Climate Investment Funds

CTF/TFC.2/7
January 19, 2009

Meeting of the CTF Trust Fund Committee
Washington, D.C.
January 29-30, 2009

CLEAN TECHNOLOGY FUND
INVESTMENT PLAN FOR EGYPT

TABLE OF CONTENTS

Introduction		**1**
I.	**Country and Sector Context**	**1**
II.	**Priority Sectors for GHG Emission Reduction**	**5**
	Energy Sector	6
	Transport Sector	9
III.	**Rationale for Selected Sector for CTF Co-financing**	**10**
	Renewable Energy: Wind Power	11
	Urban Transport Sector	14
IV.	**Enabling Policy and Regulatory Environment**	**17**
	Wind Power	17
	Transport	18
V.	**Implementation Potential and Risk Assessment**	**19**
	Wind Power	19
	Transport	20
VI.	**Financing Plan and Instruments**	**22**
Annex 1:	**Egypt Wind Energy Scale–up Program**	**24**
Annex 2:	**Egypt Urban Transport Sector**	**28**
Annex 3:	**Identification of Priority Areas for CDM: List of Technology Options**	**35**

EGYPT: CLEAN TECHNOLOGY FUND INVESTMENT PLAN
(Final Draft, January 16, 2009)

INTRODUCTION

1. This Clean Technology Fund (CTF) Investment Plan, agreed among and owned by the Government of Egypt, the World Bank, the African Development Bank (AfDB) and IFC, is a proposal for the use of CTF resources in Egypt, including a potential pipeline of projects and notional resource envelopes. It is based on Egypt's National Climate Change Communication (NCCC), we well as relevant sector development policies and programs, such as the Power Sector Strategy and Greater Cairo Urban Transport Strategy. It is important to note that the CTF investment plan is a dynamic document and this version is based on the mature proposals considered at this time. As and when additional substantive mitigation proposals are formulated, they could be considered for inclusion subject to the availability of funds.

I. COUNTRY AND SECTOR CONTEXT

2. The key development objectives of the Government of Egypt (GOE) are the "achievement of high and sustainable GDP growth" and the "alleviation of poverty and attenuation of income disparities" (CAS Report 32190-EG, 2005). The growth-enhancing potential of the private sector is to be harnessed through improving the business climate across a broad range of policies (covering trade, finance, and taxation, among others) while the complementary role of the public sector is to be strengthened through enhancing the provision of public services such as infrastructure, education, and macroeconomic stability, among others. The reforms are also focusing on stepping up public-private partnerships (PPPs) (especially for infrastructure investments), reducing energy subsidies, and reforming the social sector, including safety net mechanisms to support the reduction of subsidies. As a result of a comprehensive reform program launched in 2004, the rate of Gross Domestic Product (GDP) growth exceeded 7 percent in both 2006/07 and 2007/08[1] and unemployment rate declined as well (9.4 percent in 2006/07, 8.8 percent in 2007/08[2]. Egypt ranked among "top reformers" in *Doing Business 2008* reflecting the friendlier investment climate and the associated positive private sector response. As a consequence of the global financial crisis and recession in developed countries, it is expected that the short-term real GDP growth in Egypt will decrease. The Government is considering a policy response to mitigate the external shock.

3. This economic growth has been accompanied by a growth in energy use and, consequently, increased air pollution and greenhouse gas emissions. According to the *First National Communications* submitted to the UNFCCC, the aggregate GHG (greenhouse gas) emissions without the impacts of land use changes was estimated to be over 116 million tons of CO2 equivalent in the baseline year 1990/91.[3] The relative contributions of greenhouse gases in 1990/91, in the total emissions, by sector, are presented in Table 1. Energy related emissions were the main sources of GHG emissions, in large part due to combustion of fossil fuels. The agriculture sector was the second largest GHG source, mainly from enteric fermentation and rice cultivation, followed by the non

[1] Fiscal year: July 1-June 30.

[2] Source: Egypt, Economic Monitoring Report, September 2008, the World Bank, Middle East and North Africa Region.

[3] In terms of CO2 emissions, Egypt ranks fourth in the MENA region after Iran, Saudi Arabia and Algeria, and second in the Africa region after South Africa with about 147 million tons of emissions annually in 2005 (IEA/OECD, 2007).

combustion related industrial emissions of CO2 , mainly from the steel and cement industries (EEAA, 1999).

Table 1: GHG emissions in the year 1990 (UNFCCC)

Sector	Emissions in Million Tons of CO2	% of total emissions
All Energy	82.72	71
Industry (other than energy)	10.27	9
Agriculture	17.93	15
Wastes	5.69	5
Total	116.60	100

Source: Egypt National Green House Gases Inventory 1990/91(www.eeaa.gov.eg)

4. Within the energy related emissions, the main emitters of GHG in Egypt were fuel combustion in the power sector (22%), in industry (21%), in the transport sector (18%) and small combustion (9%). Recent information from IEA/OECD database indicates that the share of the emissions of the energy (power and small combustion) and transport sectors have increased between 1990 and 2006 from 31% to about 42% and from 18% to 21%, respectively, while the share of other sectors have come down. Transport sector CO2 emissions contributed over 30 million tons in 2005. Recent data from the US Energy Information Administration (EIA) database shows the growing trend (see Figure 1) in fossil fuel based CO2 emissions (www.eia.doe.org).

5. The total primary energy supply in Egypt from fossil fuels is estimated to be 2,461 PJ (or about 58.6 mtoe)[4] with 51% from oil and oil products, 47% from natural gas and 2% from coal and coal products. The primary energy demand has grown at an average annual rate of 4.64% during the last 25 years (1981/1982 – 2004/2005). During the same period, the oil demand has grown at an average annual rate of 3.34% while the increase in natural gas demand was much faster, at 13% annual rate. The increasing share of fossil fuel in the total primary energy consumption is shown in Figure 2 below (EIA).

6. It is important to note the growing trend in the energy intensity of the economy as shown in Figure 3 (EIA). This mirrors a trend across many countries in MENA as demonstrated in a recent study carried out by the World Bank on Energy Efficiency in MENA region. According to this study, MENA region ranks second in the world in terms of energy intensity (see Figure 4, World Bank, 2008).

7. Egypt ranks among the 11 countries in the world showing fastest growing GHG emission. The analysis undertaken as part of the National Strategy Studies (NSS) in 2002 indicates that by 2017 emissions could reach more than three times the 1990 levels. The overall energy sector (including transport) is expected to remain by far the largest source, with the growth rate of 4.9%. The actual growth of emissions, based on IEA/OECD database, has been slower compared to the NSS projections (in large part due to a lower GDP growth) but still show well over 30% increase from the 1990 levels.

[4] PJ denotes a petajoule (10^{15} Joule), and GJ denotes a gigajoule (10^{9} Joule). One Joule is equivalent to about 947.82 MBTU (Million British Thermal Units) or about 0.000278 Wh (watt-hours). One mtoe (million tons of oil equivalent) is equivalent to about 42 PJ.

Figure 1: Annual Emission from Fossil Fuels

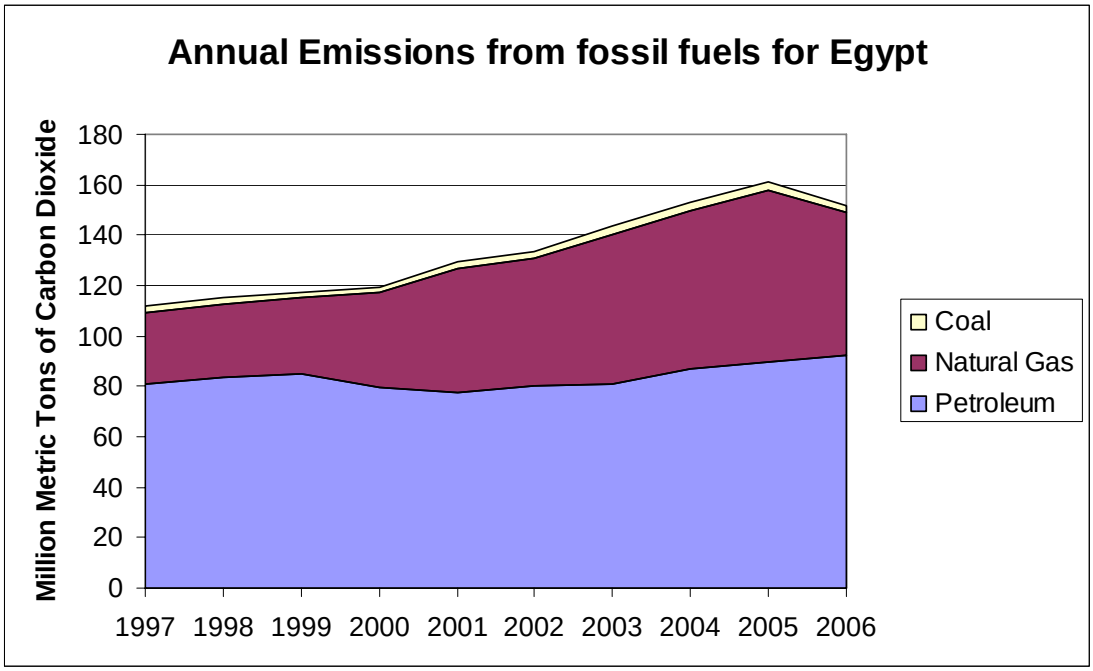


Figure 2: Share of Fossil Fuels in Total Primary Energy Consumption

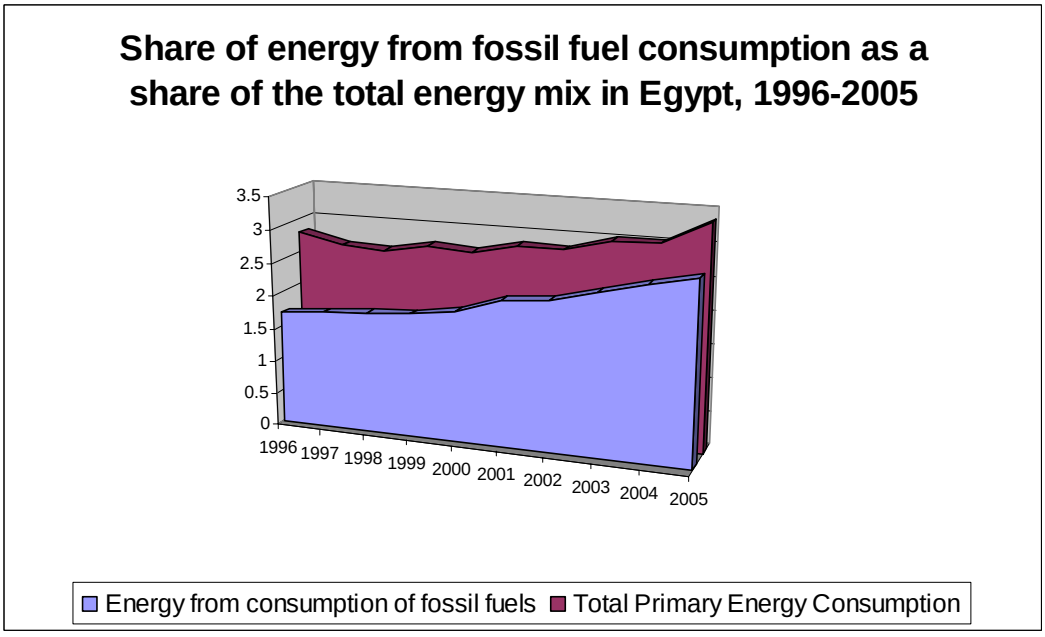


Figure 3: Total Energy Consumed per Unit of GDP

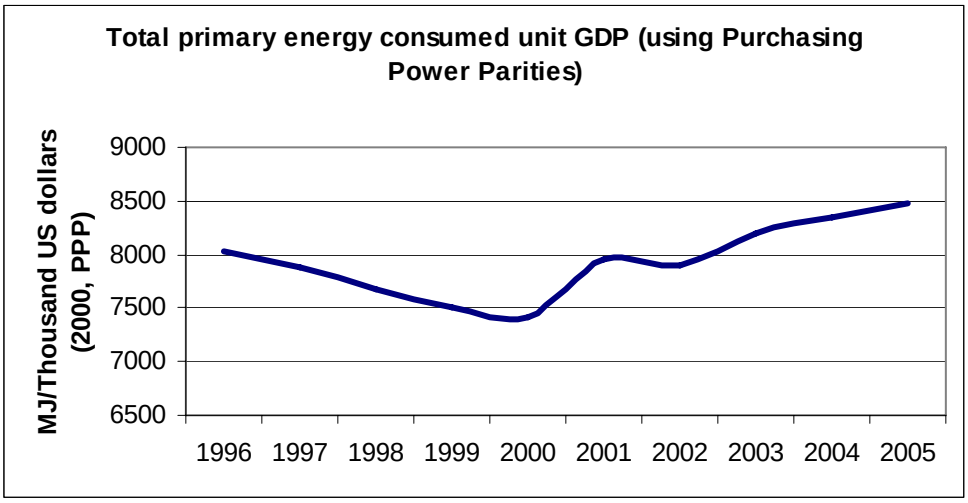
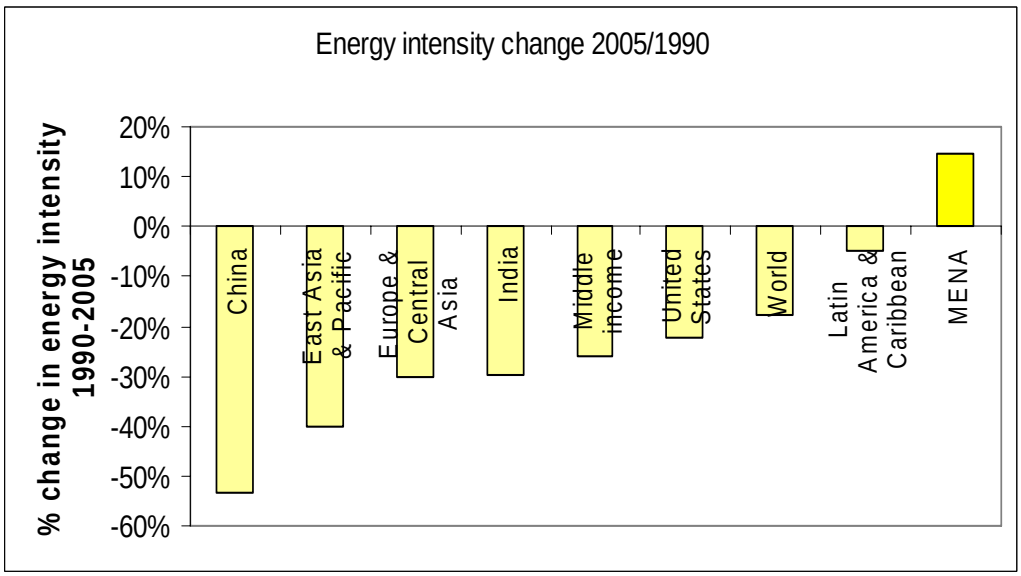


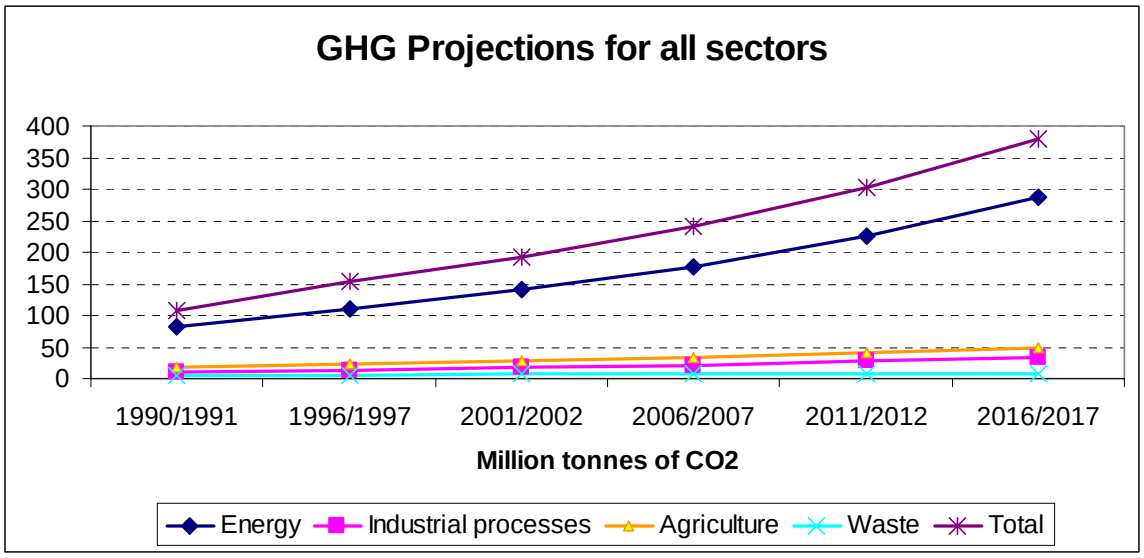
Figure 4: Energy Intensity change 2005/1990



8. The growth of the GHG emissions in Egypt is primarily linked to the strong economic growth and the attendant increases in energy demand, especially through higher demand for electricity and transport services. Electricity demand is growing at 7-8% per year, which implies adding about 1,500-2000 MW per year over the next several years (current installed capacity is close to 22,000 MW). The increase in energy demand has been met primarily by increased use of fossil fuels (Figure 2), leading to the high energy and carbon intensity of the economy. The Government's power generation expansion plan is based primarily on natural-gas fired combined-cycle and steam technology, supplemented by wind power and nuclear plants. About 60% of the domestic natural gas production is utilized by the power sector and the domestic gas demand is increasing, both in power generation and in other uses, competing with increasing gas exports through pipelines and LNG

terminals.[5] These trends are driven by the Government's objectives to (a) reduce the use of fuel oil, gasoline and LPG in the domestic market; (b) to position itself as a global exporter of natural gas; and (c) foster regional integration through the interconnection of natural gas pipelines. Furthermore, the foreign partners engaged under production-sharing agreements (PSAs) in Egypt are increasingly demanding to export their share of natural gas rather than to sell it into the domestic market due to the higher prices and (to some extent) better credit-worthiness that exports bring.

Figure 5: GHG Emissions by Sector



Source: Egyptian Environmental Affairs Authority(www.eeaa.gov.eg)

9. The demand for energy in the transport sector -- by some estimates at over 6% per annum (Gelil; see www.idrc.ca) -- has been driven by the economic and population growth, and the increasing pace of urbanization. Road transport is the dominant mode of internal transport in both passenger and freight operations: in 2003–2004 the volume of people transported by road had reached nearly 115.6 billion passenger-km, while freight transport amounted to nearly 43.1 billion tons-km (State Information Service, 2006). The opportunities for more energy-efficient rail and inland waterway transport are clearly underutilized. The transport demand is concentrated on a few transport corridors starting from or ending in Cairo. Half of all motorized vehicles in Egypt operate in Greater Cairo Metropolitan Area (GCMA), at one of the fastest growing motorization rate in MNA (4% per year, reaching more than 2.5 million by 2022). The GCMA is also the preeminent transport center of Egypt accommodating over 20 million motorized person trips and 7 million non-motorized trips daily. As a result, about 2/3 of transport sector emissions is due to urban transport, especially in GCMA (13 million CO2 tons/year).

II. PRIORITY SECTORS FOR GHG EMISSION REDUCTION

10. In view of the characteristics of GHG emissions, the main priorities for achieving GHG reductions lie in the *electricity and transport* sectors which, combined, contribute to over 70 percent of the GHG emission in Egypt. Although no recent marginal abatement cost calculations have been undertaken, an extensive survey for identifying projects (see Figure 6 below) in the targeted promising sectors and technologies was carried out as part of the National Strategy Study (NSS) to

[5] Egypt is connected via the Arab Gas Pipeline with Jordan, Syria and Lebanon and by pipeline to Israel.

identify priority areas for CDM financing and currently remains the best source of such analysis. The analysis covered 31 different technology options (see Annex 3 for a full list). Sector and technologies that have not been considered in this study include oil and petroleum sector; losses in transmission and distribution; energy from agricultural residues; irrigation energy efficiency; and modal shift in urban transportation options such as Metro, Bus Rapid Transit (BRT) and Light Rail Transit (LRT). The analysis is consistent with the global abatement cost curve prepared more recently by McKinsey and classifies energy efficiency, cogeneration and transportation fuel switching options (Option no.2) as those with negative abatement costs (McKinsey: Enkvist, Naucler, Rosander, 2007). Renewable energy technologies such as wind energy (Option no 25) and concentrating solar power (Option 27) (CSP) are shown having positive abatement costs in the range of 30-65 $/ton of carbon. The key options that were prioritized included the following:

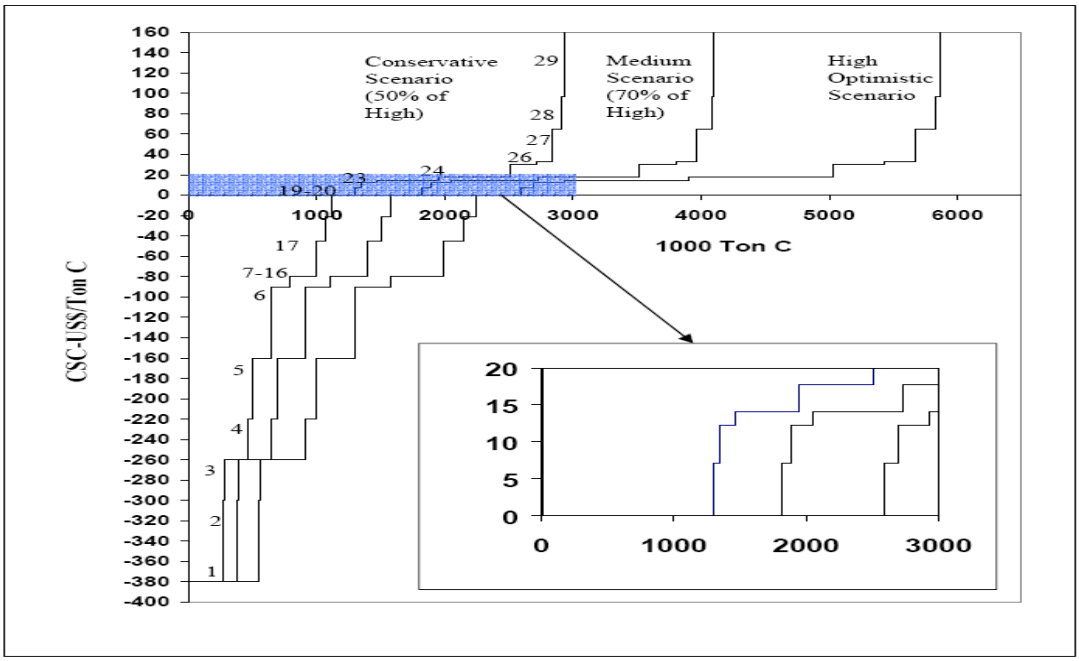
a) Co-generation in textile, chemicals, food and beverage, metals, buildings, and hotel sectors;
b) Energy efficiency in textile, chemicals, food and beverage, metals, buildings, and hotel sectors;
c) Fuel switching to natural gas in industry and transportation;
d) Wind energy development;
e) Organic waste management and municipal solid waste methane utilization;
f) Afforestation projects;
g) Concentrating Solar Power (CSP) options such as integrated solar-fossil fuel combined cycle power station and solar pumps;
h) Extension and electrification of railways and underground lines; and
i) Support mass transit system for transport modal shift and extension of waterways transportation infrastructure.

11. At the time of the NSS studies, it was estimated that an expansion of 600 MW of wind capacity would provide an additional 1.5 million tons of CO2 reductions on annual basis (currently updated as per the generation expansion plan; see below). Energy efficiency, in particular cogeneration in the industries, was estimated to have potential for at least 3 million tons of CO2 reductions on an annual basis. A scale-up of Concentrating Solar Power at a level of 600 MW (mostly for export) was estimated to be able to provide about 0.6 million tons of CO2 reductions at a cost of about US$ 65/ton of carbon.

Energy Sector

12. To meet the growing electricity demand, the Ministry of Electricity and Energy (MoEE), with endorsement from the Cabinet, adopted the following power sector development strategy: (i) increased use of efficient fossil-fuel generation technologies (CCGT and supercritical steam boilers) ; (ii) large scale development of Egypt's renewable resources with the goal of having 20% of its installed generation capacity in the form of renewable by 2020 ; and (iii) stepping up efforts for more efficient consumption of electricity. As shown in the Table 3, the main features of the generation expansion plans is large scale deployment of wind resources (estimated to reach 10% by 2027), complementing the addition of thermal generation plants and nuclear technology.

Figure 6: Marginal Abatement Cost Curve



Source: Egyptian Environmental Affairs Authority website

13. The Government of Egypt is a champion of renewable energy in the region. Already, Egypt has taken significant leadership in this regard through the creation of a regional Renewable Energy and Energy Efficiency Center, supported by EC, GTZ and Danida, and is co-President of the Mediterranean Solar Plan[6]. Furthermore, Egypt has installed 225 MW of wind-energy capacity under power purchase agreements with the Egyptian Electricity Transmission Company (EETC). A further 720 MW of projects are in the pipeline. These wind power plants are performing very well with some of the highest capacity factors in the world in the range of over 40%.

14. In addition to renewable energy scale-up, another area important for tackling climate change mitigation is in energy efficiency (EE). Energy efficiency is a powerful tool in that it brings a range of economic and environmental benefits as has been demonstrated in the recently completed Middle East and North Africa regional energy efficiency study (World Bank, 2008; UNEP, 2008). Economic competitiveness, energy security, facilitation of subsidy reform by stabilizing energy expenditures, local and global environmental benefits are some the key reasons why energy efficiency is attractive to the governments in the MENA region. Recognizing the importance of energy efficiency, the GOE has prepared a National Energy Conservation plan and plans to establish a multidisciplinary agency to lead the energy efficiency program implementation.

[6] See footnote 9 below.

Table 2: Prioritization of Technologies

Technology	Mitigation potential	Replicability		Development Impact	Adequacy of policy and regulatory framework	Implementation Capacity	Risks
		Maturity	Private Sector Participation prospects				
Windpower	++++	Technical	H	H	M	H	M
CSP/Large PV	++	Technical	L		L	M	H
Industry EE (conservation and NG)	+++	Commercial	M	M	M	M	L
Building EE	++	Commercial	M	M	M	L	L
Transport efficiency	++	Technical	M	M	L	M	M
Railway electrification	+	Technical	L	L	M	M	M
DSM	+++	Commercial	M	H	M	M	L
Landfill methane to power	++	Commercial	M	M	M	L	L
Pumping efficiency	++	Technical	M	H	H	H	L
Agricultural waste	++	Technical	L	M	L	L	M
Cogeneration	+	Commercial	M	M	M	M	M
……							
……..							

Note: Forestation not eligible under CTF
H: high M: Medium L: Low

Table 3: Egypt's Electricity Generation Expansion Plan

Type \ Years		Current Capacity 2007	Current %	2008-2017	% 2008-2017	2018-2027	% 2018-2027	Total in MW	Total %
Thermal Power Plant Capacity	Combined Cycle	7,365.00	33.6%	8,227.00	34.3%	11,002.50	35.7%	26,594.50	34.6%
	Steam Cycle	11,571.00	52.7%	9,472.50	39.5%	13,447.50	43.6%	34,491.00	44.9%
Hydro Power Plant		2,783.00	12.7%	32.00	0.1%	-	0.0%	2,815.00	3.7%
Solar / Thermal		-	0.0%	150.00	0.6%	-	0.0%	150.00	0.2%
Wind		225.00	1.0%	5,100.00	21.3%	2,400.00	7.8%	7,725.00	10.1%
Nuclear		-	0.0%	1,000.00	4.2%	4,000.00	13.0%	5,000.00	6.5%
Total Capacity		21,944.00	100.0%	23,981.50	100.0%	30,850.00	100.0%	76,775.50	100.0%

15. The commitment of the GoE to energy efficiency is also evident on the supply side in energy generation - the first power plant based on super critical boiler in the MENA region is under advanced preparation. The 600-MW Ain-Sokhna thermal power plant, financed by the World Bank and the African Development Bank, is an example of donor collaboration in large infrastructure projects. An energy efficient lighting scale-up is being planned in association with the electricity distribution companies that would lead to dissemination of about 4.5 million CFLs by summer of 2009. An energy efficiency program for small and medium enterprises is under implementation by the Credit Guarantee Company (CGC) is under implementation and some of the distribution companies are also providing support to their industrial consumers in the implementation of EE activities.

Transport Sector

16. Since about 2/3 of all motorized trips are made by public transport, there are tremendous opportunities for the achieving energy efficiency through accelerated modal shift (transformation to mass transit system that depends on low carbon technology) and fuel switching. The government has committed itself to significantly support modal shift, large scale fuel switching in the urban transport sector and cost effectiveness of alternative options for emission reductions have been identified.

17. The government's vision for transforming the transport sector is reflected in the Greater Cairo Urban Transport Master Plan (JIKA 2003). The Master Plan studies provided a new framework for consideration of an integrated urban transport system that emphasized putting "people's mobility before that of vehicles." The Master Plan took account of three "missions" for the urban transport:

a) a safe and environment-friendly transport system that would significantly reduce the carbon signal, focusing on modal shift toward low carbon mass transport systems;

b) an economically effective urban transport system; and

c) an equitable people's mobility.

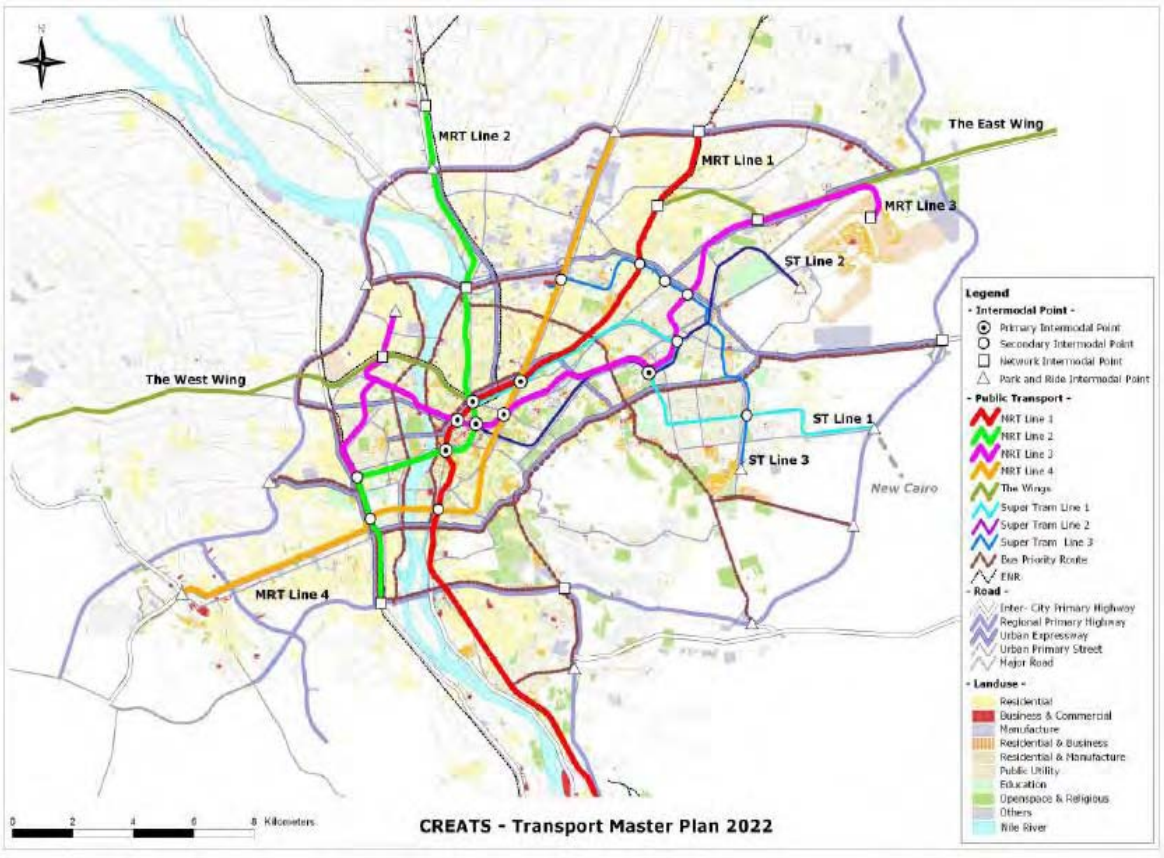
18. The Master Plan included investments for the period 2003 to 2022 in the amount of $17 billion[7] (Table 4 and Figure 7). Implementation of this Master Plan would result in an estimated 2.5-3.0 million tons of CO2 reductions per year.

Table 4: Investments proposed in the Transportation Master Plan until 2022

	Million US$	Share of investment
Mass Rapid Transit (Metro)	2,725	15.7%
LRTs	1,475	8.5%
Suburban railway	2,550	14.6%
Clean Technology Buses	1,100	6.2%
Priority Bus Facilities (BRTs)	500	2.9%
Nile Ferry	10	0.1%
Regional Roads	325	1.9%
Primary Roads	325	1.8%
Intersections	525	3.0%
Expressways	7,875	45.3%
Total	**17,410**	**100.0%**

[7] This cost may appear as high, but when expressed as a % of the gross income of the metropolitan area over the same period it is actually as low as only 0.5%.

Figure 7: Greater Cairo Urban Transport Master Plan



19. The government has already completed lines # 1 and 2 of the underground metro totaling 65km (with a commitment to complete line # 3 by 2012 and line # 4 by 2017, totaling 70 km), and a pilot scheme to scrap old and polluting buses (400 buses out of 4000) and taxis (1000 old taxis out of 84,000), replacing them with CNG-drive vehicles. This resulted in an estimated 0.5 million tons of CO2 reductions per year. But high cost of clean technology and lack of clear investment prioritization mechanism have been a major hindrance to scalability. To address these two issues, the World Bank assisted the Government, under the Greater Cairo Urban Transport Strategy (World Bank, GOPP 2006)[8], to prioritize investment needs and committed $150m IBRD financing in the most recent CAS Progress Report (June 2008). The proposed short-to-medium investment plan includes cost-effective measures which, in combination, can make significant impact in improving mass transit system, and reducing traffic congestion and emission by 1.5 million tons of CO2 annually (see para 35-36 and Annex 2).

[8] Cairo is also the only city from the MNA Region in the C40 Cities Program of Clinton Climate Initiative: http://www.c40cities.org/cities/

III. RATIONALE FOR SELECTED SECTOR OR SUB-SECTOR FOR CTF CO-FINANCING

20. Among the range of GHG mitigation options identified, two subsectors are considered as the most suitable for financing under the Clean Technology Fund (CTF) due to their GHG reduction potential; cost-effectiveness; possible replicability at the national level and regional levels; developmental impact; and the implementation potential. The two subsectors include the renewable energy (especially wind and solar) and urban transport. The rationale for the selection of these sub-sectors is presented in this section.

21. The selected sectors are fully consistent with the World Bank CAS objective of *expanded supply and improved efficiency of infrastructure services (CAS outcome 2.2)*: "The success of the reform program will depend to a large extent on the depth of restructuring and streamlining of government bodies responsible for infrastructure and the investment supply response of the private sector. Government plans to facilitate this response not only by changing some key policy parameters but also by undertaking institutional reforms and making some strategic infrastructure investments, in such areas as electricity generation and transport, for example. The Bank Group proposes to support these investments through technical and financial assistance." The FY09-11 lending program (CAS Progress Report, June 2008) includes projects to help increase electricity generation (Ain Sokhna Power Project) and improve transportation (Urban Transport Infrastructure Project).

Renewable Energy[9]: Wind Power

22. The current approach for developing wind resources relies largely on donor financed public projects implemented by the National Renewable Energy Agency (NREA). In view of the long-term benefits of renewable energy, the supreme council on energy has adopted a resolution to meet 20% of energy needs from renewable energy (including large hydropower) and to provide state support for renewable energy. This target expected to be met largely by scaling-up of wind and solar energy as the hydro potential is largely utilized.

23. As shown in Figure 8, the scale-up of wind energy in Egypt would have significant impact over the long-term in the electricity sector. When the replication potential is realized within the country, over 7,200 MW of installed capacity will be built and over 10% of emissions by the

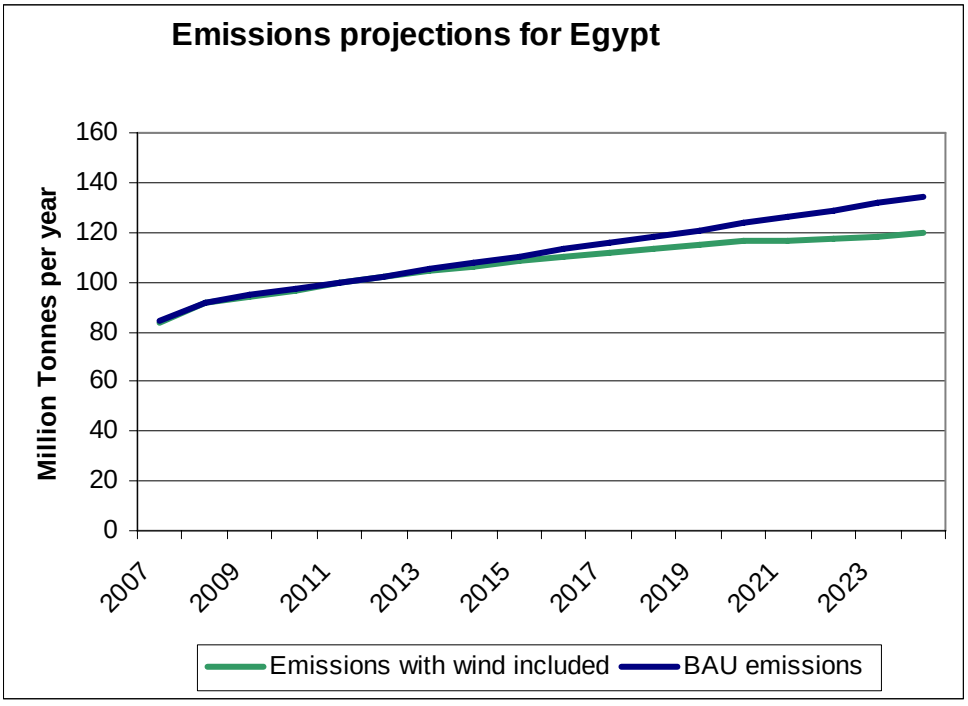
[9] MENA region and Egypt also possess some of the best *solar resources* in the world, which makes development of solar power important for the region. The scale-up in the area of Concentrating Solar Power (CSP) would benefit from the ongoing experiences with the first pilot CSP project in Egypt, supported by GEF and JBIC, which is under implementation. In order to scale-up CSP technology, Egypt is participating in the Mediterranean Solar Plan (MSP), which is being championed as a flagship initiative as part of the EU-driven Barcelona Process for the Union for the Mediterranean. The MSP would lead to about 20 GW of additional solar and other renewable energy capacity additions by 2020 in the Mediterranean region. This capacity would help meet energy needs in the MENA countries as well as in Europe through electricity exports. At a recent MSP conference (Paris, November 22, 2008), co-chaired by the Egyptian Minister of Energy and French Minister of Environment, the identification of the first set of projects was announced which are expected to be validated by February 2009. This includes projects from several MENA countries including a 50 MW CSP project in Egypt. Full implementation of the MSP will require CSP investments on a regional basis in MENA countries, including, eventually, investments in the associated transmission network. There is strong interest in the use of the Clean Technology Fund, and in Bank Group instruments more generally, including risk mitigation instruments to underpin he regulatory and contractual framework for the private sector. This initiative will be pursued through a separate regional application for CTF funding.

electricity sector in Egypt will be avoided, totaling over 12 million tons of CO2 annually. The CTF supported investment plan alone would result in annual emission reductions of about 3.3 million tons of CO2 and the preliminary cost estimate of about $30-40/ton of carbon. This abatement cost compares well with the global marginal abatement costs curve estimates for wind technology which is in the same range (Mckinsey:Enkvist, Naucler, Rosander, 2007).

24. The Government is pursuing a wind commercialization program that will comprise of two phases and focus on engaging the private sector. Phase one will follow a competitive bidding approach where the power grid company, the Egyptian Electricity Trading Company (EETC), will issue tenders requesting supply of power from renewable energy resources. In phase two, a feed-in tariff will be announced to facilitate private sector participation in wind energy development. It is expected that phase one will last for about five years and will result in additional capacity of about 2,500 MW. Depending on the experience with the competitive bidding approach, the feed-in tariffs could be considered earlier.

25. It is evident that such a scale up will be only achievable by overcoming systemic barriers, such as energy subsidies and introduction of favorable policies that will encourage commercial utility operations. The GoE has already taken steps in that direction and is raising electricity tariff by an average of 7.5% per year since 2006. The GoE is also pursuing a comprehensive energy price reform strategy for which the proposed implementation plan, along with the fiscal, macro-economic and social impacts are being analyzed.

Figure 8: Impact of Large Scale Wind Development on Emissions



26. While the Government is taking its best efforts to realize this plan, acceleration of the wind power development in Egypt would only be possible with a strong commitment of the private sector and concessional international donor support from sources such as the Clean Technology Fund (CTF). Wind power development is seriously constrained by lack of dedicated transmission network, which requires public financing. In view of the competing priorities, CTF co-financing could support

the accelerated development of the transmission infrastructure that would be specifically available to tap the best wind resources in Egypt, and perhaps the world. Without CTF financing, this infrastructure development could be delayed by about 3-5 years.

27. Egyptian electricity prices are indirectly subsidized through low pricing of natural gas used for domestic power generation, making it impossible for wind power to compete with conventional power generation in the current context. Despite the very significant wind resources in Egypt, particularly on the Red Sea coast, where mean wind speeds in the range of 8-10.5 m/s are found, it is extremely unlikely that at present gas prices wind energy will be financially viable. The marginal electricity production cost in Egypt is about US cents 3.75/kWh (based on gas price of $ 3/mmbtu), whereas the cost of wind power cost is estimated to be in the range of 9-11 US cents/kWh, depending on site conditions. As the transition to cost-reflective pricing is expected to continue during the implementation of the wind energy scale-up program, support from concessionary financing sources to buy down the higher capital costs and to develop the transmission infrastructure would be critical to support the scale-up effort.

28. In this regard, a key element of the plan for replication of wind is the emphasis on renewable energy placed in the new Electricity Law, recently endorsed by the Cabinet and scheduled to be presented to Parliament for ratification during the 2008/09 session. Under the new law, a funding mechanism to be implemented by the GoE to fulfill its proclaimed support for renewable energy includes funds from the export sale of gas saved by the wind power.

29. The use of wind resources would have significant development impacts as it would contribute to a low carbon development path (reducing carbon intensity of the economy), reduce vulnerabilities associated with resource scarcity (including water supply during periods of drought for hydro-based systems), strengthen the resilience of the power sector to future shocks (peaks in fuel costs, loss of resources or impacts of climate variability on hydro power), manage the risk/return combination of investment portfolios by diversifying energy investments, and reduce the impact of oil imports.

30. Large scale wind power development would support Egypt in building up industrial infrastructure for future development. The government also wishes to ensure local manufacturing capacity to be strengthened as part of the wind commercialization program. Starting from the first wind projects, Egypt has already had a history of encouraging local production of wind turbine components. Electrical components (cables, transformers) and wind turbine towers have been mostly produced by local companies. This program will help build local capacity and generate new jobs. This will require a maintenance staff of several hundred persons for regular maintenance and additional workforce for repairs and major overhauls. Increase local production and employment will directly contribute to local economic development.

31. The development of the wind sub-sector in Egypt would also further strengthen Egypt's role as a leader in renewable energy development in the region and could help it become regional supplier for the wind industry. Due to the current international market situation manufacturers have other even better and more attractive markets which require local production. They can only be convinced to establish local production facilities in Egypt if they can expect a continuous market share in the medium to long-term. The much needed customization of the equipment for achieving optimum performance under Egyptian conditions would also be possible only through a large program. Any decision by manufacturers to establish local production facilities is made in relation to the size of the local market which means Egypt has to compete with other regional markets which have already proven their stability.

32. There would be need for both public as well as private sector based financing for the successfully achieving the scale-up of the wind power development in Egypt. In particular, the dedicated transmission infrastructure needs would require public financing and the individual projects could utilize public as well private financing allowing a role for respective MDB groups, including the International Finance Corporation (IFC) and the private sector department within the African Development bank (AfDB). In addition, carbon financing would play an important role in enhancing the attractiveness of investments. More details of a wind scale-up program for Egypt are presented in Annex 1.

33. The key indicators that could be utilized for measuring the results of this program would be installed wind capacity, percentage of electricity generation from wind power measured on an annual basis (GWh) and the GHG emission reductions achieved on an annual basis (Tons).

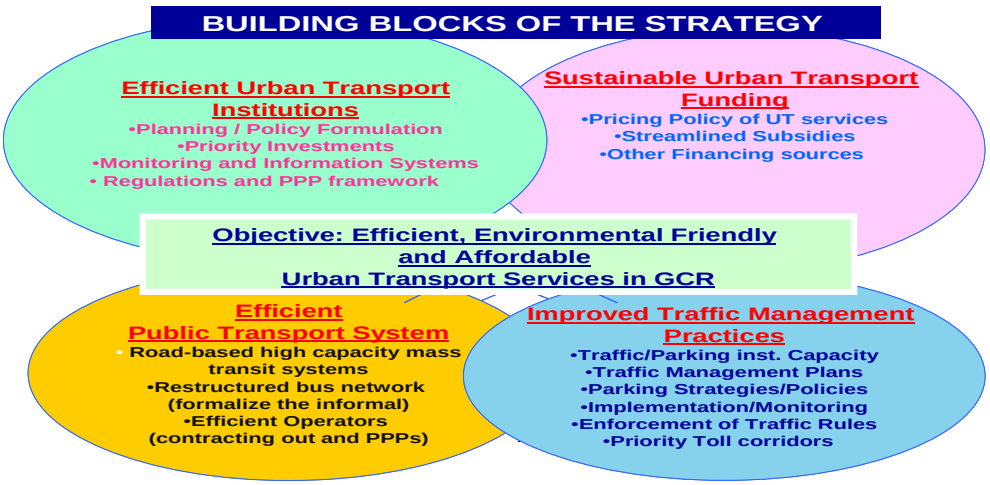
Urban Transport Sector

34. The total population of Egypt over the ten-year period between 1996 and 2006 increased from 59 million to 73 million, with an average annual growth rate at 2.04%. The Greater Cairo Metropolitan Area (GCMA) hosts the largest share of population, economy, industry, and human resources in Egypt. With a population that stood at 17 million in 2006 and fast rate of urbanization (expected to reach 24 million in 2027), GCMA is one of the largest megacities in the World and is Egypt's largest agglomeration (27% of Egypt's population). It comprises the largest three Governorates in Egypt (Cairo, Giza and Qalyobiya) as well as 6 new cities in the Governorates of 6th of October and Helwan (New Cairo City, 6th of October City, 15th May City, 10th of Ramadan City and El-Obour City and Badr City). With such a large size of population, the need to have an adequate, efficient and clean public transport system is unequivocal. While highly diversified, in terms of supply and related infrastructure and facilities, the current urban transport system in Greater Cairo requires significant improvements to reduce the current level of aggravated traffic congestion and carbon emission of 13 million CO2 tons/year. The Urban Transport Strategy for Greater Cairo Region (World Bank, GOPP 2006) identified the following urban transport and traffic management issues as the most critical challenges:

a) air pollution;
b) aggravated traffic congestion;
c) poor public passenger transport system;
d) high accident rate; and
e) insufficient financial arrangements.

35. The adopted Urban Transport Strategy for Greater Cairo is driven by the good practice principles/guiding building blocks, as shown in the chart below (Figure 9):

Figure 9: Building Blocks of the Greater Cairo Transport Strategy



36. *Prioritized investments are in line with realistic funding capacity in the urban transport sector.* As the Cairo metropolitan region continues to expand, the demand will continue to increase faster than the availability of funding. While it is possible to develop lists of projects that if implemented would address the lack of transport capacity and other deficiencies in the present supply of transport services, it is more difficult to determine how they would best be funded. Hence, a sound analytical and scoring method has been applied under the Greater Cairo Urban Transport Strategy (World Bank, GOPP 2006) to assess priority needs and provide reliable evidence and advice to support the making of political decisions on which investments to approve and implement. This included cost-effectiveness, economic and social returns, environmental impact and potential to attract the private sector participation.

37. Accordingly, the strategy identified key cost effective options for emission reductions in the amount 1.5 million tCO2 per year (or 12% of ER in transport sector in GCMA) that could be implemented in the short-to-medium (2009-2013) term and make significant and noticeable impact in improving the mass transport and traffic conditions in Greater Cairo (see list in Annex 2).

38. Once initiated in Greater Cairo (which is already of a very large scale), investments could be up scaled to Egypt's other major cities with the aim to achieve an emission reduction in the transport sector up to 4.5 million tCO2 per year (20% of ER in all transport sector).

39. *This is not business as usual.* Despite large investments made in metro lines and urban road capacity over the last two decades in Greater Cairo, the level of investment in transport infrastructure and services has failed to keep pace with the increasing demands. With the CTF support, the consolidation and acceleration of modal shift programs in Greater Cairo (from private vehicle and low capacity shared taxis into Light Rail Transit, Bus Rapid Transit and High Efficiency Buses with measures of Bus Operation Optimization) will be possible. The CTF will also enable the scaling up of GNC buses (1310 new buses), which would further reduce by an estimated 30% the emissions of standard diesel, and which would otherwise not be achieved as these buses represent an additional financial commitment, not justified by current regulations. The CTF will also enable the introduction of a scrapping program to eliminate the rolling stock (613 minibuses) displaced by modal shift, which would otherwise just be moved to other cities. This program would cement the emission reductions achieved through the introduction of new larger size vehicles. Finally, with the implementation of this ambitious investment plan, there will be full system integration between the metro system and surface transport modes, as well integrated fare system.

40. The resources required for the infrastructure developments are of a magnitude that exceeds the current funding capacity of the urban transport sector and hence the need for meeting the hard fiscal constraint in Egypt through further and more rigorous investment prioritization on the basis of objective economic criteria and cost effectiveness. Blending CTF resources ($100m) with IBRD ($150m), Private Sector ($330m), Government own resources ($285m) and other financing would make available investment capital in infrastructure which may otherwise not be readily available or facilitate the speed of adoption and scale up. The low cost financing would be instrumental in internalizing some of the climate benefits that are not typically rewarded by the financial markets. In absence of concessional sources of financing such as through the Clean Technology Fund, the likelihood of the implementation of the investment program would be low and efforts would remain scattered at the pilot subproject levels.

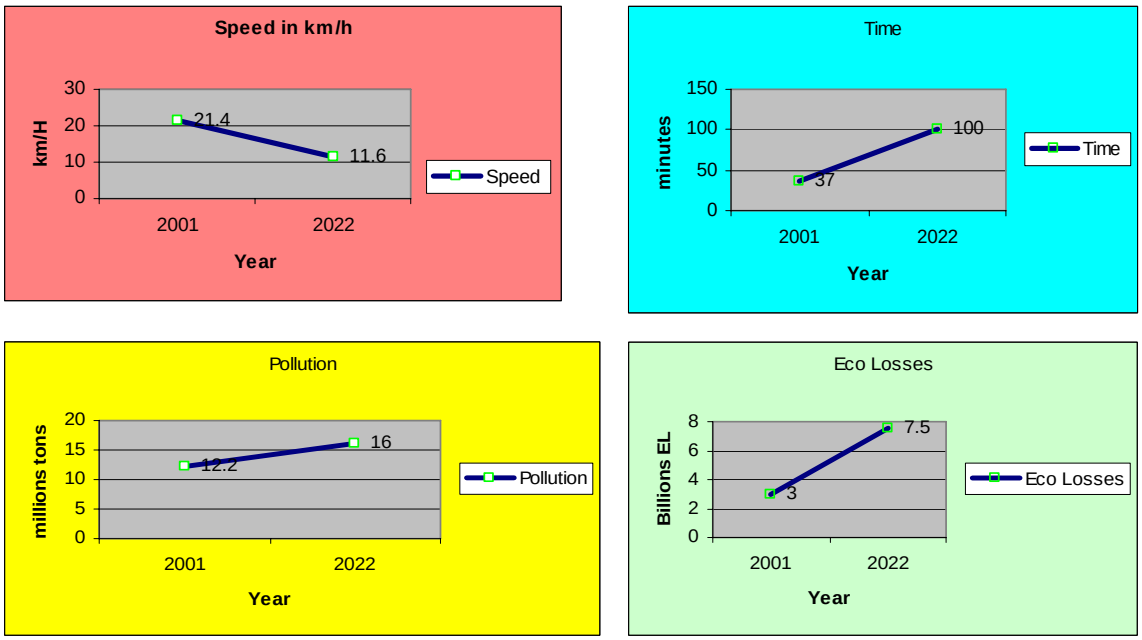
41. The emission reductions associated with the proposal for CTF cofinancing are established at 1.5 m tCO2/annum (12% of annual emission), resulting in ER of about 30m tCO2 over the 20 year lifetime of the investments. Improvements in the transport sector would also have a high level of development impacts in view of the stream of local benefits such as providing the low-income people

with adequate mass transit system and reduction of local pollution which is a key health concern for the GOE. An efficient transportation system would improve business environment, reduce losses in GDP due to increasing trip times, facilitate increased trade and commerce within Egypt and set an example for transportation sector improvements in other countries in the region.

42. It is expected that without these urban transport investments, the annual emissions will increase from a current amount of about 13 million tCO2 to about 16 millions in 2022, the average trip speed among all modes of travel would decrease from 19.0 kph to 11.6 kph and the average journey to and from work would take more than one and half hours. The total economic cost of this "do nothing" scenario is estimated at LE 7.5 billion (US$ 1.6 billion) per annum (Figure 10).

43. Private sector elements of the strategy include the structuring of the BRT and LRT operations and well as contribution to the introduction of clean buses. IFC and the private sector department of the African Development Bank will provide support to the private sector. Capacity building, especially on PPP and improved financial management, will be provided through a PPIAF grant as well as an approved GEF grant under implementation by UNDP.

Figure 10: Consequences of a "do nothing" scenario in transport sector



Urban Transport Strategy for Greater Cairo (World Bank, GOPP 2006)

44. **Baseline Statistics:**

a) Inefficient and high polluting shared taxis and microbuses account for over 50% of all public transport trips.

b) 613 old polluting minibuses run in Greater Cairo adding to health hazard and traffic congestion.

c) Current bus and tramway rider-ship: 3.1 million passengers per day.

d) Current buses operate with standard diesel drive.

e) Availability of bus priority facilities and LRT in high demand corridors: 0

f) Annual GHG emissions from the transport sector in target areas: 13 million tons CO_2 per year.

45. **Results Indicators**

a) 20-30% modal shift from passenger vehicles to high capacity and clean technology buses and light rail transit.
b) 613 old minibuses and replaced by 1310 large size clean technology vehicles.
c) 6 BRT corridors constructed and operate with articulated CNG-hybrid bus technologies.
d) 5 modern and clean technology LRT/rail lines constructed and operating.
e) Bus, BRT and LRT rider-ship: 5.0 million passengers per day.
f) Emission reduction: 1.5 million tons CO2 per year, 30 million tons CO2 over 20 year
g) Cost effectiveness of reductions is estimated at $28.8/ton for the entire financing, or about $3.3 of CTF resources/ton.
h) ER targets of replicability: 4-4.5 million tons CO2 per year

IV ENABLING POLICY AND REGULATORY ENVIRONMENT

Wind Power

46. Egypt's aggressive investment plan has been accompanied a strong reform program in the power sector. The most significant reforms to date include (i) the unbundling of the sector[10] and setting the stage for future competition and privatization; (ii) the creation of the regulator and its work to date on performance benchmarking and the drafting of the new Electricity Law (that is scheduled to be tabled in the current session of the parliament); (iii) the introduction of IPPs; and (iv) price increases. After the currency devaluation in 2003, the GoE put a hold on additional IPP transactions, but the Government is now reconsidering the PPP approach within a framework of tariff reforms and movement away from the single-buyer models.

47. The key policy platform for the wind energy scale-up program is the new Electricity Law that has undergone cabinet review and is likely to tabled in the Parliament during the current session. The law should establish a level playing field for electricity generation from renewable energy technologies by private developers. Market reform will allow third party access and prioritize dispatch of renewable energy plants. The new law will also implement a new funding mechanism to support the renewable energy commercialization program. Specifically, a "Fund for Development of Power Generation from Renewable Energies (RE Fund)" will be established and will be affiliated with the cabinet of Ministers to provide a "cents per kWh" incentive to the transmission company for purchase of renewable energy based electricity. There is experience in the operation of such funds in Egypt, as a similar fund already exists, which has established the necessary protocols for operation between the petroleum and the electricity ministries. The GoE has also shown strong commitment to energy efficiency and the cabinet is currently considering creation of an energy efficiency agency directly under the Supreme council on energy to implement a National energy efficiency and conservation plan covering all sectors where improvements in energy efficiency are feasible.

[10] The sector includes 6 generation companies, 1 transmission company (Egyptian Electricity Transmission Company, EETC, which is the single buyer), and nine distribution companies, all under the umbrella of the Egyptian Electricity Holding Company (EEHC). In addition, there are three independent power producers (IPPs).

48. A series of energy price increases was started a few years ago, in light of the growing subsidy burden of the sector. As mentioned, energy subsidies reached 6.7% of GDP in 2007/08, mostly due to subsidized gasoline in the transport sector and liquefied petroleum gas (LPG) widely used for cooking. In early 2000, gasoline price increases were introduced to bring the prices closer to their market values. Further in 2004, annual increases to the electricity tariffs were approved. In June 2008 the Government announced that the price of natural gas for energy-intensive industrial users would be increased from US$1.25/mmbtu to US$3/mmbtu with immediate effect. Likewise, the electricity price for energy-intensive industrial users was increased in one-step to US¢6.3/kWh, US¢4.6/kWh and US¢3.8/kWh for medium, high voltage and ultra high voltage, respectively. Regarding average retail tariffs, the adjustments started in 2004 (for the first time since 1992), from an average of US¢2.2/kWh to US¢2.4/kWh in that year, reaching today the average of US¢3/kWh. The energy price adjustments constitute a significant step by the Government towards reduction of energy subsidies, and the acceleration of some price increases recently demonstrates the strong commitment to price reform.

49. The price reforms being undertaken by the government will also help create an enabling environment for renewable energy and energy efficiency. Such price reforms will provide a stimulus for end users to undertake energy efficiency measures and allow for participation of the private sector and the commercial financial institutions. The existence of significant subsidies on fossil fuels and fossil fuel based electricity generation has impeded renewable energy development in Egypt. Under current market conditions, renewable energy is unlikely to be able to compete with gas for power generation with typically higher capital costs compared to conventional power generation options. While operation costs would be lower over time, the higher capital costs constitute a serious financial barrier for private power generators or for public sector investment in renewable energy.

Transport

50. On the recommendations of JICA and World Bank, the government intends to establish in 2009 a Metropolitan Cairo Transportation Authority to be responsible for regulating and coordinating the activities of various entities, assist in setting transport investment priorities according to a rational transport plan and in establishing inter-modal coordination and integration within the metropolitan region. More specifically the Authority will have the following functions:

a) Prepare and update multi-modal transport plans for the metropolitan region (Some of this work could be contracted out under the direction of the Authority).

b) Prepare capital investment budgets for passenger transport and for major road investments.

c) Plan transit service networks and transit system integration.

d) Contract for passenger transport services with public sector operators.

e) Regulate and contract for services by private sector bus operators.

f) Suggest a sustainable urban transport financing, that takes into consideration increased reliance on users charges and affordable tariff restructuring.

51. The authority would not have an operational role, leaving this to operational entities (such as the Cairo Transport Authority and a proposed Metropolitan Expressway Authority). According to recommendations made in an institutional assessment completed by Booz Allen, the authority would be institutionally mapped to Ministry of Transport and report to a high level Steering Committee chaired by the Prime Minister.

52. To ensure sustainability of the urban transport financing, the Government will also develop and implement a more sustainable financing framework for the urban transport sector. This will include application of adequate user charges policies to reflect, to the extent possible, actual transport costs for all transport modes, and substantial reduction of the current subsidies through low transport fares and pricing of gasoline and diesel. The social objective of making public transport affordable is laudable objective but it can be better achieved at lower cost by using more effective public transport modes (high capacity and mass transport systems), efficient transport operators (concessions/lease to private operators) and more appropriate subsidy schemes to those who really need them.

V IMPLEMENTATION POTENTIAL AND RISK ASSESSMENTS

Wind Power

53. Egypt was historically an early adapter of modern wind energy technology founding its first wind test station in the late 1970s (partly financed by DANIDA). NREA has substantial in-house expertise from developing some 400 MW of wind power in Egypt in areas ranging from initial resource assessment to wind farm operation and maintenance. A key problem in the present context is that NREA has a number of functions, which may lead to conflicts of interest as a wind commercialization program is implemented. A study containing recommendations on resolving these conflicts has been financed by the European Union and is currently subject to internal discussion in the GoE.

54. The technical capacity in this area for the implementation of the wind program would also need to built up, but the active wind energy business environment in the country has helped develop core skills that can be easily be scaled-up given the availability of technically skilled workforce. The experience and the capacity of the EEHC gained through the implementation of the three IPPs would play an important role.

55. In the past, the GOE has implemented three IPPs (650 MW each); two of which were supported by IFC and this experience would be helpful as a wind power development scale-up takes place in Egypt. These IPPs were considered highly successful and, when procured, achieved among the lowest PPA price/kWh in the world (largely due to subsidized natural gas). However, the IPP program was put on hold when the Egyptian pound was devalued in 2003 and the price of electricity produced by the IPPs increased (most of the costs under the PPAs with the IPPs are US$-denominated). The low final tariffs in the sector, combined with political constraints on increasing them, made the public sector unwilling to assure the high level of foreign currency risk implicit in the PPAs, particularly under the prevailing single-buyer model. The GoE is keen to re-engage with the private sector. To do so the new Electricity Law allows for private entry into most activities of the sector (generation, sales, and distribution) and encourages the entrants to enter into bilateral contracts with consumers and producers based on commercial arrangements.

56. With regard to the wind power scale-up program, the allocation of the various project risks between the developer, EETC and other Egyptian state entities must be undertaken carefully in order to allocate each risk to the party most able to bear such risk and to mitigate its effects. The government of Egypt, including state-owned companies like EETC, and the private sector will bear those risks which they can bear best and which would tend to result in a lower electricity tariff. Each of the risks to be allocated will be identified in the power purchase agreement and/or in related project documentation. Future wind farm development beyond the 2,500 MW block may be affected by potential bird protection areas, a subject which is currently being analyzed in a study financed by the European Union.

Transport

57. Feasibility studies, pre-feasibility studies, or assessment reports for all investments described in the previous section have either been prepared or are at final stage of preparation. All investments have been discussed and approved at the Cabinet level. The BRT has received strong support from the Government of Japan and the pre-feasibility study for this investment was completed by the JICA team in June 2008. The urban transportation program is an example of inter-agency coordination within countries for introduction and scale-up of low carbon technology applications. The Cairo Transport Authority (CTA), which is a well established entity and have been operating the bus and tramway service for decades, will be responsible for the bus and LRT investments. Ministry of Transport will be responsible for BRT investment. Given the Government's commitment, the BRT (which will be operating in a segregated space that has been largely secured) and bus replacement will be quicker to implement when compared to large-scale infrastructure for new highways or underground systems. The feasibility study of the LRT is under finalization and the preliminary engineering design is underway (under a Japanese PHRD grant).

58. Affordability of public transport has been so far a successful component of urban transport policy achieved through regulated low fares and highly subsidized gasoline and diesel. The social objective of affordability will remain a key component of the proposed Strategy. However, attempting to ensure affordability by implementing low fares for everyone is not a cost efficient way of achieving this objective. It diverts resources that could be used for investment to subsidies for many passengers who do not need them. The principal of affordability will be maintained as an area of action, but implemented through policies that focus more on reducing subsidies while targeting direct or indirect support to those who need them most rather than on overall low fares. Several subsidy schemes and cost reduction measures could be developed (see below). A promising logical source for much of the funding for investment is much greater reliance on user charges. Many proposals for changing transport user charges will be covered under the topics of traffic and demand management. But there is another group of user charges that are designed to raise revenue rather than change demand for services. Most prominent among these are toll charges and higher prices for transport fuel. These two measures should be seriously considered by the authorities if sustainable financing of UT operations is to be achieved.

Implementation Potential, including Risk Assessment

59. Overall implementation risk is assessed to be Moderate (see table below).

60. Egypt has a proven implementation record of World Bank financed projects, including in the energy sector and transportation sector. El-Tebbin Power project is one of the best performing projects in the Egypt portfolio, and the implementation track-record of sector entities has been proven. Indeed, a year after the loan was approved by the World Bank Board of Executive Directors, all Bank-financed contracts had been signed. All fiduciary aspects have been implemented smoothly and compliance with safeguards was rated Highly Satisfactory in the last ISR. The Independent Procurement Review (IPR) completed in the summer of 2008, found full compliance with the World Bank procurement guidelines and procedures. The key risks relating to the proposals under this investment plan are identified in the risk matrix below.

Table 5: Potential Risks and Mitigation Measures

Potential risks	Rating after mitigation [11]	Mitigation measures
Reduced private sector interest as a result of global economic slowdown.	M	The Government will incorporate lessons from the implementation of Independent Power Producers (IPP) projects. The proposed framework for wind development allows different PPP models and if necessary will consider publicly financed projects. Technical assistance for developing a robust framework for private sector participation in wind and transport sectors would be strengthened.
Slow implementation of the energy subsidy reform program could impede wind energy program.	M	The Government has a strong commitment to reforms and is currently implementing a reform program with average annual increase of about 7.5% in the electricity sector. Further, the government has announced a strategy for comprehensive energy price reforms in 2007. The level of prices and the proposed phased implementation, along with the fiscal, macro-economic and social impacts are being analyzed under the comprehensive energy pricing strategy that the Government is undertaking with the help of international consultants, funded by the World Bank
Possible institutional issues	M	With respect to wind power development, the program is currently public sector based and the main sector institution is the National Renewable Energy Agency (NREA). NREA has a number of functions, which may lead to conflicts of interest as a wind commercialization program is implemented. The European commission has provided technical assistance to resolve the issues and this is currently subject to internal discussion with the GoE. With respect to urban transport, the proposed Greater Cairo UT Authority, under establishment, is expected to address institutional fragmentation risks.
Technical issues	L	Projects under the CTF investment plan will utilize technologies that have been implemented globally and in Egypt. Based on the experience in developing around 400 MW of capacity, there is substantial local capacity in wind power (within the Government and in the private sector) ranging from resource assessment to wind farm operation and maintenance. The existing PPP Unit within Ministry of Finance will assist the Greater Cairo UT Authority, under establishment, in piloting first PPP transactions.
Safeguards	M	WB/IFC/AfDB safeguards policies will apply to all interventions. The Egyptian Electricity Holding Company (EEHC) is already applying them under ongoing projects. No major resettlement is expected under the Urban Transport since there secured right-of-way for all proposed investment. A resettlement policy framework will, however, be prepared. A Social Assessment, including an affordability to pay survey, will be carried out as part to ascertain people's behavior toward modal shift and structure proposed increase/target subsidy in fare structure.
Overall Rating	M	

[11] Rating of 4: high (H), Substantial (S), Moderate (M), Low (L)

VI. FINANCING PLAN AND INSTRUMENTS

61. The key instruments utilized for the implementation of the CTF Investment Plan in Egypt would be loans and grants and possibly guarantees.

62. **Grants**: As outlined in the CTF documents, grant funds would be utilized for advancing preparatory work with respect to each of the program areas. In particular, preparatory funds are required for additional feasibility work, structuring of private sector elements including agreements such as power purchase agreements. The total preparatory funds required would be in the range of US$ 3 million[12] related to wind power and urban transport. These preparatory funds would/are being supplemented by other sources including ESMAP, FAPA, GEF (global MSP for grid-connected renewable energy), Japan PHRD ($720,000 under implementation for the transport investment), PPIAF and others to the extent of $ 4 million.

63. **Loans**: The proposed investment plan would utilize Sector Investment Loans (SIL) instrument in conjunction with co-financing from other sources including private sector, IBRD, IFC, African Development Bank, private sector and other donors. As tentatively envisaged in the draft investment plan, the support requested from the CTF to contribute triggering of the above three programs would amount to $300 million as shown in Table 5 below.

Table 5: Program Financing

Program	Total ($ million)	Private (US$ million)	CTF (US$ million)	Govt/MDB* (US$ million)
Wind (Transmission line, Wind, Energy Fund and PPP projects)	1056	306**	200	550
Transport	865	330	100	435***
Total	1921	636	300	985

* Including IBRD, IFC and AfDB

** In addition, about $1 billion is expected to be leveraged through IPPs

** This includes $150m IBRD loan, which envisaged in the CAS Progress Report (June 2008): Urban Transport Infrastructure Project.

64. In addition to the above instruments, it likely that wind power scale-up program would need risk mitigation instruments such as guarantees to stimulate private sector interest in the program. The size of the guarantees is to be estimated but it is likely to be in the range of US$ 250 million and could be accessed through IBRD and/or AfDB.

[12] The amount is subject to further verification after the CTF preparation funds become available and its rules finalized.

65. In addition, Carbon finance for the wind projects (and potentially channeled through the proposed RE Fund) could provide additional revenue streams to make projects attractive. For the transport investments, the carbon partnership facility (CPF) can provide additional revenue streams to enhance the viability and contribute to first loss portfolio. Although as of today, CDM methodologies are available only for BRT, CPF can support development of new methodologies as needed.

ANNEX 1

Egypt Wind Energy Scale–up Program (WESP)
A Proposal to the Clean Technology Fund

1. **Problem Statement**: Egypt's economy has been growing substantially in recent years with real GDP growth increasing from 4.2% in 2004 to 7% in the first half of 2007. Concurrently, energy consumption has been increasing steadily with primary energy consumption growing at 6% on average per annum and the growth in demand for electricity reaching levels of 7-8%, Egypt needs additional 20 GW of electrical power by 2020 which would result in roughly 50 percent increase in emissions from the 2007 levels in the electricity sector alone (refer Figure 8). Fuel resources in Egypt are depleting and when used for electricity generation are adding to the environmental problems and being poorly utilized

2. **Proposed Transformation**: The objective for this program is to scale-up from the existing and planned wind projects of about 1000 MW to 2500 MW, as a first phase in reaching Egypt's target of 12% of generated electricity by 2020 (approx. 7,500 MW).

3. Renewable energy, in particular wind, has the potential to substitute for thermal-based power generation to meet future demand for power, in areas with high wind regimes. Wind energy has a negligible carbon footprint and can be scaled up in modular fashion to meet step-wise increases in demand. The Government of Egypt through its Ministry of Electricity and Energy (MoEE - Egypt) intends to issue a series of call for tenders for the supply of wind generated electricity from independent power producers in Egypt to meet the long-term electricity needs of Egypt. An annual volume of some 250-500 MW is foreseen as part of an initial block of some 2,500 MW to be tendered. By the beginning of 2009 wind power accounts for some 400 MW installed, and about 600 MW of additional projects are in the pipeline of the state-owned developer NREA (New & Renewable Energy Authority) to be commissioned over the next 2-4 years (financed by soft loans).

4. The Government has proposed three components for consideration under the Clean Technology fund (CTF):

(i) Public-Private Partnership (AfDB/IFC)

5. The first element of the Egypt Wind Commercialization Program is to support development of new business models involving innovative financing options. A possible area of support could be the proposed joint venture wind project between Abu Dhabi Future Energy Company (MASDAR) and NREA to develop a 200-MW wind farm near the Gab El Zayat. This could serve as a model future Public-Private Investments in wind and set the course for large scale development of wind resource in the Gab El-Zayat region. The indicative costs are in the range of US$ 476 million. The estimated equity contribution from NREA and MASDAR is US$ 70 million each and debt will be raised from international sources in the range of US$ 336 million. CTF support will be requested for the US$ 50 million equity contribution on behalf of NREA. The project commissioning is expected by 2011. This component would be implemented by IFC/Private sector arm of AfDB. If the project does not move ahead for some reason, the CTF funds could be utilized for other private or public wind projects within the Government of Egypt's generational expansion plan. IBRD support, if needed, could include loans for public sector projects, or support for public participation in public-private partnerships, as well as possibly IBRD guarantees. If the private sector based wind energy development shows strong growth, IFC/AfDB private sector department could request further CTF funding to support investors and sustain the wind commercialization program.

Photo: The Existing Wind Farm at Zafarana

(ii) Transmission System Upgrade (IBRD)

6. As in many parts of the world, wind power scale-up in Egypt is constrained by limited capacity of the existing transmission network. In particular, there is a strong need to build a high capacity transmission system to tap the wind resources in the Gulf of Suez region that has one of the best wind potential in the world with an estimated capacity addition of about 2500 MW at capacity factors in the range of 40%. The Egypt Electricity Transmission Corporation (EETC) is considering a 500-kV double circuit transmission line and associated facilities to evacuate power from the El-Zayat area but is faced with funding constraints. Without CTF financing, this infrastructure development could be delayed by about 3-5 years. CTF funds are proposed to be utilized to co-finance construction of this transmission system, without which, clearly, the wind resources could not be developed. The estimates are currently being prepared but it is likely that costs would be in the range of US$ 250 million and CTF support in the range of U$ 100-120 million is proposed. .

(iii) Renewable Energy Fund (IBRD)

7. A new Electricity Law has been prepared by the government to undertake electricity market reform, including creation of a level playing field for electricity generation from renewable energy technologies by private developers. Market reform will allow third party access and prioritize dispatch of renewable energy plants. The new Law will also implement a new funding mechanism to support the wind commercialization program. Specifically, a "Fund for Development of Power Generation from Renewable Energies (RE Fund)" will be established affiliated to the cabinet of Ministers to provide a cents per kWh incentive to the transmission company for purchase of renewable energy based electricity. A large part of these payments would be made through revenues from export of saved natural gas and sale of carbon credits, but additional support from CTF of about US$ 50 million would be required to start the initial operation of the RE fund to support about 250 MW of IPP development. Over time, as natural gas exports fetch better prices, the need for external

support to the fund would decrease. If the private sector based development of wind power is slow, then these funds could be utilized for supporting the GOE's public sector projects in wind.

8. Total Expected reduction in CO_2 emission for new wind program of approx. 2500 MW is about 3.3 million ton/ yr. This is roughly 7% of the emissions from the electricity sector in Egypt. When the replication potential is realized within the country about 3 times the installed capacity is likely to be achieved and approximately 20% of emissions by the electricity sector in Egypt would be avoided. The cost per unit of reduction would be in the range of $30-40/ton of carbon as a preliminary estimate. This abatement cost compares well with the global marginal abatement costs curve estimates for wind technology (Mckinsey:Enkvist, Naucler, Rosander, 2007).

9. **Rationale for CTF financing:** Further wind power development is seriously constrained by lack of dedicated transmission network and this requires public financing. In view of the competing priorities, availability of CTF funds would accelerate development of the transmission infrastructure that would be specifically available to tap the best wind resources in Egypt, and perhaps the world. Without CTF financing, this infrastructure development could be delayed by about 3-5 years and the proposed tendering program would prove less attractive to the bidders under current financial conditions, prevalent in the market, the wind option is unlikely to be able to compete with gas for power generation. The marginal electricity production cost in Egypt is about US cents 3.75/kWh based on gas price of $ 3/mmbtu. Wind power capital costs are typically higher than combined cycle gas and the cost of production is estimated to be in the range of 9-11 US cents/kWh, based on site conditions. While operation costs would be lower over time, the higher capital costs constitute a serious financial barrier for power generators or for public sector investment. While the GOE is taking steps to reform pricing (partly supported by World Bank/ESMAP through a fuel pricing study), CTF support is critical to develop renewable energy during the transition phase.

10. Blending CTF resources with IBRD and other financing would make available investment capital in infrastructure which may otherwise not be readily available or facilitate the speed of adoption and scale up of wind power capacity. The low cost financing would be instrumental in decisions taken to adopt wind power, internalizing some of the climate benefits that are not typically rewarded by the financial markets.

11. **Implementation Readiness:** Wind generators are technically proven and commercially available. Several smaller plants are already in operation in Egypt, constituting a suitable basis on which to base a scale up effort. In addition, the new electricity law would create a suitable enabling environment by encouraging private sector participation and instituting the renewable energy fund.

12. **Financing:** CTF request is approximately for about US$ 200 million and would be in the form of low interest loan. The following financing plan only covers the parts of the program funded by the CTF.

Sub-Component		**Total (US$ mill)**	**Pvt (US$ mill)**	**CTF (US$ mill)**	**Govt/Donors (US$ mill)**	
MASDAR/NREA and other IPPs (450 MW) (AfDB/IFC)		456	306*	50	100	

Transmission		250		100	150	IBRD, AfDB
		0				
RE Fund		300		50	250	IBRD
Total		**1006**	**306**	**200**	**500**	

***** For other IPPs, the private sector investment would be in the range of an additional $500 million**.**

Project Preparation Timetable

Activity	Date
Identification mission/Investment Plan	December 1-4, 2008
ROC on CTF Investment Plan	January 15, 2009
Proposal Submission to CTF	January 21, 2009
Concept Note	February 24, 2009
Project Preparation	March -- December, 2009
Appraisal & Negotiations	February 2010
Board Approval	April 2010
Implementation	August 2010- August 2016

Photo: Erection of a Wind Turbine at Zafarana

Annex 2
Egypt Urban Transport Sector

I. Problem Statement

1. The Urban Transport Strategy for Greater Cairo Region (World Bank and GOPP, 2006) and the Urban Transport Master Plan (JIKA and GOPP, 2008), identified the following urban transport and traffic management issues as the most critical challenges:

a) ***Aggravated traffic congestion****:* GCMA is experiencing traffic congestion. This has serious economic consequences and contributes to deteriorating air pollution conditions.

b) The transport demand is concentrated on a few transport corridors starting from or ending in Cairo. Half of all motorized vehicles in Egypt operate in Greater Cairo Metropolitan Area (GCMA), at one of the fastest growing motorization rate in MNA (4% per year, reaching more than 2.5 million by 2022). The GCMA is also the preeminent transport center of Egypt accommodating over 20 million motorized person trips and 7 million non-motorized trips daily. As a result, about 2/3 of transport sector emissions is due to urban transport, especially in GCMA (13 million CO2 tons/year).

c) ***Poor public passenger transport system*****:** GCMA relies on under developed, overcrowded and unreliable passenger transport services.

d) ***A high accident rate*****:** The road transport death rate in GCMA is very high. At least 1,000 Cairenes die each year in motor vehicle accidents, more than half of them pedestrians, and over 4,000 are injured.

e) ***Air and noise pollution***: Mobile source air pollution in GCMA is serious both with regard to particulate matter as well as noxious chemicals. Noise levels are high and aggravated by very old large proportion of the car and taxi fleet.

f) ***Inadequate financial arrangements****:* Overlaying all of the above problems are inadequate financial arrangements leading to under investment in transport facilities, especially in public transport capacity which suffers major shortages.

II. Proposed Transformation

2. As demonstrated in the letter of the Government of Egypt to the World Bank and African Development Bank, dated October 27, 2008, the Government of Egypt is committed to low carbon energy development and has taken a number of steps in this direction including for example in the urban transport sector: a) the preparation with the World Bank of an Urban Transport Strategy for Greater Cairo Region that included short to medium investment plan; b) scaling-up replacement of old public buses and private taxis with a new fleet operating on compressed natural gas (CNG); c) completion of line 1 and 2 of the underground Metro and a commitment to complete line 3 by 2012 and line 4 by 2017; and d) the identification and preparation for implementation specific clean technology projects, including implementation of a Light Rail Transit (LRT) and Bus Rapid Transit (BRT) systems as well accelerated conversion of public buses and private taxis to CNG/hybrid technologies. A key principle underpinning the above projects is the Government's intention to maximize when possible the private sector involvement in the implementation, operation and maintenance of these projects under innovative Public-Private Partnership arrangements.

3. The World Bank assisted the Government, under the Greater Cairo Urban Transport Strategy (World Bank, GOPP 2006), to prioritize investment needs. The proposed short-to-medium investment plan includes cost-effective measures that, in combination, can make significant impact in improving mass transit system, reducing traffic congestion and reducing emission by 1.5 million tCO2 per year:

a) Implementation of 3 major Bus Rapid Transit (BRT) corridors (6th of October West Wing corridor, Metro Line # 4 corridor, and the Ring Road corridor) and 3 other shorter BRT corridors in Cairo (replacing obsolete tramway lines).

b) Implementation of Light Rail Transit (LRT) linking Cairo main urban agglomeration with New Cairo City, as well as four other suburban railway connection between four new cities and their nearby major urban agglomerations- namely, Borg Al Arab New City-Alexandria; 10th of Ramadan New City -Line #1 Ain Shams; Salhiya New City-national railway network; and Sadat New City –Menoufiya.

c) Replacement of 613 old and polluting public minibuses with new 1310 large capacity buses operating on compressed natural gas (CNG) or GNC-hybrid drive.

4. These investments would result in the following potentially transformational change in the urban transport sector in Egypt:

Baseline	End of Project Targets
• Inefficient and high polluting shared taxis and microbuses account for over 50% of all public transport trips. • 613 old polluting minibuses run in Greater Cairo adding to health hazard and traffic congestion. • Availability of BRT in high demand corridors: 0 • Availability of LRT in high demand corridors: 0 • Current bus and tramway rider-ship: 3.1 million passengers per day. • Current buses operate with standard diesel drive. • Annual GHG emissions from the transport sector in target areas: 13 million tons CO_2 per year. • Do nothing scenario would result in increase emission to about 16 million tCO2 by 2022.	• 20-30% modal shift from passenger vehicles to high capacity and clean technology buses and light rail transit. • 613 old minibuses scrapped and replaced by 1310 large size clean technology vehicles. • 6 BRT corridors constructed and operate with articulated CNG-hybrid bus technologies. • 5 modern and clean technology LRT/rail lines constructed and operating. • Bus, BRT and LRT rider-ship: 5.0 million passengers per day. • Buses operate on CT GNC or GNC-Hybrid • Emission reduction: 1.5 million tons CO2 per year, 30 million tons CO2 over 20 year • Cost effectiveness of reductions is estimated at $28.8/tCO2 for the entire financing, or about $3.3/tCO2 of CTF resources. • ER targets of replicability: 4-4.5 million tons CO2 per year, or down to 11 million tCO2

5. Implementation of the above mentioned program is expected to result in annual emission reductions of about 1.5 m tCO2 /annum (or 30 m tCO2 over the 20 year lifetime of the investments). It is estimated that planned investments could achieve a share of 30% of daily trips in targeted cities, with a ridership eventually exceeding 10-12 million passengers per day. A key principle underpinning the above investments is the Government's intention to maximize the private sector involvement in the implementation, operation and maintenance of these projects under innovative Public-Private Partnership arrangements. Replication of CTF investments would result in an estimated 4-4.5 million tons of CO2 reductions per year.

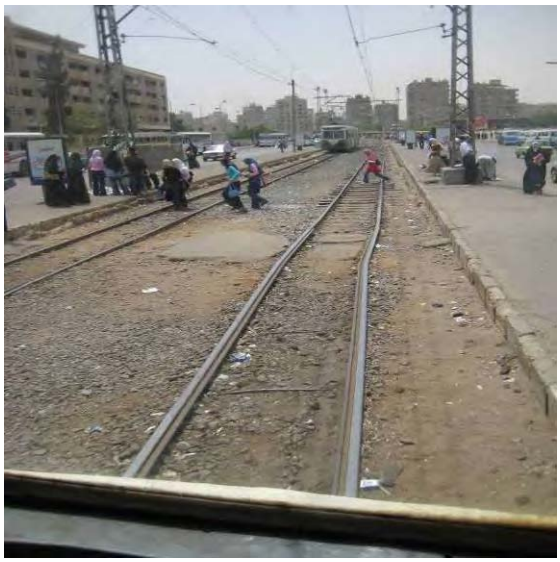
Investment 1: Bus Rapid Transit

6. The 6th of October New City is one of six new communities outside of Cairo which have been designated as growth center. The population of this new city has already exceeded 500,000 persons, is expected to reach 800,000 by 2012 and 2.5 million by 2022. This new city, which is already a good sized city by any reasonable standard, has no mass transit system even though it is essentially a dormitory development with most residents commuting to Cairo. A high percentage of residents relay on private vehicles to commute to Cairo, arrive at their destinations and buses serving this area are caught in congested traffic in the single highway linking this development with Cairo. A BRT operating in a segregated space (which has been largely secured) at high commercial speed would be able to transport users at higher speed to the metro system. The pre-feasibility study (JIKA 2008) envisages a very substantial modal shift both from private car users and from existing bus users. While initial ridership has been forecasted at 300,000 riders in 2010, a 600,000 ridership number will be reached by 2013. Implementation of this corridor can start in 2009. Two other major BRT corridors are currently being studied for subsequent implementation under this CTF investment plan-namely Metro Line # 4 corridor, and the Ring Road corridor. Another 3 corridors will be in Cairo using the right of ways of old lines of surface tramway.

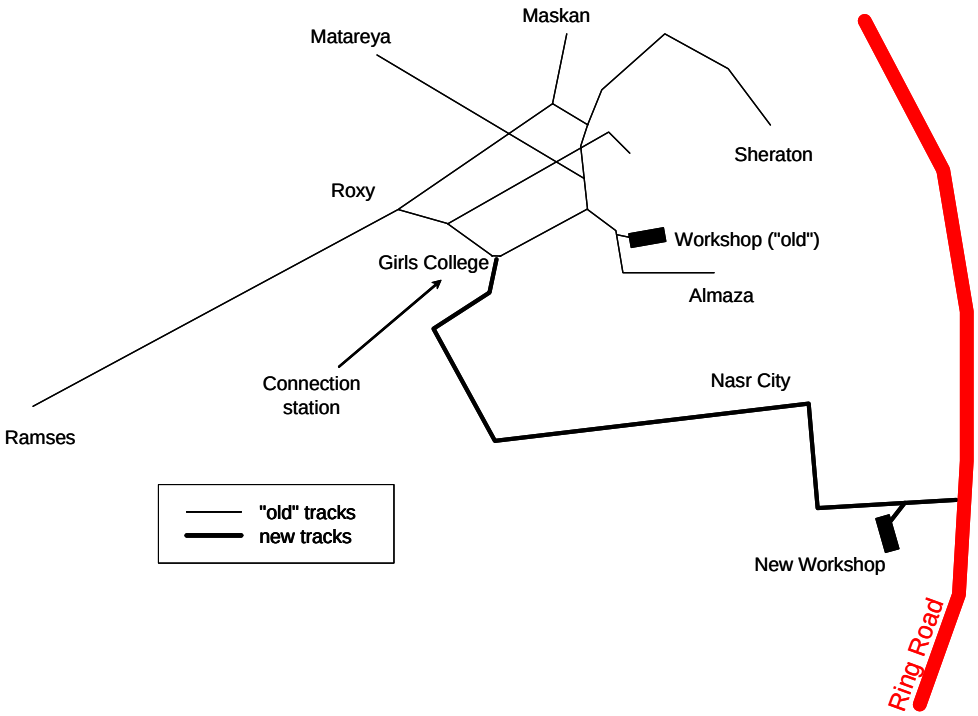
7. The planned 6 BRT corridors will introduce integrated systems with some new road infrastructure, feeder, trunk routes, parking with articulated buses operating on trunk routes. The trunk route has around 125km and will operate with 200 CNG or hybrid articulated buses. The BRT technology includes segregated running ways, terminals, exchange stations, ticketing and far collection system, new and/or upgraded buses with higher fuel efficiency and lower emissions, Intelligent Transportation Systems (ITS) which includes traffic optimization and control system, and the effective service and operating plan. The Bus Operation Optimization technology will include GPS and Radio Frequency Identification System (RFID), routing optimization hardware and software, and remote sensing data collection system. The estimated cost of this investment is $140 million. The rolling stock will cost about $80 million of the total investment cost, which is envisaged to be financed by the private sector under a long term PPP agreement.

Investment 2: Light Rail Transit (LRT) and Rail Links

8. The current old and obsolete Heliopolis surface tramway system (Metro Heliopolis- 30km) currently operate with quarter of its ridership capacity due to very low commercial speed (12km/h) and very long headways/waiting time (30-40 minutes). To quadruple this ridership capacity (to 300,000 passengers/day), the tramway will be transformed into a clean technology Light Rail Transit (LRT) and extended to New Cairo City.



9. New Cairo will soon house over 1 million persons, and is expected to house over 2 million persons within 10-15 years. The Government also plans to relocate several ministries to the area between Naser City and New Cairo. Given this reality, the case for substantially improving the public transit system to these areas is particularly important. A first phase improvement of the Heliopolis tram from Girls College Metro Station (Heliopolis) to Nasr City (two large districts in Cairo where about 700,000 people live), with an extension to New Cairo City will cost about $155 million, including conversion of the whole system into a Light Rail Transit (LRT) using 30-40 new trains, tracks change, passenger facilities, workshops and rehabilitation of the power and supporting system. The planned LRT is an integrated system with feeding system within New Cairo. The new system would extend the existing tramline by 4km to a total of about 21 km and from the current 70,000 passengers/day to 400,000 passengers/day. The other 3 lines of the old tramway will be converted into 3 additional BRT corridors (see sketch below).



Sketch showing old tracks of tramway lines that will be converted into 3 BRT corridors, and the new tracks for the LRT and its extension to the Ring Road/New Cairo. Girls College station will be an intermodal connection station (Metro, BRT, LRT)

10. On the advice of the World Bank (Towards Urban Sector Strategy- ESW 2008), the investment plan also envisages the implementation of rail connection between 4 other new cities and their nearby major cities- namely, Borg Al Arab New City-Alexandria; 10th of Ramadan New City - Line #1 Ain Shams; Salhiya New City- national railway network; and Sadat New City-Menoufiya. The estimated cost of new rail is $250 million.

Investment 3: Clean Technology Bus Facility

11. Out of about 4000 buses and minibuses (providing 2.75 million passenger trip/day) which are currently owned and operated by Cairo Transport Authority (CTA), the Government intends to retire and scrap 613 minibuses (providing 288,000 passenger trip/day) which have been running for more than 15-20 years and causing significant carbon emission and air pollution in Greater Cairo, and replace them with high capacity 1310 CNG or GNC-hybrid drive buses (providing 1.2 million passenger trip/day). The estimated cost of new buses is $475 million.

12. The investment includes improved measures of traffic management and Bus Operations Optimization (BOO) including headway and bus size optimization to match demand and supply during the peak and off-peak period.

III. Implementation Readiness

13. Feasibility studies, pre-feasibility studies or assessment reports for all above listed investments have either been prepared or at final stage of preparation. All investments have been discussed and approved at the Cabinet level. Given the Government's commitment, the BRT (which will be operating in a segregated space that has been largely secured) and bus replacement will be quicker to implement when compared to large-scale infrastructure for new highways or underground systems. The feasibility study of the LRT is under finalization and the preliminary engineering design is underway (under a Japanese PHRD grant). Technical capacity building, especially on PPP and improved financial management, will be provided under a PPIAF grant. An assessment to restructure CTA is currently underway by Ministry of Finance (through the office of Booz Allen Hamilton), while another assessment to establish a new Metropolitan Urban Transport Authority has recently been completed (also by Booz Allen Hamilton) and institutional setting up will start soon. The objective of the new Authority is to plan, regulate and coordinate urban transport activities and prioritize investment plans. It will also oversee the PPP transactions in the sector.

IV. Rationale for CTF Financing:

14. Further urban transport development is seriously constrained by lack of adequate public financing. In view of the competing priorities, availability of CTF funds would accelerate the implementation of the UT investments with the associated modal shift and GHG ER. Without CTF financing, this infrastructure development could be delayed by about 3-5 years and the proposed tendering program would prove less attractive to the bidders. Blending CTF resources ($100m) with IBRD ($150m) and other financing, including IFC and Private Sector, would make available investment capital in infrastructure which may otherwise not be readily available or facilitate the speed of adoption and scale up. The low cost financing would be instrumental in decisions taken to move faster with the implementation, attract private sector financing for operation and maintenance

(O&M) and internalize some of the climate benefits that are not typically rewarded by the financial markets. In particular:

i. The CTF financing will help keep the traffic structure within the affordability of low and middle income families who are expected to be the main beneficiaries of this investment.

ii. With CTF first loss funds, IFC would develop a financing facility to improve access to finance for private sector participants to perform as small-scale bus operators and operators of gas filling station.

iii. The CTF financing will also be used to construct, with the private sector, infrastructure required to scale up number of gas-filling stations in order to service a much increased number of GNC vehicles.

iv. The estimated cost of new buses is $475 million. CTF, with other IFIs, may fund or guarantee a portion of financing. With such a CTF first loss financing, IFC would develop a financing facility to improve access to finance for private sector participants to perform as small-scale bus operators and operators of gas filling station. This facility would leverage CTF's funds approximately 15-20 times and if loan losses are low, CTF's funds would be re-used to further increasing the leverage of funds.

15. The Bank would also seek to aggregate the carbon benefits of the taxi replacements, the benefits of which would be used to cover perceived risks for additional FIs (if required).

VI. Financing Plan

Cost in (US$) millions

Investment	GoE/Donors*	IBRD	Private Sector	CTF	Total
Total (BRT, LRT/Rail, Bus):	$285	$150	$330	$100	$865

* Donors which expressed explicit interest during the CTF donor consultation meeting in Cairo to cofinance such an Urban Transport Program include: IFC, AfDB, JBIC and KfW.

VII. Project Preparation Timetable

Activity	Date
Identification mission/Investment Plan	December 1-4, 2008
ROC	January 15, 2009
Proposal Submission to CTF	January 21, 2009
Preparation	February-October, 2009
Appraisal & Negotiations	November 2009
Implementation	January 2010- December 2013

Annex 3

Identification of Priority Areas for CDM: List of Technology Options (National Strategy Study, 2002)

Table 2.6: Summary of Technologies, Saved Carbon and Cost of Saved Carbon

	Area of Application	Technology	CSC (US$/ton C)	Ton C Saved
1	Textile	Cogeneration	-380	544,414
2	Fuel switching in transportation	Fuel switching	-300	20,640
3	Chemicals	Cogeneration	-260	353,869
4	Food and beverage	Cogeneration	-220	73,496
5	Metals	Cogeneration	-160	306,233
6	Building	Cogeneration	-90	274,929
7	Buildings	Combustion Control	-80	1,093
8	Hotels	Combustion Control	-80	6560
9	Metals	Combustion Control	-80	8201
10	Food & Beverage	Waste Heat Recovery	-80	13,649
11	Food & Beverage	Combustion Control	-80	37085
12	Metals	Waste Heat Recovery	-80	38,515
13	Textile	Combustion Control	-80	55309
14	Textile	Waste Heat Recovery	-80	58,240
15	Chemicals	Waste Heat Recovery	-80	101,336
16	Chemicals	Combustion Control	-80	103,145
17	Hotels	Cogeneration	-45	152,436
18	Fuel switching in industry	Fuel switching	-21	97,608
19	Organic waste management	Waste Management	0	37,336
20	Methane recovery from Municipal solid waste	Solid Waste Management	0	310,600
21	Coastal sand dune fixation	LULUCF	7.11	101,870
22	Casuarina and sissoo plantations around new cities.	LULUCF	12.29	240,000
23	Planting along irrigation and drainage canals	LULUCF	14.11	967,900
24	Planting of roads and highways	LULUCF	17.71	1,123,650
25	Renewable energy for electricity generation (wind farms)	Renewable Energy	30	401,380
26	Acacia stenophylla plantations around new cities.	LULUCF	32.62	240,000
27	Integrated solar thermal Combined Cycle system	Other Renewable Energy	65	161,820
28	Waterway transportation	Transportation	97	32,000
29	Railway electrification	Transportation	1600	44,375
30	Solar pumps	Renewable Energy	2141	48,000
31	Underground mass transit system	Transportation	3169	28,948