

REVIEW OF ENVIRONMENTAL PHYSICS ACTIVITIES IN EGYPT

M.N.H. Comsan

Egyptian Nuclear Physics Association, Cairo, Egypt

Efforts and activities in Egypt serving the environment went back to 1962. At that time simultaneously were established the "Atomic Fallout Laboratory" at the premises of Atomic Energy Establishment in Inshas, and the "Air Pollution Unit" within the premises of the National Research Centre in Dokki. Recent activities include: radiation monitoring, atmospheric physics, renewable energy, pollution control, environmental impact, etc.

The article aims at reviewing environmental physics activities in Egypt both on governmental and non-governmental scales.

The environment is one of the most vital axes of development, so the deterioration of the environment represents a major danger threatening social and economic development, the sustainability of natural resources, and human health. Recognizing this major importance and necessity of the protection of environment and its vital role in our lives, governments all over the globe began to take larger steps towards a better and healthier environment

ENVIRONMENTAL ISSUES IN EGYPT

Key current environmental issues in Egypt include the following:

- Population growth and depleting natural resources,
- Loss of agricultural land, as a result of urbanization and windblown sands,
- Desertification,
- Increased soil salinization below the Aswan High Dam,
- Soil erosion, as a consequence of intensive irrigation and water logging,
- Water pollution from agricultural pesticides, raw sewage, and industrial effluents,
- Very limited natural fresh water resources, with the exception of the River Nile (the only perennial water source),
- Waterborne diseases, as a result of poor sanitation,
- Air pollution in major cities, including the famous dark plume over Cairo,
- Coastline and marine degradation, and concomitant threats to coral reefs, beaches, and marine habitats,
- Oil pollution, as a result of offshore oil facilities, pipelines, and petroleum residuals from shipping vessels.

Between 1964 and 2002, Egypt's population increased from approximately 29 to 69 million people. The country's urban population increased from ~ 8 million in 1964 to almost 22 million in 2002. Population growth has placed severe pressure on the allocation of the country's limited resources.

The growing population and intensive industrial and agricultural production exert increasing pressure on Egypt's limited natural resources. The scarcity of cultivated land is related to insufficient access to a freshwater source, almost exclusively based on the River Nile, which sustains agriculture, industry and households and intakes considerable amounts of polluted water on route to the Mediterranean.



Year-round irrigation, using the water impounded behind the Aswan High Dam, causes salts to accumulate in the soil, leading to the loss of some agricultural land. Soil salinization has already reduced fertility of about 30 per cent. Before the construction of the Aswan High Dam, deposited salt was removed by the annual floods.

Excessive application of fertilizers and pesticides in agriculture contaminates drainage water, most of which flows into coastal lakes in the Nile Delta. The River Nile is heavily polluted by a large number of major industrial sources (the so-called "black spots") as well as from municipal waste water. Major investments in waste water treatment plants have not been sustained because of insufficient funding for maintenance and running costs.

Air pollution is a serious problem in the major cities, particularly Cairo and Alexandria, with direct implications on public health. Numerous major industries, many placed in or close to residential areas, emit other pollutants to the air. These pollutants are superimposed on high natural deposits of dust originating from the desert. Egypt's historical monuments, many of which represent a global cultural heritage, suffer serious damage from air pollution.

Solid waste with hazardous substances is becoming an increasing problem. Abatement of air pollution and improved waste water treatment will increase the amount of solid hazardous waste.

Egypt's coastal region is an area of rapid and uncontrolled economic development and of intensified environmental problems. The coastal lakes in the Nile Delta are heavily polluted. Coastal erosion is a general problem in the Delta. In other coastal areas local erosion problems occur in connection with uncontrolled construction. Wide areas of coral reef are endangered by uncontrolled construction and activities related to tourism. These reefs are the World's northern-most coral reefs and represent Egypt's greatest source of biological diversity. The coastal marine environment is threatened by oil pollution from ships and off-shore activities and by pollution from municipal and industrial sources.

Environmental degradation affects not only the quality, or aesthetics, of human life, but it also displays potential to undermine conditions necessary for the sustainability of human life.

NATIONAL ENVIRONMENTAL ORGANIZATIONS

Ministry of State for Environmental Affairs (MSEA)

The Ministry of State for Environmental Affairs (MSEA) was established in 1982. With its executive agency, the Egyptian Environmental Affairs Agency, MSEA is the national body responsible for the integration of the environmental dimension into national policies, plans and lines of action. The reduction of pollution and the conservation of Egypt's natural resources is the main goal of MSEA. This is to be achieved through effective environmental management in close cooperation with government departments, national and international organizations and non-governmental associations.

Egyptian Environmental Affairs Agency (EEAA)

The Egyptian Environmental Affairs Agency and its Regional Branch Offices (RBOs) are the main governmental bodies responsible for the protection of the environment in Egypt. However, as the environmental field cuts across the activities of most ministries and institutions in Egypt, EEAA is mandated to coordinate and work in close collaboration with key ministries and institutions in Egypt, each within its field of competence. In addition, there are the Environmental Management Units in the governorates (EMUs), which are the entities

responsible for the environmental management activities within each governorate. The EMUs work in association with the RBOs under the guidance of EEAA.

EEAA was first established in 1982 as the authority responsible for promoting and protecting the environment in Egypt. In 1994, EEAA was re-established in accordance to Law 4/1994 for the Environment, and was restructured with a new mandate to substitute the initially established Agency. Based on Law 4/1994, EEAA has a public juridical personality and is to be affiliated with the competent Minister for Environmental Affairs who heads EEAA's governing board.

The overall objectives of EEAA are to protect the environment and promote the different environmental activities. These objectives are realized by integrating environmental issues into all national policies, plans and programs.

The specific activities and functions of EEAA, necessary to fulfil these objectives, are clearly defined within Law 4/1994 for the Environment. One of the most significant activities of EEAA is the enforcement of Law 4/1994 and its executive regulations. Moreover, EEAA together with the Ministry of Foreign Affairs plays an important role in coordinating and fostering the environmental partnerships at bilateral, regional and international level.

Other Governmental Bodies Relevant to the Environment

Almost all national authorities in Egypt are concerned with environment improvement. These constitute the three traditional authorities: legislative, executive, and juristic; along with public media organs. A list of executive authorities relevant to the environment is given in Table 1.

Table 1. Governmental bodies relevant to the environment

Organization	Relevant Departments/Institutes
Ministry of Agriculture and Land Reclamation	-Agricultural Research Institute -The Central Agricultural Pesticides Laboratory -Desert Research Institute -The Central Department for Afforestation and Environment
Ministry of Transport	-Port and Lighthouse Administration
Ministry of Industry and Technological Development	-The General Organization for Industrialization
Ministry of Housing and Public Utilities	-National Organization for Potable Water and Sanitary Drainage
Ministry of Petroleum	-Egyptian General Petroleum Corporation
Ministry of Electricity and Energy	-Atomic Energy Authority -Organization for Energy Planning
Ministry of Health and Population	-General Department for Environmental Health -Higher Executive Committee for Protection Against Ionizing Radiation
Ministry of Water Resources and Irrigation	-Nile Protection Department -Shore Protection Authority -National Water Research Institute
Ministry of Interior	-The General Department for Surface Water and Environmental Police -Traffic Department
Ministry of Education	-Environmental Education Department
Ministry of Scientific Research and Higher Education	-National Research Center -Academy of Scientific Research and Technology

Governorates	<ul style="list-style-type: none"> -Greater Cairo Water General Organization -Greater Cairo General Organization for Sanitary Drainage -Cairo and Giza Beautification and Cleaning Authorities -Alexandria Water General Organization -Alexandria General Organization for Sanitary Drainage -Other governorates water, sanitary drainage and cleaning departments
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Egypt's Atomic Energy Authority (EAEA)

The Egyptian Atomic Energy Authority is the national competent body in the environmental law as regards ionizing radiation. According to article 47 of the Law, EAEA has to set limits on the level of radioactivity or concentration of radioactive substances in the air. According to article 25 of the executive regulation of the Law (PMD 338/1995), EAEA is the responsible to license for the displacement and use of hazardous substances and waste from which ionizing radiation is emitted

National Non-Governmental Organizations (NGOs)

Non-Governmental Organizations (NGOs) in Egypt have an important role to play in contributing to the Country's social, economic, and democratic development. In this respect, the Egyptian government has been encouraging and supporting the establishment of various NGOs, especially those working in the fields of environmental awareness and protection. Currently, there are more than 2,000. Data available on national NGOs are summarized in Table 2.

Table 2. Data on National NGOs

Type of CSO	Number of CSOs	Total Membership
Associations / NGOs	17,000 (77.6%)	3,000,000 (26.5%)
Business Associations	13 (0.06%)	12,000 (1.1%)
Syndicates	24 (0.11%)	4,300,000 (38%)
Clubs	930 (4.2%)	1,600,000 (14.1%)
Youth Centers	3,920 (17.9%)	900,000 (8%)
Political Parties	14 (0.06%)	1,500,000 (13.3%)
Total	21,901	11,312,000

Not all organizations are active, but collectively they play an indispensable role in raising public awareness towards environmental issues, and in conducting environmental protection and conservation activities. Among them is the environmental protection, and community development Coptic Evangelical Organization For Social Services (CEOSS) established in 1960 at el-Minya.

According to Law, non-governmental associations are classified into two main categories of activity. The first is social care, where about 75% of associations are working in childhood, motherhood, disability, health service, social assistance, and religion and culture issues. The other 25% of associations are active in community development aimed at involving citizens in development activities. Cairo, being the capital, is home to ~25% of all associations. The other three-quarters are distributed all over Egypt's 26 governorates, with higher concentrations in urban areas.

INTERNATIONAL ENVIRONMENTAL ORGANIZATIONS

International Non-Governmental Organizations

There are several international NGOs working in the field of the environment in Egypt, most of which work concurrently in other fields. A list of them is given in Table 3. The main goal of these NGOs is to improve the social, economical and environmental conditions of the Egyptian community.

Table 3. Major international NGOs working in Egypt

Organization	Governorate	Established
Near East Foundation	Cairo	1915
Cooperative for American Relief Everywhere (CARE)	Cairo	1954
Catholic Relief Services	Cairo	1956
Ford Foundation, Cairo Office	Cairo	1957
Agricultural Cooperative Development International	Cairo	1963
Medicines Sans Frontiers	Cairo	1975
Institute of Cultural Affairs Middle East and North Africa (ICA)	Cairo	1976
Fredrich-Ebert foundation	Giza	1976
Plan International	Cairo	1980
Save the Children/USA	Cairo	1982

International Donor Agencies on Environment

These organizations contribute significantly to environment improvement in Egypt through donor projects. Major agencies involved in recent activities are listed in Table 4.

Table 4. Major international donors on environment

Donor Agency	Country	Field	Duration
UNDP		Coastal Management	1995-2001
		Cultural Heritage	2000-2002
		Natural Conservation	1997-2005
		Technical and Institutional Assistance	1999-2002
		Water and Land Management	1995-2004
		Capacity Building and Development	1996-2002
USAID	USA	Air Pollution	1996-2003
		Cultural Heritage	1993-2005
		Technical and Institutional Assistance	Ongoing
		Environmental Policy	1999-2003
		Water and Land Management	1995-2002
		Water Supply and Sanitation	1994-2004
JICA	Japan	Environmental Monitoring	1997-2002
		Solid Waste Management	1996-1998
		Industrial Pollution	1999-2000
		Technical and Institutional Assistance	1997-1998
		Water and Land Management	2000-2005
		Energy	1999-2000
KfW	Germany	Water Supply and Sanitation	1997-2002
		Industrial Pollution	1997-2003
		Water and Land Management	ongoing
		Energy	1999-2003
		Water Supply and Sanitation	2000-2005

	Italy	Cultural Heritage Solid Waste Management Natural Conservation Water and Land Management	2000-2002 2002-2004 2002-2005 2002-2005
	Netherlands	Solid Waste Management Technical and Institutional Assistance Water and Land Management Capacity Building and Development Water Supply and Sanitation	2000-2003 2001-2003 1999-2004 2001 2000-2004
DANIDA	Denmark	Environmental Monitoring Technical and Institutional Assistance	1996-2004 1999-2007
	France	Water Supply and Sanitation	1996-2004
	Finland	Hazardous Waste Management Industrial Pollution Technical and Institutional Assistance Water Supply and Sanitation	1996-2002 1996-2002 1996-2002 1993-2003
	EU	Coastal Management Solid Waste Management Natural Conservation	1996-2001 1998-2002 1996-2002
CIDA	Canada	Technical and Institutional Assistance Water and Land Management	1997-2004 1997-2004

ENVIRONMENT RELATED LAWS IN EGYPT

Egypt has extensive legislation base covering areas and activities affecting the environment. Each law has its executive regulations delegating authorities to competent bodies. Table 5 gives a collection of these laws.

Table 5. Environment related laws in Egypt

Year	Law	Description
1953	66	Regulates the management of fuels, mines and quarries.
1956	68	Sets guidelines for the activities of mines and quarries.
1958	46	Regulates the work in mines and quarries.
1960	59	Controls the use of ionizing radiations.
	280	Regulates activities within the ports and the regional waters.
1961	79	Determines measures to be taken in case of marine disasters.
1962	93	Regulates the discharge of wastewater into public sewer networks.
1963	PD 421	Ratification of the Convention for the Protection of Pollution of the Sea by Oil, London.
1965	PD 1948	Establishes a permanent committee for protecting the sea from oil pollution.
1966	53	Protects agricultural lands, prohibits the hunting of specific types of birds and terrestrial animals.
1967	38	Concerning public hygiene.
	48	Requires employers to inform their employees that they are dealing with hazardous waste.
1968	72	Concerning the prevention of pollution of sea water by oil.
1973	66	Controls air pollution caused by vehicles.

1975	380	Identifies requirements for the establishment of industrial and commercial facilities.
1977	55	Regulates the establishment and operation of boilers and thermal stations.
1978	27 57	Regulates public water resources for drinking and domestic use. Sets measures for treating ponds and marshes.
1981	52 124 137	Regulate smoking in public places. Regulates the usage and management of desert land owned by the government of Egypt. Requirements for labour safety and health in workplaces.
1982	3 48	Regulates urban planning and land use. Concerning the protection of River Nile and waterways from pollution.
1983	102 116 123 124 PD 45 PD 284	Controls natural protected areas. Prohibits the fallowing of agricultural land, or its use in building and construction. Regulates the management of cooperatives of water resources. Regulates the management of fishing activities and aquacultures. Signs the Protocol for the protection the Mediterranean from land based pollution Sources. Establishes the Cairo and Giza Beautification and Cleaning Authorities. Their mandates include the collection and disposal of garbage and solid waste.
1984	12	Regulates irrigation, water distribution, groundwater management in the Nile Valley and Delta, and the establishment and maintenance of drainage canals.
1994	4	Environment protection law.
1996	874	Prohibits the use, import, handling and preparation of potential carcinogenic pesticides.

ROLE OF PHYSICS

Physics is a major science, its contribution to all aspects of life, material and non-material is essential for the foreseeable future. Physics is and will continue to be essential for analysing and solving urgent environmental and energy problems.

Understanding of basic physics laws is essential to understand environmental problems, while mastering physics thinking helps in tackling the problem. Major disciplines of physics that are of close relation to environmental problems include:

At the Thermal Physics level: thermal comfort and insulation, energy use in buildings. efficiency of the internal combustion engine.

At the Sound and Acoustics level: noise pollution reduction.

At the Surface and Chemical Physics level: heterogeneous catalysis for cleaning of emissions from vehicles and industries, use of stratospherically relevant photoreactions on ice particles.

At Molecular Physics level: cloud formation, soil-water balance, evaporation from the land surface, atmospheric profiles of VOCs (volatile organic carbons) both from petrochemical plants and in hot flue gases, soil-organic matter dynamics.

At the Fluid Physics level: atmospheric structure and composition, air masses and wind pattern, ozone depletion, the green house effect, air particulates and precipitation..

At the Atomic and Nuclear Physics level: sun and earth as ideal radiators, ionizing and non-ionizing radiation, energy from fission and fusion.

ENVIRONMENTAL PHYSICS ACTIVITIES IN EGYPT

Most environmental physics activities in Egypt deal with measurement and monitoring of ionizing radiation, natural and man-made radioactivity, transfer and distribution of environmental radionuclides, radioactivity in seas, rivers, lakes, ground-waters, sediments, soils, and atmosphere, predictive modeling, assessments of health effects, criteria for discharge control and options for ultimate disposal of nuclear wastes.

Other field of interest is that dealing with atmospheric physics. Activities include weather prediction, plume dispersion, wind modeling, solar energy mapping.

On the NGO scale, the Egyptian Nuclear Physics Association (ENPA) has organized several seminars to increase public awareness towards environment related issues. These were:

- Seminar on Environmental Radioactivity in Egypt, during the period 24-25 Nov. 1998.
- Seminar on the Role of Nuclear Technologies for the Service of Society and Environment, during the period 22-23 March 1999.
- Seminar on Electromagnetic Radiation (nature, effects, and applications), during the period 13-14 May 2000.
- Seminar on Depleted Uranium (properties, use, effects, and issues), during the period 19-20 May 2001.