

# Chapter 1: Air Quality

## Introduction

Pure air consists of several gases, most important of which are nitrogen and oxygen, composing, successively, 78% and 21% of air weight, in addition to few quantities of other gases such as Carbon Dioxide, Helium, Neon, Argon, and other gases. Life on earth depends on this natural composition of air.

Air is considered to be polluted if its composition is changed and when it contains impurities or other gases by quantities which harm living organisms inhaling this air. Air is polluted due to natural factors and different human activities. In the first case (for example, dust emissions due to storms such as Khamasin and others), pollution is temporary with limited impacts; air promptly restores its original nature after the end of these natural factors. In the second case, air pollution persists as long as various human activities continue. Pollution sources are usually divided into two types: fixed sources (factories, fossil-energy power stations, waste open burning, etc.) and mobile sources (different means of transportation fueled by oil and gas).

## MSEA Achievements

### First: Encouraging using natural gas as environmentally clean fuel

#### 1. Using natural gas in public means of transportation:

- a. Within the framework of the Egyptian environmental policy program, during 2006 and 2007, 50 natural-gas-fueled buses have been added to Greater Cairo Public Transportation Authority fleet, under a policy aiming to annually add 25 natural-gas-fueled buses.
- b. A pilot project is implemented in cooperation with Greater Cairo Public Transportation Authority and Arabeya Gas Company financed by Environmental Protection Fund (EPF) to convert 5 Gasoline-fueled hard-service buses to work through double-fuel cycle (natural gas and gas oil). Thus, the number of buses fueled by natural gas is 105 buses. 5 mini-buses are being converted to work through the double-fuel cycle (natural gas and gas oil).
- c. An MoU has been signed between Egypt (represented by EEAA, Technological Development Sector, Ministry of Industry, and Cairo governorate) and Italy (represented by the Italian Embassy in Cairo) to transfer the advanced Italian technology in producing mini-buses fueled by natural gas to the Engineering Automotive Manufacturing Company and establish a production line for these vehicles through technical and technological cooperation with the Italian Iveco Company.
- d. Concerning disposal of old vehicles, which exhausts form a major reason behind air pollution, the first phase of an ambitious project has been initiated to replace old taxies aging more than 35 years by other new ones fueled by natural gas. Economic incentives are offered to old taxi owners encouraging them to scrap their old taxies to be replaced by new ones. During this phase, 100 old taxies are replaced by new ones fueled by natural gas, where old-taxi owners are offered economic incentives as EPF

funds the bank interests on the car loan from a budget of 1.9 million LE.

- e. In light of first phase success, the Minister of Finance agreed that the MoF will participate in funding a national project to replace 5000 old taxis in Greater Cairo by new ones fueled by natural gas.
- f. The government has agreed on MSEA proposal of granting economic incentives to the private sector to encourage private investment in using natural gas as vehicle fuel. Ministerial decrees have been issued in February 2007 providing for reducing custom duties on equipment used in converting vehicles to work by natural gas and natural gas stations equipment to be categorized as environment-friendly equipment. Therefore, customs imposed on such equipment decreased to reach 2%. This has contributed to decreasing the costs of converting cars to work by natural gas and expanding natural gas station network.
- g. A study has been prepared on the environmental and economic benefits of replacing Greater Cairo public transportation fleet with another one fueled by natural gas. This project is included in the presidential platform and Egyptian government program with the cost of about 1200 million LE.



Picture (1-1): Replacement of Greater Cairo old taxis by new ones fueled by natural gas

## 2. Using natural gas in government-owned means of transportation:

- a. An ambitious program has been executed to convert vehicles owned by governmental bodies to be fueled by natural gas instead of gasoline. The four-stage program is funded by the MoF and aims to convert about 4200 government-owned vehicles. The first phase has been completed where 1960 government-owned vehicle owned by 62 governmental bodies have been converted with a total cost of 13 million LE.
- b. Within the framework of implementing the project second phase, 804 government-owned vehicles have been technically inspected to check their suitability to be converted to work by natural gas. 696 vehicles are found suitable (owned by 50 governmental bodies). MoF has been addressed to provide the necessary funding for the conversion process with a cost of 4 million LE.
- c. 870 government-owned vehicles have been checked in order to initiate the third phase.
- d. The presidential platform and government program have been implemented within the framework of an ambitious program to convert 5000 government-owned vehicles with a total budget of 27.5 million LE within the program of converting government-owned vehicles to work by natural gas.

## 3. Using natural gas as a fuel for power stations:

- a. Efforts by MSEA have succeeded in coordinating between both Ministry of Electricity and Energy and the Ministry of Petroleum to operate power stations by natural gas instead of fuel oil, in order to reduce pollution loads of sulfur oxides from fuel oil combustion.
- b. Such step has lead a significant decrease in sulfur oxide emissions in Greater Cairo air (almost by 680 tons of sulphur oxides annually). Consequently, the concentration of

this gas in air has decreased to limits permissible by Environment Law no. 4/1994 in most monitored regions.

## Second: Elimination of Vehicle Emissions

### 1. Vehicle exhausts examination in traffic units:

- Vehicles exhaust inspection program has been fully applied in the traffic units of 12 governorates in cooperation with the Ministry of Interior, over 3 stages:
  - First stage (Cairo – Giza – Kaliobia).
  - Second stage (Alexandria – Dakahlia – Beni Suef).
  - Third stage (Minya – Sohag – Qena – Red Sea – Beheira – Fayoum).
- These stages include supplying 194 measurement devices of gasoline-fueled vehicles exhaust, 175 measurement devices for exhausts of diesel-fueled vehicles with the cost of about (12 million LE). Vehicles in these governorates represent 77% of total licensed vehicles on country level.
- The program procedures have been applied in 10 governorates during the fourth stage (Sharqia – Assuit – New Valley – South Sinai – Gharbia – Kafr El-Sheikh – Suez – North Sinai – Damietta – Menofia). 130 exhaust measurement devices are provided to traffic units in such governorates with a total cost of 4 million LE.

### 2. Vehicles exhaust examination on roads:

- In cooperation with Ministry of Interior through traffic departments, environment police, and water surface police, this program is currently applied in Greater Cairo roads besides vehicle periodical examination while renewing licenses to eliminate vehicles emissions, considered one of the reasons of air pollution in greater Cairo.
- During 2006/2007, examination committees have examined about 100,000 gasoline- and diesel-fueled vehicles. 67% of vehicles have passed, while the licenses of 33% have been cancelled since their exhausts exceed limits set forth in law 4/1994. Such are re-examined after adjusting their motors to comply with Law limits.

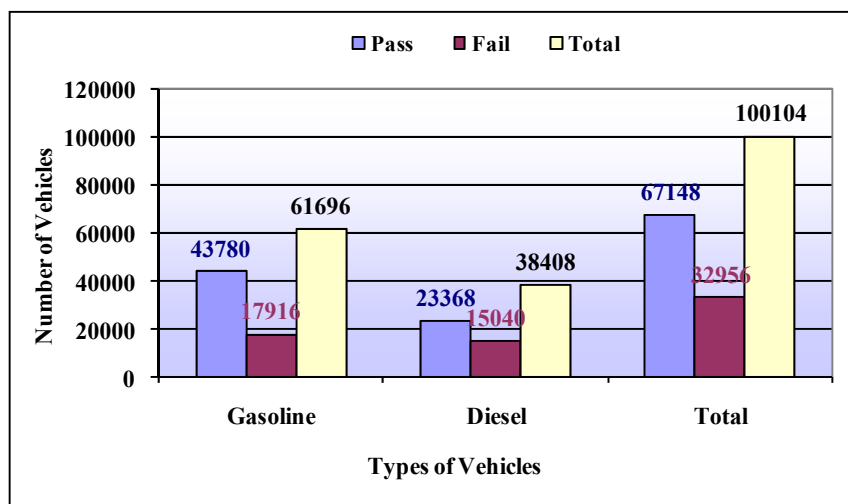


Figure (1-1) Number of vehicles examined on roads

- c. A study on examining the exhaust of Public Transportation Authority buses has been prepared and implemented through examination campaigns in all Authority 22 garages with a total of 4750 buses. Examination results have been sent to Cairo Governor and Authority BoD Chairman to set a plan to rehabilitate buses which exhausts exceeds permissible limits.

### 3. Transfer of garages out of residential areas:

- a. The Prime Minister agreed upon MSEA proposal regarding the necessity of implementing the project of transferring Greater Cairo Public Transportation Authority garages out of residential areas.
- b. Alternative sites for the garages have been identified. Environmental, economic, urban study has been conducted to estimate the costs of establishing garages in the new sites compared to the potential economic and environmental revenue from transferring the garages.
- c. The study has been submitted and approved by utilities ministerial group and a decree is issued to be included it in the integrated study of restructuring Greater Cairo Public Transportation Authority.

### 4. Eliminating pollution from motorcycles exhaust program:

- a. The Ministry of Industry has issued a decree prohibiting the production of motorcycles with bi-phase motor which are not provided with nourish oil pumps as of 31/12/2003 and prohibiting the production of all types and sizes of motorcycles with bi-phase motor for local use as of 31/12/2007.
- b. The Ministry of Foreign Trade has issued Decree no. 466/2004 on 29/6/2004 regarding listing motorcycles with bi-phase motor which are not provided with nourish oil pumps as prohibited imports on Annex (1) of the Executive Regulations of Export and Import Law provisions.
- c. The Ministry of Foreign Trade has issued Decree no. 113/2005 on 14/2/2005 prohibiting importation of all types and sizes of motorcycles with bi-phase motor regardless of the purpose of importation.

## Third: Environmental Monitoring of Air Pollutants

### 1. Monitoring Air Pollutants:

- a. Environmental monitoring stations on the national level are 54 monitoring stations for air pollutant. During the last 3 years, 13 air pollutant monitoring stations have been established in different sites at Greater Cairo and areas affected by it in delta and Upper Egypt region. These stations are as follows.
  - (1) 6 new air pollutant monitoring stations have been established in Beni Suef in cooperation with EMG component at Beni Suef. The new stations are added to the national network for air pollutant monitoring.
  - (2) 6 new air pollutant monitoring stations have been established in Cairo and Giza governorates and some affected governorates. Stations are at



Picture (1-2) Air Quality Monitoring Station at Tahrir square

(Giza Square, Heliopolis, Mohandseen, Helwan, Shebin El Kom cities, and Belibis in the Delta) to follow up on environmental changes during the black cloud period. The new stations are added to the national network for air pollutant monitoring.

- (3) An air pollutant monitoring station has been established in Tahrir Square within the framework of REMIP, displaying its data to the public on a large screen that will be installed in the first half of 2008.
- b. Under modernization and development processes of the national network for air pollutant monitoring, MSEA has provided a budget of 4.5 million LE to update air pollution monitoring devices. 15 devices for monitoring suspended dust, 4 new devices for monitoring sulphur dioxide, 2 devices for monitoring nitrogen oxides, and 2 devices for monitoring carbon monoxide are provided.
- c. Egypt Air quality reports are prepared on monthly basis. Monitoring result indicators are prepared and analyzed through data provided by the national network for air pollutant monitoring. Furthermore, these reports are published on the EEAA website according to MSEA policy of informing the public on environment quality.
- d. Three annual reports have been drafted (2004, 2005, and 2006) on air quality in the A.R.E. Monitoring result indicators are prepared and analyzed through data provided by the national network for air pollutant monitoring. Furthermore, these reports are published on the EEAA website
- e. An early-warning unit for sever air pollution episodes is established, staffed, and equipped to predict air quality in greater Cairo for three days. Cooperation protocol has been signed between EEAA and Egyptian National Metrological Authority to receive and analyze satellite pictures and prepare them as entries to air pollution early warning system.
- f. MSEA has contributed to the establishment of 3 air pollutant monitoring stations in Cairo and Sharm El-Sheikh international airports. Currently, procedures for delivering the stations and adding them to the national network for air pollutant monitoring are being taken.

## **2. Follow-up and quality assurance of environmental monitoring processes:**

- a. Environment quality reference laboratories are operating, quality examination programs of environmental monitoring institutes are conducted, and annual inspection programs on air quality environmental monitoring stations are implemented to follow up on the fulfillment of quality requirements. Air and water quality environmental monitoring laboratories of air and coastal water monitoring program are inspected in cooperation with the Faculty of Sciences, Ain Shams University, and the National Institute for Calibration.
- b. An annual program is implemented to calibrate laboratory equipment and environmental monitoring devices in air pollutant measurement stations within the framework of the annual contract with the National Institute for Calibration and the Arab British Company, Arab organization for Industrialization, to calibrate the laboratory thermal devices and balances.

## **3. Régional environmental management improvement project (REMIP):**

- a. During 2006, in cooperation with JICA, REMIP has been initiated resulting in the following:

**(1) Determining pollution loads of rice agricultural wastes (rice straw):**

A baseline study has been prepared on the quality and quantities of rice straw burning emissions to calculate pollution loads of this process. Several environmental measurements of rice straw burning have been made in agricultural areas, using furnaces and in laboratories by using sampling devices in cooperation with Tibbin Institute for Metallurgical Studies.

**(2) Determining pollution loads of vehicles:**

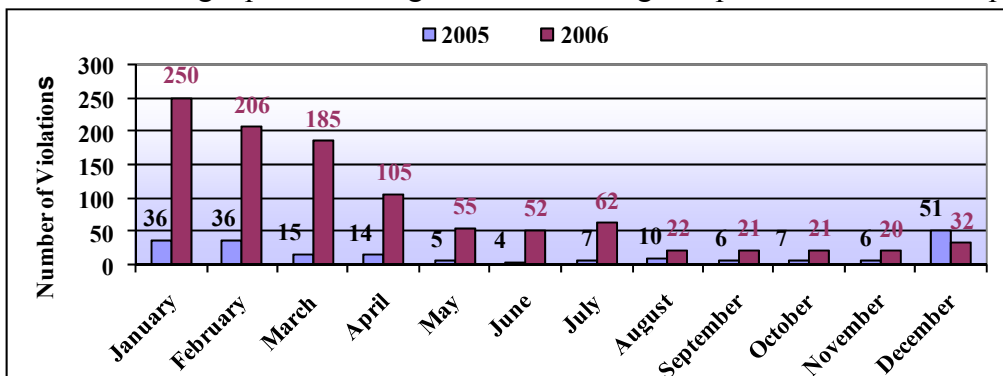
A baseline study has been conducting to define vehicles and roads. Data available at competent entities are collected including the number and distribution of vehicles in Greater Cairo and Delta governorates affecting Cairo, besides. Roads and major streets connecting cities are also determined.

**Fourth: Surveying Emissions from Fixed Sources**

Emissions from fixed sources survey including Tanta, Mansura, and Greater Cairo RBOs and EMUs in industrial cities (10<sup>th</sup> of Ramadan, 6<sup>th</sup> of October, Badr, and Obour Cities has been prepared to be completed by the work group from industrial facilities.

**Fifth: Monitoring of Air Pollutants in Greater Cairo and Delta Region**

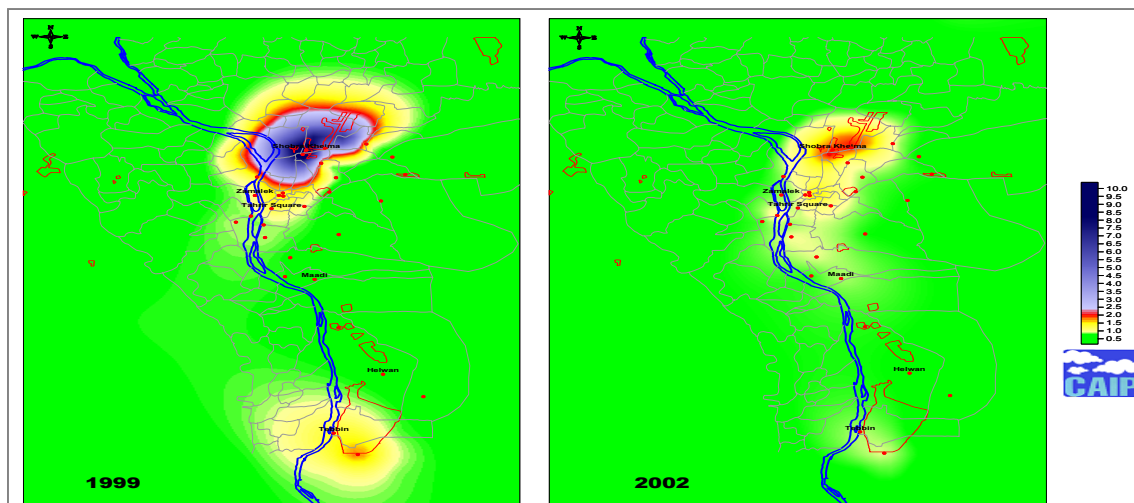
1. A study has been conducted to measure sulfur and nitrogen oxides concentrations in 60 sites covering Greater Cairo and Delta governorates during the four seasons (Fall 2006, winter 2006, spring 2007, and summer 2007) to put the geographical distribution map of such pollutants in Greater Cairo and Delta governorates linked to pollutant sources.
2. Industrial Emissions Monitoring Network:
  - a. The national network for monitoring dust emissions from cement factory chimneys has been established with a total cost of 1.2 million LE. The automatic monitoring devices fixed on the chimneys of 15 cement factories are directly and electronically linked to EEAA and the headquarters of the national network for monitoring dust emissions from cement factory chimneys. Emissions database has also been established to survey industrial facilities emissions.
  - b. More than 1500 violations by different cement companies have been identified during 2005–2007. Legal procedures against the violating companies have been adopted.



**Figure (1-2) Comparing the number of emission violations monitored at different cement companies during 2005 and 2006**

## Sixth: Lead Pollution Control

1. In coordination with Qalyubia Governorate, five of the biggest lead foundries in Egypt, producing 75% of the total Egyptian lead production have been relocated from Shubra El-Khema to the new industrial zone in Abu Zaabal. This step has resulted in a remarkable reduction of more than 80% in air lead concentrations in Shubra-El-Khema.



Map (1-1): Purification of lead-polluted areas in Shubra-El-Khema.

2. A joint project between MSEA, Qalyubia Governorate, and USAID is implemented, in cooperation with the NGOs and the National Council for Women (NCW), to purify lead-polluted areas in Shubra-El-Khema and launch a comprehensive public awareness campaign on lead pollutants dangers and means of protection. Such project is an extension to Cairo Air Improvement Project that succeeded lead pollution abatement in Shubra-El-Khema.
3. Lead-polluted areas are defined and included within the project action plan. They have also been purified from lead dusts and rehabilitated to be safely utilized.
4. Purification and rehabilitation of 10 lead-polluted sites (7 foundries, 2 schools, and 1 medical center) have been finished. Agreements on defining and organizing the future utilization of such buildings after being purified have been signed with the owners of such buildings in order not to be misused.
5. A cooperation agreement between Qalyubia Governorate, Foundries Branch in the Federation of Egyptian Industries, and Industrial Development Authority (IDA) is signed to relocate the foundries to El-Safa industrial zone. The implementation of such agreement takes three years and a half to establish zone infrastructure, construct and operate the new foundries, and stop working in the old foundries.
6. An agreement with the Arab Contractors Company has been signed for the treatment of lead pollution and purification of the Company battery workshop in Shubra-El-Khema East District under the supervision of EEAA and Qalyubia Governorate, with a technical aid introduced by LIFE Project.
7. The program of monitoring lead concentrations in Greater Cairo air continues in 20 sites. Monitoring results demonstrates the success of the State policies to reduce lead concen-

trations in Greater Cairo. The annual concentration average decreased from 3.6 mcg/m<sup>3</sup> in 1999 to 0.7 mcg /m<sup>3</sup> in 2007.

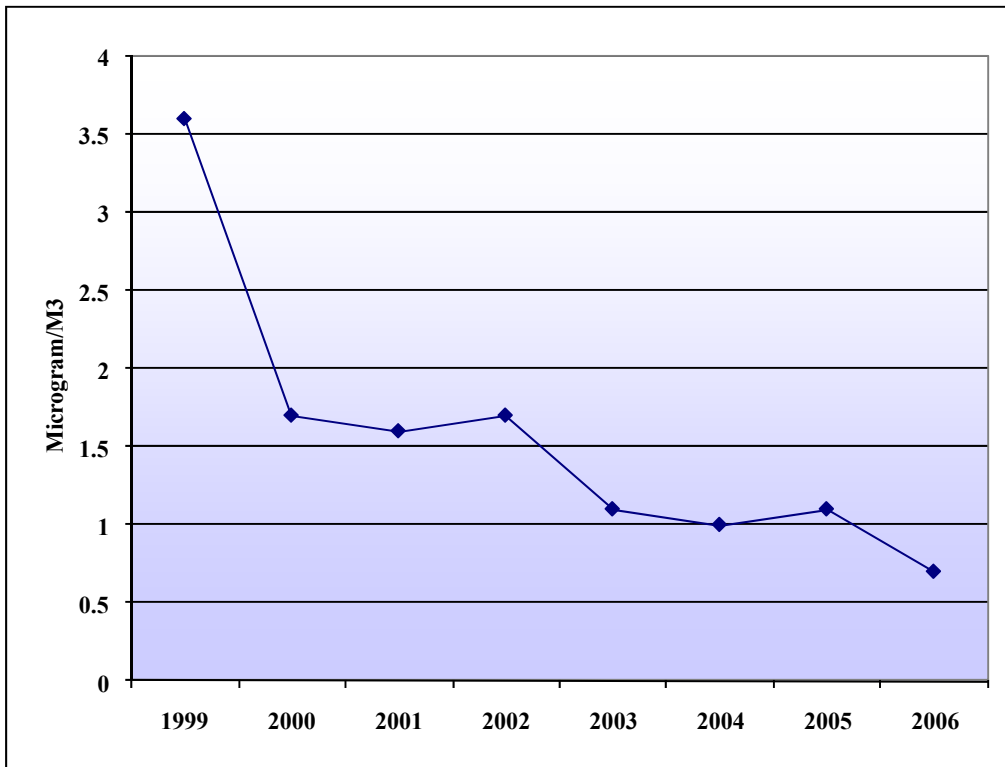


Figure (1-3) Rate of change in lead concentrations in PM10 suspended dust from 1999 – 2006 (annual average for Greater Cairo).

Table (1-1) Financing relocation and development of polluting activities in governorates

Sr.	Governorate	Project	Total financial provisions in (Million LE)
1	Cairo Governorate (Elfakhar village project)	<p><b><u>First: Batn Elbaqara:</u></b></p> <p><b><u>First stage:</u></b></p> <ul style="list-style-type: none"> <li>Establishment of 100 model and developed workshops, and 25 ateliers and studios, in addition to their utilities (30 million LE).</li> </ul> <p><b><u>Second stage:</u></b></p> <ul style="list-style-type: none"> <li>Establishment of a traditional industry technology center, center for pottery, crockery, and glass industries, a technical education school, and an administrative building.</li> <li>Construction of a residential compound (2000 units) for the project workers (with 64 million LE provided by the Governorate).</li> </ul> <p><b><u>Second: El-Mothalatha Area:</u></b></p> <ul style="list-style-type: none"> <li>The whole area is pulled down, replanned, and rebuilt including 30 model workshops.</li> </ul>	58.117
2	Giza Governorate (El-Herafeyen Village Project)	<ul style="list-style-type: none"> <li>El-Herafeyen village designed for the relocation of foundries and handicraft workshops: The project is located in Cairo-Faiyum road from kilo 36.5 to kilo 38.5 over 122 feddans, 12.2 of which are divided into 300 to 1800 m<sup>2</sup> unit areas allocated for foundries (49 ones), 2534 workshops, and 73 units for investment.</li> <li>The plan encompasses an area for used car market, car exhibition area. The establishment of car licensing unit is under study.</li> </ul>	30
3	Qalyubia Governorate (El-Safa Industrial Zone Project)	<ul style="list-style-type: none"> <li>The project area is 142 feddans. It encompasses 99 industrial units with areas ranging between 300 m<sup>2</sup> to 6000 m<sup>2</sup> designed for the relocation of Shubra El-Kheima foundries.</li> </ul>	61.5
4	Minya Governorate (El-Herafeyen city project)	<ul style="list-style-type: none"> <li>The project area is 22 feddans in Zawyet El-Sultan, Minya City, on the east bank of the Nile.</li> <li>The project includes 197 workshops, 197 apartments, and one market.</li> </ul>	18.5

Cont. Table (1-1) Financing relocation and development of polluting activities in governorates

Sr.	Governorate	Project	Total financial provisions in (Million LE)
5	<b>Matruh Governorate</b> <b>(Center for Environmental Industry Enhancement and Comprehensive Development of Siwa Oasis)</b>	<ul style="list-style-type: none"> <li>Comprehensive development of Siwa oasis project costs 40.834 million LE for the project 3 stages.</li> <li>First stage: manufacturing 660 ton cooling and freezing fridge, supplying quality control laboratory equipments, developing existing factories, and constructing infrastructure networks.</li> <li>Second stage: finishing the first stage of date packaging line, completing the industrial compound for date packaging, and equipping industrial and marketing centers. <ul style="list-style-type: none"> <li>◇ Urban planning, drawing maps, and developing Siwa airport have been implementing.</li> </ul> </li> <li>Third stage: industrial compound for olive products – equipments – raising old building efficiency.</li> </ul>	<b>11.286</b>
6	<b>Sohag Governorate (Elherafeyen village project)</b>	<ul style="list-style-type: none"> <li>Location: Awlad Azaz, Sohag Markaz, El-Kawamel road, around 8 km away from Sohag, over 70,000 m<sup>2</sup>. The project encompasses 382 workshops.</li> </ul>	<b>10</b>
	<b>(El-Nasageen village project)</b>	<ul style="list-style-type: none"> <li>El-Nasageen village is located in Al Kawthar district. The project is designed to establish 300 textile units, 237 country houses, and water and electricity networks, and pave roads.</li> </ul>	<b>4</b>
7	<b>Alexandria Governorate (Petrochemicals zone project)</b>	<ul style="list-style-type: none"> <li>New foundry compound in the petrochemicals zone. Total number: 252 foundries (192 small foundries, 48 medium foundries, 12 large foundries).</li> </ul>	<b>15</b>
8	<b>Menoufia Governorate (Establishing workshop compound project)</b>	<ul style="list-style-type: none"> <li>The relocation of noisy workshops from the city main streets to the uninhabited areas in Menoufia, Ashmoon, and Shebin-El-Kom.</li> <li>The relocation of El Sadat city landfill.</li> </ul>	<b>6</b>
<b>General Total</b>			<b>214.403</b>