TOWARDS ENVIRONMENTALLY SUSTAINABLE TRANSPORTATION
SINGAPORE

Chua Yew Peng
Director, Policy And Planning Division
National Environment Agency
Introduction

- Singapore - an urban and densely populated city of 4 million
- Over 700,000 motor vehicles in land area of 700 km$^2$
- 20% increase in vehicle population over last decade
- Air quality good, well within WHO and USEPA standards
Singapore Vehicle Population

- Passenger Cars: 58%
- Motorcycles: 19%
- Buses: 18%
- Taxis: 3%
- Commercial Vehicle: 2%
Challenges

- Ensure air quality remains good
- Reduce emission from vehicles – particularly PM2.5
  - PM2.5 inc risk of asthma, bronchitis, respiratory tract infection
  - Diesel vehicles are a significant source of PM2.5
Strategies Towards EST

- Emission Standards
- Cleaner Fuels
- Legislation/Enforcement
- Education
- Government Enablers
Vehicle Emission Standard

- 1984 - UN/ECE R15.03 - petrol vehicles
- 1986 - UN/ECE R15.04 - petrol vehicles
- 1991 - UN/ECE R 24.03 - diesel vehicles
- 1994 - 91/441/EEC and JIS 78 - petrol vehicles
- 1997 - Euro I - petrol and diesel vehicles
- 2001 - Euro II - petrol and diesel vehicles
- 2003 - 97/24/EC – motorcycles
- 2006 - Euro IV - diesel vehicles
Cleaner Fuels

- **July 98** – Phased out leaded petrol
- **Sulphur reduced in diesel**
  - **July 96** – 0.5% to 0.3% by wt
  - **Mar 99** – 0.3% to 0.05% by wt

- **ULSD (Ultra Low Sulphur Diesel)**
  - **Dec 05** – 0.05% to 0.005% (ULSD) by wt paved the way for **Euro IV emission standard w.e.f 1 Oct06**
  - **Lower SO₂ and PM2.5 emission**
**Enforcement**

- Visible smoke - 50 HSU (Hartridge Smoke Unit)
- Video cameras capture smoky vehicles
- Smoke test carried out on chassis dynamometers since Sep 2000
Mandatory Periodic Inspection

- In-use vehicles called up for mandatory periodic inspection
- Emission test (free acceleration smoke test)
- Plan to introduce chassis dynamometer smoke test from 1 Jan 2007

Strategies Towards EST

- Emission Standards
- Cleaner Fuels
- Legislation/Enforcement
- Education
- Government Enablers
Education

Educate fleet owners/drivers on

- Common causes of excessive emission
- Proper and regular maintenance
- Proper driving habits
- Proper payload

Strategies Towards EST

- Emission Standards
- Cleaner Fuels
- Legislation/Enforcement
- Education
- Government Enablers
Vehicle Quota System

- Implemented since May 1990
- Controls vehicle population
- Number of new vehicles predetermined
- Owners bid for Certificates of Entitlement (COEs)

Strategies Towards EST

- Emission Standards
- Cleaner Fuels
- Legislation/Enforcement
- Education
- Government Enablers
Electronic Road Pricing

- Replaced manual Area Licensing Scheme in 1998
- Reduces congestion
- Vehicles fitted with in-vehicle unit
- Vehicle is charged when it passes gantries
Public Transportation

- Comprehensive public transport system
- Seamless travel: buses, mass rapid transit (MRT) and light rail transport (LRT)
- Efficient public transportation is key to environmentally sustainable transportation
MRT System

Three main lines, 65 existing operating stations. An additional 29 new stations would be opened when the Circle Line is operational in 2010.

Daily trips: 1.27 million

Strategies Towards EST

- Emission Standards
- Cleaner Fuels
- Legislation/Enforcement
- Education
- Government Enablers
LRT System

43 stations and 2 depots. All stations are within walking distance of less than 400m from most apartment blocks.

Strategies Towards EST
- Emission Standards
- Cleaner Fuels
- Legislation/Enforcement
- Education
- Government Enablers
Public Bus System

• No. of routes:
  Trunk - 201 - SMRT Buses (54), SBS (147)
  Feeder - 64 - SMRT Buses (19), SBS (45)

• Total Fleet:
  3,429 – SMRT (729), SBS (2,700)

• Daily trips:
  Total - 2.97m passenger trips
Taxis

- **Total Fleet**: 20,400
- All fitted with meters; all air-conditioned;
- about 90% of taxis have radiophones; call booking is done via GPS or digital voice despatch
- **Daily trips**: about 588,632
Green Vehicles

- Incentivise green vehicles
e.g. Hybrid vehicles, CNG vehicles
- Encourage public fleet operators to switch from diesel to CNG
- Test-bedding of fuel cell vehicles

Strategies Towards EST
- Emission Standards
- Cleaner Fuels
- Legislation/Enforcement
- Education
- Government Enablers
Alternative Fuels

CNG Pilot Project

Strategies Towards EST

- Emission Standards
- Cleaner Fuels
- Legislation/Enforcement
- Education
- Government Enablers
Summary of Strategies Towards EST - Singapore

- Unleaded petrol
- Sulphur reduction in diesel e.g. ULSD
- Euro I: Unleaded petrol
- Euro II
- Euro IV

TODAY
Managing Vehicular Emissions

- Periodic Inspection
- Proper Maintenance
- Proper Handling
- Green Vehicles
- Public Transportation
- Regulatory Framework e.g. COE, ERP

Environmentally Sustainable Transportation

Cleaner Fuels

Enforcement

Education

Govt Enablers
Singapore’s Vision ON EST

- More low/zero emission vehicles
  - Hybrid, electric, fuel cell

- More cleaner fuel vehicles
  - CNG
  - Hydrogen

- Seamless public transportation
In conclusion...
Relevance of AICHI Statement to Singapore

- **Land-use planning**
  - Integration of land use and transport planning through mixed-use development, with emphasis on public transport, traffic safety and environmental control

- **Environment- and people-friendly urban transport infrastructures**
  - Providing affordable and socially acceptable transport infrastructure and facilities, such as mass transit systems for increased mobility, in urban areas

- **Public transport planning and transport demand management**
  - Controlling the demand for private motor vehicles through a combination of policies
Relevance of AICHI Statement to Singapore

- **Road safety and maintenance**
  - Inter-agency coordination to address road safety and acknowledging road safety as a guiding principle for transport planning

- **Cleaner fuel**
  - Phasing out of leaded gasoline, reducing sulphur levels in petrol and diesel, and promote use of cleaner fuels such as CNG, as well as plan for transition to renewable fuels

- **Vehicle emission control, standards, and inspection and maintenance**
  - Phasing-in of strict emission standards for new vehicles, tightening enforcement regimes for in-use vehicles as well as test methods for vehicle inspection programmes
THANK YOU
Singapore Vehicle Population

- Passenger Cars: 400
- Motorcycles: 120
- Buses: 30
- Taxis: 50
- Commercial Vehicle: 100