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# Egypt: Environmental Issues

## Introduction

Egypt is 97% desert and is therefore dependent on the Nile River for its existence. Only 5% of the land area in Egypt is actually occupied and less than 4% of the land is suitable for agriculture. Since such a small percentage of land is habitable, population densities in some areas along the Nile River are greater than 1,000 people per square kilometer.

The Nile River is the lifeblood of Egypt. The river is the main source of freshwater for household use and irrigation, a source of power from the hydroelectric facility at Aswan, and a means of transportation for people and goods.

Economic development has placed great stress on Egypt's environment. Population density, combined with long-postponed infrastructure investments, has severely overwhelmed water and wastewater services of urban areas creating numerous environmental hazards. Oil pollution and careless anchoring of boats have damaged coral reefs off the coast, as has pollution from urban and industrial sources and improper disposal of solid wastes. Rapid population growth is straining natural resources as agricultural land is being lost to urbanization, desertification, and salination. The Nile and its tributaries are being contaminated with pollutants, chemicals, and heavy metals.

Although Egypt does not have an extensive history of environmental law, regulatory policy has gained momentum over the past few years. In 1994, Egypt passed Law 4 for the preservation of the environment. This law restructured the existing environmental ministry and created the Egyptian Environmental Affairs Agency (EEAA) to draft laws, create and enforce regulatory standards, establish near- and long-term plans for environmental management, coordinate local, regional and national environmental protection efforts, and regularly report on the state of Egypt's environment. The 1994 environmental protection law also established the Environmental Protection Fund, which completed its pilot year in 2000/20001. The fund dispersed five grants of more than \$50,000 each to projects focusing on solid waste management.

The main energy-related environmental issues facing Egypt are air pollution, carbon emissions, energy consumption, and preservation of coastal areas.

## Air Pollution

The greater Cairo area, home to 15 million people, has the worst air pollution in Egypt. Fumes from Cairo's 1.2 million vehicles, combined with suspended particulate matter (including lead) plus sand blown into urban areas from the neighboring Western Desert, create an almost permanent haze over the city. Cairo also has high levels of sulfur dioxide and nitrogen oxide. Air quality in Cairo and throughout Egypt is measured by an every-growing network of monitoring stations (42 stations in 2001) installed with the support of USAID. Air pollution in Egypt comes from a number of sources, including industrial sites, vehicular emissions, and smoke from burned garbage and agricultural detritus.



A cloud of haze hanging over Cairo.

Sources

and vehicles and is very dangerous to human health as the fine particles can penetrate deep into people's lungs. NO<sub>x</sub> and SO<sub>x</sub> levels were generally within limits proscribed by Egyptian law in 2000, but in industrial areas or areas with traffic congestion levels, they were sometimes higher than both Egyptian and World Health Organization standards. Finally, lead levels, although still high, decreased 30% between 1999 and 2000. Lead pollution is a serious threat to human health because high lead concentrations in the blood can lead to high blood pressure, kidney problems, infertility, decreased I.Q. levels in children, and disorders to the nervous system.

The Cairo Air Improvement Project (CAIP), sponsored by EEA and USAID has, over the past six years, addressed air pollution in metropolitan Cairo at a number of levels. To address fine particle emissions, CAIP instituted vehicular emissions testing, the first of its kind in Africa. CAIP also has pushed the use of compressed natural gas (CNG) as a fuel for municipal buses, private vehicles, and as energy for power plants throughout greater Cairo. As of 2001, 50 municipal buses were using CNG and multiple CNG fueling stations were set up throughout Cairo. A project cosponsored by the Climate Change Action Fund of Canada and EEA aims to bring CNG motorcycles to Egypt. This will both lower PM<sub>10</sub> and SO<sub>x</sub> emission from motorcycles and decrease their carbon emissions. To date, there are 50 fueling stations dispensing CNG to the 40,000 CNG vehicles in the Cairo metropolitan area.

Finally, CAIP has addressed the high levels of lead in Cairo by promoting the use of environmentally friendly technologies at lead smelting plants and by supporting the removal of such facilities away from populated areas. Four smelting plants have been relocated outside of Cairo, and the new facilities are equipped with advanced pollution-control technology to further reduce their lead emissions.

CAIP does not address one major cause of urban air pollution--the burning of garbage. Waste incineration in a large city can be easier and less expensive than treating the refuse, compacting it, or removing it from the city. However, fine particles are released when garbage is burned and can contribute to smog and damage human health. Rather than address this issue as an air pollution problem, Egypt has moved forward on a comprehensive waste management system that should eliminate the need for burning refuse in major cities. In 2000/2001 Egypt began the Integrated Solid Waste Management program to establish the regulatory framework in which effective waste

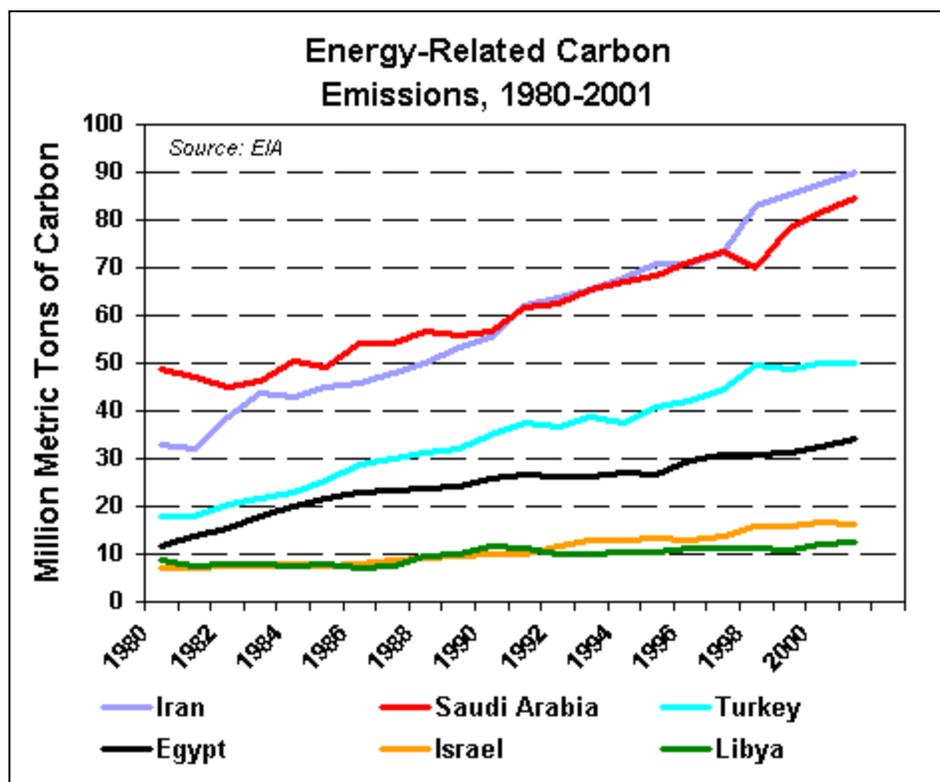
management can operate. Over the past two years the program has progressed such that at the end of 2002 numerous sites were selected for further testing as potential landfills.

USAID, which has sponsored CAIP since 1997, ended its continuous support at year-end 2002. USAID will continue to provide technical training and some cash transfer funding for further air quality improvements, but the CAIP program has been turned over to the Government of Egypt. This transfer also marks the beginning of a transition in USAID environmental assistance to Egypt. Past programs generally have helped Egypt to establish a system of laws, regulations, and enforcement, as well as improved monitoring and the adoption of best practices and technologies. From FY2005, USAID intends to focus less on institutional infrastructure and more on actual environmental improvement.

### Carbon and Energy-Related Emissions

Egypt is at risk from climate change in a number of ways. First the Nile River delta, already subsiding because upstream damming blocks sediment from reaching the delta, is at risk of salination and inundation by the Mediterranean if sea levels rise even slightly. In addition, Egypt relies on the annual flow of the Nile for nearly all its freshwater, so changes in rainfall patterns in the Nile Watershed could reduce available water resources, decimating Egypt's agriculture and undermining the hydroelectric power facility at Aswan. These threats to Egypt's environment have made the country highly cognizant of the detrimental effect that emissions of carbon and other greenhouse gases have on the Earth's atmosphere. As a non-Annex I country under the Convention, Egypt is not required to cut its carbon emissions. Although Egypt has not yet ratified the Protocol, it is a signatory, and Egypt stands to benefit from the Protocol's implementation.

Egypt's carbon emissions have risen 34% over the period 1990-2001, to 34.3 million metric tons of carbon. Egypt's carbon emissions were less than 0.5% of global emissions in 2001, and while per capita emissions have been increasing since 1950, they are still significantly lower than in most developed countries. In 2001, Egypt emitted 0.5 metric tons of carbon per person, while the United States emitted 5.5 metric tons of carbon per person and the European Union member states averaged 3.1 metric tons per person. While oil (72%) and coal (3%) make up three-quarters of the country's carbon emissions by fuel source, Egypt's growing market for natural gas, which makes up the other quarter, should help slow the increase in carbon emissions.



### Energy and Carbon Intensity

While Egypt's energy intensity is high compared to Western Europe, Egypt's energy intensity is comparable to other oil producing countries. Egypt's 2001 energy intensity was 26,400 Btu/\$1995, which is significantly higher than countries such as [Germany](#) (5,300 Btu/\$1995) and [France](#) (5,800 Btu/\$1995), but right on par for the region: Egypt's energy intensity level is much lower than [Iran's](#) (40,000 Btu/\$1995) and Qatar's (58,800 Btu/\$1995), but above Libya's (19,000 Btu/\$1995). In comparison, US energy intensity in 2001 was 10,700 Btu/\$1995.

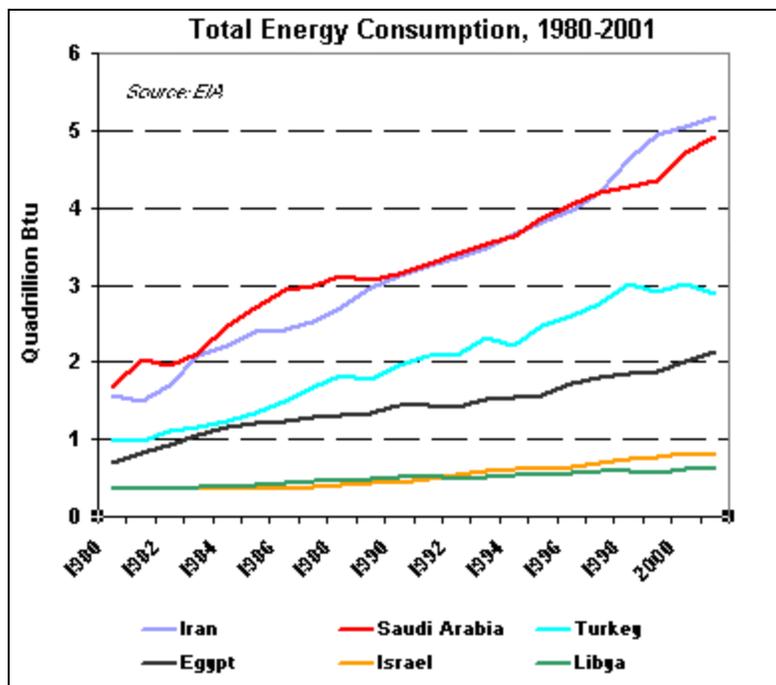
Egypt's energy intensity should fall as the country implements more energy efficiency and conservation programs. In 1997, USAID entered into a 20-year partnership with Egypt and created the Egyptian Environmental Policy Program. With the help of USAID, Egypt has created a National Energy Efficiency Strategy that focused on three goals: (1) accelerating the use of natural gas rather than oil; (2) developing national energy efficiency codes and standards, and (3) promoting private investment in energy efficiency activities. The EEPP estimates that if Egypt can aggressively adopt energy efficient technologies, there could be an annual savings of about 1% of GDP and a more than 10% drop in annual CO<sub>2</sub> emissions by the end of the program.

A reduction in carbon emissions growth, combined with a shift of Egypt's energy mix to more natural gas, should help reduce the country's carbon intensity in coming years. In 2001, Egypt's carbon intensity level was 0.42 metric tons of carbon/thousand \$1995. Although this level compares favorably with other countries in the region--Saudi Arabia's carbon intensity was 0.59, while Iran's was 0.71, and Libya's was 0.34 in 2001--it is still several times higher than European averages: France's 2001 energy intensity was 0.06, while Germany's was 0.08. As Egypt begins to use more natural gas and hydropower, its carbon intensity should fall, perhaps coming closer to the level of the United States (0.17 metric tons of carbon/thousand \$1995) or [Turkey](#) (0.26).

### Energy Consumption

Egypt's rising level of energy consumption is a major factor behind the country's air pollution problems. Over the last 20 years, Egyptian energy consumption has risen by more than 200%, from 0.7 quadrillion Btu in 1980 to 2.1 quads in 2001. Despite this upward trend, Egypt still only accounts for 0.5% of total world energy consumption, and Egypt's energy consumption is still below that of other countries in the region; it is less than half of Iran's (5.2 quads) and Saudi Arabia's (4.9 quads).

Although Egypt's per capita energy consumption is on the rise, it is still well below the level of the [United States](#) and many European countries. Egypt's per capita energy consumption of 31.4 million Btu is significantly lower than US per capita consumption of 341.8 million Btu.



Oil's share of Egypt's energy consumption has been dropping rapidly over the past four years. In

1998, oil's share in energy consumption was nearly 69% while now it is only 54% --a 20% decrease. As Egypt's oil reserves decrease, the country is looking to reduce its consumption of oil. In addition to stemming the domestic consumption of oil (and freeing up oil to be exported for hard currency), the conversion of all oil-fired, power-generating plants in Egypt to natural gas will contribute to protecting the environment through cleaner air. In 2001, natural gas accounted for 36.6% of Egypt's total energy consumption.

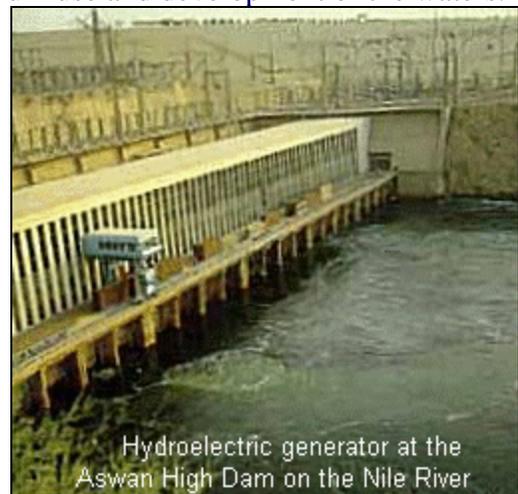
### Hydroelectric Power and the Nile River

Hydroelectric power is an important source of energy in Egypt--during the 1980s, the Aswan High Dam on the Nile River provided *half* of Egypt's electricity. This percentage has fallen while energy demand has increased, but over the past ten years hydropower still contributed about 20% of the total energy generated in the country.

Fully 86% of the water that Egypt consumes annually originates from the Blue Nile River, which flows from Lake Tana in Ethiopia, while the remainder comes from the White Nile, which flows from Lake Victoria in Uganda. The rivers join in Khartoum, [Sudan](#), and then flow on to Egypt. Water rights to the Nile have become an important issue between all ten countries in the Nile River Basin. Egypt, Ethiopia, and Sudan are the most powerful countries in the basin, but Eritrea, Rwanda, Burundi, Uganda, Kenya, Tanzania, and the Democratic Republic of Congo are all vying for rights to the Nile's waters. Until recently, there was no agreed-upon regime governing the actions of these countries, and no integrated plan for optimum use and development of the waters.

Over the past fifty years there have been numerous attempts by countries in the basin to discuss water rights.

Egypt, however, is the most powerful country in the region and has generally pursued its water policies even in the face of disagreement from its neighbors. For instance, Egypt went ahead with construction of the Aswan High Dam from 1964-1971 without Ethiopia's approval. Although the dam irrigated a substantial amount of land, provided electricity and water, and created Lake Nasser, environmental critics point out that it also blocked the normal flow of the Nile, changing the character of the river both up- and downstream. The dam prevented the nourishment of agricultural lands farther down the river, prevented sediment from recharging the subsiding Nile delta, and destroyed the river's fishing industry. In addition, vegetation in Lake Nasser has grown rapidly, resulting in clogged irrigation channels, and creating stagnant water that has become a breeding ground for disease-bearing insects and invertebrates. Also, hydrologists have estimated that each year the reservoir loses a staggering 15 cubic kilometers (9.3 cubic miles) of water to evaporation from Lake Nasser.



Hydroelectric generator at the Aswan High Dam on the Nile River

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In 1998, the ten countries in the basin met and began to create a framework in which they can work together to develop the Nile's water resources. The project, called the Nile Basin Initiative, calls for the creation of hydroelectric facilities strategically placed along the Nile. The electricity generated from these facilities would be carried to all countries in the basin and help meet the rising electricity demand of the region. Despite these efforts, Egypt is still resistant to the idea of upstream dam development on the Nile.

Egypt uses far more of the Nile's annual flow than any other country in the basin and is concerned about what will happen when other countries like Ethiopia begin to utilize its waters for

hydroelectric power. The Blue Nile terrain favors the construction of dams to generate power, and Ethiopia has been exploring the possibility of building a dam on Lake Tana for a long time. Between 1956 and 1964, the US Bureau of Reclamation surveyed the Nile Basin, proposing four major dams on the Blue Nile with a combined storage of 51 cubic kilometers (31.7 cubic miles) and a hydroelectric capacity three times that of Aswan High Dam.

Recent findings reveal that the Blue Nile has a power potential of 172 billion kilowatthours, twice the combined national hydroelectric output of both Sudan and Egypt. Experts say that the amount of water available to downstream states would not be substantially affected, even if Ethiopia were to implement the Blue Nile Plan drawing off 3.7 cubic miles of water. In fact, water experts feel that Egypt and Sudan would still benefit from the construction of the reservoirs within Ethiopia, which would allow Ethiopia to generate enough electricity not only to satisfy most of its own needs but also to export to Sudan and Egypt, as well as the Arabian peninsula.

However, Egypt has questioned the effects--both environmental and otherwise--of this potential hydropower development. Some years ago the lowering of the water level at the Aswan High Dam drastically affected agricultural and industrial output in Egypt, and a potential future decrease of water levels at the dam would also reduce Egypt's hydroelectric power supply. In the absence of agreements on water rights, if irrigation dams were to be built in either Ethiopia or East Africa (or if climatic change were to result in increased warming or in droughts and increased evaporation), Egypt believes that the annual flood of the Blue Nile, upon which Egypt is dependent, would be virtually eliminated. Indeed, a permanent reduction in the quantity of Blue Nile water into Egypt would have widespread effects. Given the resistance of Egypt to change in the basin, it is unclear whether the proposed regional hydroelectric plan stands a chance of implementation.

### **Other Renewable Energy Sources**

Aside from hydroelectricity, Egypt is boosting its use of renewable energies such as solar and wind power. Egypt's New and Renewable Energy Authority is working together with the Danish and German governments to bring a large-scale wind project to the Red Sea Coast. Egypt has successfully begun a number of smaller projects and this one will bring 117 660 kilowatt wind turbines to the country. The contract for the installation of these turbines was awarded in May 2002. The project will generate 60 Mw of wind energy when completed.

The Government of Egypt has also been working with USAID to plan a combined natural gas/solar power plant in Egypt. Feasibility studies have been completed on the 127-MW plant, which will use solar energy during the day and natural gas at night. The plant, which has received funding from USAID and the Global Environmental Facility, is expected to cost \$120 million and come online in 2006.

Egypt has also been experimenting with using photovoltaic (PV) panels to bring small amounts of electricity to rural areas away from the grid. PV panels have been used in rural areas to pump water from wells, to desalinate water, and to run small cookstoves. Although these types of projects are small-scale, bring even a little energy to people in rural areas can vastly improve their quality of life.

### **Egypt in the 21st Century**

Environmental awareness in Egypt is slowly increasing through government programs and policies and high-visibility environmental conferences such as the World Summit on Sustainable Development held in Johannesburg in 2002. Although many of Egypt's environmental programs are just beginning to gain momentum, the government's awareness-raising programs are preparing Egyptians to tackle their environmental challenges.

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