Egypt’s Policies and Measures for Sustainable Transport

Prof. Ibrahim Abdel Gelil
Arabian Gulf University

Hydrogen Fuel Cells and Alternatives in the Transport Sector: Issues for Developing Countries
UNU-INTECH, 7-9 November 2005
Egypt’s Current Situation of the Transport Sector

- The largest population in the Arab world and is the second largest economy after Saudi Arabia.
- Population is growing by some 1 to 1.5 million people per year, expected to reach 80 million by 2015.
- Transport sector is responsible for 28% of the final energy consumption.
- Growth of transport energy consumption is the highest among other sectors (6.2% pa).
Egypt’s Current Situation of the Transport Sector (2)

- Transport sector produces about 25% of the energy related CO2 emissions.
- Among non-Annex I countries, Egypt ranks 15th in terms of CO2 emissions (127.2 million tons of CO2 per year).
- Growing rate of private vehicles ownership.
Egypt’s Current Situation of the Transport Sector (3)

- 90% of all the freight is transported by road transport system.
- To reduce pressure of growing urban population in old Cairo, new urban settlements around Cairo were developed since 1970s.
- The principles of sustainable transport have not been fully integrated into the urban planning of these new settlements.
The Situation in Cairo

- Greater Cairo is one of the world’s mega-cities with a population of more than 17 million.
- Demand for mobility has greatly outpaced the capacity of the public transportation system.
- The gap has been primarily filled with shared taxis (informal transport) and use of private cars.
The Situation in Cairo (2)

- **Traffic congestion.**
- **Baseline scenario through 2022:**
  - Average trip speed of all modes will drop from current 19.0 km/h to 11.6 km/h.
  - Average commuting time will increase from current 37 minutes to 100 minutes.
- **Air Quality deterioration.**
Air Quality problems in Cairo

A cloud of haze hanging over Cairo.
Air Quality problems in Cairo

- Mobile emissions are one of the major sources of air pollution in Greater Cairo.
- Cairo is surrounded with two industrial areas from north and south.
- PM10 is the most critical air quality problem.
- Lead has been a critical air quality problem, mainly due to secondary lead smelters.
Patterns of SO2 Conc. In Egypt

SITE
10 Shoubra
8 FumAlKhalig
11 Giza CairoUn
15 Suez
5 Maadi EEAA
2 Gomhoriya
6 Tebbin
7 Tebbin South
30 IGSR
29 El-Max
32 Gheat ElEnab
14 10 Ramadan
13 6 October
31 El Azafra

Monthly averages, March 1999
SO2 concentrations (ug/m3)
PM10 concentrations in Cairo (June 2005)
Environmental Damage Costs in Egypt

- World Bank estimated the total damage cost of environmental degradation in Egypt in 1999 at:

  - LE 10-19 billion (mean estimate LE 14.5 billion)
  - 3.2-6.4 % of GDP (mean estimate of 4.8%)
Annual cost of environmental degradation (mean estimate as % of GDP)

Reference: WB
The Cost of Environmental Degradation as a Percentage of GDP

Reference: WB
## Estimated Cost of Environmental Degradation in Selected Countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Cost (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OECD Countries</td>
<td>1-2%</td>
</tr>
<tr>
<td>Tunisia</td>
<td>2.1%</td>
</tr>
<tr>
<td>Mexico</td>
<td>3.3%</td>
</tr>
<tr>
<td>Lebanon</td>
<td>3.4%</td>
</tr>
<tr>
<td>India</td>
<td>4.5%</td>
</tr>
<tr>
<td>Egypt</td>
<td>4.8%</td>
</tr>
<tr>
<td>China</td>
<td>8.0%</td>
</tr>
</tbody>
</table>

Ref. WB
Air Quality Management Program

- Phasing out of leaded gasoline (90%)
- Relocation of a major lead smelters away from Cairo.
- Enforcement of vehicle emissions standards.
- Self monitoring of emissions of large industries (Cement)
Air Quality Management Program (2)

- Switching to Natural Gas in power, industry, residential sector, and transport.
- Policies to remove old fleet of vehicles from the streets.
- Promote public transport: Expansion of underground Metro.
- Enhancement of solid waste management: ban open-air burning of solid waste.
- Introduction of Alternatives: CNG buses operated by Cairo public bus companies.
Air Quality Monitoring

- A comprehensive national air quality monitoring system (42 monitoring stations).
- Operational for the past 6 years, measuring concentrations of sulphur dioxide (SO2), nitrogen dioxide (NO2), carbon monoxide (CO), ozone (O3) and particulate matter (PM10).
- Additional 36 stations around Greater Cairo to monitor lead and particulate matter.
- A pilot phase of an early warning system producing 3-day forecasts for air pollution levels in Greater Cairo.
Air Quality Monitoring Stations

[Map of air quality monitoring stations in Egypt and the Arabian Peninsula]
Egypt’s Climate Change Action Plan

- Promote use of clean fuels, such as compressed natural gas (CNG) and hydrogen.
- Review and revise current vehicle emission limits in the Environmental Law #4 for more stringent standards.
- Impose vehicle emission testing as a pre-requisite for vehicle license issuance or renewal.
- Retrofit or replace two-stroke engines of motorcycles by four-stroke engines with CNG as fuel.
- Introduce traffic management plans to reduce urban transport congestion and vehicle on-road time.
- Conduct public awareness campaigns on air pollution.
- Expand the current underground electric metro system in three stages to cover the greater Cairo, including Cairo airport.
- Increase the use of River Nile for public transport.
Energy Resources in Egypt

- Abundant supply of Natural Gas (67 TCF).
- Some oil resources (2.7 Billion barrel)
- Large wind power potential (20000 MW).
- Large solar energy resources (4000 MW).
- Hydropower resources (2500 MW)
Sectoral Energy Consumption

Where is Energy Used?

- Residential & Commercial: 10%
- Agriculture: 0%
- Transport: 24%
- Manufacturing & Construction: 28%
- Electricity: 33%
- Petroleum: 5%
Proven Natural Gas Reserves in Egypt (TCF)
CNG in Transport

- 6 CNG companies (Sept., 2005)
- 93 CNG fueling stations (Sept., 2005).
- 60,000 CNG vehicles are in use (May 2005).
Local capabilities to support Fuel Cell technologies

- A well established Bus manufacturing industry.
- Extensive experience of operating refineries, petrochemical complexes, fertilizer plants including H2 production.
- Experience in building and operation of Natural Gas distribution networks that could be extended to H2 distribution systems.
- Extensive education and research system to produce needed professionals and human resources.
Existing Hydrogen Production Capabilities

- KIMA plant (in Aswan) uses hydropower to produce H2 by electrolysis.
- Fertilizer plants (in Alex., Talkha, Suez) are producing H2 by Natural Gas reforming.
- 8 major oil refineries (in Alex., Cairo, Suez) produce H2 for their own use by Natural Gas reforming.
Commercialization Barriers

- High initial cost of the GEF demonstration project (23.5 m US$ for 8 Buses).
- Technology uncertainties.
- Large capital investments.
- Public acceptance of H2.
- Short of qualified human resources to serve the industry in the short term.
- Lack of proper regulatory framework.
- Lack of proper infrastructure.
Identified Policy Interventions

- Economic incentives to support H2.
- Energy price reform to remove subsidies of competing fuels.
- Government support of R & D of H2 technology.
- Establishment of codes and standards for safe hydrogen operations.
Egypt’s Planned Sustainable Transport Project

- Integrating sustainable transport planning principles into general urban planning.
- Facilitating modal shift to less polluting forms of public transportation.
- Promotion of non-motorized transport facilities in middle size provincial cities.
- Traffic Management and Traffic Demand Management to discourage individual use of private cars.
Why Egypt declined from the Fuel Cell program?

- **Policy considerations:**
  - Recommendation from UNDP-GEF due to implementation problems in Brazil and Mexico.
  - It was focused on single technology driven approach without an integrated strategy.
  - To give more time to commercialization of CNG.
  - To give more time to demonstration of Hybrid electric buses.
  - It is a matter of time (too early).
Why Egypt declined from the Fuel Cell program? (2)

- **Technical and Economic Issues**
  - High capital cost of the fuel cell demo.
  - Large capital investments.
  - Lack of H2 distribution infrastructure.
  - Lack of support from technology providers in cost sharing.
  - Lack of public/private partnerships.
Thank you