

Energy Efficient Cities Initiative

GOOD PRACTICES IN CITY ENERGY EFFICIENCY

Cairo, Arab Republic of Egypt - Taxi Scrapping and Recycling Project

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Project title	Egypt Vehicle Scrapping and Recycling Program
Sector	Transport
Type of project	Incentives for vehicle replacement and recycling
City and country	Cairo, Arab Republic of Egypt
City population	20 Million (Greater Cairo Region)
Total program costs	US\$620.24 million
Estimated annual % energy reduction	29% as of 2009 (~2,214 TJ)
Project status	Active (2009-2037)

Project Summary:

In April 2009, the Egyptian Ministry of Finance, with support from the Prime Minister, initiated the Vehicle Scrapping and Recycling Program for the Greater Cairo Region (GCR). Under this initial phase, a taxi replacement and recycling program was launched on a voluntary basis, where private taxi owners receive financial and other incentives to surrender their old vehicles for new, more fuel-efficient models, while the old vehicles are scrapped and recycled. The program was launched to support enforcement of Traffic Law 121, which went into effect on June 9, 2008, and targets improvements in air quality and reduction of greenhouse gases (GHG) associated with Egypt's aging fleet of taxis, minibuses, and buses. With an initial focus on taxi replacement in the GCR, a collaborative effort between the government and private sector in the GCR offers an attractive financial package to attract owners of taxis more than 20 years old to participate. This includes a 25-30% reduction in the price of a new, replacement vehicle, €2,500 in subsidies and tax waivers, discounts on the loan terms and insurance agreements, and other incentives. The estimated total program cost would be about \$620.24 million, depending on the number of participants, share of each model, etc. The program will remain active for 28 years, replacing 45,000-50,000 taxis in the GCR during the first phase. Then, pending approvals, taxis and other mass transport vehicles in other regions would be replaced in later phases. The first phase will reduce emissions by an estimated 1.3-2.3 million tons CO₂e over 10 years. The project will be supported by carbon financing, which will support development of a recycling facility for the scrapped vehicles. As of 2009, a total of 17,000 taxis had already been replaced, resulting in 57,233 tons CO₂e emissions reduction and a 29% reduction in energy use.

1. Introduction

The Arab Republic of Egypt has a population of approximately 77 million, with about 20 million people living in the Greater Cairo Region (GCR). The GCR is home to the

megacities of Cairo, Giza and Shubra El-Kheima, making it the urban, political, social, and economic capital of Egypt and one of the world's largest urban megalopolis. The GCR has a high population density, with 25% of Egypt's population concentrated in only 6% of the country's total area.

In recent times, the GCR has seen a dramatic increase in total vehicle registrations, with the number of vehicles more than doubling in 15 years (from 2.1 million in 1993 to 4.3 million in 2008).¹ The Ministry of State for Environmental Affairs indicates that vehicle emissions in the GCR region contribute 26% of the total pollution from suspended particulate matter, more than 90% of total carbon monoxide (CO), 90% of hydrocarbons, and 50% of total nitrogen oxides (NO_x). The pollution effect is exacerbated in the GCR due to its unique geographical characteristics. This region is located in a rectangular depression on the two sides of the Nile River, extending from Shoubra in the north to Helwan in the South; when the air is calm, the accumulation of pollutants increases. GCR's unique topography therefore exacerbates the pollution problem with a "Black Cloud" occurrence, or "Greenhouse Layer Effect," over the region, during which high concentrations of pollutants are trapped in the air.

Egypt ranks among the 11 countries showing the fastest growing greenhouse gas (GHG) emissions (CIF, 2009). Analysis conducted as part of the National Strategy Studies (NSS) in 2002 indicates that by 2017 emissions could reach more than three times 1990 levels. The electricity and transportation sector combined contribute more than 70% of Egypt's GHG emissions. While emissions from other sectors (agriculture, waste and others) have fallen in recent times, emissions from the energy and transport sectors have steadily increased, with the share of energy emissions (power and small combustion) rising from 31% to 42% and transport² rising from 18% to 21% between 1990 and 2006. The present scenario sees GHG emissions increasing from 13 million tons of CO₂e (2001) to about 16 million tons (2022) (Eiweida & Krambeck, 2010).

In addition to environmental issues, the existing situation in the GCR severely impacts productivity and safety. Under a business-as-usual scenario, during 2001-2022 the average trip speed would fall from 19 kilometers per hour (km/h) to 12 km/h, while the average commute time to and from work would rise to more than 1.5 hours. This situation would result in some US\$1.6 billion in lost productivity and other economic costs. The aging fleet is also a contributing factor to Egypt's high road fatality rates—the average number of fatalities per 100,000 registered motor vehicles in Organization for Economic Cooperation and Development (OECD) countries is 13, compared with Egypt's national average of 286 (2000% higher).³

Due to these trends, the NSS in Egypt identified the transportation sector as a main priority area for reducing GHG emissions in the country. Unfortunately, the lack of institutional coordination for planning and traffic law enforcement, and insufficient resource allocations for public transit, have contributed to chaotic travel conditions, poor air quality and very high GHG emissions rates. Thus, the main priority areas for designing an effective and environmental friendly transportation sector in the region are

¹ Private vehicles represent 48% (2 million) of the total number of licensed vehicles, followed by trucks at about 19% (0.82 million), motorcycles about 17% (0.72 million), and taxis, about 8% (0.32 million).

² In 2005 alone, the transport sector contributed over 30 million tons of CO₂ emissions.

³ World Bank, 2010.

sector institutional development of institutions, improving urban transport finance, public transport system enhancement, and improved traffic management practices. This transportation reform is to be achieved with existing assets and infrastructure and the best use of public resources.

Traffic Law 121 represents one initiative within a broader framework of a comprehensive transportation reform strategy. The Law is aimed at reducing GHG emissions by disallowing vehicles more than 20 years old to operate as public transport vehicles (taxis, minibuses, minibuses, buses) in the GCR. The average age of private taxis in Egypt is 32 years old, and more than 62% of vehicles are over 22 years old (see Table 1).⁴ Comparison of average vehicle emissions by vehicle age shows that older vehicles have, on average, significantly higher emissions than newer ones⁵. For instance, a 1985 vehicle averages almost 38 times more CO₂ emissions per mile than a 2001 model. Similar variations characterize hydrocarbon (HC) and NO_x emissions. Newer model-year vehicles are associated with lower emissions, due to improved vehicle technology and less deterioration of engine and emission control equipment. Increased fuel efficiency in technologically advanced newer cars is also strongly associated with decreasing emissions. Lower fuel economy and increased fuel consumption from the aging vehicle fleet also contributes to the rising share of fossil fuel in the country's energy demand⁶. Other problems associated with an aging vehicle fleet are reduced occupant safety, more accidents, a higher rate of vehicle breakdowns causing traffic jams, and reduced traffic flow.

Table 1: Distribution of Model Years of Registered Taxis in Egypt and the Greater Cairo Region

Governorate	1987+	1982-1987	1978-1982	1972-1977	Before 1972	Total	Total <=1987
Cairo	23,741	7,436	11,299	9,212	4,071	55,759	32,018
Giza	10,369	2,929	5,604	4,292	1,804	24,998	14,629
Kalubea	1,636	590	1,230	1,328	128	4,912	3,276
Total	35,746	10,955	18,133	14,832	6,003	85,669	49,923

Percent of GCR Taxis >=22 years old: 58%
 Percent of GCR Taxis >=32 years old: 24%
 Percent of GCR Taxis >=37 years old: 7%

Egypt	1987+	1982-1987	1978-1982	1972-1977	Before 1972	Total	Total <=1987
Total	71,741	19,465	43,007	38,488	13,961	186,662	114,921

Percent of Egypt Taxis >=22 years old: 62%
 Percent of Egypt Taxis >=32 years old: 28%
 Percent of Egypt Taxis >=37 years old: 7%

Source: World Bank, 2010.

⁴ Ministry of Interior, Egypt.

⁵ Other primary vehicle characteristics affecting emissions include model, fuel economy, mileage, and engine type, although other characteristics, such as vehicle weight, make, and certain engine attributes also influence emissions.

⁶ From 1980 to 2005, primary energy demand in Egypt grew at an average annual rate of 4.64%, mainly due to growing demand for fossil fuels (3.34% in oil demand and 13% in natural gas demand). Additionally, Egypt's energy intensity over this period has increased while global intensity has declined.

Traffic Law 121 went into effect on June 9, 2008, and prohibits license renewal of public transport vehicles more than 20 years old. The Law is designed to accelerate the rate of fleet replacement to improve air quality (including the reduction of greenhouse gas emissions) and reduce the number of traffic accidents involving these older vehicles. Despite its clear intent, Traffic Law 121 merely denies older vehicles a license to operate as mass transportation vehicles and does not mandate any replacement or disposal mechanisms for the old vehicles. Nor does it specify any means of permanently removing these vehicles from the roads. As a result, vehicle owners have unanticipated motivations to: a) sell vehicles to regions where the law does not apply; b) convert vehicles to private use, excluding them from the Law; or, c) dismantle the vehicles and sell the engines for use in other vehicles. Without proper enforcement and better incentives, there was a fear that many of the 20-year-old (and older) vehicles (and/or their engines) could continue operating for at least 10 more years. Another barrier to the Law's implementation was the limited ability of owners to pay the capital investment for a replacement vehicle. A robust set of incentives was considered essential to help mitigate the high replacement cost, ensure high participation rates, and allow for older vehicles to be permanently and safely taken off the road. But the government also did not simply want to subsidize the replacements, given the huge budgetary impact such a program would have. Thus, an innovative scheme was developed, as discussed below, that combined resources from a range of stakeholders – from the vehicle manufacturers to taxi owners to local banks—to help overcome this investment gap.

2. Project Description and Design

The program was launched on April 21, 2009 with an initial focus on private taxis and will be expanded to other mass transport vehicles over time. As noted, the taxi replacement is the first phase of the program and targets replacement of 100% of the eligible vehicle taxi fleet more than 20 years old (45,000-50,000) over the project period. As experience is gained, the program is expected to include minibuses, trailer trucks, trucks, buses, and other mass transport vehicle categories, and expand to other regions, such as Alexandria.

The national Ministry of Finance (MOF) launched the program and assumed responsibility for implementation and monitoring. The program is structured as a Public Private Partnership (PPP), with different parties contributing financial incentives. MOF was able to negotiate an attractive financial incentive package with contributions from the public budget and some private program partners. All private project partners report directly to MOF to implement the vehicle replacement and financial incentive scheme. To maximize participation, MOF conducted a public awareness campaign prior to the project launch, which included announcements of the program through advertisements in newspapers, radio, television, and other public media. The campaign outlined the program objectives, eligibility and participation criteria, and financial incentives available to vehicle owners who volunteer to participate. MOF also established a telephone hotline to address all inquiries about the project.

The Ministry of Interior (MOI) agreed to provide the land for the vehicle replacement and scrapping site. The project site operates as a one-stop-shop where vehicle owners can complete all activities, ranging from vehicle inspection and surrender, to financing and

incentives and the purchase of new vehicles (see Figure 1). Vehicle owners voluntarily bring their old vehicles to the project site for inspection, which is conducted by technical staff from the MOI's Traffic Police Department. The inspectors verify eligibility requirements, such as proof of ownership, confirmation of the vehicle age, and the vehicle's operational condition. After a successful inspection, the vehicle owner surrenders the vehicle in exchange for a government-issued check, which can be deposited at a participating commercial bank as a down payment for a replacement vehicle. MOI de-registers surrendered vehicles and provides the vehicle owner with new operating licenses and registration for the newly purchased vehicle. The auto dealers, advertising firms (which offer additional cash incentives if the owner agrees to allow advertisements on the new taxi), insurance firms, and banks are available to vehicle owners at the project site. Additionally, personalized help is made available to interested candidates at the project site, where they are given an orientation on project details and provided resource material illustrating eligibility and participation procedures.

Figure 1. Vehicle Scrapping and Recycling Project Site



1) New vehicle inspection and recording of motor and chassis serial number; 2) Advertising on new vehicle; 3) New vehicles (foreground) and scrapped vehicles (background); 4) Various on-site stations

Source: World Bank, 2009

The vehicles are properly stored (fluids drained, batteries removed, and air removed from tires) at a processing facility located on Cairo-Alexandria Desert Road, about 20 km west of downtown Cairo. The recycling site for this project has not yet been constructed, but the government-owned site has been identified and reserved for this purpose. The program's environmental benefits has made it eligible for registration as a Clean Development Mechanism (CDM) program, expected to last 28 years from the start date, through April 2037. Advance payment funding from the CDM certified emission reductions (CERs) will be used toward the cost of site preparation for the recycling

facility. The CDM proposal is designed as a program of activities (PoA), so that future phases of the program can be included without duplication of project registration and validation. MOF will select a private recycling firm through a public bidding process to manage all scrapping and recycling activities. As of March 2010, 12 competitive bids had been received and are now under evaluation. The recycling facility and scrapping process will be monitored by MOI for security and safety purposes. The Ministry of Environment (MOE) will also conduct random audits to ensure the facility is operating within the environmental management plan and relevant regulations. The World Bank provided technical guidance on the design of an emissions monitoring scheme, as well as enhanced quality assurance and quality control mechanisms.

3. Cost, Financing, Benefits, and Results

The monetary equivalent of the economic costs and benefits associated with the program will depend on the total number of vehicles purchased and share of each vehicle model type. MOF estimates assume 49,000 vehicles will be part of the program from 2010-2018. Total project cost for this period is estimated at US\$620.24 million (EGP3.48 billion)⁷, which includes the participant costs, incentives, subsidies, tax and custom waivers, program coordination and monitoring, and the preparation of the recycling plant (see Table 2).

Table 2: Estimated Project Cost (2010-2018)

	No. Of Vehicles	Per Vehicle (\$)*	Total (US\$m) (2010-18)
	49,000		
Max. Govt. Subsidy per vehicle**		911	44.64
Tax and Custom Waivers ⁺		2,674	131.03
Vehicle price after discounts		8,833	432.82
Annual Program Coordination & Monitoring ⁺			0.05
Recycling Site Preparation**			11.70
Total Estimated Project Cost			\$620.24

* Based on US\$1=5.61 EGP (Egyptian pounds)

** World Bank (2010). Carbon Finance Assessment Memorandum (CFAM)

⁺ UNFCCC (2009). *Egypt Vehicle Scrapping and Recycling Program*. CDM SSC-POA-DD Ver. 01. Oct. 6 '09

During the same time period, the expected emissions reductions are: 1.30-2.29 million tons CO₂e (range is dependent on the actual vehicle-kilometers traveled by project vehicles each year). Assuming a market price of US\$11 per Certified Emissions Reduction (CER) generated through 2013, and a price of US\$6 per CER generated after 2013, this tonnage is worth US\$10-18 million. The program is expected to be active for 28 years (from 2009 through 2037), and CERs are expected to generate US\$15.8-27.8 million to support program costs.

MOF's innovative PPP scheme allows vehicle owners to receive several layers of financial incentives for participating in the vehicle scrapping and recycling program. Some public funding is provided by MOF, including payment for the surrendered

⁷ Based on US\$1=5.61 EGP (Egyptian pounds)

operational vehicle⁸, along with exemption of sales tax and custom fees for vehicle owners. Participating automobile dealers offer the new vehicles at prices 25-30% lower than the market rate. The new vehicles are financed with a below market-rate interest loan from participating banks, and MOF provides a loan guarantee in special cases.⁹ The owners are also offered an option to participate in an advertising scheme, where a portion of advertising revenue is directly paid by an advertising agency to the lending bank toward vehicle owners' debt service payments.¹⁰ The owners receive a reduced cost for maintenance and spare parts along with insurance for all new taxi vehicles against all standard causalities (theft, fire, accidents, etc.). Under this program, 12 different vehicle options are available as replacement vehicles. With assistance from the incentives, vehicle owners can expect to pay back the car loan in less than 6 years, on average. Table 3, below, provides an estimated average benefit from the perspective of vehicle owners.

Table 3: Estimated Average Benefit from Perspective of Vehicle Owners

	EGP	USD
Vehicle Price after Scrapping and Discount	49,554	\$8,833
Total Monthly Loan Installment Including Insurance	1,250	\$223
Installment Paid by Advertising Company	550	\$98
Installment Left to be Paid by the Owner	700	\$125
Payback for Vehicle Owners (Years)		5.9

Source: World Bank, 2010

MOI's data indicates early success of the program. From April through August 2009, 18.5% of older taxis in GCR were already replaced by newer, fuel-efficient ones. This has resulted in a 6.5% reduction in the number of accidents, and a 4% reduction in traffic-offense citations among the GCR taxis affected by Law 121. A survey of over 600 vehicle owners shows the replaced taxi fleet had an average baseline fuel efficiency of 12.87 liters/100 km for motor gasoline vehicles, 12.23 m³/100km for CNG vehicles, and 14.14 l/100km for LNG vehicles. The project reduced the total amount of fuel combusted by replacing these vehicles with fuel-efficient ones that have an average fuel efficiency of 9.39 l/100 km for the motor vehicles and 8.34 m³/100km for the CNG vehicles. With an estimated average of 38.8 thousand km/year driven by these vehicles, the project resulted in a reduction of 57,233 tons CO₂e in emissions and a 29% reduction in energy savings¹¹ (~2,214 TJ). Over the 2009-2018 period, the project will result in an estimated reduction of 1.3 million tons CO₂e in emissions. There will also be other

⁸ If the vehicle is non-operational, it may be eligible for the program, but it would not be counted toward the annual CER calculations. In very few cases, an old vehicle could be non-operating due to an accident. In such cases, if the actual value of the vehicle is less than EGP5,000 (which is paid by the MOF for each scrapped vehicle), MOF issues a check that corresponds with the actual value, and the taxi owner pays the difference to the bank, and then continues with the remaining procedures.

⁹ The three participating banks – the Bank of Alexandria, Banque Misr, and the National Bank of Egypt--were offering a rate of 6.24%, which was less than typical commercial rates of 8% to 9% (commercial rates confirmed by representatives from each of the three banks during a Designated Operations Entity validation site visit on December 7, 2009).

¹⁰ The participating advertising firm offers a fixed rate of EGP550/month for up to five years.

¹¹ Based on heating value of 33,034 kJ/l for gasoline and 47,300 kJ/Kg for CNG (Source: International Energy Agency, IEA). The CO₂e emissions for gasoline are 69,300 kg/TJ and 56,100 kg/TJ for CNG vehicles (Source: IPCC emissions factors for tons CO₂e per unit fuel combusted).

indirect benefits: reduced fuel consumption¹²; a reduction in CH₄ and N₂O emissions; less traffic congestion in the GCR due to less breakdowns of old cars; fewer traffic accidents; job opportunities in car factories, storage facilities, and at the recycling plant; increased business for companies and banks during the global financial crisis; better working conditions for the taxi drivers; and reduced economic losses associated with increased commute time due to traffic congestion.

4. Project Innovation

The Vehicle Scrapping and Recycling Program is the first of its kind in Egypt. As such, it represents the first attempt by the government to promote fuel-efficient, private vehicles through a blend of outreach, incentives, and market organization. A key innovation and success factor is the successful partnership between three government departments (MOF, MOI, and MOE), the several private sector participants (commercial banks, insurance companies, auto dealers, advertising firms), and other program stakeholders (taxi owners, recycling and scrapping operator, World Bank carbon finance). The program also convinced stakeholders to each contribute to the incentive scheme, which helped taxi owners overcome the high upfront investment cost barrier.

Another key innovation was the use of a “one-stop-shop” for the taxi exchanges. By allowing the taxi driver to have the old vehicle inspected and scrapped, purchase a new vehicle, get insurance and licenses, auto loans, etc., all in one place made it convenient and helped achieve a high program participation rate. The program also benefitted from careful program planning and close monitoring, including several stakeholder meetings prior to project launch to ensure coordination between project partners, detailed record keeping (project vehicle and scrapped vehicle databases), and periodic random surveys of project participants to estimate emissions reductions. The program also maintained a degree of flexibility, allowing for periodic procedural changes to be made based on feedback from the vehicle owner surveys and interviews.

5. Lessons Learned

A significant lesson from the Cairo experience was that achieving the objectives of environmental legislation on its own, without incentives and efforts to facilitate compliance, can be difficult. This project demonstrates that governments interested in considering legislation to address urban or environmental problems can help preempt low compliance rates by careful planning and consideration of common barriers, such as scope and applicability, geographical constraints and fiscal and technological barriers. The use of financial incentives, particularly when there are layers of incentives from the government and private sector, can help offer an attractive package to the target vehicle owners and significantly boost participation.

Another program feature was outlining a broad objective to replace mass transit vehicles, but then testing program approaches on a pilot basis for one vehicle mode in one region. The initial focus of owners of older taxis in the GCR allowed the program to be properly designed, the information and outreach to be targeted, and the partnerships carefully

¹² Based on reported fuel efficiencies of the old and replacement vehicles; every vehicle replacement will save an estimated 13,508 liters of gasoline, and 15,099 m³ of CNG over a 10-year period.

cultivated. The scope allowed MOF to focus on getting the program elements carefully worked out—from the memorandums of understanding (MOUs) signed with each partner (with their individual roles, responsibilities, and obligations), to the one-stop-shop, to the information campaign and hotline. The relatively smaller initial focus also allowed the program to develop an exemplary monitoring system, which included the number and type of vehicle replaced, subsidy payment, tax waiver, and MOF loan guarantee.

6. Financial Sustainability, Transferability, and Scalability

Environmental problems associated with aging vehicle fleets are common, particularly in developing countries. Removing old technologically outdated and polluting vehicles can be difficult to enforce and there are usually financial, logistical, and technological barriers. The permanent scrapping and recycling of vehicles in a safe and closely monitored manner can be among the most effective ways of permanently disposing of older vehicle fleets. Vehicle scrapping programs have been running successfully in many developed countries, but are yet to become widespread in the developing world.

The Cairo Vehicle Scrapping and Recycling Program is among the first operational program in an emerging economy and first-year results are impressive, with about 20,000 taxis already replaced to date. The government plans to replicate this program in Alexandria as well as extend it to include all public transport vehicles, including minibuses, trailer trucks, trucks, and buses. The program is also getting more international attention, and governments in Yemen, Morocco, and Mexico have all expressed interest in launching similar programs.

Governments interested in such schemes need to be aware, though, that vehicle scrapping and recycling can pose some environmental risks, particularly in areas associated with the handling of liquid and solid waste from the older vehicles. It is thus important that such recycling facilities be carefully planned and designed, with in-depth environmental and social assessments conducted to avoid such risks.

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ANNEX: CITY AND PROJECT PROFILE

CITY PROFILE

1. Name of the City	Cairo (Egypt)
2. Area	1,269 sq km
3. Population	20 Million(2009) – Greater Cairo Region
4. Population Growth Rate	1.6%
5. GDP of the City	US\$ 145 billion (for metro area)
6. GDP Growth Rate	5% (Projected 2008-2025)
7. GDP per Capita	US\$ 1,656 (for metro area)

PROJECT PROFILE

1. Project Title	Egypt Vehicle Scrapping & Recycling Program
2. Sector	Transport
3. Project Type	Incentives for vehicle replacement/recycling
4. Total Project Capital Cost	US\$153.4 million
5. Energy/Cost Savings	29% as of 2009 (~2,214 TJ)
6. Internal Rate of Return	NA
7. Project Start Date	APR 2009
8. Project End Date	APR 2037
9. % of Project Completed	Ongoing

Project contacts:

Ahmed Eiweida
 Energy & Transport Unit, Middle East & North Africa
 The World Bank
 1818 H Street NW,
 Washington, DC 20433, USA
 Tel: +1 (202) 458-9046
 Fax: +1 (202) 522-2151
 Email: aeiweida@worldbank.org

Nabil Rashdan
 Ministry of Finance
 2 Ramses Extension Street
 Nasr City, Cairo 11635, Egypt
 Tel: +20-22686-1200
 Fax: +20-22686-1561
 Email: nyehia@mof.gov.eg

Holly Krambeck
 Carbon Finance Unit, Environment Department
 The World Bank
 Tel: +1 (202) 473-2282
 Fax: +1 (202) 522-7432
 Email: hkrambeck@worldbank.org