Chapter 1
Review of Literature

Introduction

The increasing use of coal, oil products and other fossil fuels in power generation, industry, transport, residential as well as land use change leads to the emission of large amounts of Greenhouse Gases (GHG), in particular from the industrialized countries. This increases the "insulation" property of the atmospheric cover of the earth and results in rising mean surface temperatures. This climate change might cause more extreme weather events such as drought, hurricanes and flooding all over the world.

To mitigate climate change, one of the mechanisms for international GHG abatement is the Clean Development Mechanism (CDM). In short, an Annex I country (or firm) pays for GHG mitigation in a developing country through projects such as a wind power plant or other renewable energy, energy efficiency, and purchases the resulting measurable reduction of GHG emission in the host country. Another possible project type for CDM is afforestation: in permanently increasing the vegetated area by planting trees, the vegetation takes up carbon from the atmosphere that is sequestered in the plants, reducing the amount of carbon dioxide in the atmosphere and therefore mitigating climate change. All CDM projects have to comply with the criteria set by the Kyoto Protocol and has to be approved by the host and investor countries.

Chapter one presents a summary of previous studies conducted in Egypt and other countries. The first section offers a brief study of the Kyoto Protocol with focus on issues concerning the Clean Development Mechanism (CDM). The section also sheds light on greenhouse gases (GHG) international market as well as summarizing the benefits and barriers of CDM projects in Egypt. The chapter specifies the policies and measures that should be undertaken to reduce the GHG emissions. It demonstrates the initial national communication prepared in Egypt, its objectives and approaches. Furthermore, the chapter highlights the needs for building capacities and summarizes the current initiatives that support the CDM projects either on the institutional level or the technological level. Moreover, the vision of the Energy Efficiency Council (EEC) was illustrated as an example of the activities for the GHG emissions. More information that was stated in other reports was also included in this chapter. The chapter concludes with Egypt's institutional, technical and financial needs regarding CDM.

1.1 UNFCCC Process [1,2]

The United Nations Framework Convention of Climate Change (UNFCCC) is the first international legal instrument to address the issue of climate changes caused by anthropogenic emissions of Greenhouse Gases (GHGs). The ultimate objective of this convention is to achieve stabilization of GHG concentrations in the atmosphere at a level that would "prevent dangerous anthropogenic interference with the climate system" Furthermore, the Convention stipulates that this level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened, and to enable economic development to proceed in a sustainable manner. The convention calls for formulating policies and programs for the effective transfer of environmentally sound technologies, creation and maintaining information centers, cooperating in scientific and technical research and more.

1.1.1 Evolution of a Climate Change Institutional Framework [3]

The UNFCCC designates the Conference of the Parties the "supreme body of the Convention that shall review, on regular basis, the implementation of the Convention and any related legal instruments that the Conference of the Parties may adopt". The first Conference of the Parties, COP-1, took place in Berlin (1995). The parties agreed on the inadequacy of current Convention commitments and the consequent need for clarification and enhancement of the Convention. The most important outcome of this Conference was drafting the so-called Berlin Mandate to outline broad responsibilities and to prepare a protocol for GHG emissions reduction after the year 2000, to be adopted at COP-3. COP-2, held in Geneva, focused on the details of how to move from this start at COP-1 to a fruitful COP-3, which was to provide the Parties with a legally binding document that would significantly strengthen the commitments of Annex I Parties. Right after COP-3 until COP-7 parties were deeply involved in negotiating and adapting decisions with the aim of operating the Kyoto Protocol. The outcomes of COP-7 approved most of the framework needed to allow parties to ratify the Kyoto Protocol and start implementing the protocol.

1.1.2 The Kyoto Protocol [1,2,3]

Lately, with the end of the third conference of the parties in Kyoto (1997), the Parties were able to agree on a set of measures governing reduction of Annex I GHG emissions and adopted them within the Kyoto Protocol. The mechanism of emissions limitations targets listed in the Protocol basically depend on the following Articles:

Article 3 stated that the Parties included in Annex I shall, individually or jointly, ensure that their aggregate anthropogenic carbon dioxide equivalent emissions of the greenhouse gases listed in Annex A do not exceed their assigned amounts, calculated pursuant to their quantified emission limitation and reduction commitments inscribed in Annex B and in accordance with the provisions of this Article, with a view to reducing their overall emissions of such gases by at least 5 per cent below 1990 levels in the commitment period 2008 to 2012.

Article 6 of the Protocol allows the transfer of "emissions reduction units" from joint implementation projects among Annex I Parties.

Article 12 defines a "clean development mechanism" (CDM). The purpose of the clean development mechanism shall be to assist parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the Convention, and to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments under Article 3.

Article 17 refers to allowance trading. According to this Article, the conference of the Parties shall define the relevant principals, modalities, rules and guidelines, in particular for verifying, reporting and accounting for emissions trading. The Parties, included in Annex B, may participate in emissions trading for the purpose of fulfilling their commitments under Article 3. Any such trading shall be supplemental to domestic actions for the purpose of meeting quantified emission limitation and reduction commitments under that Article.

1.2 GHG Mitigation Option: Development of New Basic Concepts

1.2.1 International GHG Market [3,4]

The Kyoto Protocol sets binding quantified emission limitation or reduction commitments for the period 2008-2012. Each of the industrialized countries has its own

quota, which is specified in Annex B of the Protocol. This quota ranges from 8% reduction to 10% increase from the 1990 base year. The average reduction commitment is 5.2% for all countries. The greenhouse gases market is a relatively new concept originating from the flexibility of the Kyoto Protocol. It allows trading between Annex I Parties, committed to reduction targets, and Non – Annex I Parties.

The concept of trading means those countries that emit less than the given emissions cap or without emission cap are allowed to sell the difference between their actual emissions and the defined cap. These emission permits can be bought by a second Annex I party whose emissions exceed its defined target for that period. The two parties can implement the deal through direct negotiations or through specialized brokers, using the international *prices* of the emissions reduction units. In this case only the aggregate (net) emissions are monitored via national emissions inventories.

1.2.2 Clean Development Mechanism: Benefits & Barriers in Egypt [5,6,7,8]

The Egyptian Environmental Affairs Agency (EEAA) stated in its publication "Global Climate Change, Egypt faces the challenge", prepared for COP–6, that Egypt considers global climate change as a dual face coin. While global climate change presents a real threat to its future development in different economic sectors, it offers a potential opportunity for upgrading the country's energy, transportation and industrial bases while reducing GHG emissions. This potential arises mainly from CDM projects.

1.2.2.1 Expected Benefits

The total benefits that Egypt could gain from introducing the CDM can be summarized as follows:

a. Financial Flow

The sequence of gaining such benefits begins by attracting foreign currency from Annex I countries. This, in turn, would increase local revenues through custom duties on imported machinery, equipment and raw materials, income taxes as well as exports.

b. Improvement of Local Environment

Reduction of polluting emissions from different sources is significant for regional, public and environmental health. The ultimate impact will be reflected on human health, which will be assessed in regions with high population densities in Egypt.

The corresponding benefits could even be expressed in terms of pollution abatement costs (or associated damage costs) for meeting national or local standards.

c. Technology Transfer

Due to the technology transfer from the investor to the host country, the later would benefit from the management of new technology. The management process would require local institutions and human resources to be developed and organized in order to successfully operate and maintain the transferred technology.

d. Creation of Jobs

The implementation of the CDM projects will attract foreign investments and will consequently need manpower. Education and training to enhance capabilities of manpower ought to be provided given the fact that these types of projects need the build up of new skills. Eventually, this process will produce specialists who can give their expertise to other neighboring countries.

1.2.2.2 Expected Barriers

The expected barriers facing the CDM projects in Egypt can be generally classified under the following categories:

i. Decision Maker and Stakeholder Awareness

An interactive program of awareness for CDM projects should be addressed to the stakeholder as well as the decision-makers to introduce the CDM definition, approach, methodology selection, implementation etc. This program should include seminars and workshops, which affirm the importance and benefits of CDM projects for the national economy as well as for the investors.

ii. Training and Capacity Building for CDM

An intensive training program for capacity building and preparation of CDM experts should be implemented. This should include the target area for CDM projects and focus on all activities of the CDM. The coordinators for this program should be properly selected.

iii. Institutional Barriers

In spite of the existing institutions and universities, the creation of a CDM unit is needed to coordinate all these institutions. This unit should be supported in order to coordinate the CDM projects. This support can be adopted through a strong link with CDM related institutions, either governmental or private. This unit should be linked to other international firms in this concern. This link may be beneficial in CDM project validation, certification and other related activities.

iv. Financial & Economic Barriers

In order to facilitate investment in Egypt, Law No. 230 of 1989 provides certain incentive and guarantees for foreign investors who carry out activities in Egypt in accordance with its provisions. This law was repeated by a unified investment guarantees and incentives (Law No. 8 of 1997).

Although some measures were added to that law concerning the investment in the solid waste treatment and recycling, the area of CDM still needs more attention especially in financial and economic initiatives. The measures needed should be in charge of the current investment procedures in order to accommodate and enhance the implementation of CDM projects. The CDM projects should also have preferential transactions, such as exemption or reduction of custom duties, more than other projects.

1.3 Policies and Measures to Reduce GHG Emissions Prospects [6,9]

1.3.1 Egypt's Climate Change National Action Plan (ECCNAP)

ECCNAP was the main outcome of the Support for National Action Plan (SNAP). The project deals with both the assessment of Egypt's vulnerability to the adverse impacts of climate change as well as the assessment of the potential GHG mitigation. Within the assessment GHG mitigation, the project has been providing an in-depth coverage of the financial, environmental, social and economic impacts of a set of seven energy efficiency technologies. These technologies are fuel substitution, cogeneration, combustion control, waste heat recovery, efficient lighting, use of renewable energy and steam condensate recovery.

The SNAP objectives were as follows:

- Preparation of National Climate Change Action Plan,
- In-depth evaluation of priority mitigation and adaptation technologies and measures,

- Identification of opportunities to promote technology diffusion, and
- Assessment of additional resources that Egypt requires for implementing the plan, improving institutional capacities, and enhancing information resources and governmental agencies.

The aim of ECCNAP is to integrate climate change concerns into planning processes and programs of the development plans of the Government of Egypt (GOE).

Results:
The Support of National Action Plan (SNAP) evaluates the different technologies necessary for emission reduction, energy saving and associated capital investments, cost of saved carbon as well as the social and cultural impact. Furthermore, it provides an analysis of the assessed technologies. Meanwhile, it produces an overview of a national action plan taking into consideration all the assessed technologies and associated options.

1.3.2 Egypt's Initial National Communication on Climate Change [6]

The aim of the ECCNAP would be realized by enhancing policy dialogue, raising national awareness, building national capacity to deal with climate change and identifying and adopting the priority policies and measures to mitigate and adapt to possible impacts of climate change.

The objectives and approaches of Building capacity for Egypt to respond to UNFCCC are:

Objectives:
- Strengthening Egypt's capacity to comply with the requirements of the UNFCCC,
- Institutionalizing the national communication to comply with the UNFCCC, and
- Contributing to the emergence of Egyptian approaches and responses to the UNFCCC.

Approaches:
- Training of experts,
- Setting-up of seminars, workshops and studies related to climate change, and
- Establishing close links with regional UNEP/GEF projects in general and taking part in international training programs.

1.3.3 Current Initiatives for GHG Reduction

Currently, many donors initiatives are being implemented. These initiatives can be classified into institutional, technical and strategic initiatives. The coordination between these initiatives and CDM activities could support or contribute to specific needs for CDM realization in Egypt. Also, lessons learnt from donor funded projects may help in replicating these projects as CDM projects. The following are examples of these initiatives:

1.3.3.1 Institutional Initiatives

a. National Committee on Climate Change

An inter-ministerial committee was formed in 1997 representing a wide range of governmental and non-governmental stakeholders. The Chief Executive Officer of the Egyptian Environmental Affairs Agency (EEAA) heads the committee, which is responsible for coordination, establishment, and communication of national policy on climate change.

b. Climate Change Capacity Building Phase II
This initiative is a continuation of the previous GEF-assisted Capacity Building Project aimed at institutionalizing climate change issues on a national level. This second phase focuses on assessing technology needs for adaptation measures for coastal zones, agriculture, and water resources. Other activities include studying impacts on coral reefs and human health, and assessing technology needs to alleviate negative effects.

1.3.3.2 Technology/Market Initiatives

a. Technology Cooperation Agreement Pilot Project (TCAPP) [10,11]
Acknowledging technology transfer as one of its highest priorities, Egypt is focusing on such initiatives as the Technology Cooperation Agreement Pilot Project (TCAPP), in cooperation with the U.S. Country Studies Program. The TCAPP is chartered to develop consensus among key Egyptian organizations on a set of high priority, climate-friendly, technology issues aimed at successful commercialization.

Results are expected to produce candidate technology transfer areas for consideration under the guidance of the National Climate Change Committee. Market development plans for selected technologies are currently underway.

b. Promotion of Wind Energy for Electricity Generation
This is an active program within the Ministry of Electricity and Energy, through the New and Renewable Energy Authority. Supported by many international donors, this project aims at installing 600 MW of wind turbine by the year 2010. The first 300 MW is already contracted through different donors, and most of them are scheduled to be operating by 2006.

c. Fuel Cell Bus Demonstration Project
Funded by the GEF, the UNDP is currently supporting fuel cell bus projects in Cairo, San Paolo, New Delhi, Beijing, and Mexico City to reduce GHG emissions and other pollutants. The demonstration in Cairo features eight fuel cell buses with associated hydrogen production and supply facilities. The program will run for five years, with three years devoted to driving, monitoring and testing performance. Service is targeted for implementation in the year 2001. With a focus on technology transfer, Egypt hopes to expand the success of this demonstration in its transportation fleet.

d. Hybrid-Electric Bus Technology in Egypt
The overall objective of the project is to introduce to Egypt a viable Hybrid-electric bus that will have significant benefits and sustainability in various segments of the country. The project is funded by GEF and implemented by UNDP and the Egyptian Social Development Fund. The project will be applied to high priority historical sites starting with the Giza plateau, where the ancient pyramids are located.

e. Natural Gas Motorcycles
This is a demonstration project in Egypt, of a Canadian technology, developed to reduce the emissions of GHG by converting two-stroke gasoline engines used in motorcycles to Compressed Natural Gas (CNG). The project will be implemented in three phases: identification of capabilities and barriers, demonstration of the technology, and a hand-over and transition to the local market.

f. Methane Recovery from Landfills

This is a demonstration project on the recovery of methane generated in landfills in cooperation with the Canadian government and Industry. The proposed work plan involves the design and construction of two bioreactor landfill cells in Cairo. After the completion of the project, the team will hand over the two-bioreactor cells to the Cairo Solid Waste Management Authority. On-site training will be provided for the Egyptian staff for future operation and monitoring.

g. The Integrated Solar Thermal/Natural Gas Power Plant at Kuraymat

The New and Renewable Energy Authority (NREA) has prepared a program for establishing a series of solar thermal power plants. This includes the first Integrated Solar Combined Cycle System (ISCCS) with a 100-150 MW capacity in Kuraymat, Egypt. The GEF/World Bank funded project began in 1997 with a target date of operation during 2004. A second project of almost similar capacity is anticipated to go into operation before 2005.

h. The Energy Efficiency Improvement and Emissions Reduction Project

A four-year project implemented by the UNDP, with GEF funding, was designed to achieve reduction in GHG emissions. This would be achieved through the adoption of policies that promote demand-side management and energy conservation activities, and the creation of an enabling environment for energy efficiency. It focuses on the transmission and distribution of electrical systems, cogeneration policies, and market support for emerging energy service companies.

i. Fuel Switching

Current Egyptian energy policy calls for shifting the demand from liquid fuel oil to natural gas. This is due to the abundance in natural gas supply estimated at 55 trillion cubic feet (CF), and with the identified 3D seismic potential, can reach 120 trillion CF. Fuel switching is currently being applied to the electricity generation, industry, and residential sectors. The transport sector is also experiencing similar activities through the USAID-assisted Cairo Air Improvement Project (CAIP). This project promotes the use of Compressed Natural Gas (CNG) in public transport as well as small passenger cars and taxis.

1.3.3.3 Global Initiatives

National Strategy Study on Clean Development Mechanisms (CDM)

Within the framework of promoting market-based instruments for GHG emissions reduction through CDM, the World Bank, with Swiss funding, is assisting Egypt in exploring opportunities and benefits through the adoption of this mechanism.

The study aims at identifying institutional national prerequisites for CDM, preparing a pipeline of projects for implementation under the CDM, and studying the international market for GHG emissions reductions for Egypt's CDM projects. The scope of this study will concentrate on the potential sectors for CDM projects in Egypt, including energy, industry, transportation, waste management and agriculture. The study started in late October 2000, and will continue for one year.

1.3.4 Other Activities in Egypt for GHG Emissions Reduction [5,6,9,12,13]

- Egyptian Energy Efficiency Council (EEC) Programs etc.

The Energy Efficiency council (EEC) is a voluntary consortium of public and private sector organizations associated with the generation, distribution, and use of energy resources in Egypt. It was formed to foster inter-agency cooperation for promoting and

guiding energy efficient practices in Egypt. The council currently includes 12 organizations representing seven Ministries (Electricity and Energy, Petroleum, Environment, Industry, Transportation, Water Resources, and Planning) and two organizations representing the views and interests of the private sector. These two organizations are the Federation of Egyptian Industries: a forum representing most Egyptian industries, and the Egyptian Energy Service Business Association: a non-government organization representing providers of energy efficiency products and services.

The main vision of the Council is to create an enabling framework that allows a wide adoption of energy efficiency in Egypt. Its aim is to oversee the development of a national energy efficiency strategy that will be used as a roadmap to increase Egypt's efficient use of its natural resources. The strategy, which will be designed and formulated by the member organizations with support from other interested parties and international donors, will include short-term and long-range initiatives targeting policy reform and market initiatives to increase efficiency and reduce greenhouse gas emissions.

1.4 Egypt's Needs Regarding CDM

The following are the major needs for capacity building in the field of CDM:

- Establishment of institutional linkages required for implementation of the CDM;
- Project identification, formulation, and design;
- Monitoring, verification, auditing, and certification of project activities;
- Development of baselines;
- Project negotiation skills;
- CDM demonstration projects to enhance capacity building (learning by doing); including assessment of costs/risks (long and short-term); and
- Data acquisition and sharing.

The needs may include, but are not limited to, the following proposed points:

1.4.1 Institutional Needs

This can be overcome through formulating measures including national motivation transparent research programs. These measures should reflect the CDM project cycle. The measures should also enhance the capabilities of experts in all CDM related activities.

1.4.2 Technical Needs

The CDM project cycle requires intensive technical needs in all stages. These technical needs include well-trained human resources and equipment.

1.4.3 Removal of the Financial and Economic Barriers

This can be done by formulating a clear and stable transparent policy to enhance and attract the investors, whether foreign or local, to participate in the GHG projects.

1.4.4 Knowledge and Information Needs

These needs can be met by formulating data base centers for the project areas, project details, technical support, financial aid, certification procedures, etc.

1.4.5 Intensifying the Awareness and Training Activities to Change Peoples Habits Towards GHG Projects

A program of awareness for CDM projects should be organized. This program will target the concerned candidates as well as the target groups. In parallel, a training program may be organized for selecting and creating human resources specialized in CDM activities.

1.5 Other Resources or Documents [14,15,16,17]

The National strategy studies of other countries are considered an important source of information. They represent a learning experience in preparing for the Clean Development Mechanism projects. These studies include policies of each country and measures as well as the area of the implementation of CDM projects. These studies further include the socioeconomic barriers and the needed measures to overcome these barriers. This is besides the incentives needed for investors to implement CDM projects.

The work program on mechanisms for Articles 6, 12 and 17 of the Kyoto Protocol, included in Marrakech accord, which was adapted in COP-7 details most of the relevant rules and modalities needed for executing activities under those Articles. The part of this work program dealing with Article 12 is the basis for the real implementation of the Clean Development Mechanism. The work program provides a detailed guidance on all procedural and operational activities along the project cycle of the CDM.

Matters related to land use, land use change and forestry within Marrakech accord is also important for the inclusion of these activities under the CDM.

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