

Chapter 6

CDM Pilot Projects Pipeline

Introduction

Regarding the Purpose and Objectives, The Clean Development Mechanism operates basically on a project level. To promote the implementation of CDM in Egypt, this Chapter presents a list of promising projects. The most favorable projects of the project pipeline are described in more details. These projects are suitable as pilot projects. By implementing them experiences in every possible aspect of the CDM-cycle in Egypt shall be gathered. The selected CDM projects should represent a wide variety of possible projects from various sectors.

Regarding the Overview of the Content, In Section 6.1 the methodology used in identifying the project pipeline is presented. This is in addition to the descriptions of the used approach, definition and explanation of some important terms such as Baseline, Additionality, and Project Cycle.

A portfolio of 22 projects is given in Section 6.2. This project portfolio is the result of an overall assessment of possible CDM-projects in Egypt. Only projects where sufficient data had been available and that passed the below defined ‘essential criteria’ (additionality) had been considered. The projects are described by their key figures. Also included is the evaluation and ranking of the projects.

The project pipeline is shown in Section 6.3. It consists of the seven top ranked projects within the project portfolio.

6.1 Methodology and Basic Considerations

6.1.1 Approach

The foundations for the project pipeline evaluation were elaborated in close cooperation with the team responsible for the bottom-up assessment of the potential areas for CDM projects in different sectors in Egypt. The results of the bottom up assessment are shown in Chapter 2. Annex 6.1 presents an overview on the associations, private companies and governmental bodies that are involved within potential areas for CDM projects. The following two-step screening process was used to select the most promising CDM projects in Egypt:

- a. Compilation of a list of possible projects from all relevant sectors by screening existing studies and personal contacts of key players.
- b. Assessment and ranking of the projects by using a criteria-set. A detailed description of the most promising projects of the CDM project pipeline.

6.1.2 System Boundaries

On the national level, all sectors of the economy were screened for suitable projects. However, most effort was laid on the ones with the highest GHG emission reduction potential, such as power generation, industry, transport sector and land use, land use change and forestry.

On the project level, all necessary technical equipment, infrastructure, project planning and implementation activities were considered. These data served as basis for the calculation of costs and emissions.

6.1.3 Definition of Some Important Terms

In order to reach a common understanding and to enable the correct interpretation of the presented results, the important and specific terms concerning this Chapter are

explained. Several issues to characterize pilot projects must be taken into consideration to identify CDM projects. Among these issues are project baseline, additionality, and project leakage, certified emission reduction and project cycle.

6.1.3.1 Project Baseline

Prior to the initiation of projects, the “Baseline”, the counterfactual scenario of what would happen if the project is not implemented as CDM (business as usual), must be described. For this baseline-scenario, GHG emissions and costs (e.g. levelized investment, fuel costs, operation and maintenance) on a project level are assessed. The baseline is used in comparison to the scenario of the CDM project to calculate the additional costs and the additional emission reductions resulting from the CDM project. Baseline emissions and methods for measuring actual emissions will be important input into a project Monitoring and Verification Protocol (MVP).

There are several options for defining the baseline. Currently binding rules for the selection of project baselines have partially finalized within COP-7. Appendix C attached with COP-7 decision on the clean development mechanism indicates the terms of reference for establishing guideline on the baseline and monitoring methodologies. The CDM Executive Board in light of the CDM modalities and procedures shall develop and recommend general guidance on methodology relating to baseline and monitoring.

At the present time, no standardized baselines for CDM in Egypt have been developed. Therefore, in the present study, the assessment of projects will be based on project level baselines.

Project level baselines may be designed in several ways. A common approach is to carry out a project investment analyses and to investigate the profitability of different technologies and project designs that deliver the same output/services as the CDM project (without taking into consideration the GHG emissions). From these, the technology or design that would most probably be implemented in the BAU case is chosen as the baseline. In many cases, this is the least cost solution. This approach is used for baseline design for the project evaluation in the present study.

Another method of estimating baseline especially for demand side management projects is called control group approach. A control group analysis selects as the baseline the situation that prevails where the JI or CDM activity has no effect, either before, the project activity or outside the project area. In the example of an engine-tuning project with passenger cars, a set of cars that takes not part in the project (the control group) is monitored regularly. During the project activity, the average emissions by control group vehicles is considered the baseline for the calculation of the GHG emission reduction made in the vehicles of the program.

In Egypt most of the LULUCF projects are pure afforestation projects, and mostly they depend on irrigation. The rate of growth depends on soil and water. If fertile soils of the Nile delta are irrigated the growth rates can be enormous. The project activity “irrigation” is absolutely precondition for any vegetation. So without project no carbon accumulation would happen. Baseline of carbon flows is equal zero.

Because there is no natural vegetation on these areas at all, project activities are tree planting, building up irrigation infrastructure and maintenance of the infrastructure.

6.1.3.2 Additionality

CDM activities are supposed to result in carbon reduction, which are additional to those that might have resulted in the baseline scenario, i.e. without the CDM activity. Additionality refers to the issue of whether greenhouse gas emissions reduction in a CDM project occurs over and above the baseline and constitutes a new reduction that would not have otherwise occurred without the existence of the project.

6.1.3.3 Permanence

In contrast to energy projects, forestry projects have the possibility of having the sequestered CO₂ remitted into the atmosphere. The CO₂ that is sequestered by a forestry project should remain stored as carbon in the plantation's biomass and soil for a period, which is at least as long as the average duration of CO₂ molecules emitted into the atmosphere. There is still no consensus on the length of this period. But it is evident that it is much longer than the useful life of the majority of projects or of the period during which a project can receive credits: 10 years without renovation or 3 consecutive renovation periods lasting 7 years each, according to the Marrakesh Accords. There are various methodological proposals, which take into account the non-permanence of the sequestered carbon, when determining the quantity of CERs that a project can receive. However, when applying them to the same project, different quantities of credits are obtained. This issue tops the list at the negotiations of the technical group of the Convention, SBSTA, scheduled to begin in June 2002.

The solution for the permanence issue is sustainable forestry. After one rotation period the replanting must be guaranteed as well as the continuing of function of infrastructure. This is guaranteed by contracts with the landowner related to the initial implementation. In Egypt the landowner is the state so this issue can be handle.

One financial measure to guarantee the permanence of the carbon stock is to relate the replantation costs and the renewing of the irrigation system at the end of the rotation period to the previous rotation period and this what we have done in our calculations.

6.1.3.4 Project Leakage

One practical question arises in assessing additionality, which is the issue of "project leakage". Leakage appears if the project not only leads to a reduction or sequestration of GHG emissions within the project boundaries, but also results in an increase in emissions outside its boundaries as a side effect.

Much of the carbon reduction in developed countries could be offset by the so-called "leakages", as carbon-intensive industries (e.g. metallurgical chemical, ceramic, and cement industries) are driven to developing countries. In other words, if developed countries were to take serious measures to reduce their consumption of fossil fuel, the carbon emissions by developing countries would rise.

In Egypt most of the LULUCF projects are pure afforestation projects mostly in desert land, and mostly they depend on treated wastewater irrigation. The rate of growth depends on soil and water. If fertile soils of the Nile delta are irrigated the growth rates can be enormous. The project activity "irrigation" is absolutely precondition for any vegetation. So without project no carbon accumulation would happen. Baseline of carbon flows is equal zero, and potential leakages are not foreseen.

6.1.3.5 Certified Emission Reductions (CERs)

CERs are verified and authenticated units of greenhouse gas reductions generated from CDM abatement or sequestration project's activities. They represent the traded

commodity that an investor yields from a CDM project. He/She will use the CER to reach compliance in the relevant industrialized Annex I countries or use them for trading.

6.1.3.6 Project Cycle

The project cycle from the technical point of view is defined as the steps of project realization through which the formulation of a feasible project according to the rules of the CDM is done. Its main components are project validation, registration, and implementation, followed by monitoring, verification, certification and issuance of CERs for GHG emission reductions from the CDM projects. For more details see Chapter 4.

6.1.4 Evaluation of GHG Emission

First, the CDM project is defined and the annual emissions of GHG are estimated (based on emission factors described below). Then the baseline is defined (see above) and the annual baseline emissions are calculated. The difference between the baseline emissions and the CDM project emissions represent the annual GHG emission reduction of the project. The total GHG emission reduction of the project then will be the annual reduction multiplied by the project lifetime in years.

Table 6.1 shows the emissions factors used in the calculation of CO₂ emissions.

Table 6.1: Emission Factors Used in Egypt for Different Energy Types ¹

Fuel Type	Emission Factors	
	TCO ₂ /Ton Fuel	TC/Ton Fuel
Gasoline	3.1046	0.846709
Kerosene	3.2160	0.877091
Gas Oil Fuel #2 (Sular)	3.2093	0.875264
Fuel Oil Fuel #6 (Mazout)	3.1094	0.848018
Natural Gas	2.6115 1 ton N.G. = 1272 Nm ³	0.712227
Power Generation	0.605 kgCO ₂ /kWh	0.165 kg C/ kWh

For LULUCF projects the total and annual sequestration of GHG is estimated according to the CO₂ Fix model.

6.1.5 Calculation of the Cost of Saved Carbon (CSC) and the Payback Period

In this part, each of the identified projects will be subjected to cost calculations taking into consideration a comparison between the base line (BAU) scenario and the CDM project.

The calculation of cost of saved carbon and the payback period will be used to assess the (environmental) additionality of projects, i.e. projects with very low CSC and short payback period are commercially viable and would be implemented also in absence of the CDM, and therefore not additional.

The considered projects are in both the private and the public sector. All projects are assessed in a *financial* analysis, i.e. based on prices and interest rates, which are actually paid by the project hosts locally, and not on international prices. Also, social and environmental costs (for air pollution etc.) are not included. Accordingly, the cost of saved carbon partially reflects the distorting effect of fuel subsidies as experienced by the project hosts (see Table 6.2).

For public project hosts, e.g. public companies, communities etc., it may be argued that the investment decisions of the government are guided by full cost *economic* pricing, taking also into account (fuel) subsidies and external social and environmental costs. Taking the additional costs into account, the economic analysis may find projects attractive, which are not from the perspective of the financial analysis. Also, the economic analysis may result in some projects to be too profitable to be additional, e.g. in the area of energy efficiency, whereas the financial analysis of the same project may result in a lower profitability and demonstrate the additionality of the project.

However, a closer analysis on a project level shows that most public entities taking investment decisions act more like private investors and do not take into account any costs that are not related directly to their budget. E.g. the director of a public sector company that implements an energy efficiency measure will not get any transfer payment for the fuel subsidies that the government will save. Therefore, if one asks (following the Kyoto Protocol) what would happen “in absence” of the CDM project, also in the public sector the *financial* analysis is appropriate in the framework of the screening of candidate projects. For every project, a later detailed analysis in the framework of the baseline study will have to clarify if the financial analysis is suitable to assess investor decisions or if an economic analysis would be more appropriate.

6.1.5.1 Cost of Saved Carbon (CSC)

The calculations of cost of saved carbon, CSC for CDM projects as presented in Annex 6.2 take into consideration the following parameters:

- The activity period of the CDM project, which will differ from one project to another;
- The average inflation rate (for Egypt, the average annual inflation rate is 2.8% in 1999/2000);
- The nominal interest rate (for Egypt, the nominal short term interest rate is 17.8% - mid 2000);
- The real interest rate (from 12% to 18%), which is in average 15%; as it is the rate for commercial loans ($17.8\% - 2.8\% = 15\%$);
- The year 2000 as the base year;
- The exchange rate against US\$ which is considered 1 US\$ = LE 3.9;
- The local fuel prices shown in Table 6.2 will be used (international prices are for information purposes only).

Table 6.2: Local Energy Prices Used for Cost Calculations (International Prices Given Only for Information) ^{2,3}

Fuel / Energy Type	Local Price (Egypt)		International Price
Gasoline	1.00 LE/ liter	0.256 US\$/liter	Varies between countries ^{4,6}
Kerosene	0.4 LE/liter	0.103 US\$/liter	215 US\$/t
Gas Oil Fuel #2 (Sular)	462 LE/t	118.5 US\$/t	215 US\$/t
Fuel Oil Fuel #6 (Mazout) 3.5% S	185 LE/t	47.5 US\$/t	114 US\$/t
Natural Gas	0.14 LE/m ³ In industry	0.036 US\$/m ³ In industry	0.26 – 0.40 LE/m ³ (0.066 – 0.103 US\$/m ³)
	0.45 LE/m ³ In transport	0.115 US\$/m ³ In transport	
Electricity: Medium voltage, Ultra high voltage, Demand for medium voltage	0.154 LE/kWh 0.068 LE/kWh 7.3 LE/kW/month	0.039 US\$/kWh 0.017 US\$/kWh	Varies between countries ^{5,6}

An important financial indicator characterizing the project is the costs of saved carbon (CSC), also sometimes referred to as incremental abatement costs or net emission reduction costs (NRC) of the project. In the present study, CSC is calculated in the following steps:

1. The total annual operating cost, A, in case of both baseline (BAU) and CDM project is obtained by summing the annual maintenance and operating cost as well as the salaries.
2. The annualized capital costs, B, are the initial investment costs multiplied by a capital recovery factor. The capital cost recovery factor is based on project lifetime and an annual interest rate of 15% and computed according to the following formula ⁶:

$$\frac{i(1+i)^n}{(1+i)^n - 1}$$

Where:

i = the interest rate or cost of capital

n = the activity period of the project in years

3. The total annual cost, C, is the sum of the annual operating cost and the annualized capital cost: $C = A+B$. The total annual cost is calculated for both the project and the baseline case, resulting in C_{CDM} and C_{base} , respectively.
4. D is the income generated directly from both the case of baseline and CDM project. E.g. in co-generation, an additional income may result from the selling of power to the public grid.
5. The annual incremental cost, E, is then calculated as the difference between CDM project and the baseline case:

$$E = ((C_{CDM} - D_{CDM}) - (C_{base} - D_{base}))$$

6. The annual GHG emissions reduction, F, is the difference between the annual emissions in the case of baseline and the annual emissions in the case of CDM project.
7. The cost of saved carbon (CSC) consists of the annual incremental cost divided by the annual GHG emission reduction, E/F .

6.1.5.2 Payback Period of the CDM

The second financial indicator used for the evaluation of the projects is the payback period of the CDM investment (Annex 6.3). The payback period is a result of dividing the difference of the investment of the possible CDM project and the baseline case by the annual return:

$$\text{Payback period} = (\text{Investment}_{\text{CDM}} - \text{Investment}_{\text{baseline}}) / \text{Annual Return}$$

With

$$\begin{aligned} \text{Annual return} &= \text{Cost}_{\text{baseline}} - \text{Cost}_{\text{CDM}} - \text{Income}_{\text{baseline}} + \text{Income}_{\text{CDM}} \\ &= \text{Saving of operation costs} + \text{additional interest costs} \end{aligned}$$

The annual cost for both baseline and CDM case includes all energy, operating, maintenance and staff costs as well as interest payments. A change in the annual income may result from a change in electricity, heat or biogas sold in the two cases.

6.2 Project Portfolio

6.2.1 CDM Project Eligibility Criteria

These criteria are intended for the evaluation of projects. Article 12 of the Kyoto Protocol has stated the CDM project selection criteria. That is, CDM projects activities have to insure real, measurable and long-term benefits related to the mitigation of climate change and the emission reductions must be additional to what would otherwise occur (in absence of the CDM project). However, Egypt in the light of COP/MOP decisions needs to develop its own criteria.

In the following, the projects of the project portfolio will be evaluated by applying a set of criteria. The criteria set consists of three groups, i.e. CDM eligibility (or “knock out”) criteria, national criteria and investors criteria. The last two groups are used as ranking criteria.

The aim of the first screening of the CDM projects is to ensure the exclusion of clearly non-additional projects (with respect to the baseline scenario) or projects that are not in line with the governmental strategies. Only projects that meet the following eligibility criteria have been included in the present CDM project pipeline:

- The project must bring a real and measurable reduction of GHG emission compared with the baseline-scenario.
- The simple payback period for the proposed CDM investment ought to be more than two years.
- The proposed CDM project must be support accomplishment of national development plans or support sustainable development in areas, where no national development plans have been formulated yet.

The second criterion (payback period of the project criteria should be longer than two years) is a rough “rule of thumb”. It is intended to filter out the projects that have a very low probability of passing a (later) detailed assessment of project additionality. The criterion is based on the fact that investment projects with a payback of less than two years are in common management practices regarded as highly cost effective*. There is a very high probability that such projects are implemented anyway, also without additional revenue from the selling of CERs (see Section 6.2.4 below). Therefore they are not regarded as being additional. This criterion will be replaced by nationally or

* This rule of thumb for project screening has been motivated by the study Determination of Baselines under the CDM. Final Report. Swiss State Secretariat for Economic Affairs, 2000

internationally binding rules on additionality assessment for CDM projects as soon as they will exist. It is a simple rule used to filter out the most profitable and therefore non-additional projects in the context of the present Chapter, but is not a general rule for the assessment of project additionality.

6.2.2 Overview of Projects

The eligible CDM projects that passed the additionality criteria were then tested against the eligibility criteria. The aim of the eligibility criteria is to ensure that the CDM contribute to sustainable development in Egypt where the ranking criteria is to identify their implementation priorities on the national level by testing the major economic, environmental, social and health impacts of the project from the national perspective.

Table 6.3 summarizes investment cost, cost of saved carbon and payback period of all eligible projects. The formats of the calculation are presented in Annexes 6.2 & 6.3.

Table 6.3: Overview of the Project Portfolio

Project Code	Project	Initial Investment (MUS\$)	GHG Reduction (Tons C/y)	CSC (US\$/tC)	PBP (Years)
I. Electricity Generation					
I.1 Electricity Generation by Wind Farms					
I.1.1	60 MW Wind farm	54	40138	30	No PBP
I.2 Electricity Generation by Integrated Solar Thermal System					
I.2.1	CDM Integrated Solar Thermal Combined Cycle System 300 MW	240	49664	107.5	No PBP
II. Other renewable Energy Applications					
II.1 Other Solar Energy Applications					
II.1.1	Toshka PV Water Pumping	0.65	39.4	2141	No PBP
II.1.2	Solar Food Dehydration	2	1691	156.8	No PBP
III. Transportation Projects					
III.1 Railways Electrification Projects					
III.1.1	Cairo–Alex. Railway Electrification	355	21073	1604.5	No PBP
III.2 Underground					
III.2.1	Alex. Underground	687	11579	3169.9	No PBP
III.3 Waterway Transportation					
III.3.1	Development of Cargo River Nile	174	31855	97	No PBP
III.4 Switching to N.G in Transportation					
III.4.1	Installing Dedicated CNG Engines to Replace Low Efficiency Diesel Engines	12.3	2580	-300.6	3.8
IV. Energy Efficiency					
IV.1 Control Systems and Energy Saving Equipment					
IV.1.1	Control Systems and Energy Saving Equipment at Zenotex Dyers	1.1	1932	-76.2	6.2
IV.2 Waste Heat Recovery					
IV.2.1	Using N.G. & Regenerative Burners in Ezz El Dekhela Steel Company	4	3956	-21.3	9.5
IV.3 Cogeneration					
IV.3.1	Beni Soeif Cement	8.3	6336	-125	8.5
IV.3.2	Industrial Investments Company (Chemical Industry)	0.3	185	-174	7.8
IV.3.3	Misr Elmonifia (Textile)	1.6	911	-237	6.3
IV.3.4	Mohm (Metal Works)	0.3	369	-133	5.5
IV.3.5	Egypt Air Hospital (Building)	0.3	59	-488	8.5
V. Waste Management					
V.1 Solid Waste Management					
V.1.1	Feed Stock from Organic Waste	1	37336	-3.9	6.1
V.1.2	Organic Solid Waste Digestion	40	34636	163	No PBP

Table 6.3: Overview of the Project Portfolio (Cont.)

Project Code	Project	Initial Investment MUS\$	Annual GHG Reduction (tC)	CSC (US\$/tC)	PBP (Years)
VI. Land Use, Land-Use Change and Forestry (LULUCF)					
VI.1 Protecting Some New Cities By Tree Plantations Using Sewage Water					
VI.1.1	Establishment of Forest Plantations and Shelterbelts Around 10 th of Ramadan City	0.473	1946	12.29	Not Applicable (NA)
VI.1.2	Establishment of Forest Plantations and Shelterbelts Nearby El-Arish Sewage Water Station	0.653	349	32.62	NA
VI.2 Protection of Irrigation and Drainage Canals					
VI.2.1	Protecting El-Hager Canal and El-Omom Main Drainage Canal by Windbreaks	0.151	281	14.11	NA
VI.3 Stabilization of Coastal Sand Dunes					
VI.3.1	Sand Dune Fixation in North Sinai Governorate	0.170	1019	7.11	NA
VI.4 Protection of Roads and Highways					
VI.4.1	Afforestation of a Part of Cairo-Aswan Highway	0.274	471	17.71	NA

6.2.3 Project Portfolio Description

I. Electricity Generation

I.1 Electricity Generation by Wind Farms

Project Code: I.1.1	
Project Name: CDM 60 MW Wind Farm in Comparison with BAU 45 MW Steam Turbine (Mixed Fuel) ^{6,7}	
Project description	CDM 60 MW Wind Farm on the red sea
Initial investment costs	54 MUS\$
GHG emission reduction	40138 tC/y
CSC	30.2 US\$/tC
Status of project	In the development plan & strategy (it is additional because the financing is not available for the time being).
Replication potential	3
Additional socio-economic and environmental benefits	CDM project substitution reduces emissions from fossil fueled power stations.
Possible barriers / project risks	Financing of investment, new technology to Egypt, local acceptance of wind farm, electricity tariff uncertainties.

I.2 Electricity Generation by Integrated Solar Thermal System

Project Code: I.2.1	
Project Name: CDM Integrated Solar Thermal Combined Cycle System 300 MW in Comparison with BAU 300 MW Steam Turbine ^{7,8}	
Project description	CDM Integrated Solar Thermal Combined Cycle System 300 MW.
Explanation of GHG emission reduction	CDM project of solar thermal integrated system substitute power that would be produced by mixed fuel power of 280 MW.
Initial investment costs	240 MUS\$
GHG emission reduction	49664.1 tC/y
CSC	107.5 US\$/tC
Status of project	In the development plan & strategy (it is additional because the financing is not available for the time being).

Replication potential	2
Additional socio-economic and environmental benefits	Substitution reduces emissions from fossil fueled power stations.
Possible barriers / project risks	Financing of investment, new technology to Egypt, local acceptance, and electricity tariff uncertainties.

II. Other Renewable Energy Applications

II.1 Other Solar Energy Applications

Project Code: II.1.1	
Project Name: Toshka PV Water Pumping	
Project description	Land reclamation projects located in the southwestern desert areas of Egypt specially Toshka need considerable amounts of water pumping for irrigation. Those areas are - in many cases- far from the national electric grid. Photovoltaic water pumping offers a good opportunity as an electric energy source to power the said pumps. The system consists briefly of the following components: 1. Photovoltaic array system including controls, supports and necessary equipment. 2. Pump sets including electric motors, both deep well and service pumps.
Explanation of GHG emission reduction	The PV system replaces the diesel / generator set producing the same amount of electric energy annually. The PV will prevent CO ₂ emissions that could otherwise take place in case of using diesel. The provide system is very reliable power source.
Initial investment costs	0.65 MUS\$ (module 100 feddans)
GHG emission reduction	39.4 tC/y
CSC	2141 US\$/tC
Status of project	In the development plan & strategy (it is additional because the financing is not available for the time being).
Replication potential	Thousands
Additional socio-economic and environmental benefits	Project reduces local emissions of pollutants from diesel.
Possible barriers / project risks	Financing of investment, new technology to Egypt, local acceptance.

Project Code: II.1.2	
Project Name: Solar Food Dehydration ⁹	
Project Description	Using solar energy for the production of hot air or steam for the drying (dehydration) of food crops, especially vegetables & fruits. Heat mirror collector & concentrator farm system is integrated with compressed air heat exchangers and or steam boiler system. Food drying technology varies from direct to indirect curing & drying for preservation depending on the stage of process. Optimum locations are available especially in high intensity solar energy areas e.g. Upper Egypt and Toshka valley.
Explanation of GHG emission reduction	Drying (dehydration) of food crops as a mean of preservation. The BAU project uses fossil fuels for drying but the CDM project uses solar energy.
Initial investment costs	2 MUS\$
GHG emission reduction	1690.9 tC/y
CSC	156.8 US\$/tC
Status of project	Prefeasibility study
Replication potential	20 units 10,000 t capacity per module. With total capacity of 200,000 t/y.
Additional socio-economic and environmental benefits	Project reduces local emissions of pollutants from fossil fuels, less dependence from fuels.
Possible barriers / project risks	Financing of investment, new technology to Egypt, local acceptance.

III. Transportation Projects**III.1 Railways Electrification Projects**

Project Code: III.1.1	
Project Name: Electrification of Cairo-Alexandria Railway Line ¹⁰	
Project Description	The project is proposing to change the operation system of the trains from diesel driven units to an electrified system. The objective of this project is to raise the capacity of the railway line by 9% (Which is almost national target), while reducing the air emissions.
Explanation of GHG emission reduction	Changing from diesel to electricity and emission reduction due to switching from passenger cars to railways.
Initial investment costs	355 MUS\$
GHG emission reduction	21073.3 tC/y
CSC	1604.5 US\$/tC
Status of project	Feasibility studies
Replication potential	One line (Cairo – Portsaid) (230 Km)
Additional socio-economic and environmental benefits	<ul style="list-style-type: none"> • Increasing public transport capacity. • Saving fuel. • Improving environmental conditions.
Possible barriers / project risks	<ul style="list-style-type: none"> • Financing. • Not all of the additional capacity will lead to a modal switching from cars and busses to the railway, but the new capacity will also generate a new demand for transportation. This will partly offset the GHG emission reduction.

III.2 Underground

Project Code: III.2.1	
Project Name: Electrification of Alexandria Metro Line, Phase I, Abu Keer - Misr Station, 22 km	
Project Description	The objective is to introduce this type of public transportation service to improve traffic conditions in Alexandria. A metro-line is suggested to be constructed from east of Alexandria at Abou-Keer to the west at Al Amerayah with a total length of 55 km. This line can be constructed through three different independent phases (Sections). The proposed CDM project is only for one phase; the electrification of the existing line from Abou-Keer to Misr Station – 22 km long.
Explanation of GHG emission reduction	Changing from diesel to electricity in the existing line reduces emissions and emission reduction due to switching from passenger cars to Metro line.
Initial investment costs	687 MUS\$
GHG emission reduction	11578.9 tC/y
CSC	3169.9 US\$/tC
Status of project	Feasibility studies
Replication potential	Two other stages as new construction for the existing line to add a total length of 34 km.
Additional socio-economic and Environmental Benefits	<ul style="list-style-type: none"> • Increasing public transport capacity. • Saving fuel. • Improving environmental conditions.
Possible barriers / project risks	<ul style="list-style-type: none"> • Financing. • Programming of civil works. • Executing program & avoiding damage of underground nets. • Not all of the additional capacity will lead to a modal switching from cars and busses to the Metro line, but the new capacity will also generate a new demand for transportation. This will partly offset the GHG emission reduction.

III.3 Waterway Transportation

Project Code: III.3.1	
Project Name: Development of Cargo River Nile Transportation ¹¹	
Project Description	<p>River transportation is the cheapest means to transport cargo and it is the most environmentally friendly one comparing with other means (Trucks).</p> <p>The target of the existing CDM project (stage#1) is to increase the transportation capacity via River Nile by 5Mt/y (the existing capacity is 5Mt/y approximately) of the cargo.</p> <p>The project consists of:</p> <ul style="list-style-type: none"> • The introduction of the container transportation in the inland waterway transport and the construction of container terminals at Ather El Nabi, Abou Zaabel, Assiut and Qena. • The upgrade of inland water ways through dredging works, river side protection, installation of vessel traffic control system, Navigational aids and the rehabilitation of the locks. • The construction of river – ports at the four mentioned locations to facilitate the cargo handling operations along the waterways. • Construction of 140 river barges with 900 tons capacity each.
Explanation of GHG emission reduction	River Nile cargo transportation reduces fuel consumption rate via trucks transport from 36 to 6.8 gm/t.km trip, resulting in a total energy saving potential of 36500 ton Sular/y.
Initial investment costs	174 MUSS (stage #1)
GHG emission reduction	31855 tC/y
CSC	97.2 USS/tC
Status of project	Feasibility studies.
Replication potential	4 stages (every one 5Mt/y) this means to reach 10% of the transportation volume by water way in Egypt until the year 2020.
Additional socio-economic and environmental benefits	New communities, more employment, fuel saving, cost reduction and better environment.
Possible barriers / project risks	Financing, acceptance, detailed distribution of goods.

III.4 Switching N.G in Transportation

Project Code: III.4.1	
Project Name: Installing Dedicated CNG Engines to Replace Low Efficiency Diesel Engines ¹²⁻¹⁶	
Project Description	<ul style="list-style-type: none"> • Public Transportation companies (Cairo Transport Authority “CTA” and Greater Cairo Bus Company “GCBC”) operate a fleet of 3200 busses in Cairo. • The rate of busses entering the service is 200-250 busses per year. • The project module is proposing a 100 NG operated bus engines to replace the locally manufactured diesel engines annually.
Explanation of GHG emission reduction	<ul style="list-style-type: none"> • According to the design data in normal operating conditions, the fuel consumption of the new, local-made diesel engine is 0.65 lit/km. From practical operating conditions at commercial speed about 16 km/h, the fuel consumption is 0.75 lit/km. • The current existing laws & regulations enforce the governmental and public sectors to purchase the local production, due to the difficulty of current foreign currency situation. • The choice criteria in purchasing are based only on the lower price. The other criteria such as O&M cost, fuel saving cost and its environmental impact are taken into consideration where the prices are equal (law 4/94 for environmental protection puts only limits for the concentration of the emissions and not the amount of the emissions). • There is no enforcement for private sector to purchase the low efficiency local-made engines. On the contrary, the companies, which are looking for high quality services and ISO 14000, encourage the CNG engines.

	<ul style="list-style-type: none"> The GHG emissions reduction is due to replacing inefficient new local-made diesel engines by CNG engines.
Initial investment costs	12.3 MUS\$
GHG emission reduction	2580.4 tC/y
CSC	-300.6 US\$/tC
Status of project	Feasibility Study.
Replication potential	Annually.
Additional socio-economic and environmental benefits	<ul style="list-style-type: none"> Saving fuel. Cairo Air Quality Improvement.
Possible barriers / project risks	Financing.

IV. Energy Efficiency

IV.1 Control Systems and Energy Saving Equipment

Project Code: IV.1.1 Project Name: Control Systems and Energy Saving Equipment at Zenotex Dyers¹⁷	
Project Description	The project brings the implementation of Measurement & Control Systems and Energy Saving Equipment at Zenotex dyers. The objectives of this project are to improve the effects of energy conservation and reduction in CO ₂ emission through installation of measurement & control systems and energy management systems and introduction of energy-saving equipment for the main target equipment involved in dyeing processes (boilers, dyeing machines and dryers) that consume the largest amount of energy in such processes of the textile & dyeing industry – one of Egypt's major industries.
Explanation of GHG emission reduction	Saving in fossil fuel leads to GHG emission reduction.
Initial investment costs	1.1 MUS\$
GHG emission reduction	1931.6 tC/y
CSC	-76.2 US\$/tC
Status of project	Feasibility study
Replication potential	Estimated fuel consumption in textile industry - dyeing only - (717,000 toe/y). As this CDM project deals with about 5158 toe/y consumption, It is expected that this will lead to replicability of about 150 small / medium textile dyers.
Additional socio-economic and environmental benefits	Cost reduction for companies, quality improvement of the product, reduction of the emission of SO ₂ and sulfur dioxide.
Possible barriers / project risks	Financing.

IV.2 Waste Heat Recovery

Project Code: IV.2.1 Project Name: Using N.G & Regenerative Burners in Ezz El Dekhela Steel Company (Rolling Mills Reheating Furnaces with Capacity of 0.5 Mt/y)^{18,19}	
Project Description	Waste heat recovery of the combustion gases using regenerative burner techniques.
Explanation of GHG emission reduction	Using N.G.& regenerative burners reduces energy consumption and emissions by 30-35%.
Initial investment costs	4 MUS\$
GHG emission reduction	3956.4 tC/y
CSC	- 21.3 US\$/tC
Status of project	Feasibility study.
Replication potential	More than 3 Mt/y capacities of metal & glass reheating furnaces are capable for the change in more than 10 facilities (Factories).
Additional socio-economic and environmental benefits	Better yield quality, lower production cost. Better environment and less emission.
Possible barriers / project risks	Financing

IV.3 Cogeneration**Project Code: IV.3.1****Project Name: Cogeneration Project of 15 MW Capacity at Beni Soeif Cement Company (Cement)**

Project Description	Install a gas turbine cogeneration system of a capacity of 15 MWe. The proposed system will cover almost all plant electrical energy requirements as well as part of thermal demand. The hot gases coming out from the gas turbine will be used in kiln to cover part of the thermal demand required.
Explanation of GHG emission reduction	Base line annual energy is 151,000,000 kWh. After implementation of the gas turbine cogeneration project it is expected the annual natural gas consumption will be increased by about 55,000,000 m ³ . The reduction in GHG emission will be achieved by: <ul style="list-style-type: none"> • Produce electrical energy on-site with an efficiency higher than the utility power station, higher than 85%, for both thermal and electrical, compared to about 40% for utility power station. • Reduce NG consumption in kilns by about 22,000,000 m³. As hot gases coming out from the cogeneration system will cover part of kiln thermal demand. Less amount of fuel is required to produce the same electrical and thermal loads. Therefore, less amount of carbon dioxide will be produced.
Initial investment costs	8.3 MUS\$
GHG emission reduction	6336 ton of Carbon equivalent per year
CSC	- 125 US\$ / ton of Carbon equivalent
Status of project	Feasibility study.
Replication potential	Replication of cogeneration in cement industry is high.
Additional socio-economic and environmental benefits	Improves cost of products, environment and health of employees.
Possible barriers / project risks	Financing and convincing the French owner company.

Project Code: IV.3.2**Project Name: Cogeneration Project of 500 kW Capacity at Industrial Investments Company (Chemical Industry)**

Project Description	Install a gas engine cogeneration system of a capacity of 500 kWe. The proposed system will cover almost all plant electrical energy requirements as well as part of thermal demand. The hot gases coming out from the gas engine will be used in powder column to cover part of the thermal demand required.
Explanation of GHG emission reduction	Base line annual energy is 3,900,000 kWh. After implementation of the gas engine cogeneration project it is expected the annual natural gas consumption will be increased by about 1,160,000 m ³ . The reduction in GHG emission will be achieved by: <ul style="list-style-type: none"> • Produce electrical energy on-site with an efficiency higher than the utility power station, higher than 85%, both thermal and electrical, compared to about 40% for utility power station. • Reduce NG consumption in powder column by about 334,000m³. As hot gases coming out from the cogeneration system will cover part of column thermal demand. Less amount of fuel is required to produce the same electrical and thermal loads. Therefore, less amount of carbon dioxide will be produced.
Initial investment costs	300,000 US\$
GHG emission reduction	185 ton of Carbon equivalent per year
CSC	- 174 US\$ / ton of Carbon equivalent
Status of project	Feasibility study.
Replication potential	Replication of cogeneration in chemical industry is high.
Additional socio-economic and environmental benefits	Improves cost of products, environment and health of Employees.
Possible barriers / project risks	Financing.

Project Code: IV.3.3 Project Name: Cogeneration Project of 3.5 MW Capacity at Misr Elmonifia Company (Textile)	
Project Description	Install a gas turbine cogeneration system of a capacity of 3.5 MWe and waste heat boiler. The proposed system will cover almost all plant electrical energy requirements as well as part of thermal demand. The hot gases coming out from the gas turbine will be used in production of part of steam demand.
Explanation of GHG emission reduction	Base line annual energy is 15,000,000 kWh, 1,162 ton of Solar (fuel # 2) and 1,400,000 m ³ of NG. After implementation of the gas turbine cogeneration project it is expected the annual natural gas consumption will be increased by about 5,000,000 m ³ . The reduction in GHG emission will be achieved by: <ul style="list-style-type: none"> • Produce electrical energy on-site with an efficiency higher than the utility power station, higher than 85%, both thermal and electrical, compared to about 40% for utility power station. • Reduce NG consumption in boiler house by about 615,000 m³. As hot gases coming out from the cogeneration system will be used in steam production. Less amount of fuel is required to produce the same electrical and thermal loads. Therefore, less amount of carbon dioxide will be produced.
Initial investment cost	1.6 MUS\$
GHG emission reduction	911 ton of Carbon equivalent per year
CSC	- 237 US\$/ ton of Carbon equivalent
Status of project	Studying by the company
Replication potential	More than 100. As Textile and spinning industry represent a large portion of the Egyptian industry.
Additional socio-economic and environmental benefits	Add economic value & better environment.
Possible barriers / project risks	Financing. Nevertheless the top management is enthusiastic to implement this project.

Project Code: IV.3.4 Project Name: Cogeneration Project of 350 kW Capacity at Mohm Company (Metal Works)	
Project Description	Install a gas engine cogeneration system of a capacity of 350 kWe. The proposed system will cover almost all plant electrical energy requirements as well as part of thermal demand. The hot gases coming out from the gas engine will be used in the degreasing / phosphating process or the dryer of powder coating process to cover part of the thermal demand required.
Explanation of GHG emission reduction	Base line annual energy is 2,500,000 kWh and 446 ton of Solar (fuel #2). After implementation of the gas engine cogeneration project it is expected the annual natural gas consumption will be increased by about 781,000 m ³ . The reduction in GHG emission will be achieved by: <ul style="list-style-type: none"> • Produce electrical energy on-site with an efficiency higher than the utility power station, higher than 85%, both thermal and electrical, compared to about 40% for utility power station. • Reduce NG consumption in powder column by about 334,000 m³. As hot gases coming out from the cogeneration system will cover part of in the degreasing/phosphating process or the dryer of powder coating process thermal demand. Less amount of fuel is required to produce the same electrical and thermal loads. Therefore, less amount of carbon dioxide will be produced.
Initial investment costs	304,000 US\$
GHG emission reduction	369 ton of Carbon equivalent per year
CSC	- 133 US\$ / ton of Carbon equivalent
Status of project	Feasibility study.

Replication potential	Replication of cogeneration in metal industry is moderate.
Additional socio-economic and environmental benefits	Improves cost of products, environment and health of employees.
Possible barriers / project risks	<ul style="list-style-type: none"> • NG supply line needs to be installed; this may take about 4 years to be done. • Financing.

Project Code: IV.3.5**Project Name: Cogeneration Project of 400 kW Capacity at Egypt Air Hospital (Building)**

Project Description	Install a gas engine cogeneration system of a capacity of 400 kW and Waste heat recovery boiler. The proposed system will cover almost all plant electrical energy requirements as well as part of thermal demand. The hot gases coming out from the gas engine will be used to produce steam.
Explanation of GHG emission reduction	<p>Base line annual energy is 3,800,000 kWh and 322,000 m³ of NG. After implementation of the gas engine cogeneration project it is expected the annual natural gas consumption will be increased by about 1,200,000 m³. The reduction in GHG emission will be achieved by:</p> <ul style="list-style-type: none"> • Produce electrical energy on-site with an efficiency higher than the utility power station, higher than 85%, both thermal and electrical, compared to about 40% for utility power station. • Eliminate NG consumption in boiler house. As hot gases coming out from the cogeneration system will be used in steam production. <p>Less amount of fuel is required to produce the same electrical and thermal loads. Therefore, less amount of carbon dioxide will be produced.</p> <p>Cogeneration Technology leads to reduction in fuel consumption and consequently to reasonable reduction in GHG emission.</p>
Initial investment costs	300,000 US\$
GHG emission reduction	59 ton of Carbon equivalent per year
CSC	- 487.9 US\$ / ton of Carbon equivalent
Status of project	Pre-Feasibility study.
Replication potential	Replication of cogeneration in buildings is moderate.
Additional socio-economic and environmental benefits	Improves environment and health of Employees.
Possible barriers / project risks	Financing and convincing top management.

V. Waste Management**V.1 Solid Waste Management**

Project Code: V. 1.1	
Project Name: Feed Stock from Organic Waste ^{9,20}	
Project description and explanation of GHG emission reduction	<ul style="list-style-type: none"> • All food processing plants results in a considerable (%) of organic wastes as landfill. This is considered as a source of G.H.G emissions. • The CDM trend is to use these organic wastes to produce animal feed concentrates resulting in eliminating most of the G.H.G emissions. • The project (Module) is executed within the existing food processing plant using the existing facilities & personnel. • The equipment needed are mixers, drying furnace, crushers & packing units.
Initial investment cost	1 MUS\$
GHG emission reduction	37336.4 tC/y
CSC	- 3.9 US\$/tC
Status of project	Prefeasibility study.
Replication potential	10 module
Additional socio-economic and	Add economic value.

environmental benefits	Better environment.
Possible barriers / project risks	Financing, size of market for product, price for product, quality and availability of food wastes to be used, danger of spread of epidemics.

Project Code: V. 1.2	
Project Name: Organic Solid Waste Digestion²⁰	
Project description	Burning organic Solid Wastes or leaving them at dumping sites is not acceptable solution. The technology of biogas production and using for electricity generation, industry and others comes as one of the suggestion solutions. What makes this trend acceptable is the presence of the resources, which are not properly exploited. Besides, the production of valuable fertilizer reducing the need for artificial fertilizer. A complete Biogas system include the following: <ul style="list-style-type: none"> • Organic waste pretreatment unit. • Biogas digesters. • Biogas storage. • Biogas treatment unit. • Power station unit. • Fertilizer treatment unit. • Fertilizer storage unit.
Explanation of GHG emission reduction	The baseline for CH ₄ emissions from waste assumes continuation of the current unregulated waste disposal for the entire projects lifetime. Methane emissions reductions are calculated as the methane collected and generated by the project minus CO ₂ emissions due to the burning of the methane. CO ₂ emission reductions due to the cogeneration and power generation is neglected in the currently stage of rough calculations
Initial investment cost	40 MU\$
GHG emission reduction	34636 tC/y
CSC	163 US\$/tC
Status of project	Study based on: "Biomass Energy Potential in Egypt", H.A. Korkor and et al, Second Cairo International Symposium on Renewable Energy Resource, 1990
Replication potential	50 projects with different capacities (50000 – 100000 organic waste material per year)
Additional socio-economic and environmental benefits	<ul style="list-style-type: none"> • Production of valuable fertilizer, creation of permanent income of plant operators. • Reduction of pollution from run-off from landfill.
Possible barriers / project risks	<ul style="list-style-type: none"> • Financing. • Selecting the organic waste sources for the project. • Collection of organic waste from e.g. food industry.

VI. Land Use, Land-Use Change and Forestry (LULUCF)²¹⁻²⁷

VI.1 Protecting Some New Cities By Tree Plantations Using Sewage Water

Project Code: VI.1.1	
Project Name: Establishment of Forest Plantations and Shelterbelts Around 10th of Ramadan City	
Project Description	The project aims to protect the 10th of Ramadan city of winds and greening of the area.
Explanation of GHG sequestration	Establishment of carbon sink
Initial investment costs (2 years)	473,251 US\$
GHG sequestration	38926 tC 1946 tC/y
CSC	12.29US\$/tC
Status of Project.	Preliminary Study.

Replication potential.	The project can be replicated in 32 new cities.
Additional socio-economic and environmental benefits	<ol style="list-style-type: none"> 1. Providing wood. 2. Employment of about 100 people. 3. Improving local environment. 4. Using of sewage water without harm to mankind.
Possible barriers / Project risks	Financing and possibility of attack by pests.

Project Code: VI.1.2	
Project Name: Establishment of Forest Plantations and Shelterbelts Nearby El-Arish Sewage Water Station	
Project description	The project aims to protect the sewage water station from sand dunes in addition to wood production and greening of the area.
Explanation of GHG emission reduction/sequestration	Carbon sequestration by tree plantation.
Initial investment costs	65,344 US\$
GHG sequestration	5065 tC 349 tC/y
CSC	32.62 US\$/tC
Status of Project	Preliminary study.
Replication potential	The project can be replicated in 32 new cities.
Additional socio-economic and environmental benefits	<ol style="list-style-type: none"> 1. Providing job opportunities for 12 persons and 600 workdays. 2. Amelioration of the local environment. 3. Using sewage water without harm to people.
Possible barriers / Project risks	Financing and browsing of seedlings.

VI.2 Protection of Irrigation and Drainage Canals

Project Code: VI.2.1	
Project Name: Protecting El-Hager Canal and El-Omom Main Drainage Canal by Windbreaks	
Project description	Establishing windbreaks along El-Hager canal and El-Omom main drainage canal.
Explanation of GHG emission reduction/sequestration	Carbon sequestration by tree plantation.
Initial investment costs (4 years)	151,483 MUS\$
GHG sequestration	5,626 tC 281 tC/y
CSC	14.11 US\$/tC
Status of Project	Preliminary study
Replication potential	Very high
Additional socio-economic and environmental benefits	<ol style="list-style-type: none"> 1. Protection of the irrigation and drainage canals. 2. Providing job opportunities. 3. Amelioration of the local environment.
Possible barriers / Project risks	Financing and possible salinity of drainage water.

VI.3 Stabilization of Coastal Sand Dunes

Project Code: VI.3.1	
Project Name: Sand Dune Fixation in North Sinai Governorate	
Project description	Fixing sand dunes in the vicinity of farmlands, roads, settlements, industrial complexes and valuable installations and providing wood and fodder.
Explanation of GHG emission reduction/sequestration	Storage of carbon in the form of wood and biomass (carbon sink).
Initial investment costs (3 years)	0.170 MUS\$
GHG sequestration	10,187 tC 1,019 tC/y
CSC	7.11 US\$/tC
Status of Project	Preliminary study
Replication potential	The project can be replicated on an area of 10,000 ha.
Additional socio-economic and environmental benefits	<ol style="list-style-type: none"> 1. Protection of farmlands, roads, settlements and valuable installations.

	2. Providing fodder for livestock.
Possible barriers / Project risks	Financing, irregularity of rainfall, browsing by camels and drafting of young seedlings by sand.

VI.4 Protection of Roads and Highways

Project Code: VI.4.1	
Project Name: Afforestation of a Part of Cairo-Aswan Highway	
Project Description	Establishing 1 row windbreak along both sides of a part of Cairo-Aswan highway from Cairo to El-Menia (240 km, of which 170 km still unplanted) along main irrigation canals.
Explanation of GHG sequestration	Establishment of carbon sink.
Initial investment costs (4 years)	0.274 MUS\$
GHG sequestration	9428 tC 471 tC/y
CSC	17.71 US\$/tC
Status of Project	Preliminary Study
Replication potential	High
Additional socio-economic and environmental benefits	<ol style="list-style-type: none"> 1. Protecting the road. 2. Amelioration of the harsh climatic conditions of Upper Egypt. 3. Providing job opportunities. 4. Increasing the traffic safety on the road.
Possible barriers / Project risks	Financing

6.2.4 Evaluation and Ranking of the Projects

Once the proposed CDM projects are suitable according to the eligibility criteria, the evaluation and ranking will proceed to the national and investors criteria (Ranking Criteria).

6.2.4.1 CDM Project Ranking Criteria

The ranking criteria consist of the national and the investors criteria. The national criteria reflect the major economic, environmental, social and health impacts of the projects from the national perspective, therefore assessing the project's contribution to sustainable development. The investors criteria reflects the view of a potential international investor looking for interesting CDM projects.

6.2.4.2 National Criteria

A. Economic Benefits

In general, the proposed CDM projects ought to fit and contribute positively to the overall economic profile of Egypt, measured by the following economic parameters:

- Infrastructure: the contribution of the proposed CDM project in creating / expanding / replacing infrastructure in its community.
- Export potential / import substitution: the likelihood of the CDM project to become actively involved in exports or import substitution to earn foreign exchange.
- Payback period: the profitability of the project and its contribution to the local economy.
- Energy savings: the contribution of the project to the saving of energy (and the related savings of fuel subsidies).
- State of technology: the contribution of the project to the transfer of state of the art technology.

B. Environmental Benefits

Despite that CDM projects are designed primarily to realize reduction in GHG emissions, other environmental benefits may accrue through implementation of such projects. Egypt would therefore need to ensure that additional environmental benefits are achieved from CDM projects. In this context, a number of environmental parameters could be assessed. For the present analysis, the following stands as an indicator for environmental performance:

- Improvement in environmental performance of the CDM project compared to the business as usual scenario

C. Social Benefits

From the possible social aspects of proposed CDM projects only the following is considered in the present analysis for the sake of simplicity:

- The employment opportunities generated by the proposed CDM project.

6.2.4.3 Investor Interest Criteria

In addition to the above-mentioned criteria, which reflect the national interests, there is another set of criteria, which reflect the international investors interests. It is important to consider in the phase of project selection the point of view of a potential investor. Usually they look at the projects very differently. This has to be included already at the stage of project selection. The best CDM projects are the ones that are of high national interest and at the same time of high interest for an international investor.

The set of criteria from the international investor includes:

- High project profitability: A good CDM project with a high return on investment will encourage foreign investors to invest more in such types of projects.
- Creating good international Image; good and positive CDM project image is considered the most important reclamation of the project itself.
- Minimum project risk; this criterion indicates the risk that the project does not have the required impact it was designed for. Low risk means high probability that the project will generate the CERs, including management capability, financial status of the host etc. (See also discussion of project risks in Chapter 3).

6.2.4.4 Importance and Weight of the Criteria

Not each of the above-mentioned criteria is of the same importance. This is expressed by assigning a weight to each criterion. The evaluation and ranking of the projects is done by using the national and investors criteria.

The criteria indicators and their weights are shown in a blank project evaluation sheet in Table 6.4. Every criteria indicator ranges between 0 and 2 (L=0, M=1 and H=2). Every indicator is then multiplied by its weight (10, 20, or 30) and the sum over all scores is taken. The total score is then used for the ranking of the projects. Table 6.5 gives the criteria indicators range for project portfolio (for the detailed evaluation of the projects see Annex 6.4).

The indicators and weights have been proposed by the study team. More weight has been given to the national criteria (110 to 70), reflecting the Egypt perspective seeking for CDM projects that are interesting for foreign investors, but with the predominant aim to support sustainable development in Egypt.

Table 6.6 summarizes both the score of possible CDM projects as well as it's ranking according to their criteria indicators.

Table 6.4: Criteria, Indicators and Their Weight for the Evaluation of Possible CDM Projects

Project Code:

Project Name:

	Criteria Indicators	Allocated Weight	Grade +			Score ++ (Weight * Grade)	Range
			L	M	H		
1	Economic Benefit	(80)					
1.01	Infrastructure	10					L= replacing, M= expanding, H= creating
1.02	Export Potential/ import substitution	10					L ≤ 15%, 15% < M ≤ 35%, H > 35% of Annual production
1.03	Payback period	30					L > 8 or no payback, 5 < M ≤ 8, 2 < H ≤ 5 years
1.04	Energy savings	20					L ≤ 10 %, 10% < M ≤ 15%, H > 15% TOE/year of BAU
1.05	State of technology	10					L= Commercially available, M = modern technology, H= advanced technology
2	Environmental	(20)					
2.01	Improvement in environmental performance	20					L= comply with Egyptian legislation, M= comply with Annex I countries legislation, H = significantly better than Annex I countries legislation
3	Social	(10)					
3.01	Employment	10					L = job reduction by project, M= no significant change in number of jobs, H= significant creation of jobs
Subtotal		110					

+ L= 0, M= 1, H= 2

++ Maximum Subtotal Score = 220

4	Criteria for International Investors View						
4.01	Profitability	20					L= no return or loss on investment, M= return on investment ≤ 6%, H= ROI > 6%
4.02	Investor Image	20					L= project might contribute to a negative image of the investor or has no impact on image at all, M= impact of project on investors image is slightly positive, H= is very positive
4.03	Project Risk	30					L < 50%, 50% < M ≤ 90%, H > 90% of the probability of the generation of the expected CERs
Subtotal		70					

+ L= 0, M= 1, H= 2

++ Maximum Subtotal Score = 140

Total		180					
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+ L= 0, M= 1, H= 2

++ Maximum Total Score = 360

Table 6.5: Criteria Indicators Range for Project Portfolio

	Alloc. Weight		III.1.1	I. 2.1	II. 1.2.	III.2.1	III.3.1	V.1.1	II.1.1	IV.2.1	IV.3.1	V.1.2	IV.3.5	I.1.1	IV.3.2	VI	IV.3.4	III.4.1	IV.1.1	IV.3.3
	Projects		Electrification Railway Line	Solar Thermal Cycle vs. Steam Turbine	Food Dehydration	Electrification of Metro Line	Cargo River Nile Transport	Feed Stock	Water Pumping	Burners in Steel Comp.	Cogen.at Cement Ind.	Waste Digestion	Cogen. at Egypt Air Hospital	Wind Farm vs. Steam Turbine	Cogen.at Ind. Investment	LULUCF	Cogen. at Mohm Comp.	CNG in Transport	Zenotex	Cogen. at Misr Elmonifia
(Weight * Grade)																				
1	Economic Benefit	(80)																		
1.01	Infra structure	10	2	2	1	2	2	0	0	1	1	2	1	2	1	2	1	2	1	1
1.02	Export Potential/ import substitution	10	0	1	1	0	0	1	0	0	1	1	1	1	1	0	1	0	1	1
1.03	Payback period	30	0	0	0	0	0	2	0	1	1	0	1	0	1	0	2	2	2	2
1.04	Energy savings	20	1	1	2	2	2	0	2	2	0	2	0	2	1	2	2	2	2	2
1.05	State of technology	10	1	2	2	1	1	0	2	2	1	1	1	2	1	1	1	2	2	1
2	Weighted average Economic	80	0.63	0.88	1	0.88	0.88	0.88	0.75	1.25	0.75	1	0.75	1.13	1	0.88	1.63	1.75	1.75	1.63
2.01	Environmental Improvement in environmental performance	20	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1
3	Weighted average Social	20	Environmental	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1
3.01	Employment	10		2	1	1	2	2	1	1	1	1	1	1	1	2	1	1	1	1
	Weighted average	10	Social	2	1	1	2	2	1	1	1	1	1	1	1	2	1	1	1	1
4	Criteria for International Investors View	(70)																		
4.01	Profitability	20	0	0	0	0	0	1	0	1	1	0	1	0	1	0	1	1	1	1
4.02	Investor Image	20	1	1	1	1	1	1	2	1	2	1	1	2	2	2	1	1	1	1
4.03	Project risk	30	0	0	0	0	0	0	1	0	1	1	2	1	1	1	1	1	1	2
	Weighted average	70	International Investors	0.29	0.29	0.29	0.29	0.29	0.57	1	0.571	1.29	0.71	1.43	1	1.29	1	1	1	1.43
Total Weighted Average		180	Total	0.61	0.67	0.72	0.72	0.72	0.78	0.89	0.94	1.00	1.00	1.06	1.06	1.11	1.11	1.28	1.33	1.44
			110	120	130	130	130	140	160	170	180	180	190	190	200	200	230	240	240	260

Table 6.6: Ranked List of Proposed CDM Projects According to Criteria

Score	Total Weighted Average	Project Code	Project Name	Ranking	Ranking Category
260	1.44	IV.3.3	Cogeneration project of 3.5 MW Capacity at Misr Elmonifia Company (Textile)	1	I
240	1.33	IV.1.1	Control Systems and Energy Saving Equipment at Zenotex Dyers	2	
240	1.33	III.4.1	Installing Dedicated CNG Engines to Replace Low Efficiency Diesel Engines	3	
230	1.28	IV.3.4	Cogeneration project of 350 kW Capacity at Mohm Company (Metal Works)	4	
200	1.11	VI (5 projects)	LULUCF	5	II
200	1.11	IV.3.2	Cogeneration Project of 500 kW Capacity at Industrial Investment Company (Chemical)	6	
190	1.06	I.1.1	CDM 60 MW Wind Farm in Comparison with BAU 45 MW Steam Turbine (Mixed Fuel)	7	
190	1.00	IV.3.5	Cogeneration Project of 400 kW Capacity at Egypt Air hospital	8	
180	1.00	V.1.2	Organic Solid Waste Digestion	9	
180	1.00	IV.3.1	Cogeneration Project of 15 MW capacity at Bani Soeif Cement Company (Cement)	10	
170	0.94	IV.2.1	Using N.G & Regenerative Burners in Ezz El Dekhela Steel Company (Rolling Mills Reheating Furnaces with Capacity of 0.5 Mt/y)	11	
160	0.89	II.1.1	Toshka PV Water Pumping	12	III
140	0.78	V.1.1	Feed Stock from Organic Waste	13	
130	0.72	III.3.1	Development of Cargo River Nile Transportation	14	
130	0.72	III.2.1	Electrification of Alexandria Metro Line, Phase I, Abu Keer – Misr Station, 22 km	15	
130	0.72	II.1.2	Solar Food Dehydration	16	
120	0.67	I.2.1	CDM Integrated Solar Thermal Combined Cycle System 300 MW in Comparison with BAU 300 MW Steam Turbine	17	
110	0.61	III.1.1	Electrification of Cairo-Alexandria Railway Line	18	

Figure 6.1 shows the results of the project evaluation. The overall score of each project is given. The score of each project regarding their national criteria is given for the social aspects, the environmental aspects and the economic aspects. Also included in the analysis is the investor's point of view.

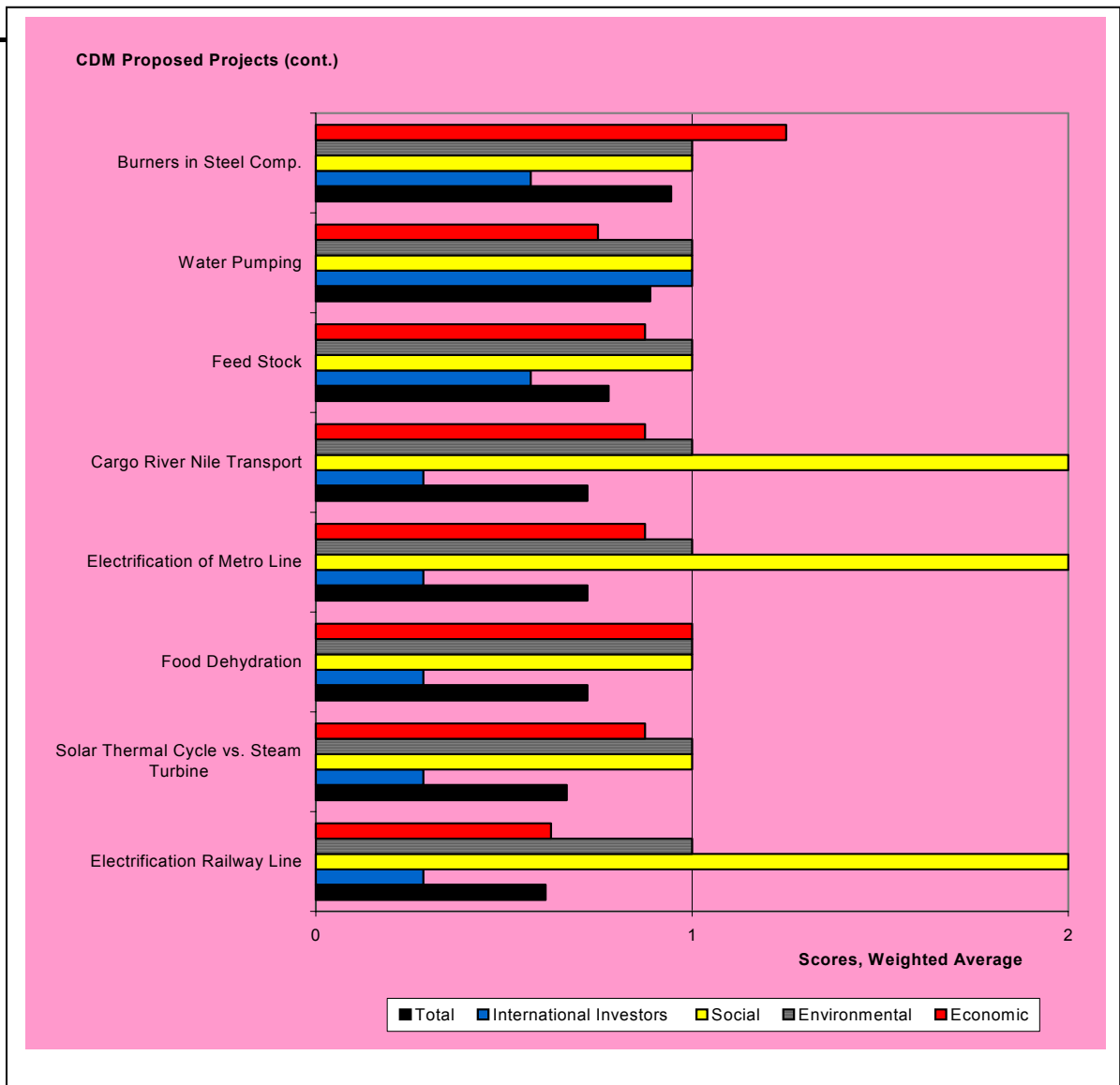


Figure 6.1: Results of the Project Evaluation

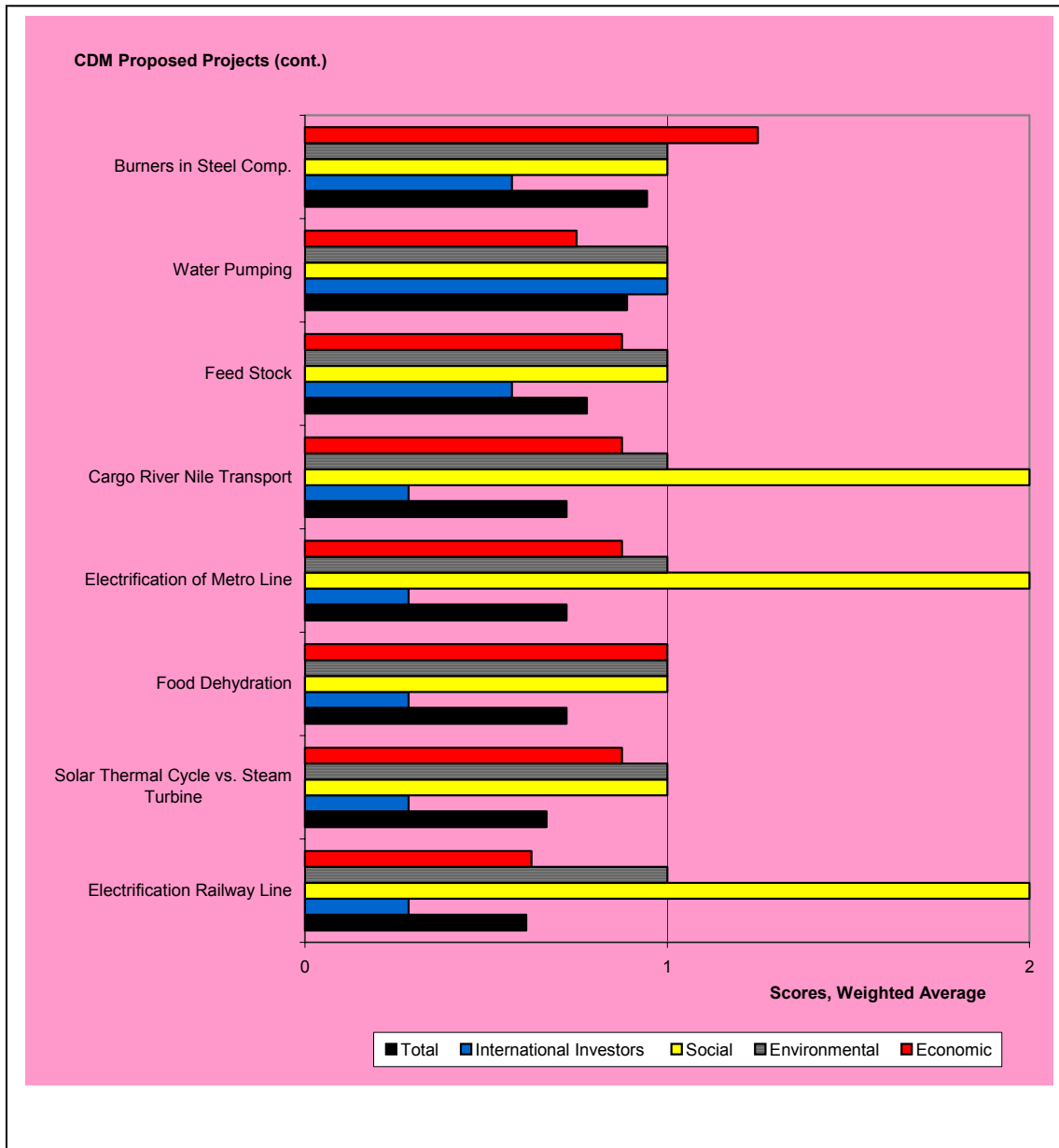


Figure 6.1: Results of the Project Evaluation (Cont.)

6.3 Selected CDM Projects Pipeline

6.3.1 Overview

All CDM projects of the pipeline were ranked and evaluated according to the criteria indicators in Table 6.5, Figure 6.1 and then categorized in three categories as follows:

Category I lies between 260-230 score and includes four projects; one of them in transport & the other three projects in energy efficiency (one in control system and energy saving equipment and the other two projects in cogeneration)

Category II lies between 200-170 score and includes LULUCF projects and 6 non-LULUCF projects. Three of the non-LULUCF projects are co-generation projects, one wind, one in the waste sector and one fuel switch in the steel industry.

Category III lies between 160-110 score and includes seven projects: three projects in the application of solar energy, three projects in the transport sector (electrification of Cairo-Alexandria railway line, electrification of Alexandria Metro line, phase I, Abu Keer - Misr Station 22 km and Development of Cargo River Nile transportation.), and one project in the waste sector.

The most promising CDM projects in the pipeline after omitting repetitions are:

A. Energy Efficiency:

- a. Cogeneration Project of 3.5 MW Capacity at Misr Elmonifia Company (Textile)
- b. Control Systems and Energy Saving Equipment at Zenotex

B. Transport:

- a. Switching to N.G in Busses (100 Units)

C. Electricity Generation:

- a. CDM 60 MW Wind Farm in Comparison with BAU 45 MW Steam Turbine (Mixed Fuel)

D. Solid Waste Management

- a. Organic Solid Waste Digestion

For LULUCF two of five projects represent the most promising CDM projects:

E. Protecting Some New Cities by Tree Plantations Using Sewage Water

- a. Establishment of Forest Plantations and Shelterbelts Around 10th of Ramadan City

F. Protection of Roads and Highways

- a. Afforestation of a Part of Cairo-Aswan Highway

6.3.2 Pipeline Project Description

Following are the selected projects for CDM pipeline:

Project # 1

Cogeneration Project of 3.5 MW Capacity at Misr Elmonifia Company (Textile).

Project # 2

Control System and Energy Saving Equipment at Zenotex.

Project # 3

Installing Dedicated CNG Engines to Replace Low Efficiency Diesel Engines.

Project # 4

Establishment of Forest Plantations and Shelterbelts Around 10th of Ramadan City.

Project # 5

Afforestation of a Part of Cairo-Aswan Highway.

Project # 6

CDM 60 MW Wind Farm in Comparison with BAU 45 MW Steam Turbine (Mixed Fuel).

Project # 7

Organic Solid Waste Digestion.

These seven most promising projects are described in more details in the standard Project Idea Note (PIN)-Format of the Prototype Carbon Fund in Annex 6.5. This form is used for convenience and for comparability with other projects. Its use does not imply that the projects have to be submitted to the PCF (only), but might facilitate their submission to any governmental or non-governmental institution within Annex I country parties.

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