EGYPTIAN ENVIRONMENTAL POLICY PROGRAM MONITORING SYSTEM: DRAFT PROTOTYPE WORKING INDICATORS

1. INTRODUCTION TO THE INDICATORS SYSTEM

The EEPP Monitoring System is designed to provide information useful in understanding and assessing the Egyptian Environmental Policy Program. It focuses on the areas in which the program is already working to help the Government of Egypt improve its environmental management capability, and in areas in which the program is likely to become more active in the coming years.

ABOUT EEPP AND RELATED USAID ENVIRONMENTAL WORK

EEPP is now wokring in four general areas: solid waste, air quality, energy, and Red Sea conservation and tourism. In addition, ongoing AID work on water resources management in agriculture is to be folded within EEPP in 2002.

Solid Waste Management: EEPP is working with three governorates on the privatization of solid waste management, as a strategy for improving trash collection and handling and reducing the environmental risks posed by current trash management systems. The work focuses on implementing more effective contracting systems for trash management than those now in place, in that standards and requirements are explicit and contractors can be held to them. The project is working with the governorates of Alexandria, Cairo and Kalyubia. The hope is that these will serve as a model to help other governorates put in place more effective private sector contracts as well.

Air Quality: Through the Cairo Air Improvement Project and portions of the EEPP energy project, EEPP is helping the Egyptian government to strengthen its air pollution control system. Specific components of the program are working with the government to issue revised ambient and emissions standards, initiate the procurement of CNG buses, close the lead smelters in Shoubra El Kheima and clean up the toxic wastes left behind.

Energy: EEPP is working with the ministries of Petroleum and Electricity on energy efficiency and reduced greenhouse gas emissions. They are doing this through energy policy reform designed to encourage switches from petroleum products to less expensive and cleaner natural gas.

Red Sea Tourism: EEPP is working with the Tourism Development Authority and private tourism companies to instill more sustainable practices in the growing tourist industry in the southern portion of the Red Sea coast. Among the new practices being introduced are improved practices for management of water and waste water, better preparation and review of environmental impact assessments, better land use planning, and green marketing.

Agriculture and Water Resources Management: The Agriculture Policy Reform Program is working on a wide range of issues. Among them is a component focused on management of irrigation water, through which AID is supporting the establishment of user groups that will manage and finance the maintenance of their own irrigation infrastructure. AID is also beginning the conceptualization of a new water resources management program, which will be a direct component of EEPP or its successor.

Scope of the Indicators System

The Indicators System covers a limited set of environmental issues that provide the context for understanding the EEPP activities:

- Population
- Solid and hazardous waste
- Local and global air pollution
- Energy consumption
- Biodiversity conservation , protected areas and tourism, with particular emphasis on the Red Sea
- Water resources management
- Commitment to Environmental Protection

Within these areas, the indicators in the system are of several types. Some are specifically designed to monitor EEPP activities, and are narrowly focused on accomplishment of the tasks set out in the program. Others are directed more broadly at tracking the policy objectives of the different components of EEPP. These shed light on how well the objectives of the program are being met, rather than on whether the activities are being carried out as planned. A third set of indicators complements the previous two by providing data on broad trends in environmental quality and management in the areas in which EEPP is working. Finally, the indicators related to water resources management, address broad environmental trends in areas where EEPP expects to become active in the future.

2. Background Data

Information about several general issues is crucial to understanding environmental trends and placing them in context. This section presents background data and indicators in a few such areas, notably population, geography, and the interplay between the two.

2.1 Urban and Rural Population

Rationale:

The ultimate cause of all environmental problems is people. As our numbers grow, if our production and consumption patterns do not change, we will gradually overuse the resources available to us and overstress their ability to absorb our wastes. For this reason, population is crucial to the interpretation of virtually all statistics about social, environmental, or economic trends.

Measurement:

CAPMAS, the Central Agency for Public Mobilization and Statistics, is the official national organization responsible for censuses of population and other demographic surveys. Censuses were conducted in 1960, 1976, 1986, and 1996, and population data extrapolated to obtain intercensal estimates.

Data:

Population by governorate and by urban and rural, from 1996 Census

Governorate	Total Population	% urban	Urban Population	% rural	Rural Population
URBAN GOVERNORATES					
Cairo	6,800,992	100.0%	6,800,992	0.0%	

Alexandria	3,339,076	100.0%	3,339,076	0.0%	
Port-Said	472,335	100.0%	472,335	0.0%	
Suez	417,527	100.0%	417,527	0.0%	
Sub-total	**11,029,930**	100.0%	**11,029,930**	0.0%	**0**
LOWER EGYPT					
Damietta	913,555	27.4%	250,578	72.6%	662,977
Dakahlia	4,223,919	27.8%	1,174,466	72.2%	3,049,453
Sharkia	4,281,068	22.5%	964,731	77.5%	3,316,337
Kalyoubia	3,301,244	40.6%	1,340,815	59.4%	1,960,429
Kafr El-Sheikh	2,223,659	22.9%	509,790	77.1%	1,713,869
Gharbia	3,406,020	31.1%	1,058,615	68.9%	2,347,405
Menoufia	2,760,431	19.9%	548,013	80.1%	2,212,418
Behera	3,994,297	22.8%	910,276	77.2%	3,084,021
Ismailia	714,828	50.3%	359,645	49.7%	355,183
Sub-total	**25,819,021**	27.6%	**7,116,929**	72.4%	**18,702,092**
UPPER EGYPT					
Giza	4,784,099	54.1%	2,589,807	45.9%	2,194,292
Beni-Suef	1,859,214	23.5%	437,671	76.5%	1,421,543
Fayoum	1,989,774	22.5%	446,773	77.5%	1,543,001
Menia	3,310,129	19.4%	643,059	80.6%	2,667,070
Asyout	2,802,334	27.3%	764,206	72.7%	2,038,128
Suhag	3,123,115	21.7%	678,657	78.3%	2,444,458
Quena	2,442,016	21.2%	517,649	78.8%	1,924,367
Aswan	974,068	42.6%	415,130	57.4%	558,938
Luxor	361,138	46.1%	166,308	53.9%	194,830
Sub-total	**21,645,887**	30.8%	**6,659,260**	69.2%	**14,986,627**
FRONTIER GOVERNORATES					
Red Sea	157,315	74.7%	117,499	25.3%	39,816
El-Wadi El-Gedid	141,774	48.3%	68,408	51.7%	73,366
Matrouh	212,001	55.5%	117,762	44.5%	94,239
North Sinai	252,160	59.1%	149,147	40.9%	103,013
South Sinai	54,826	50.0%	27,400	50.0%	27,426
Sub-total	**818,076**	58.7%	**480,216**	41.3%	**337,860**
TOTAL (Resident)	**59,312,914**	42.6%	**25,286,335**	57.4%	**34,026,579**

Source: CAPMAS, Table 1-2

2.2 POPULATION GROWTH

RATIONALE:

The historical growth of population is an important determinant of future population growth, and therefore a key issue in anticipating the magnitude of our environmental problems and planning for their management.

MEASUREMENT:

Population growth is calculated from population estimates. Because intercensal population data are estimated, the only empirically verified population growth rates are those between actual census years. However, the intercensal figures are still useful in projecting population into the future.

DATA:

Historical Resident Population Data in Census Years

Year	Total population in 1000s	Annual Growth Rate	% Urban	% Rural
1927	14,178		26.9%	73.1%
1937	15,921	1.16%	28.2%	71.8%

1947	18,967	1.75%	33.5%	66.5%
1960	26,085	2.34%	38.2%	61.8%
1966	30,076	2.52%	40.0%	60.0%
1976	36,626	1.92%	43.8%	56.2%
1986	48,254	2.75%	44.0%	56.0%
1996	59,313	2.08%	43.0%	57.0%

Source: CAPMAS, Table 1-4

2.3 POPULATION ESTIMATES AND PROJECTIONS

RATIONALE:

The last Egyptian census was carried out in 1996. Based on population trends and the age structure of the society, CAPMAS has estimated population through 2001 and made projections into the future. These estimates are an essential part of the context for understanding environmental problems.

MEASUREMENT:

Population estimates and projections are made based on demographic models that take into account current population, recent birth and death rates, and the age structure of the population.

DATA:

These data are available from CAPMAS but have not yet been obtained.

2.4 MORTALITY

RATIONALE:

Information about mortality - particularly causes of death among adults and infant mortality rates - is essential to understanding environmental health issues. Air pollution can be a significant contributing factor in adult mortality, particularly among the elderly, while water pollution can be a significant cause of infant mortality. Moreover, the overall spatial distribution of mortality patterns and causes can help to flag areas with specific environmental health problems that require further investigation and analysis.

MEASUREMENT AND DATA:

These data should be available through CAPMAS, from the 1996 census of population. They have not yet been obtained.

2.5 ACCESS TO SAFE DRINKING WATER

RATIONALE:

Access to safe drinking water is a key aspect of environmental health. Consumption of contaminated water leads to a variety of diseases and can be a major cause of infant mortality from diarrhea. The share of the population with access to safe water is therefore an important indicator of development in general and environmental health in particular. Over the past few decades, Egypt has made a significant commitment to provide drinking water to the entire population, as is shown in the statistics below.

MEASUREMENT:

The Egyptian censuses of the past three decades have asked questions about whether households receive piped drinking water; these are the data provided below. This is not, of course, the same as access to safe drinking water, since although all water is treated, impurities can be introduced in the distribution network. However it does give some sense of the actual safety of the water supply, and certainly shows how that has changed over time.

DATA:

Percent of Population with Access to Piped Water

Governorate	1976	1986	1996
Cairo	91.1	95.7	96.9
Alexandria	94.9	98.9	99.8
Port-Said	90.5	97.2	100.0
Suez	92.9	97.9	99.9
Urban Governorates	92.3	96.7	98.0
Lower Egypt:	69.2	69.7	80.5
Urban areas	80.8	92.2	95.3
Rural areas	65.0	61.2	75.0
Upper Egypt:	60.4	55.2	73.9
Urban Areas	72.4	83.6	93.8
Rural Areas	55.2	42.2	65.1
Frontier Governorates:	47.8	68.9	81.0
Urban areas	63.6	88.6	99.9
Rural areas	28.7	42.5	54.1
Egypt:	70.9	70.0	81.4
urban areas	84.2	92.0	96.2
rural areas	60.6	52.9	70.4

Source: 1976 and 1996 data from *Egypt Human Development Report 1998/99*, Table G.4 p. 148. 1986 data from *Egypt Human Development Report 1995*, Table G.4, p. 118.

2.6 ACCESS TO SANITATION SYSTEM

RATIONALE:

The adequacy of the sanitary sewer system is an important environmental health concern. The problems caused by an inadequate sewage collection and treatment system can take several forms, depending on design of the system. Where sewage is collected but not treated, health risks at the source may be low, but downstream and in receiving water bodies we may expect harm both to the environment and to public health. Where sewage is not even collected, or it flows into inadequately maintained septic tanks, we may expect public health and environmental problems at the source. Thus this issue is of importance both from the perspective of environmental health and from the perspective of downstream ecosystems.

MEASUREMENT:

Data on sewage hookups, collection, and treatment in Egypt are incomplete. The National Organization for Potable Water and Sanitary Drainage, which operates the drinking water and sanitary sewer systems, should have detailed operational data on the capacity of the sewage treatment networks, the number of hookups, and perhaps some estimates of flows and discharges. Less detailed data are accessible from the census of buildings, which identifies the number of buildings connected to the public sewer network, by governorate in urban and rural areas.

DATA:

Buildings connected to public sewer network and households with some form of toilet

	Urban areas - Number of Buildings: (1)		**Rural areas - Number of Buildings: (1)**		**Households with access to toilets (2)**	
Governorate	**connected**	**not**	**connected**	**not**	**urban**	**rural**
URBAN GOVERNORATES						
Cairo					99.9%	
Alexandria					99.8%	
Port-Said					100.0%	
Suez					100.0%	
Sub-total					99.8%	
LOWER EGYPT						
Damietta					100.0%	99.1%
Dakahlia					100.0%	99.0%
Sharkia					99.5%	98.3%
Kalyoubia	**NOTE: full detail by governorate is available from CAPMAS (source below) - the data need to be typed into the "working tables" spreadsheet and transferred here.**				100.0%	97.3%
Kafr El-Sheikh					98.2%	94.1%
Gharbia					99.2%	96.3%
Menoufia					98.8%	97.3%
Behera					98.9%	96.6%
Ismailia					100.0%	100.0%
Sub-total					99.4%	97.5%
UPPER EGYPT						
Giza					99.6%	97.8%
Beni-Suef					97.5%	79.2%
Fayoum					97.3%	75.3%
Menia					97.4%	87.1%
Asyout					96.2%	61.3%
Suhag					92.2%	72.0%
Quena					95.2%	83.2%
Aswan					97.7%	80.8%
Luxor						
Sub-total					97.7%	79.9%
FRONTIER GOVERNORATES						
Red Sea					99.3%	100.0%
El-Wadi El-Gedid					96.7%	100.0%
Matrouh					97.1%	43.6%
North Sinai					99.4%	69.5%
South Sinai					92.1%	84.0%
Sub-total					n/a	n/a
TOTAL	1296543	1114178	537921	5342713	99.2%	89.6%
Percent shares	53.78%	46.22%	9.15%	90.85%		

(1) Data from the 1996 Census of Buildings on the number of buildings connected to the public sewer network in urban and rural areas of each governorate. Source: CAPMAS, Table 7-5.
(2) Data from a 1999 survey of households on the presence in the home of any kind of toilet. Source: Egypt Human Development Report 1998/9, Table G8.

2.7 POPULATION DISTRIBUTION (OR DENSITY)

RATIONALE:

Fairly detailed data on the spatial distribution of population (or population density) are an important source of information, both on their own and when combined with other environmental data. For example, trends in population density close to the Red Sea coast will show the growth in pressure on aquatic resources. Combining population density with ambient air quality would give a clear sense of how many and which people are at risk from elevated air pollution. Tracking changes in these data over time would give information about changes in urban patterns that may affect air and water quality, transportation, wildlife habitat, and many other factors that influence the quality of the environment.

MEASUREMENT:

Population distribution or density is estimated by using the most detailed census data available - for example, by census enumeration district - and dividing them by the area of the district itself. These data should exist within CAPMAS, as they are developed in the process of carrying out the census.

DATA:

The monitoring system has not yet attempted to obtain these data.

2.8 ECOLOGICAL ZONES

RATIONALE:

A detailed map of the ecological zones of Egypt is an important basic source of information about the biodiversity and natural environment, as well as an input into understanding settlement patterns and their impact on environmental quality and wildlife habitat. When used in combination with other data, such as population density or the location of protected areas, it will be useful for the calculation of a range of indicators.

MEASUREMENT:

The location of ecological zones must be determined from scientific research and from analysis of available data on such factors as geography, meteorology, hydrology, and soil types.

DATA:

A source for these data has not yet been identified.

2.9 LAND USE/LAND COVER

A land use/land cover map classifies land areas according to general types of land use - agriculture, forestry, industry, urban settlements, etc. - and by vegetation type where land is not developed. Such a map combines some elements of the population density and ecological zone maps mentioned above. It is a valuable tool for identifying potential environmental problems, anticipating the impacts of new development, and so on.

MEASUREMENT:

Land use/land cover maps are assembled from a combination of sources, although they generally depend heavily on aerial photography and remote sensing.

DATA:

A source for these data has not yet been identified.

3. MUNICIPAL SOLID WASTE

The management of municipal (i.e. household, commercial, and government) waste is a significant problem in Egypt. If inappropriately handled, solid waste can contribute to a number of environmental and health problems. Some household trash is piled in the streets, where it shelters disease-carrying pests ("vectors"), particularly rats, and its combustion is a significant cause of air pollution. Waste is stored in improperly managed dumps, whose leachate can contaminate the groundwater with heavy metals and other pollutants. Spontaneous combustion in the dumps contributes to local air pollution, and methane emissions contribute to global warming.

The broad goal of solid waste management efforts is to handle the trash in safer ways, in order to eliminate all of these problems. This may be done in a number of ways:

- reducing the trash flow (through more recycling within the household),
- effective trash pick-up so that it is not dumped in the streets,
- more recycling or composting of trash that is collected, and
- sanitary landfills or clean incineration of that which cannot be recycled.

Solid waste indicators could shed light on these issues at several levels; the data and indicators below focus on some of these issues:

- Understanding the scope of the problem: how much trash is generated each day, how much trash is piled on the streets?
- Responding to the problem: how much trash is collected, recycled, composted, landfilled, and how? What share does this represent of total trash? Is this improving over time?
- Consequences of the problem: do we see any improvement in pests, disease, groundwater contamination, air pollution?

3.1 TOTAL MUNICIPAL WASTE AND MUNICIPAL WASTE PER CAPITA

RATIONALE:

"Municipal waste" refers to trash produced by households, commercial enterprises, service institutions such as schools and hospitals, government agencies, and litter. The total amount of municipal waste is important information for several reasons. First, to design an effective trash management program, we want to know how much trash must be managed. Second, we will use total trash as a basis for comparison with management indicators, to assess whether we are making progress in addressing the problem. Third, if we aim to reduce trash generated, total waste will be an important indicator of success. Egyptian solid waste management policy is focused on improving management rather than decreasing total flow, so the first and second reasons will apply here but the third will not.

SOURCES AND MEASUREMENT:

No direct data are available on municipal waste flow in Egypt. Estimates have been made of per capita trash generation rates by governorate, distinguishing between urban and rural areas (people in urban areas typically generate more trash than rural dwellers). These estimates were included in the June 2000 draft National Municipal Solid Waste Strategy, without explanation of how they were derived. Those coefficients have been combined with population data form the 1996 census to derive the trash generation estimates in the table below.

Without empirical data on trash production patterns in Egypt, updates of this indicator will necessarily reflect only of changes in urban and rural population. As seen above, in between census years, changes in population data are also estimates. Without additional empirical measurements of trash generation rates, per capita trash figures at the governorate level will not change over time. The average per capita trash figures for the country will change if the balance of urban and rural population changes.

DATA:

1996 PER CAPITA AND TOTAL TRASH BY GOVERNORATE

Governorate	Urban Trash Generation Rates in kg/ capita/day	1996 Urban Population in 1000, from CAPMAS	Annual urban trash, in 1000 tons	Rural Trash Generation Rates in kg/ capita/day	1996 Rural Population in 1000, from CAPMAS	Annual rural trash, in 1000 tons
Cairo	1.2	6,801	2,979			
Giza	0.8	2,590	756	0.35	2,194	280
Kalubeya	0.8	1,341	392	0.35	1,960	250
Greater Cairo Region		**10,627**	**4,127**		**4,155**	**531**
Alexandria	0.8	3,339	975			
Behaira	0.8	910	266	0.35	3,084	394
Matrooh	0.4	118	17	0.2	94	7
Alexandria Region		**3,309**	**1,258**		**3,178**	**401**
Damietta	0.8	251	73	0.35	663	85
Dakahleya	1.3	1,174	557	0.35	3,049	390
Kafr El-Sheikh	0.9	510	167	0.35	1,714	219
Kharbeya	1.05	1,059	406	0.35	2,347	300
Menoufeya	1	548	200	0.35	2,212	283
Delta Region		**3,541**	**1,404**		**9,986**	**1,276**
Port Said	0.65	472	112			
Suez	0.65	418	99			
Ismaileya	0.6	360	79	0.35	355	45
Sharkeya	0.8	965	282	0.35	3,316	424
North Sinai	0.4	149	22	0.2	103	8
South Sinai	0.4	27	4	0.2	27	2
Suez Canal Region		**2,312**	**597**		**3,802**	**479**
Bani Sueif	0.6	438	96	0.25	1,422	130
Fayoum	0.6	447	98	0.25	1,543	141
Menia	0.6	643	141	0.25	2,667	243
N. Upper Egypt Region		**1,594**	**335**		**5,632**	**514**
Assuit	0.6	764	167	0.25	2,038	186
New Valley	0.4	68	10	0.2	73	5
Assuit Region		**832**	**177**		**2,111**	**191**
Sohag	0.6	679	149	0.25	2,444	223
Qena	0.6	518	113	0.25	1,924	176
Luxor	0.6	166	36		195	
Aswan	0.6	415	91	0.25	559	51
Red Sea	0.4	117	17	0.3	40	4
S. Upper Egypt Region		**1,822**	**406**		**5,162**	**454**
TOTAL		**24,037**	**8,304**		**34,027**	**3,845**

Sources: Urban trash generation coefficients from National Municipal Solid Waste Strategy, Draft "obtained June 2000" [*sic*], Table 2.1. Rural trash generation coefficients from same source, Table 2.2. Urban and rural population data from CAPMAS, Table 1-5. Subtotals, totals, and annual figures calculated based on those data.

FUTURE WORK:

Before spring 2002, the indicators team should determine the source of the trash generation coefficients and evaluate how accurate they might be. If it is possible to refine or update them, this should be done. With these or refined coefficients, trash generation figures should be recalculated with the most current population data available.

3.2 TRASH ACCUMULATION IN STREETS

RATIONALE:

The accumulation of trash in unmanaged heaps on urban streets poses major risks to health and air quality, as well as making the urban environment unpleasant for those who must live or work nearby. The SWMS provides some estimates of the magnitude of this accumulated trash, and sets as a goal to clean it up and prevent its recurrence. Regular monitoring of the existence of such trash piles would provide a clear indicator of the success of the government's urban trash management schemes.

MEASUREMENT:

The available data on accumulated trash are provided in the Solid Waste Management Strategy; neither source nor explanation for how these data were developed is provided.

DATA:

WASTE ACCUMULATION OUTSIDE OF DUMPS

Governorate	Waste in m3
Cairo	2,236,500
Giza	447,050
Kalubeya	504,395
Greater Cairo Region	**3,187,945**
Alexandria	344,830
Behaira	
Matrooh	
Alexandria Region	**344,830**
Damietta	
Dakahleya	921,820
Kafr El-Sheikh	
Kharbeya	1,235,000
Menoufeya	
Delta Region	**2,156,820**
Port Said	
Suez	1,219,550
Ismaileya	
Sharkeya	
North Sinai	
South Sinai	512,000
Suez Canal Region	**1,731,550**
Bani Sueif	
Fayoum	
Menia	952,081
N. Upper Egypt Region	**3,195,631**
Assuit	
New Valley	
Assuit Region	
Sohag	
Qena	
Luxor	107,022

Aswan	259,512
Red Sea	386,351
S. Upper Egypt Region	**752,885**
TOTAL	**11,369,661**

Source: Solid Waste Management Strategy, Table XXXXX, p. XXX, quoting Urgent Plan, Interministerial Committee for Solid Waste Management, Technical Secretariat, 1999.

FUTURE WORK:

Prior to spring 2002, the indicators team should determine how these data were obtained and whether updates are possible.

3.3 SOLID WASTE ACCUMULATION IN SPECIFIC DISTRICTS OF CAIRO, QALYUBIA AND ALEXANDRIA

RATIONALE:

The solid waste component of EEPP is working with the governorates of Cairo, Qalyubia and Alexandria to improve private contracting for solid waste management. One aim of this effort is to prevent the accumulation of trash in uncontrolled piles on city streets. Tracking the quantities of street trash on a regular basis in these specific areas will therefore be important to assess effectiveness of the program.

MEASUREMENT:

The volume of street trash would be estimated based on visual surveys.

DATA:

These data are not currently available; a dedicated data collection system would have to be established to track this indicator.

FUTURE WORK:

Prior to spring 2002, the indicators team should investigate the monitoring units which are to be established in the pilot governorates to track compliance with the terms of the new trash collection contracts, to determine what data they will collect. The indicators team, in collaboration with these monitoring units if appropriate, should develop the specifications of a system to collect such data on a routine basis.

3.4 COLLECTION AND DISPOSAL OF SOLID WASTE

RATIONALE:

To assess whether we are making headway on the problems caused by solid waste, we must track how much trash we collect and how we dispose of it.

MEASUREMENT:

The Solid Waste Management Strategy provides estimates of trash collection efficiency for a few governorates, although it does not explain how these were developed. The table below provides those coefficients, and calculates the corresponding quantities collected by those governorates, based on the sum of rural and urban trash generation from the table above. The nationwide average efficiency is calculated as the total amount collected by the total amount generated in rural and urban areas. This should be an underestimate, since no collection efficiency estimates at all are available for many governorates.

At present no data are believed to be available on the disposal of solid waste after collection.

DATA:

COLLECTION OF SOLID WASTE		
Governorate	**Governorate Collection Efficiencies**	**Quantity Collected Annually in 1000 tons**
Cairo	0.625	1,861.8
Giza	0.64	663.4
Kalubeya	0.5	321.0
Greater Cairo Region		**2,846.1**
Alexandria	0.77	750.8
Behaira		
Matrooh		
Alexandria Region		**750.8**
Damietta		
Dakahleya		
Kafr El-Sheikh		
Kharbeya	0.5	352.8
Menoufeya		
Delta Region		**352.8**
Port Said		
Suez		
Ismaileya		
Sharkeya		
North Sinai		
South Sinai	0.333	2.0
Suez Canal Region		**2.0**
Bani Sueif		
Fayoum		
Menia		
N. Upper Egypt Region		**0**
Assuit		
New Valley		
Assuit Region		**0.0**
Sohag		
Qena		
Luxor	0.45	16.4
Aswan	0.41	37.3
Red Sea	0.525	9.0
S. Upper Egypt Region		**62.7**
TOTAL	**0.33**	**4,014.4**

Sources: Collection efficiencies from Solid Waste Management Strategy, Table 2.2, p. 25-26, quoting Urgent Plan, Interministerial Committee for Solid Waste Management, Technical Secretariat, 1999. Quantities collected calculated based on collection efficiencies and total (rural plus urban) trash generation from table above. Total collection efficiency calculated based on total quantity collected divided by total (rural plus urban) trash generated.

FUTURE WORK:

Prior to spring 2002, the indicators team should identify the source of the collection efficiency coefficients and assess their reliability. It should also investigate any possible sources of information on the disposal of solid waste.

3.5 TRASH COLLECTION BY DISTRICT WITHIN THE CAIRO, QALYUBIA, AND ALEXANDRIA GOVERNORATES

RATIONALE:

The privatization of trash collection in these three governorates is expected to improve trash collection rates. To determine whether this expectation is met, the monitoring system should begin tracking trash collection rates in those areas as soon as possible. It should also track trash collection rates in comparable areas that are not part of the EEPP pilot activity, e.g. in the three Cairo zones that are not covered by the project. The aim is to build both time series and cross-sectional data with which to assess the effectiveness of the AID program.

MEASUREMENT:

Actual trash collection rates will probably have to be assessed using routine sample surveys in the neighborhoods concerned. These will have to be updated on a regular basis to assess impact of the program.

DATA:

These data are not currently available, so specialized data collection will be needed for this component of the monitoring program. Some of this data work may be done through the monitoring units to be established in the three target governorates through EEPP.

3.6 TRASH COMPOSITION

RATIONALE:

Information on the composition of solid waste is important in order to design effective systems for disposing of it. For example, organic waste can effectively be composted, whereas packaging may be recycled and agricultural waste can sometimes be burned for energy. Information about the composition of waste will therefore be valuable in designing appropriate waste handling systems for each city or governorate.

MEASUREMENT:

Waste composition would be determined by sample surveys.

DATA:

To our knowledge, no such data are currently available; specialized data collection would be needed in order to obtain this information.

4. HAZARDOUS WASTE

Hazardous waste management is receiving increasing attention as a significant problem in Egypt. At present, no environmentally sound systems exist for disposal of hazardous wastes, and they are regularly deposited in dumps, left on the streets, or disposed of in the canals of the Delta along with other solid waste. To begin managing this problem, Law 4 of 1994 requires permits for use of hazardous substances and for disposal or export of the resulting wastes, and bans imports of hazardous wastes. However, the systems to implement this portion of the law have largely not yet been established. Government agencies are still working on identifying lists of hazardous products used in their sectors or hazardous wastes that must be disposed of, and most permitting systems are not yet in place.

4.1 USE OF HAZARDOUS SUBSTANCES

RATIONALE:

Information about the use of hazardous substances is important both to plan for disposal and to anticipate possible health or environmental disasters related to accidental releases.

MEASUREMENT:

If permits will be required for the use of hazardous materials, then this information should be tracked from the permits. For emergency management purposes it should be available at the plant level and should be linked to spatial location of the plants.

DATA:

These data are not currently accessible. As systems are put into place (including with EEPP support), these monitoring data should be tracked and made available. The indicators team should collaborate with EEPP units working on use of hazardous substances to ensure that EEAA establishes appropriate monitoring systems and makes the data available to MVE.

4.2 HAZARDOUS WASTE DISPOSAL

RATIONALE:

Routine disposal of hazardous waste is at present a significant and totally uncontrolled problem in Egypt. Information about disposal is important in order to track whether these wastes are being handled properly, identify polluted areas, and enforce Law 4.

MEASUREMENT:

Under Law 4, permitting systems for disposal of hazardous waste are to be established. The data from these permits should be tracked to obtain information about what is supposed to happen. In addition, data from the enforcement of the permits should be tracked to ensure compliance with the terms of the permits.

DATA:

None of these data are now available. As the permit system is implemented, these monitoring data should be tracked and made available. The indicators team should collaborate with EEPP units working on disposal of hazardous wastes to ensure that EEAA establishes appropriate monitoring systems and makes the data available to MVE.

5. AIR POLLUTION

5.1 POLLUTANT EMISSIONS

RATIONALE:

Tracking emissions of key air pollutants is fundamental to developing and monitoring an effective air pollution control system. In order to target pollution reduction efforts and evaluate their effectiveness, it is essential to have ongoing data about who is emitting how much of which pollutants. Such data are also necessary if the country hopes to use any kind of financial instruments to manage pollutant emissions, or wishes to analyze the economic impacts of more stringent air pollution emissions limits.

MEASUREMENT AND DATA:

Unfortunately, no emissions data are currently available in Egypt. For future editions of the indicators report, probably after spring 2002, the indicators team should investigate the possibility of developing emissions estimates based on technical data about Egyptian industry and vehicles and emissions coefficients from other comparable countries. With such data, it would also be possible to make initial estimates about the costs that emissions reductions would impose on different parts of the economy. This is a standard way to obtain initial emissions estimates for policy purposes, and has been used in many other countries.

5.2 STATIONARY SOURCE LEAD EMISSIONS IN CAIRO AREA

RATIONALE:

Reduction of lead emissions from lead smelting emissions in Shoubra El Kheima is one of the policy objectives of EEPP. The work discussed above to develop pollutant emissions data should therefore begin with this sector and pollutant, so that the effectiveness of EEPP activities can be tracked.

MEASUREMENT:

Estimation of lead emissions would be done based on a detailed survey of the existing pollution sources, to determine the technology used and level of activity. Once emissions coefficients were developed for the relevant plants, emissions estimates could be updated regularly based only on level of activity.

DATA:

Some baseline data may be available from studies done at the start of CAIP; however these are not yet available to the monitoring system.

FUTURE WORK:

Prior to spring 2002, any available baseline studies should be obtained and assessed, and data included in the monitoring system. After spring 2002, more detailed work should be undertaken to regularly update the emissions estimates.

5.3 MOBILE SOURCE EMISSIONS IN CAIRO AREA

RATIONALE:

Reducing mobile source emissions in the Cairo area, particularly from buses, is a policy objective of EEPP. In order to assess effectiveness of the program and to understand the context in which it is working, it is important to track total mobile source emissions and more specifically emissions from buses. These can then be compared with the number of CNG buses in the municipal fleet, and thus the emissions prevented through use of the new buses.

MEASUREMENT:

Mobile source emissions are estimated by combining known information about the type of vehicle, the fuel it uses, and the quantity of fuel burned or miles traveled. These types of data are available and are being used to estimate mobile source greenhouse gas emissions, so it should be possible to do the same for other mobile source pollutants. Standard emission coefficients used widely throughout the world are available from USEPA.

DATA:

These data are not yet available; the work to estimate them should be undertaken through the monitoring system.

5.4 AMBIENT AIR QUALITY

RATIONALE:

The ultimate goal of air pollution control is to improve ambient air quality, so monitoring it is obviously essential.

MEASUREMENT:

Air quality is being monitored at 39 sites in the Cairo area and 42 sites dispersed around the rest of the country, through systems established, respectively, by the Cairo Air Improvement Program (CAIP) and the Environmental Information Monitoring Program (EIMP). Regular reports provide monthly, quarterly, and annual updates on air quality and discuss factors that explain extreme incidents or other changes over time.

Simplifying these data into a manageable set of indicators requires some choice, as the amount of data available is substantial. Moreover, some apparently simple aggregations are not possible. It is not meaningful to add data about different pollutants, since each has different causes and consequences, so they must be tracked separately. It is also not meaningful to add observations from different parts of the country, as air pollution is a local phenomenon and it is essential to know where it occurs.

Three simplifying indicators would give a quick snapshot of how well the country is doing in its efforts to control air pollution:

- The percent of observations on each pollutant at each location that exceed the applicable standards over the course of the year.
- The amount by which applicable standards are exceeded. This could be indicated by providing the mean and standard deviation of the observations for each location over the course of the year.
- The spatial location of sites where air quality measurements exceed the standards.

These three measures offer a fairly simple overview of the magnitude of the problem, without combining items that cannot be aggregated. Time series data on these indicators, particularly on the first two, will show whether the country is making headway in dealing with the problem.

DATA:

The standards to be achieved with respect to air quality are established by the regulations promulgated under Law 4 of 1994, and shown in the table below.

AMBIENT AIR QUALITY STANDARDS		
Pollutant	**Standard in ug/m3**	**Time period**
Sulfur Dioxide SO2	350 150 60	1 hr 24 hours annual
Carbon Monoxide CO	30 10	1 hour 8 hours
Nitrogen Dioxide NO2	400 150	1 hour 24 hours
Ozone O3	200 120	1 hour 8 hours
Black Smoke	150 50	24 hours annual
Total Suspended Particulates	230 90	24 hours annual
Suspended Partiuclates - PM10	70	24 hours
Lead	1	annual

Unfortunately, the EIMP published reports do not provide the actual air quality measurement data. They do provide some summaries, data on the highest observed levels, and valuable information on unexpected spikes or other anomalies in air quality. However, the full underlying data set is required in order to calculate the three indicators suggested above, so this can not be done until the data are obtained.

FUTURE WORK:

Prior to spring 2002, the indicators team should work with EEAA to obtain the air quality data so as to calculate the desired indicators.

5.5 AMBIENT LEAD IN THE CAIRO AREA

RATIONALE:

Reducing emissions from the lead smelters in Shoubra El Kheima is one of the major objectives of EEPP. The effect of these efforts will be measured by tracking lead in the ambient environment in the Cairo area.

MEASUREMENT:

These data are available from the ambient air quality monitoring being done through CAIP.

DATA:

The monitoring system has not yet obtained the detailed ambient air quality data from CAIP.

FUTURE WORK:

Prior to spring 2002, the indicators team should work with CAIP to obtain the Cairo air quality data.

5.6 GREENHOUSE GAS EMISSIONS

RATIONALE:

Greenhouse gas emissions differ from the local air pollution discussed above in that their impacts are global rather than domestic. They are regulated under the evolving Framework Convention on Climate Change (FCCC). Each signatory to that convention is asked to estimate its emissions for a baseline year of 1990 and to track them over time. EEAA issued its first report under the climate change convention in June 1999, the "Initial National Communication on Climate Change."

MEASUREMENT:

Greenhouse gas emissions are generally estimated based on empirical information about economic activity and fuel consumption combined with standard coefficients provided by the Intergovernmental Panel on Climate Change (IPCC). Using this approach, EEAA estimated emissions for fiscal year 1990-91 from energy consumption, industry, agriculture, forestry, and waste management (methane releases). Their work includes emissions of carbon dioxide, methane, and nitrous oxides. Following IPCC protocol, they do not include emissions from so-called "bunker fuels," the fuels burned on ships and airplanes in international waters or airspace. The energy emissions are from all fuel combustion, not from the energy sector; thus they include all transport emissions.

EEAA has established institutional mechanisms for annual updates of emissions from energy consumption and solid waste and biennial updates of forest sinks and emissions from agriculture and industry. The solid waste updates calculate the releases that should result from additional trash generated each year, rather than those from trash stockpiled in dumps, so they show the annual change in emissions rather than the actual total of emissions from the sector. At present only the 1990-1 baseline data are readily available in published form.

Greenhouse gas emissions data are also available from a global indicators database compiled by the World Bank. These provide estimates of carbon dioxide emissions from fuel combustion for each year up to 1998. Based on a comparison with the EEAA data for 1990, the Bank data appear to include emissions from energy combustion and industrial processes, as the numbers are comparable. They are available for each year through 1997. The table below provides a time series of the World Bank emissions figures as presented in the CD, in terms of carbon dioxide equivalents. The second column provides the EEAA figures for carbon dioxide emissions from industry and energy for 1990/91.

DATA:

CO2 Emissions

Year	CO2 emissions, industrial (kt) (1)	EEAA emissions (kt) (2)
1960	17,094.03	
1965	28,844.47	

1970	23,009.92	
1975	32,395.26	
1980	46,660.31	
1985	66,306.67	
1990	82,460.52	84,459.00
1991	85,767.28	
1992	89,375.95	
1993	96,594.03	
1994	96,403.51	
1995	101,274.42	
1996	113,704.91	
1997	118,262.93	

(1) From WB Indicators CD
(2) For FY 1990-1, from EEAA "Arab Republic of Egypt: Initial National Communication on Climate Change." Prepared for the UNFCCC, June 1999.

ADDITIONAL WORK:

Before spring 2002, the indicators team should obtain the updated emissions data from EEAA, so that the next report presents Eygptian government estimates rather than those of the World Bank. They should also work with EEAA to determine whether it is possible correctly to estimate emissions from waste based on trash stockpiles rather than trash flows.

5.7 PRODUCTION AND CONSUMPTION OF OZONE-DEPLETING SUBSTANCES

RATIONALE:

Depletion of the stratospheric ozone, a protective layer in the atmosphere that screens out harmful ultraviolet radiation from the sun, is a global problem to which all countries contribute. The international community began work on controlling emissions of substances that deplete the ozone layer with passage of the Vienna Convention in 1985, and agreement on the Montreal Protocol in 1987. The Protocol, together with subsequent amendments, sets a baseline for regulating each country's emissions, and target dates by which specified emissions reductions must be accomplished. Signatories to the convention must report their production, consumption, imports and exports of regulated substances annually to the Ozone Secretariat.

MEASUREMENT:

"Consumption" of ozone depleting substances is defined by the terms of the Protocol as domestic manufacture plus imports minus exports, irrespective of how much is actually used in the country. Egypt does not manufacture any of these substances, so its reporting is based solely on imports.

DATA:

The table below shows Egypt's consumption of ozone-depleting substances by type since it began reporting to the Ozone Secretariat. It also shows the targets which the country must achieve for each group of substances under the terms of the Protocol. As t he table shows, Egypt is well ahead of its targets for four of the six product groups. For two groups, 2000 consumption is above the first targets the country will have to meet in 2002. For halons, it may be possible to meet the target; 2000 consumption is 860 and the target is 776. For methyl bromide, the target is farther off; 2000 consumption is 420 and the target only 262.

Consumption of Ozone-Depleting Substances in metric tons x ozone-depleting potential						
	Annex A Group I - CFCs	**Annex A, Group II - Halons**	**Ax B Gr II - Carbon Tetra-chloride**	**Annex B Gr III - Methyl Choroform**	**Annex C Group I - HCFCs**	**Annex E - Methyl Bromide**
1986	2,362	3,000				
1989	2,373	2,100	220	50	0	
1990	2,144	2,100				
1991	1,960	1,750				55
1992	2,015	4,200	n/a	7	n/a	
1993	1,746	4,620	165	10	11	
1994	1,870	680	66	20	11	90
1995	1,640	720	220	31	0	270
1996	1,732	705	220	38	60	190
1997	1,632	690	110	35	66	252
1998	1,540	860	55	33	88	240
1999						
2000	1,267	860	28	20	152	420
Baseline for calculating targets:						
	1,668	705	64	29	Baseline is 2015 consumption level. Consumption is to be frozen in 2016 and to be down to 0% of base (with possible additional 15%) by 2040.	238
Reduction Targets:						
1999	1,835					
2000						
2001						
2002		776				262
2003				32		
2004						
2005	1,001	423	61			190
2006						
2007	417					
2008						
2009						
2010	250	106	10	23		
2011						
2012						
2013						
2014						
2015				4		0

Sources: Reduction targets and data for all years except 2000 from UNEP, *Production and Consumption of Ozone-Depleting Substances, 1986-1998*. UNEP Ozone Secretariat, October 1999. 2000 data provided by EEAA in metric tons and converted using ozone-depleting potential coefficients from UNEP 1999. Empty data cells signify that Egypt was not required to report for that year; n/a signifies that they were supposed to report but data are missing.

FUTURE WORK:

Prior to spring 2002, the indicator team should obtain 1999 data from EEAA. They should also confirm that the targets reported here are correct, as there may be some misinterpretation of the target descriptions presented in the UNEP report.

6. ENERGY

The energy sector is crucial both for national development and for environmental protection. On the development side, energy is a key input into virtually all economic activity. Ensuring that energy supply will not become a bottleneck to the economic growth - either by ensuring an affordable supply or by working for energy efficiency and reduced demand - is crucial for development in any country.

On the environment side, fuel combustion to produce energy is a major source of both local and global air pollution, which in turn leads to public health problems. Strategies to reduce both local air pollution and greenhouse gas emissions often rely heavily on reducing emissions from fuel combustion, by improving energy efficiency, shifting to less polluting fuels, and reducing activities that depend on fuel (e.g. substituting public transit for private cars). Because development needs often constrain environmental protection, understanding both aspects of energy use is important.

6.1 Final Energy Demand by Sector

Rationale:

Final energy demand is the amount of energy directly used by consumers and producers, in the form of petroleum products, natural gas, electricity, and other energy sources. It is distinguished from energy supply, which is roughly equal to energy produced in the country less exports plus imports. Final demand for energy is a useful indicator if we are interested in management of energy consumption and resulting air pollution from the demand side. Energy policies that operate through demand management - for example, by increasing gasoline or electricity taxes - will be designed to change final consumption. Knowing how much final consumption there is, and how it responds to price changes, is therefore important if we wish to project the impacts of energy pricing policies.

Measurement:

The table below shows final energy consumption by industry, transport, agriculture, residential/ commercial, and government/utilities for the years 1996-2000. The data are in tons of oil equivalents, or TOE; this is a conventional measure that makes it possible to convert data on other fuels into the equivalent power had it been derived from petroleum.

Final energy consumption is the energy that goes into the productive activities of these sectors. It does not include energy consumed in the process of converting petroleum, natural gas, or hydro into electricity, but it does include the electricity itself. It does not include losses anywhere in the energy production, transmission and distribution systems. It also does not include bunker fuels (fuel consumed by ships or airplanes while outside the country).

Data:

Final Energy Consumption 1995-2000 by sector, in TOE

	Industry	Transport	Agriculture	Res/Comm	Govt/utility	Total
1996	12.825	7.345	0.304	4.573	0.587	25.634
1997	12.75	7.576	0.309	4.833	0.608	26.076
1998	13.782	8.236	0.317	5.202	0.713	28.25
1999	13.743	9.113	0.32	5.652	0.714	29.542
2000	14.016	9.654	0.329	6.024	0.825	30.848

Source: Organization for Energy Planning, *Energy in Egypt*. 1995/6, 1996/7, 1997/8, 1998/9, 1999/2000.

6.2 Final Energy Consumption by Energy Source

Rationale:

Different sources of energy lead to different quantities of pollution, so the choice of fuel can be significant in environmental protection. Their availability and price also vary, and with them the constraints on their use and the potential contribution to development. For all of these reasons, it is interesting to track energy by source as well as by sector experiencing the demand.

MEASUREMENT:

OEP's energy balances provide data on final consumption by energy source; these are shown in the table below. These data are appropriate for addressing some, but not all, analytical questions. From the perspective of demand management and understanding how economic growth will affect demand for energy from different sources, these are essential data. However, to understand the total pollutants emitted from Egyptian energy use, they are not the right data, because they do not include energy burned in order to produce electricity and a few other smaller uses that produce pollutant emissions. Similarly, they are not the right data to use in calculating greenhouse gas emissions.

Final Energy Consumption by power source, in TOE

	Petroleum	Electricity	Natural Gas	Coal	total
1996	17.324	3.985	3.314	1.011	25.634
1997	17.576	4.207	3.457	0.836	26.076
1998	18.898	4.555	3.667	1.13	28.250
1999	19.507	4.867	4.242	0.926	29.542
2000	20.287	5.234	4.733	0.594	30.848

Source: Organization for Energy Planning, *Energy in Egypt.* 1995/6, 1996/7, 1997/8, 1998/9, 1999/2000.

6.3 USE OF NATURAL GAS AS A SHARE OF TOTAL ENERGY CONSUMPTION, BY SECTOR

RATIONALE:

EEPP energy strategies are targeted at encouraging conversion from petroleum products to natural gas. Tracking natural gas as a share of total energy use by sector will show which sectors find it easiest to make this conversion.

MEASUREMENT:

The OEP energy balance tables allow us to track the use of natural gas as a share of total energy consumption by broad sectors; the results are shown in the table below.

DATA:

Only the industry and residential/commercial sectors consume any natural gas, according the energy balance tables produced by the Office of Energy Conservation and Policy. Both of them show steady increases in the share of natural gas in their total energy consumption over the five years for which data are available.

Share of Natural Gas in Total Energy Consumption, by Sector

	Industry			Residential & Commercial		
Year	**Gas Consumption in TOE**	**Total Energy Consumption in TOE**	**Share of Gas in Total**	**Gas Consumption in TOE**	**Total Energy Consumption in TOE**	**Share of Gas in Total**
1995	3.153	12.625	25.0%	0.161	4.573	3.5%
1996	3.266	12.75	25.6%	0.191	4.833	4.0%
1997	3.42	13.782	24.8%	0.247	5.202	4.7%
1998	3.923	13.743	28.5%	0.319	5.653	5.6%
1999	4.363	14.016	31.1%	0.37	6.024	6.1%

Note: Only industry and residential/commercial sectors consume natural gas. Source: Energy balance tables from *Energy in Egypt*, editions from 1995/6 through 1999/2000.

6.4 USE OF RENEWABLE AND NON-POLLUTING ENERGY SOURCES

RATIONALE:

Renewables and non-polluting energy sources are important for different reasons. From an energy supply perspective, renewables are desirable because unlike petroleum or natural gas, they can be used without depleting the source that supplies them. However some renewable energy sources, such as biomass energy, are quite as polluting as petroleum products, so they do not contribute to solving air pollution or global warming problems. Many renewable energy sources, such as wind, the sun, water, and nuclear fission, also do not contribute to air pollution, and are therefore of interest from both energy supply and pollution perspectives. Most of them do have other environmental impacts, of course; wind power creates noise and consumes land, hydroelectric dams radically alter aquatic ecosystems, and nuclear power plants pose problems of accidents and disposal of spent fuel.

At present Egypt's only significant source of renewable energy is hydropower, which comes from the dams on the Nile. In 2000 the first wind power source came on line, but this is not a significant source at present. Because all renewables are used to produce electricity, they are shown as a share of electric power generation sources rather than as a share of overall energy sources. In the future, there is interest in using agricultural wastes, particularly animal waste and the bagas that is a residual of sugar cane processing, as a power source. If prices were competitive, solar power also could offer considerable potential, given the climate.

MEASUREMENT:

The OEP energy balance tables allow us to calculate the share of hydropower and wind in electricity generation, as shown in the table below.

DATA:

Electricity Generation - Sources of Power

Year	Thermal	Hydro	Wind	Total	% renewable
1996	3.69	0.994		4.684	21.22%
1997	3.929	1.032		4.961	20.80%
1998	4.409	1.051		5.46	19.25%
1999	4.531	1.316		5.847	22.51%
2000	5.041	1.26	0.002	6.303	20.02%

Source: Energy balance flow charts published in Organization for Energy Planning, *Energy in Egypt*, editions for 1995/6, 1996/7, 1997/8, 1998/9, and 1999/2000.

6.5 ENERGY SUPPLY

RATIONALE:

Energy supply is the total amount of primary energy available to the economy, including that which is used to produce electricity. It is an important factor in the air pollution created by energy use, including both local pollution and greenhouse gases. This is the base used to calculate greenhouse gas emissions from energy consumption, and it should be used to calculate conventional air pollutant emissions as well.

MEASUREMENT:

The data to calculate energy supply should be available from the energy balance tables. However, it is not yet clear precisely which items should be included in this figure, particularly how own consumption of energy in refineries and electrical generation plants should be handled. For this reason no data are included below.

DATA:

Although underlying data are available, calculation of energy supply will wait until more inforation can be obtained about precisely what it should include.

FURTHER WORK:

Prior to spring 2002, the indicators team should confer with OEP energy experts about the calculation of energy supply and the base used to estimate greenhouse gas emissions. They should then calculate energy supply based on OEP advice.

6.6 CUMULATIVE INCREASE (OVER BASELINE) IN THE NUMBER OF PRIVATE AND QUASI-PRIVATE SECTOR COMPANIES OFFERING ENERGY EFFICIENCY SERVICES IN THE MARKET

RATIONALE:

This is one of the PMP indicators for EEPP energy work.

MEASUREMENT AND DATA:

These issues are to be resolved through the energy contract within EEPP.

7. WATER RESOURCES MANAGEMENT

Water resources management is *the* key natural resource issue on which Egyptian survival has always depended. The growth of the domestically produced food supply, and in some measure the growth of the economy as a whole, depend on efficient use of the country's limited water supply. Agriculture is overwhelmingly the largest user of water in the country, accounting for 83% of water withdrawals from the Nile, and 97% of consumptive use.

Concerns about water use in agriculture could center around the contribution of the sector to GDP, to employment, or to food self-sufficiency. The sector accounts for less than 20% of GDP (CAPMAS p. 267), but employs some 37% of the labor force (EPIQ p. 26). Direct estimates of food self-sufficiency are not readily available, but in 1999 the value of imported of food products was almost ten times that of exports (CAPMAS, pp. 275, 277), suggesting a significant shortfall in domestic agricultural production relative to demand. In point of fact, it appears that of the three, employment is the driving concern in the design of Egyptian agricultural and water allocation policies. The country is pursuing a strategy of agricultural expansion, as a way to ensure employment opportunities for an unskilled labor force expected to grow dramatically in the next twenty years.

Water resource management strategies in Egypt could focus on several objectives:

- Increase the supply of water available from nature, through such means as better capture of rainfall and flash flood waters, more use of groundwater, negotiating a larger share of the Nile's waters from Sudan and Ethiopia, or desalination.

- Increase the recycling of the water already available, by using it more than once before it flows into the Mediterranean. This could involve such technologies as reuse of agricultural water or treating industrial and sewage effluent so that the outflow can be reused directly.
- Reduce final demand, through pricing or changes in technology.

Clearly these are very complex tools, and simple indicators will not give a full picture of the situation. However, a few general indicators suggested below can set the context; however this must be reviewed as USAID moves towards developing priorities for its upcoming water projects

7.1 CONSUMPTIVE USE OF SURFACE AND GROUNDWATER BY SECTOR

RATIONALE:

Consumptive use is water that cannot be reused by someone else downstream. It is therefore the key final element in the allocation of water resources among users and is a fundamental input into any analysis of water management.

MEASUREMENT:

The 1996 Nile River Basin water balance provides data on consumptive use by major user group. Information on how this was calculated is not currently available. Several points should be raised in order to understand these figures better. The goal of the water management policy is presumably to use all available water, so eventually consumptive use should be 100% of available water (assuming, of course, some minimum considered unavailable because it is needed to protect aquatic ecosystems). Water may be used more than once. Thus if most municipal and industrial use is non-consumptive, it may be reused later by agriculture, which does consume most of what it accesses. Even within agriculture, water may be used several times before it is eventually consumed, as it may run off one field providing some nutrients and then move onto another. An increase in agricultural output per unit of water consumed (see section 7.2), may therefore reflect increased recycling of the water before it is eventually consumed. However these data do not give us any information about how much water may evaporate off the fields, rather than being absorbed by plants, and thus be consumed without contributing to plant growth. This is an inefficient use of water that must be identified and eliminated in order to ensure maximum return on the available resource.

DATA:

Extraction and Consumptive Use of Nile River Basin Water, in billions of m3

WATER CONSUMPTION	Extraction and return of water	Sectoral shares in extraction	sectoral shares in consumptive use
Municipal Extraction	4.54	6.24%	
Return to river - treated	0.7		
Return to river - untreated	2.93		
Consumption	0.91		2.16%
Industrial Extraction	7.53	10.34%	
Return to river	7.08		
Consumption	0.45		1.07%
Agricultural Extraction	60.73	83.42%	
Return to river	19.91		
Consumption (evapotranspiration)	40.82		96.78%
Total Extraction	72.8	100.00%	100.00%

Total Consumptive Use	42.18		

Source: NEAP 1996 Nile River Basin Water Balance, p. 17.

FURTHER WORK:

Prior to spring 2002, the indicators team should investigate whether updated water balance data are available from the Ministry of Water Resources and Irrigation. They should also investigate whether more detailed sectoral water use data are available within the industrial and agricultural sectors.

7.2 AVERAGE PRODUCT OF WATER BY SECTOR

This indicator gets at the efficiency of water use in agriculture and other sectors. Within each sector, decreases in water use per unit of output over time would indicate increased efficiency of water use within the sector. At the level of a specific product, water use could be measured per physical unit of output. However, because non-homogeneous products cannot be summed, for many purposes it is more meaningful to measure water use per unit of value of output. Time series data on the average product of water within each sector will show whether the sector is becoming more efficient in its water use.

Comparison across sectors within a time period is more controversial, since it highlights that the economic contribution of water allocated to industry is much greater than that of water allocated to agriculture. From a purely economic perspective, this could suggest that the country should adjust its water allocation from agriculture to industry until the contribution of water in each sector was the same. However, this conclusion is incorrect for several reasons. First, economic theory suggests that the marginal product of water in each sector should be equalized, but we are looking at the average, not the marginal product. Second, we are looking at only one input, but both industry and agriculture require a whole package of inputs. Because inputs usually cannot be reallocated independently of each other, we would have to analyze the contriution of a full package of inputs in each sector, not a single input individually. Third, and perhaps most important, this data we are looking at only consider marketed economic outputs of the allocation of water. In reality, we must also consider the social outputs. Reallocation of water to industry on the scale required to equalize the return in the two sectors would entail huge social disruption, since much of the Egyptian labor force is in agriculture. For all of these reasons, why the cross-sectional comparisons appear to be very interesting, the time series data will be more meaningful.

MEASUREMENT:

Available data on consumption of water are the same as those shown in the table above. Since they are for 1996, they are compared with 1996 GDP data to obtain the average product of water. If an updated water balance, or simply updated data on consumptive use, is available, then this can be updated to obtain the desired time series.

DATA:

Average Product of Water, 1996			
Sector	**Consumptive use in billions of cubic meters**	**Contribution to GDP**	**Average product in $ per thousand cubic meters**
Industry	0.45	$18,941,069	$42.09
Agriculture	40.82	$9,741,710	$0.24

Sources: Consumptive use from water balance, NEAP p. 17. GDP data from World Bank Indicators CD.

7.3 REAL VALUE OF AGRICULTURAL PRODUCTION PER UNIT OF NILE WATER USED

PMP indicator - data from APRP.

7.4 IRRIGATED FEDDANS WHERE WATER DELIVERY IS MANAGED THROUGH PARTICIPATORY PROCESSES.

PMP indicator - data from APRP.

8. BIODIVERSITY CONSERVATION / RED SEA COASTAL ZONE MANAGEMENT / PROTECTED AREAS

8.1 COASTAL WATER QUALITY

RATIONALE:

Coastal zone pollution is one of the major threats both to the health of Red Sea aquatic ecosystems and to Red Sea tourism. Tracking water quality is key to monitoring the situation, to assess the magnitude of the problem, determine whether pollution control strategies are working, and identify major sources of pollution.

MEASUREMENT:

Since 1999, the Environmental Information Monitoring Program (EIMP) is collecting data at 39 monitoring stations in the Red Sea region. Their data track three categories of parameters:

Basic Parameters:	Temperature, Specific Conductivity, Dissolved Oxygen, and pH.
Eutrophication Parameters:	Water, Nitrate/Nitrite, Ammonia, Total N, Total P, Phosphate, Silicate, and Chlorophyll.
Bacteriological Parameters:	Total Coliform , Fecal Coliform, and Fecal Streptococci.

Developing simple indicators of water quality can be difficult. When the primary concern is human health, it is easier than when the concern is biodiversity. We know what is meant by human health, and extensive research has been done on the health impacts of different pollutants and the levels that can be tolerated without adverse impact. This research is the basis for establishing many water quality standards. While they are not perfect - for example, most research has looked at impacts on adults rather than children - norms are relatively well established. Thus in the case of the bacteriological parameters, the Government of Egypt has adopted water quality guidelines with which the observed data can be compared to assess whether the situation is acceptable.

When the concern is biodiversity, it is much harder to establish standards or indicators. As a rule we do not know what the "natural" species composition would be in the absence of human intervention. We also don't have an *a priori* standard as we do in the case of human health; do we want the biodiversity composition to be what it was ten years ago, fifty years ago, before humans ever set foot in the area?

EIMP has identified a few simple measures that provide some frame of reference for evaluating aquatic biodiversity. For concentration of heavy metals in sediment, they have compared Red Sea data with tolerances developed in Canadian research. These are referred to as threshold effect levels and probable effect levels, and they apply to cadmium, copper, lead, and zinc. The use of indicator species also permits relatively simple identification of water quality problems that threaten biodiversity. In the Gulf of Suez, the presence of a specific species of Capetellid polychaete worm indicates that sediments are highly polluted with organic matter and low in oxygen. The density of this species is therefore a simple indicator of organic pollution.

For the other parameters, baselines and time series data are needed in order to determine what the "natural" conditions are and assess the magnitude and trends in the water quality problems. Examination of time series will make it possible to identify changes due to human activity in the area. Overlaying spatial patterns of water quality with spatial data on land use, industrial activity, sewage disposal, and boat traffic (including dive boats) should help identify the causes of some of the problems observed.

DATA:

Unfortunately, the published EIMP reports do not include the full monitoring data collected through their program, so it is not yet possible to calculate indictors of progress relative to such standards as do exist.

FURTHER WORK:

Prior to spring 2002, the indicators team should work with EEAA to obtain the base data and assess whether it is possible to develop other simple indicators of water quality in relation to biodiversity based on available data. They should also consider what indicators may be developed as the time series become long enough to track trends over time. Finally, they should see whether spatial data on land use, point source pollution discharges, navigation activity, or other relevant variables are available that can be overlaid with water quality data to suggest simple causal relations between human activity and water quality.

8.2 THREATENED AND ENDANGERED SPECIES AS A SHARE OF TOTAL BIODIVERSITY

RATIONALE:

Conservation of native biodiversity is one of the overall objectives of the environment movement. Indicators of the number of species in the country that are threatened to different degrees are important to track. These data are more meaningful, however, if placed in the context of the total species diversity of the country, so as to show whether a large proportion of species are threatened or only a few.

MEASUREMENT:

Data on threatened and endangered species generally come from research in the country, which is used to assess whether specific species meet internationally defined criteria for different categories of risk. Such categories have been defined by the IUCN (World Conservation Union) Species Survival Commission. The categories are part of the "Red List," a list of threatened species all over the world which is regularly updated based on recent research. The list itself, along with full details of the classification system and criteria for including a species in each class, are on the web at www.redlist.org.

The number of species in Egypt that are on the Red List can be used as a simple indicator of the extent of risk to national biodiversity; these data are presented below. However, it is important to be aware that the number of species that make it to this list depends on two factors that may run counter to each other; the threat to native species and the extent of research on that threat. Countries with the resources to protect their biodiversity well may also have the resources to do extensive research on it, and may also be likely to provide their data to international bodies like the Species Survival Commission. In addition, of course, countries in the tropics will naturally have more species diversity, and therefore more species at risk, than countries further north or south.

DATA:

At present, only data on threatened and endangered species are available to the indicators team; these are shown below. Studies carried out by MVE on Red Sea biodiversity suggest that data on the total biodiversity of the country (number of species known to be present) should exist. With these, it will be possible to calculate the share rather than number of threatened and endangered species.

Seventy three species that occur, or have occurred in the past, in Egypt are on the Red List. Of these, 28 are classified as threatened. Threatened species fall into three classes; vulnerable, endangered, or critically endangered. These are distributed among species groups as follows:

Mammals	Birds	Reptiles	Amphibia	Fishes	Molluscs	Other Inverts	Plants	Total
12	7	6	0	0	0	1	2	**28**

Source: Summary Data Tables from 2000 Red List of Endangered Species. www.redlist.org.

The others species on the Red List are already extinct, at lower risk and not considered vulnerable, or data is not sufficient to evaluate their status.

Data have not yet been sought on the extent of species diversity in the country; however MVE studies conducted in the past year suggest that such data may be available.

FURTHER WORK:

Prior to spring 2002, investigate Egyptian sources of data on threatened species to assess how complete the coverage of the Red List is for Egypt. Assess Egyptian data sources to see whether enough data are available to express the number of threatened species as a percent of total native species rather than simply as a number.

8.3 PROTECTED AREAS

RATIONALE:

Protected areas, if properly implemented, can be a valuable tool for protecting biodiversity and wildlife habitat. The IUCN Commission on Parks and Protected Areas, working with the United Nations, has set as a guideline that countries should protect ten percent of the land area in each ecozone in their country.

MEASUREMENT:

Egypt has a well-established protected areas program, and plans to add a significant amount of additional land to the system in upcoming years. The available data show the existing protected areas and their size. The size of each ecozone is not available for purposes of comparison with the IUCN guideline; only a comparison with total area of the country is possible.

DATA:

The protected areas system includes the following areas. As the data show, slightly over 8% of the country is included in protected areas. In the absence of information about ecological zones, however, this is not a particularly informative figure, since protecting large areas of desert will do relatively little to protect wildlife habitat or biodiversity.

Protected areas	
Name	**Area in km2**
Ras Mohamed National Park	850
Zaranik Protectorate	230
Ahrash Protectorate	8
El Omayed Protectorate	700
Elba National Park	35,600
Saluga and Ghazal Protectorate	1
St. Katherine National Park	5,750
Ashtum El Gamil Protectorate	180
Lake Qarun Protectorate	250
Wadi El Rayan Protectorate	1,225
Wadi Alaqi Protectorate	30,000
Wadi El Assuti Protectorate	35
El Hassana Dome Protectorate	1
Petrified Forest Protectorate	7
Sannur Cave Protectorate	12
Nabaq Protectorate	600
Abu Galum Protectorate	500
Taba Protectorate	3,595
Lake Burullus Protectorate	460
Nile Islands Protectorates	160
Wadi Digla Protectorate	60
Total Protected Area	80,224
Total Area of Country	1,000,250
Percent protected	8.02%

Source: EEAA data provided by Environics.

FURTHER WORK:

Prior to spring 2002, investigate possible sources of a map of the ecological zones of Egypt.

8.4 TOURIST NIGHTS IN RED SEA GOVERNORATE

RATIONALE:

Increasing tourism in the Red Sea Governorate is a major economic objective of the Government of Egypt. At the same time, the presence of tourists can threaten aquatic ecosystems and biodiversity. Tracking the number of tourist nights in each town will be essential in order to monitor the area and anticipate environmental problems.

MEASUREMENT:

Data on tourist nights should be available from hotel records and TDA data.

DATA:

These data have not yet been sought for the monitoring system.

8.5 DIVE TRIPS

RATIONALE:

Scuba diving is one of the major tourist attractions on the Red Sea coast. Knowing how many divers and dive boat trips there are can be important context information for several reasons. If dive boats anchor in the corals, they can directly threaten the health of the ecosystem (see also the indicator below on mooring buoys). One possibility for generating revenue to support coral reef conservation is to charge a special fee for diving; information about how many divers there are will be valuable in assessing the revenue-generating potential of such a fee and its impact on demand. Congestion among divers on the reefs is also a deterrent to potential tourists, so knowing the number and locaiton of diving activity will help in managing the market.

MEASUREMENT:

Data on dive trips might be collected from the dive operators, if such a reporting system can be set up with TDA.

DATA:

These data have not yet been sought for the monitoring system.

8.6 COASTAL ZONE LAND USE

RATIONALE:

Development of land within the coastal zone can have significant negative impacts on water quality and coral reefs. While storm runoff is not a problem, transport of solid waste by wind is a cause of water pollution in the region. Although current rules proscribe creation of beaches or any development directly on the shoreline, monitoring actual practices is still a good idea in order to verify that the rules are being followed. In addition, the construction process itself can be a source of considerable erosion and sedimentation, even if the building under construction is well-designed and employs best management practices designed to protect water and reef quality. Such monitoring might look at two issues; development very close to the coast, within perhaps a fifty meter buffer, and development within a one-kilometer buffer. The former would shed light on direct protection of the coast, while the latter would identify areas within which to track solid waste management and other potential environmental hazards.

MEASUREMENT:

Data on coastal land management will be most comprehensive if they come from satellite imagery or aerial photographs, rather than from government records about permitted construction. Such imagery will show what is being constructed on the ground and along the coast, and may also show signs of sediment or pollution going into the water from land-based activity.

DATA:

No such data are available at present.

8.7 FEES COLLECTED FOR USE OF NATURAL RESOURCES

RATIONALE:

User fees are a reasonable way to raise funds to help pay for conservation of natural resources, and EEPP encourages their use in Egypt. Entry fees are now charged for protected areas, and in at least one area fees are charged for diving as well. To assess the potential of such fees and the contribution they are making to the costs of conservation, it is useful to track the amounts collected at each site.

MEASUREMENT:

Data on fees collected should be available from the government agencies that collect them.

DATA:

No such data have been sought for the monitoring system to date.

8.8 MOORING BUOYS AT RED SEA DIVE SITES

RATIONALE:

Direct damage may be caused to coral reefs by dive boats anchoring on them. To prevent this, mooring buoys can be installed at popular dive sites, which boats attach to instead of using anchors. EEPP is encouraging the placement of mooring buoys in popular areas to address this need. Tracking the number of such buoys will provide a direct measure of whether this objective is being met.

MEASUREMENT:

Data on the number of mooring buoys should be available from the government agencies that install them.

DATA:

No such data have been sought yet for the monitoring system.

8.9 EEAA BUDGET FOR CONSERVATION IN GENERAL AND RED SEA CONSERVATION IN PARTICULAR

RATIONALE:

Encouraging EEAA to take responsibility for financing its conservation activities in general, and its conservation work on the Red Sea in particular, is an objective of EEPP. Monitoring the EEAA budgetary contribution to these costs will show to what extent this objective is being met.

MEASUREMENT:

Such data should come from the EEAA budget.

DATA:

No such data have been sought yet for the monitoring system.

8.10 Coral Reef Quality and Extent

Rationale:

One of the ultimate goals of AID work on the Red Sea is to protect the extent and quality of the coral reefs. A set of data and possibly indicators that provide direct information about the extent and quality of the reef ecosystems will be very valuable, if it can be established.

Measurement:

Developing relatively simple measures of ecosystem quality and extent is difficult. The quality of the reef, in particular, is hard to define. To assess this, we would want to have solid background knowledge of the species composition of the reef, the numbers of different species, the normal variation that occurs in responses to natural fluctuations in weather or other factors, and so on. Given a rich understanding of how the systems naturally operate and vary, it may be possible to observe changes due to human intervention in the region or changes from which the ecosystem will not recover quickly. This could be built into a monitoring system that can distinguish between natural variation that the system has the resilience to resist, human interventions that the system can resist, and human interventions that will cause permanent degradation of the system.

Data:

Data to build this kind of information base have not yet been sought for the monitoring system.

8.11 Share of Tourist Facilities With Approved EIAs Before Construction

Rationale:

PMP indicator.

8.12 Percentage of Hotel Rooms in Facilities Located on TDA-Owned Lands in the Red Sea Region Which Instituted Best Practices

Rationale:

PMP Indicator.

8.13 Number of Qualified EEAA Nature Protection Rangers Assigned to Work Within the Red Sea Governorate

Rationale:

PMP Indicator.

9. Commitment to Environmental Protection

9.1 Planned Government Investment in Environmental Protection

RATIONALE:

Government expenditure on environmental protection is a useful general indicator of the magnitude of public commitment to environmental protection. By distinguishing between domestic funding sources and foreign aid, this indicator also helps indicate the role of foreign pressure in inducing public activity on the environment.

MEASUREMENT:

Data on planned government investment is available from the five-year plans.

DATA:

The monitoring system has not yet obtained these data.

9.2 GOVERNMENT EMPLOYMENT AND EXPENDITURE IN ENVIRONMENTAL PROTECTION

RATIONALE:

This information complements data on government investment in the environment, and is an important way to assess whether environmental policy is likely to be effectively implemented.

MEASUREMENT:

Estimating government employment and expenditure on the environment is difficult, because it is not clear what should be considered "environmental." Some items are easy to classify; thus all EEAA expenditures and employment are considered environmental, as are all resources devoted to trash handling, drinking water supply, and sewage collection and treatment. Items that are harder to allocate are water resources management, energy management, public health, forest management, and agriculture. In doing this, the monitoring system should follow the approaches being developed in the development of environmental accounts in Europe and elsewhere, so that the resulting data will be compatible with that being developed elsewhere in the world.

The allocation principles used to classify expenditures and employment will be the same; for this reason, both kinds of information are being discussed together. As the data are developed, the sources of the funds should be identified as well, distinguishing in particular routine government budgetary resources, other government funds (e.g. fees and fines), donor support, and other sources.

DATA:

These data are not available yet. A fair bit of work, and access to detailed government budgets, will be required in order to develop them. This might be initiated by spring 2002, but it may not be possible to complete it that quickly.

9.3 ENVIRONMENTAL PROTECTION FUND REVENUES BY SOURCE

RATIONALE:

The EPF is EEAA's major source of funding, accounting for considerably more than routine budgetary resources. Moreover, increasing the revenues available to the EPF and diversifying its sources are policy objectives of EEPP. For both of these reasons, it will be important to track how much money the fund has and where it comes from.

MEASUREMENT:

This information should be available from government financial documents.

DATA:

The monitoring system has not yet obtained these data.

FUTURE WORK:

Prior to spring 2002 the indicators team should obtain these data for inclusion in the first full report on the system.

9.4 ALLOCATION OF EEAA FUNDS AND STAFF BETWEEN CAIRO AND RBOS

RATIONALE:

EEPP is working to encourage decentralization of EEAA's authority to implement environmental regulations. The magnitude of effort involved in properly implementing Law 4 and its regulations is too great to be handled effectively from Cairo. Only by creating strong and well-staffed regional and branch offices (RBOs) will the agency be able to keep track of regulated activities all over the country.

MEASUREMENT:

These data should be available from EEAA budgets and other administrative documents.

DATA:

These data are not yet available to the monitoring system.

FUTURE WORK:

Prior to spring 2002 the indicators team should seek these data from EEAA so they can be included in the first fully implemented report.

9.5 INSPECTIONS CARRIED OUT BY EEAA

RATIONALE:

In order to effectively implement Law 4, EEAA must commit staff time and resources to inspect potentially polluting plants and ensure that they are in compliance. Tracking the number of inspections carried out each year will give some sense of whether the agency is making anything like the necessary commitment to see that the law is implemented. It will also be useful to know under which regulation each inspection was conducted, and by which EEAA office.

MEASUREMENT:

This information should be available from EEAA records.

DATA:

These data are not yet available to the monitoring system.

FUTURE WORK:

Prior to spring 2002 the indicators team should work with EEAA to obtain information about the number of inspections carried out, so this can be included in the first full report on the system.

REFERENCES:

Central Agency for Public Mobilisation ad Statistics (CAPMAS), June 2001. *The Statistical Yearbook, 1993-2000.*

EEAA "Arab Republic of Egypt: Initial National Communication on Climate Change." Prepared for the UNFCCC, June 1999. Available on the web at www.unfccc.de/resource/docs/natc/egync1.pdf.

EPIQ, September 1997, "Environment Sector Assessment: Draft Final Report Volume I." Produced for USAID/Cairo by International Resources Group under the Environmental Policy and Institutional Strengthening Indefinite Quantity Contract.

Institute of National Planning, 1995 *Egypt Human Development Report 1995*

Institute of National Planning, 2000. *Egypt Human Development Report 1998/99*

IUCN Species Survival Commission, Red List of Endangered Plants and Animals, 2000. On the web at www.redlist.org.

Ministry of State for Environment, Egyptian Environmental Affairs Agency (Directorate General for Wastes), June 2000, "The National Strategy for Integrated Municipal Solid Waste Management - A Frame Work for Action"

"The National Environmental Action Plan of Egypt 2002/17: Environment at the Center of Modernizing Egypt" July 9, 2001. Draft.

"National Municipal Solid Waste Strategy" Draft (obtained June 2000 [*sic*])

Organization for Energy Planning, *Energy in Egypt.* 1995/6, 1996/7, 1997/8, 1998/9, and 1999/2000.

UNEP, *Production and Consumption of Ozone-Depleting Substances, 1986-1998.* UNEP Ozone Secretariat, October 1999. Available on the web at www.unep.ch/ozone/DataReport99.shtml.

World Bank 2001, "2001 World Development Indicators CD-ROM" (Washington, D.C.: The World Bank)