organic material	2
20<BOD≤150	Polluted water	3
BOD>150	Untreated sewage	4

Another measure of water salinity is based on the variable of chloride (Cl) concentration, measured in milligrams of chloride per liter (mg/l).

Cl VALUE (mg/L)	Description of Water
Cl≤600	Fresh Water
600<Cl≤4000	Brackish Water
Cl>4000	Saline Water

LIMITATIONS OF THE DATA

1. The data do not cover all of the streams, but only apply to 11 major rivers selected by the Nature Reserves Authority and the Yarqon River Authority. Regarding other streams that do not appear in the table, complete data are available at the Central Bureau of Statistics, including comparative data with other countries.
2. The data do not cover all of the pollutants or all of the tests conducted in the field. Thus, the most representative data were selected in terms of their impact on plant and animal life in the stream. This information can serve as an

indicator of the general state of the stream. Additional measures and results of other tests are available at the Central Bureau of Statistics.

3. Some of the stations along the stream were sampled only once a year. Hence the minimum and maximum measurements are equal.
4. The Nature Reserves and National Parks Authority and the Yarqon River Authority do not always examine the same parameters (in Israel, there are no regulations stipulating which parameters must be examined). Therefore, some parameters may be missing in some of the streams.
5. Not all of the stations along the stream are presented in the table (e.g., there are 21 stations on the Yarqon, while only 8 are reported in the table).

Variables in the table:

Y, X - Coordinates of monitoring stations

N - Number of repeated measurements at a monitoring station (per year)

EC - Electrical Conductivity, measured in milli-mho units per centimeter (mmho/cm), where the mho is the inverse of the ohm (mho=Ω^{-1}),

BOD - Biochemical Oxygen Demand from biological activity, measured by the breakdown of organic material by bacteria, in units of milligram of oxygen per liter (mg/l).

COD - Chemical Oxygen Demand measured by the consumption of oxygen from chemical activity by intensive breakdown and oxidation at high temperatures, measured in milligrams of oxygen per liter (mg/l).

Cl - Concentration of chlorides in the water, measured in milligrams of chloride per liter (mg/l).

B - Concentration of boron in water, measured in milligrams of boron per liter (mg/l).

TSS - Total Suspended Solids, measured in milligrams per liter (mg/l).

Saturation - indicates the saturation percent of oxygen in the water. It is calculated as the value of saturated oxygen measured in mg/l divided by the level of solubility, taking into account the temperature and the height.

Mark - A mark given by the researchers, representing the state of the water. The mark is based on BOD values.

For every chemical and biological measurement, the table indicates minimum values (MIN) and maximum values (MAX), as well as the coefficient of variation (CV) and the median for repeated measurements at the monitoring station.

The Life Sciences Institute at the Tel-Aviv University provided professional assistance and support for construction of the measures and the table.

DATA SOURCES

The quality of stream water is monitored regularly by the Nature Reserves Authority. Streams are sampled at several stations along their bank. The Yarqon River Authority monitors the quality of the Yarqon river water in the same way. The data processing and statistical analyses were conducted by the Central Bureau of Statistics, Division of Environmental Statistics.

GLOBAL RADIATION AND DURATION OF SUNSHINE

(Table 1.20)

DEFINITIONS AND EXPLANATIONS

Global radiation is short-wave radiation of the sun, both direct and dispersed, on a horizontal plane from a spatial angle of 2π radians. This component of radiation is measured by an Eppley Precision Spectral Pyranometer model PSP. (The unit of measurement is mega joule per square meter per day (Mjm^{-2} day^{-1}).

Duration of sunshine is measured by a Campbell-Stokes Sunshine Recorder.

The unit of measurement is hours, minutes and days.

SOURCE OF DATA

The Meteorological Service prepares the data on radiation and sunshine. Some stations have measured radiation as of 1965, and others began measurements only in 1990.

Global radiation is measured at four stations: Jerusalem (Giv'at Ram), Bet Dagan, Be'er Sheva, and Elat. Sunshine is measured at two stations: Bet Dagan and Jerusalem (Atarot).

For geographical locations and elevations above sea level of stations, see the section on “Climate” above.

LIMITATIONS OF THE DATA

The average duration of sunshine from 1997 and on at Bet Dagan and Jerusalem was calculated on the basis of daily data rather than hourly data. The same applies to duration of sunshine in Jerusalem in 1996.

WASTE

(Table 1.21)

SOLID HOUSEHOLD WASTE (WET AND DRY, NOT SEPARATED)

Definition

Household waste includes dry and wet waste, commercial waste, and shavings collected in 263 local authorities (municipalities, local councils, and regional councils) without separation of components.

Imputation of waste quantities for sites in which waste was not weighed: 263 observations of solid household waste (wet and dry) were obtained in cities, local councils, and regional councils. In 110 local authorities collected waste was not weighed and statistical imputation was carried out (41% of the local authorities were imputed).

In Jerusalem and Haifa, quantities of waste were estimated until 1998, inclusive, according to an evaluation based on the general waste quantities in other large cities. In 1999, quantities of waste in Jerusalem and Haifa were weighed on a partial basis. The weighing method was also changed in the Tel Aviv district in 1999.

The statistically imputed variable is kilograms of waste per person, per day. In local authorities, where the value of kilograms of waste per person per day is imputed, an estimate is calculated (according to the total number of persons in the local authority) for the general waste quantity and for tons of waste per day. After imputations were carried out for local authorities that did not weigh waste, the variables were grouped into districts and sub-districts.

Statistical imputation carried out according to the Hot-Deck system takes the value of kilograms per person from a local authority in the same district, where weights are available. In each district the authorities were classified according to type of locality and number of persons in each local authority. The imputation takes from the appropriate district the “nearest neighbour to the missing value”, according to type of locality and number of residents. Information on the depth of the imputation (number of imputed observations in each sub-district) was added to the table.

Components of Domestic Waste

Presently, waste is not separated at most sites. The following components of waste have been found: 32% paper and cardboard, 19% organic matter, 36% plastics, 2% glass, 1.17% iron metals, 2.39% non-iron metals, and 7% miscellaneous.

In Israel, there are 35 sites for collection of household waste, of which only 28 have been approved in Regional Outline Plan 16. About 20 are active and the rest are inactive. The inactive sites were either filled to capacity or closed due to faulty operation, or still at the stages of construction.

Currently, only two sites separate and recycle waste in a moving belt system. From this separation, about 30% turn into compost. The estimate of total national recycling (given by the Ministry of the Environment) is about 10%.

The size of the approved area (in Regional Outline Plan 16) is about 12,000 dunam. Only about half of the area is actively operating as waste sites.

Seven sites, which absorb about 6,000 tons of household waste per day, are slated to be closed. According to the current estimate, there is a shortage of secured landfill amounting to about 4,000 tons per day. Consequently, excess waste is transferred to “unauthorized sites” which operate on the basis of a temporary permit.

SOURCES OF DATA

Data on quantities of waste in local authorities by months were obtained from the Ministry of the Environment, the Department of Solid Waste. The data were processed and imputed at the Central Bureau of Statistics, Division of Environmental Statistics.

HAZARDOUS WASTE DELIVERED FOR TREATMENT TO THE RAMAT HOVAV SITE, BY METHOD OF TREATMENT AND TYPE OF MATERIAL

(Table 1.22)

DEFINITIONS AND EXPLANATIONS

Improperly treated hazardous waste is a source of concern for those dealing with preservation of the environment and natural resources (aquifers, streams, lakes, oceans, air, and land).

Hazardous Waste:

1. Hazardous waste is characterized by quantities, concentrations, and physical or chemical properties that may cause or contribute significantly toward increased death-rates, disease, or any other short-term or long-term (irreversible) damage to the health of individuals or the environment if it is not treated, stored, disposed of, or moved in an appropriate way.
2. Hazardous waste is any type of material that contains a hazardous substance (based on documented regulations) with a UN

identification number, or a substance which belongs to one of the risk groups according to the Orange Book of the United Nations.

Reuse**:** Hazardous waste that does not undergo a chemical or physical process and is used again in its existing form.

Reclamation and Recycling**:** Hazardous waste that undergoes a chemical and/or physical process that changes its form so that it can be used again.

Treatment outside of Ramat Hovav**:** Hazardous waste that has been granted a special permit by the Ministry of the Environment for treatment in a different process (in a plant or elsewhere) outside of Ramat Hovav.

Methods of Treating Hazardous Waste at the Ramat Hovav Site**:**

Neutralization**:** A treatment process based on neutralizing acids with an appropriate alkaline, and vice versa.

Detoxification: Processes aimed at eliminating or reducing the toxic content of inorganic waste including oxidation, hydrogenation, neutralization, and sedimentation of toxic insoluble salts.

In both the above methods the generated waste, after treatment, flows into evaporation ponds.

Secured Landfill: Solid, inorganic, and non-evaporable materials are buried in a secured landfill. The landfill is impermeable, like the evaporation ponds used for neutralization and detoxification in accordance with the regulations of the American EPA.

Incineration: A thermal decomposition of organic waste. This is the accepted and most efficient method of neutralizing hazardous organic waste. The incineration process prevents emission of toxic gases to the atmosphere since purification systems are an integral part of the mechanism.

Other Treatments: The main treatment in this category is solidification. This type of treatment converts hazardous waste into an inert solid (insoluble and chemically inactive).

Provisions for Treatment of Waste

Treatment of hazardous waste is established in the *"Regulations for Licensing of Businesses,"* (removal of hazardous substances waste) - 1990". The regulations stipulate the following:

(a) "The owner of an enterprise shall remove all waste that originates or exists in the plant. This shall be done as early as possible - no later than six months after the date it is produced. The waste shall be brought to the site for neutralization and treatment of industrial waste and waste of hazardous substances at Ramat Hovav (hereinafter - the toxic waste site). It shall be packed and transported in accordance with legal regulations and subject to the instructions of the authorities.

(b) An enterprise owner shall not remove the waste from his plant by himself and shall refuse to allow anyone else to remove it by any means or to transport it to any location that is not specified in those regulations - unless removal is for the purpose of recycling, repeated use, or any other purpose - as long as the authorities have given their permission in advance."

The hazardous waste reported in the table refers to the waste brought to the Ramat Hovav site. To date, this site is the only enterprise in Israel that deals, through various methods, with removal of waste that is hazardous to humans and the environment.

The hazardous waste site at Ramat Hovav is not authorized to treat radioactive, explosive, or pathogenic waste (bacteria, viruses, and other microorganisms).

Some of the waste that is not brought to the Ramat Hovav site is recycled or treated at the industrial plants themselves, e.g., recycling hazardous waste for use at other industries that can make secondary use of it; or reclamation, recycling and other treatment outside of Ramat Hovav. All of these procedures must be authorized in advance according to standards (Section b). Data on this activity (outside of Ramat Hovav) for 1999 were provided to the Central Bureau of Statistics by the Center for information on Hazardous Substances at the Ministry of the Environment. The amount of activity aimed at recycling, reclamation, and treatment aimed at reducing the volume and toxicity of hazardous waste that does not reach Ramat Hovav is estimated at 266,000 tons. Of this amount, about half of the waste is channeled for treatment outside of the Ramat Hovav site, one-fourth is channeled for reuse, and one-fourth for reclamation and recycling. In 1999, 530 factories removed hazardous waste to Ramat Hovav (an increase of 30 factories compared with 1998). The amount of hazadardous waste removed for treatment at the site increase increased by 12 thousand tons. Most of the waste is from the Southern District.

LIMITATIONS OF THE DATA AND CLASSIFICATION

1. The hazardous material at Ramat Hovav is classified into 20 permanent categories. In the statistical table, the following were combined: batteries and accumulators; waste water and alkaline; hydrazide waste and cotnion; and PCB and PCB oil.
2. Whenever the raw material data had a "quantity value" indicating "number of units" rather than "tons" (mainly for cytotoxic waste), the conversion factor (from units to tons) which we used is: 1 unit equals 0.128 tons.

SOURCE OF DATA

The raw data were obtained from the Environmental Services Company (Ramat Hovav) Ltd. A breakdown of the amounts of hazardous waste treated outside of Ramat Hovav was obtained from the Ministry of the Environment and is available at the Central Bureau of Statistics. The raw material was processed and analyzed at the Central Bureau of Statistics, The Environmental Division.

LAND USE, FAUNA AND FLORA

(Table 1.23)

WATER FOWL CENSUS

Yearly censuses of water fowl have been carried out in Israel since 1965.

The census, which is part of an international project, is organized by the Nature Reserves and National Parks Authority, and conducted by the staff and numerous volunteers. The Census covers a broad range of water sources in Israel - lakes, reservoirs, natural pools, and artificial pools - on the same date during the Winter season (usually in mid-January). On that day, they count the population of waterfowl. The distribution and density of the fowl are indicative of the state of the water sources in Israel and their spatial distribution.

The data are processed and analyzed every year by the Nature Reserves and National Parks Authority. The Statistical Abstract of the Central Bureau of Statistics presents the results of the censuses, by zoo-geographical regions.

DEFINITIONS AND EXPLANATIONS

Water Fowl: Fowl that live in or around a water source. These fowl consist of groups including ducks, herons, pelicans, etc. These fowl live in water, by trapping fish, by sifting the water and removing microorganisms, or by finding plants or animals around the water source.

LIMITATIONS OF THE DATA

The census counts fowl from all water of the known land water sources, except those that are inaccessible at the time the count is taken.

SOURCES OF THE DATA

The information on water fowl is sent to the Central Bureau of Statistics by the Nature Reserves and National Parks Authority. It was prepared for publication by the Central Bureau of Statistics, Division of Environmental Statistics.

FOREST AREA, BY SPECIES

See the table in the chapter on "Agriculture".

SELECTED PUBLICATIONS

TECHNICAL PUBLICATIONS

70 List of Localities, Their Population and Codes 31 XII 1998

CURRENT BRIEFINGS IN STATISTICS

35, 1996 Survey of Waste Water, 1994

37, 1997 Expenditure on Public Services for Environmental Protection, 1993