

# Chapter 3

## Climate Change





## Climate Change

### Introduction

Official international reports, including the Fourth Assessment Report (AR4) issued in 2007 by the Intergovernmental Panel on Climate Change (IPCC), have proven that recent climate change, in particular recorded increases in temperature and sea level rise have affected many physical and biological systems, which have resulted in floods, droughts, and submerged areas. Adaptation to climate change is a necessary strategy at all levels worldwide in order to complete efforts to mitigate climate change impacts which are of concern, especially in low-lying urban coastal areas. Though climate change is a global phenomenon, its impacts are local, i.e. differ from one place to another all over the Earth. Egypt is one of the most vulnerable to climate change in Africa.

### Indicators of Climate change include:

1. Surface air temperature is steadily increasing.
2. Changes in the distribution of average temperature and rainfall patterns .
3. Increased rates of heat waves and storms.
4. Reduced grain production .
5. Sea level rise.



**Map (3.1) World's Most important deltas threatened by drowning due to sea level rise**

**Source:** AR4, IPCC.

### **Pollution Sources:**

Since the industrial era, human activities have increased concentrations of greenhouse gases in the atmosphere, which has led to the Global Warming phenomenon; i.e. rise of normal rates of earth temperature due to increased infrared absorption leading to climate change.

Greenhouse gases are:

1. Carbon dioxide  $\text{CO}_2$
2. Methane  $\text{CH}_4$
3. Nitrous oxide  $\text{N}_2\text{O}$
4. Perfluorocarbons  $\text{PFC}_s$
5. Hydrofluorocarbons  $\text{HFC}_s$
6. Sulphur hexafluoride  $\text{SF}_6$

Many studies (especially during the last five years) on how physical and biological ecosystems are related to climate change have proved the link between the greenhouse effect and those mentioned in AR4 of 2007. The studies stated a “Changes in a variety of ecosystems are already being detected at a faster rate than anticipated (high confidence)”.

Current atmospheric concentrations of  $\text{CO}_2$  and  $\text{CH}_4$ , and their associated positive radiative forcing, far exceed those determined from ice core measurements spanning the last 650,000 years. Fossil fuel use, agriculture and land use have been the dominant cause of increases in greenhouse gases since 1750.

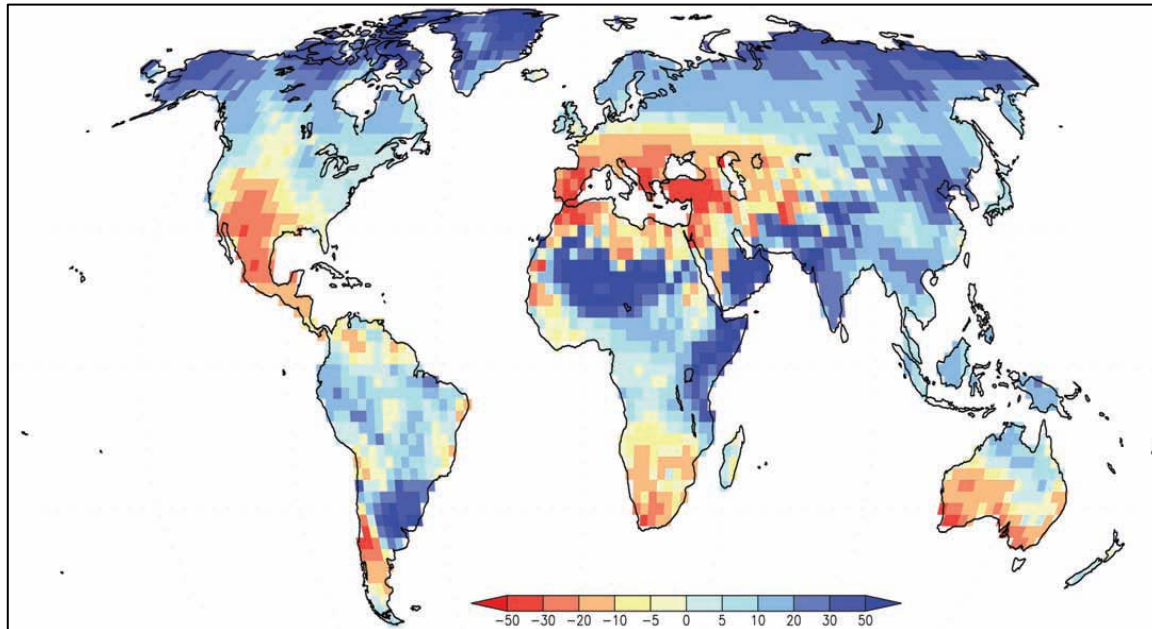
### **Climate Change Impact on Egypt**

#### **1. Impact on water resources:**

- Increased stress on water resources and the rate of consumption, especially in agriculture and industry sectors.
- Change in amount, places, and patterns of rainfall.
- Some studies show that the Nile flow may decrease by approximately 60%.
- Increased demand on water due to agricultural expansion and increasing in population.



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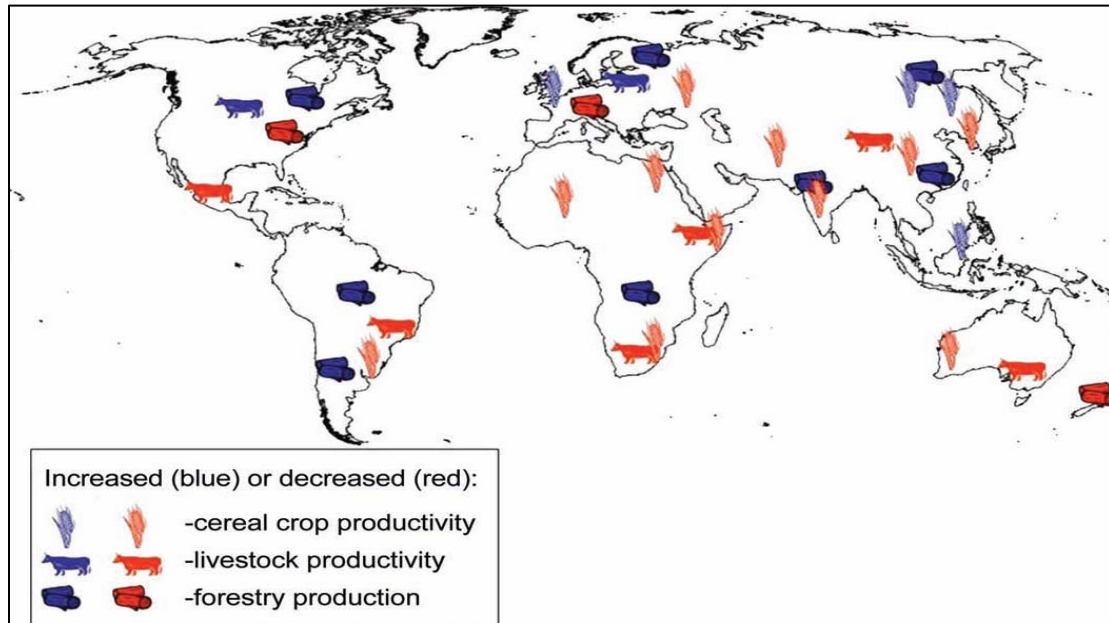


Map (3.2) Potential impact on fresh water in different world areas

Source: AR4, IPCC.

### 2. Impact on agriculture, livestock, and food resources:

- Decrease in production and food resources (some crops are more vulnerable).
- Change in agricultural yield patterns.
- Negative impacts on the marginal agriculture and increased desertification rates.
- Increased water demand due to high temperatures and evaporation.
- Negative impacts on agriculture due to the change in heat wave rates .
- Social and economic impacts.
- High temperature increases rates of soil erosion and reduces the possibility of cultivating marginal lands.



Map (3.3) Potential impacts on agricultural and animal production and forests by 2050

Source: AR4, IPCC

### 3. Impact on coastal zones

- Drowning some low-lying areas in the northern Delta and other coastal zones.
- Increasing rates of beach erosion and soil salination.
- Increased coastal land salinity, high ground water level and decreased agricultural production.
- Impact on fish production due to a change in coastal zone ecosystems .
- Social and Economic impacts.
- Impacts on human health due to water shortage, high temperature, humidity and increased heat and cold waves.

### 4. Impact on tourism

- Rapid deterioration of cultural monuments at high temperatures and variation of the climate conditions.
- Increased pressure on investment areas of Red Sea and Mediterranean coasts.
- Beach erosion negatively affects tourism services, which leads to their degradation, subsequently decreasing tourist flow and increasing unemployment.



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- Increased effects of high temperature, dust and humidity on cultural monuments, consequently reducing tourist flow and visit duration; thus, dropping tourism and increased unemployment.
- High temperatures lead to bleaching of coral reefs, a natural wealth attracting tourists.



Figure (3.1) Coral reef bleaching

### 5. Impact on human settlements:

- Economic and social stress on coastal settlements due to sea level rise, increased storms, rainfall and heat waves.
- Economic and social stress on local urban settlements due to heat waves, floods and dust storms.
- Increased air pollution episodes.
- Migration of farmers and fishermen.
- Increased unemployment leading to political instability.
- Increased levels of groundwater cause diseases and affect monuments.
- Increased pressure on slums, the most vulnerable to wind and floods.
- High temperature increases children mortality rates.
- High humidity increases dissatisfaction and reduces performance efficiency. It also affects tourism, structures of building and monuments.
- Storms and high temperature increase the amount of dust which affects the electrical appliances, consequently increasing fire rates in rural areas and slums, as well as road accidents.
- Impacts on human health due to high temperature, dust, humidity and storms.



## Egyptian efforts to mitigate the negative impacts

MSEA has adopted several procedures to face climate change in coordination with all concerned ministries. Egypt's Second National Communication Project (SNC) is developing a comprehensive study on climate change impact on Egypt, focusing on vulnerable sectors in order to deal with the mentioned impacts. SNC started in June 2006 and will be completed in June 2009.

A strategy is prepared to adapt to potential changes in agriculture, water resources, irrigation, health, coastal zone sectors in the light of SNC outputs. Each sector strategy will be prepared by specialized experts to be approved by concerned ministries, relevant sectors, National Climate Change Committee (NCCC), and the Cabinet.

Within the framework of MSEA efforts to manage climate change impacts, NCCC has been re-established by Prime Minister Decree No. 272/2007 to be chaired by MSEA and consists of scientists and experts from different line ministries and relevant bodies. NCCC makes effort to manage climate change through:

1. National coordination concerning Egypt's Membership to UN Framework Convention on Climate Change (UNFCCC), participation in consultation meetings, negotiation of resolutions, and implementation of UNFCCC articles and obligations, while avoiding any obligations upon Egypt to reduce emissions.
2. Application of climate change studies through proposing appropriate mechanisms and means of implementation, such as developing a regional model of climate change impacts on Nile Basin water resources, studying the national CDM strategy, improving energy efficiency, and expanding the use of renewable energy.
3. Development of an overview for general policies needed by Egypt to deal with climatic changes.

In its first meeting, NCCC called for utilization of UNFCCC Adaptation Fund to face climate change impacts. Accordingly, Egypt has been elected a Member of the Adaptation Fund BoD during UN Conference on Climate Change held in Bali, Indonesia, 3 –14 December, 2007.

Climate Change Unit, EEAA, in coordination with UNFCCC, has participated during 2007



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in organizing two international workshops to activate Egypt role in facing climate change:

1. Workshop on climate-change-relevant risks and vulnerabilities within the framework of Nairobi Work Program, 18—20 June, 2007, and
2. Workshop on sharing experience and training between countries not included in Annex I (developing countries) preparing National Communications, 20—22 September, 2007.

To mitigate climate change, most industrial countries, or countries included in UNFCCC Annex I in accordance with Kyoto Protocol which was adopted in December 1997, are committed the reduction of greenhouse gases (GHG) by 5.2% during 2008—2012 compared to the percentage of 1990.

To achieve Kyoto objectives, countries may reduce their emissions nationally or in other countries since GHG impact is universal. Costs of mitigation measures per Carbon Dioxide ton differ between countries; usually, they are less in countries not included in Annex I (developing countries).

## Clean Development Mechanism (CDM) Achievements

CDM is one of Kyoto Protocol three mechanisms which include Joint Implementation and Emissions Trading. The aim from applying CDM is the implementation of projects reducing GHG emissions from different sectors such as industry, waste recycling, transport, switching to usage of natural gas as a fuel, and afforestation to absorb GHG. These projects contribute to achieving sustainable development goals, create job opportunities, produce additional financial return from selling carbon reduction certificates as a result.

During 2007, NCCC held 6 meetings (3 for the Egyptian Bureau for CDM (EB-CDM) and the Egyptian Council for CDM (EC-CDM)). 17 CDM projects have been approved and Letters of No-Objection (LoN) have been issued (first phase of project approval). Such projects include:

1. Abatement of nitrous oxide from the acid factory, Delta Fertilizers and Chemical Industries.
2. Abatement of nitrous oxide from the acid factory, KIMA Chemical Industries.
3. Abatement of nitrous oxide from the acid factory, Nasr Fertilizers and Chemical Industries.
4. Fuel switching and reduction of clinker, National Cement Company.

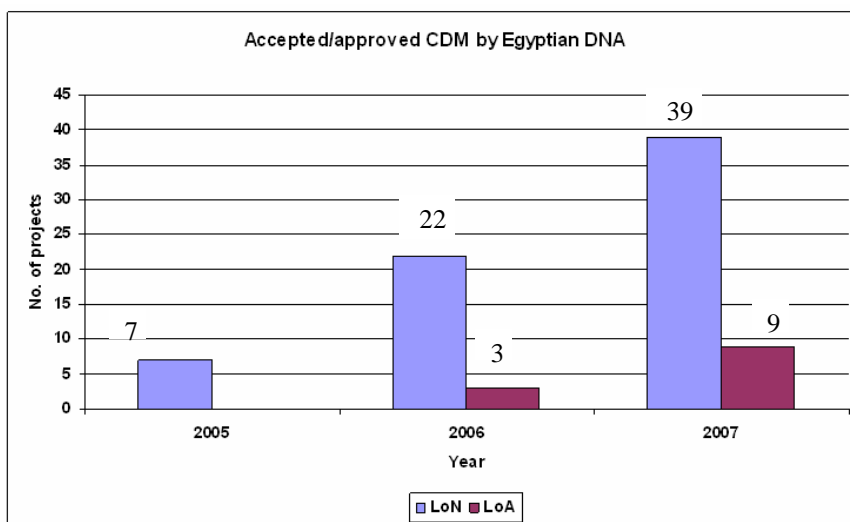
5. Fuel switching in industrial processes, El-Delta Steel Company.
6. Equipment replacement and fuel switching, El-Max Salinas Company, Alexandria.
7. Land filling, treatment, and recycling, Southern Region, Cairo Governorate.
8. Installation of cogeneration unit operating by gas recovered from the industrial processes, Alexandria Carbon Black Company.
9. Replacement of fuel oil by natural gas, Dakahlia Spinning and Weaving Company.
10. Replacement of light oil and coke gas by natural gas as a fuel for furnaces, Nasr Forging Company.
11. Fuel Switching from Light Oil to Natural Gas in Spring and Transport Needs Manufacturing Co.
12. Methane Reduction by Composting of Municipal Waste from Cairo North and West.
13. Capture and flaring of biologically-generated methane from Abu Zaabal landfills, Qalyubia.
14. Replacement of light oil by natural gas, Damietta Spinning and Weaving Company.
15. Reduction of sodium carbonate, Nile Oils and Detergents Company.
16. Reduction of CO<sub>2</sub> emissions, Egypt for Oils and Soap Company.
17. Switching fuel from heavy oil to natural gas, El-Nasr Wool and Selected Textile Company (STIA).

Thus, the number of projects initially approved since NCCC started in 2005 has reached 39. NCCC has finally approved 6 CDM projects and issued Letters of Approval and Letters of Authorization (LoA); this is the second and last stage of project approval procedures. These projects include:

1. Installation of 13 MW GT cogeneration unit operated by natural gas, Sendyan Paper Factor.
2. Switching to use natural gas as a fuel for 311 clay brick factories in Arab Abu Sa'ed and El-Saff.
3. Installation of cogeneration unit operating by gas recovered from the industrial processes, Alexandria Carbon Black Company.
4. Establishment of 120 MW power generation wind farm, Zaafarana, third stage.
5. Land filling, treatment, and recycling, Southern Region, Cairo Governorate.
6. Establishment of hydropower plant, Naga Hamady.



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**Figure (3.2) Number of CDM projects (initially and finally) approved by NCCC from 2005 to 2007**

Thus, the number of projects which received final approval since NCCC started in 2005 has reached 9. Investment costs of initially approved projects in 2007 are USD 100 million. These projects will reduce GHG by almost 1.6 ton CO<sub>2</sub> equivalent. They include reduction of nitrous oxide emission from fertilizer industry, fuel switching, recycling, and energy efficiency improvement.

Concerning the international situation of CDM projects in Egypt, CDM Executive Board has approved to register 1 Egyptian CDM project in 2007; thus the number of internationally registered Egyptian projects is 3. The registered project is “Establishment of 120 MW Power Generation Wind Farm in Zaafarana”. The Executive Board has also enlisted 2 Egyptian CDM projects in the validation stage (preceding registration), so that the number of these is 4. These projects are “Installation of a Cogeneration Unit Operating by Gas Recovered from Industrial Processes, Alexandria Carbon Black Company” and “Establishment of Hydro-power Plant in Naga Hamadi”.

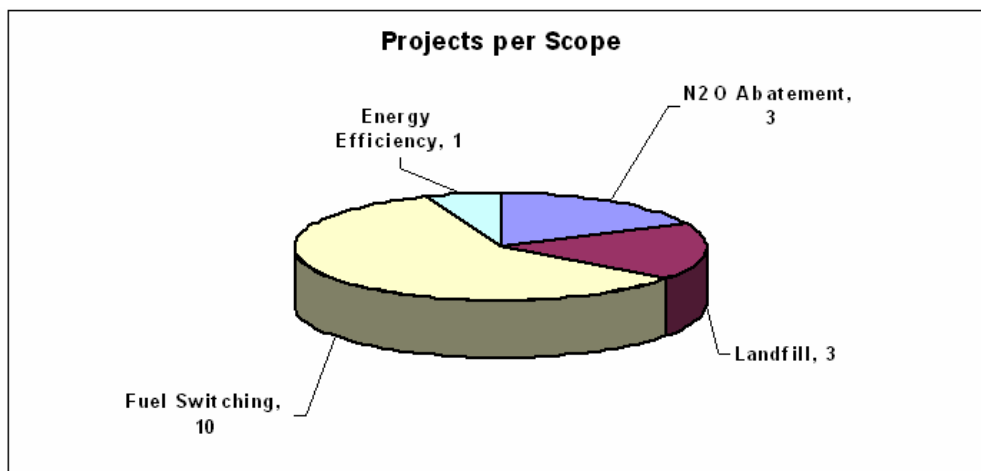
EB-CDM has applied to CDM Executive Board to review a CDM project facing technical problems, this is “Switching to Natural Gas as a Fuel in 311 Clay Brick Factories in Arab Abu Sa’ed and El-Saff”.

On the executive level, 4 CDM projects are implemented in Egypt and are currently operating achieving emission reduction. These projects include:



1. Installation of a unit for the abatement of nitrous oxide from acid factory exhausts, Abu Qir Fertilizers Company.
2. Capture and flaring of methane gas biologically generated from landfills, Alexandria.
3. Installation of 13 MW GT cogeneration unit operating by natural gas, El-Sendyan Paper Company.
4. Establishment of 80 MW power generation wind farm, Zaafarana.

Concerning capacity building, many achievements have been made. On 6 June, 2007, a national forum on climate change and CDM has been organized during MSEA celebrations of the World Environment Day, in cooperation with the British Embassy in Cairo; experts from the team work of Stern's report on climate change economics have been invited to this forum. During 18—19 March, 2007, a workshop has been organized in cooperation with World Bank and EcoSecurities company for CDM capacity building. 5 specialized workshops have been held for different industries for capacity building and raising awareness on CDM. To promote CDM projects, EEAA participated in Carbon Expo, Cologne, Germany.



**Figure (3.3) Total No. of Projects = 17**



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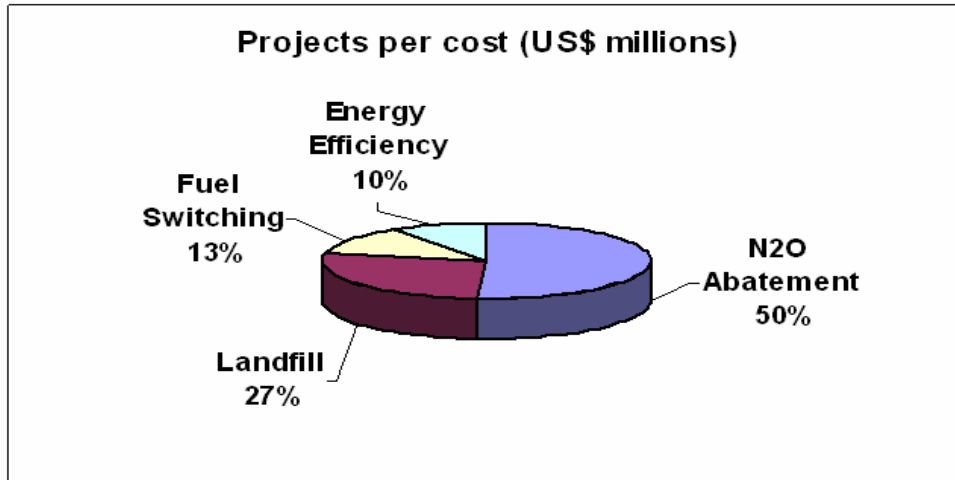


Figure (3.4) Total project costs = approx. USD 100 million.

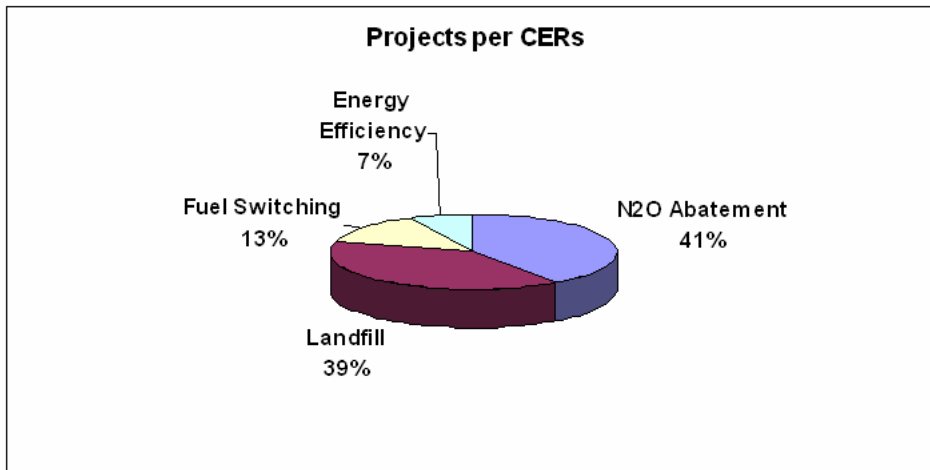


Figure (3.5) Total reduction of GHG = about 1.6 million tons CO<sub>2</sub> equivalent