

# TOWARDS ENVIRONMENTALLY SUSTAINABLE TRANSPORTATION SINGAPORE

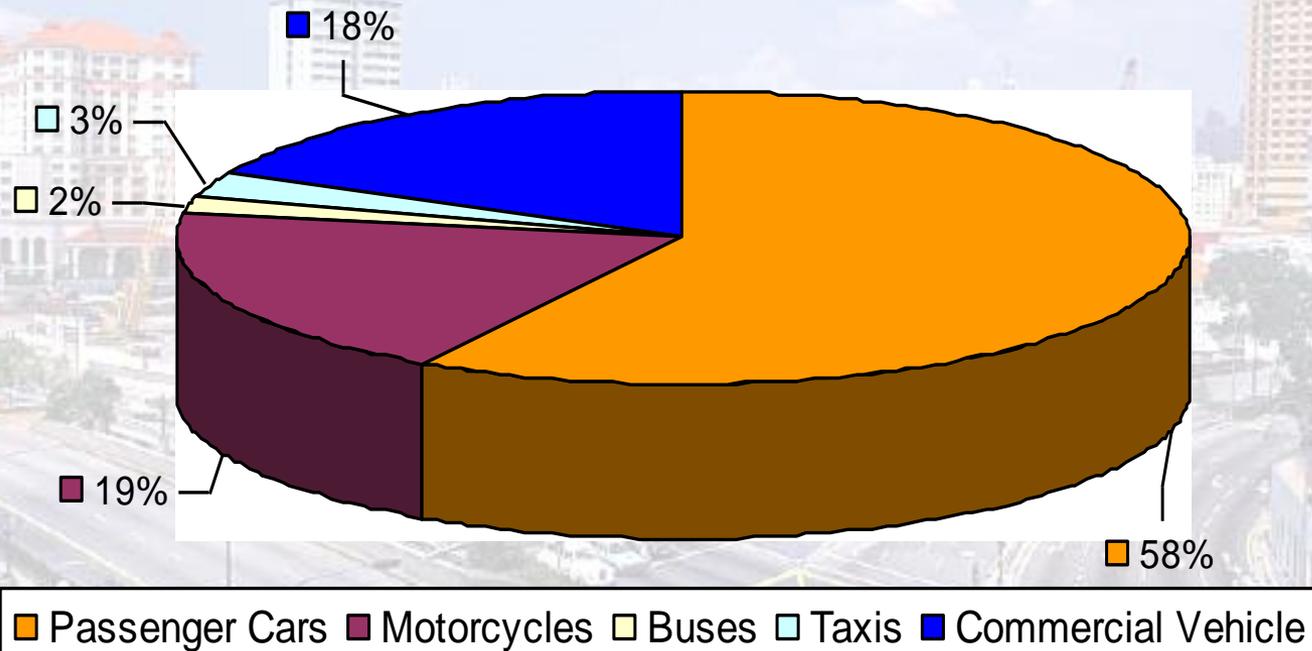
Chua Yew Peng  
Director, Policy And Planning Division  
National Environment Agency



# Introduction

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

## Singapore Vehicle Population



# 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**
- **1991 - US 40 CFR - motorcycles**
- **1992 - UN/ECE R 83/Japanese Article 31- petrol 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**

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

# Cleaner Fuels

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

- **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 SO<sub>2</sub> and PM2.5 emission**

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

# Enforcement

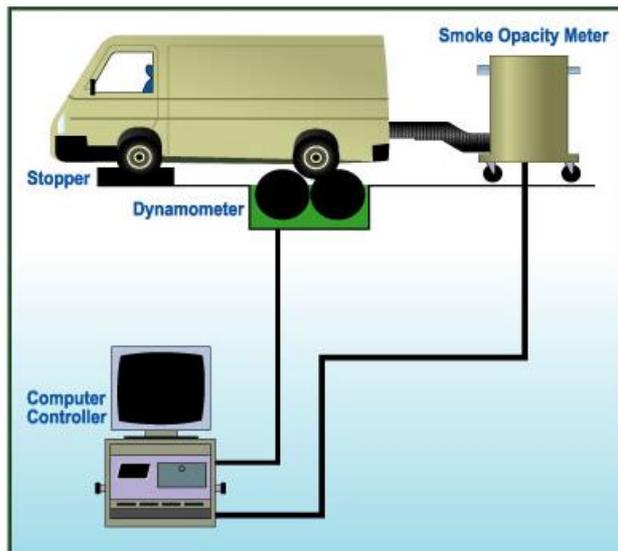
- **Visible smoke - 50 HSU (Hartridge Smoke Unit)**
- **Video cameras capture smoky vehicles**
- **Smoke test carried out on chassis dynamometers since Sep 2000**



# 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**

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

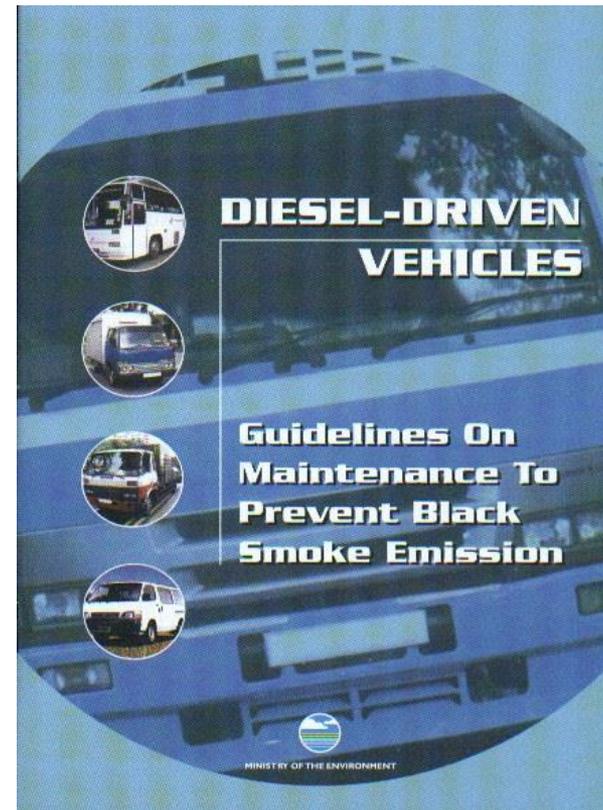


# Education

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

## Educate fleet owners/drivers on

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



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

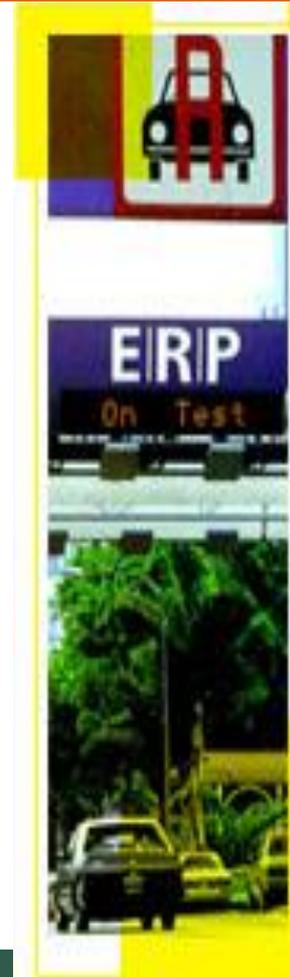
# Vehicle Quota System

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

- 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

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

- **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**



An Effective Land Transport Network in Singapore



# MRT System



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

**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**



# LRT System

## Strategies Towards EST

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



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

# Public Bus System

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

- **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**



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

# 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

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

- **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**



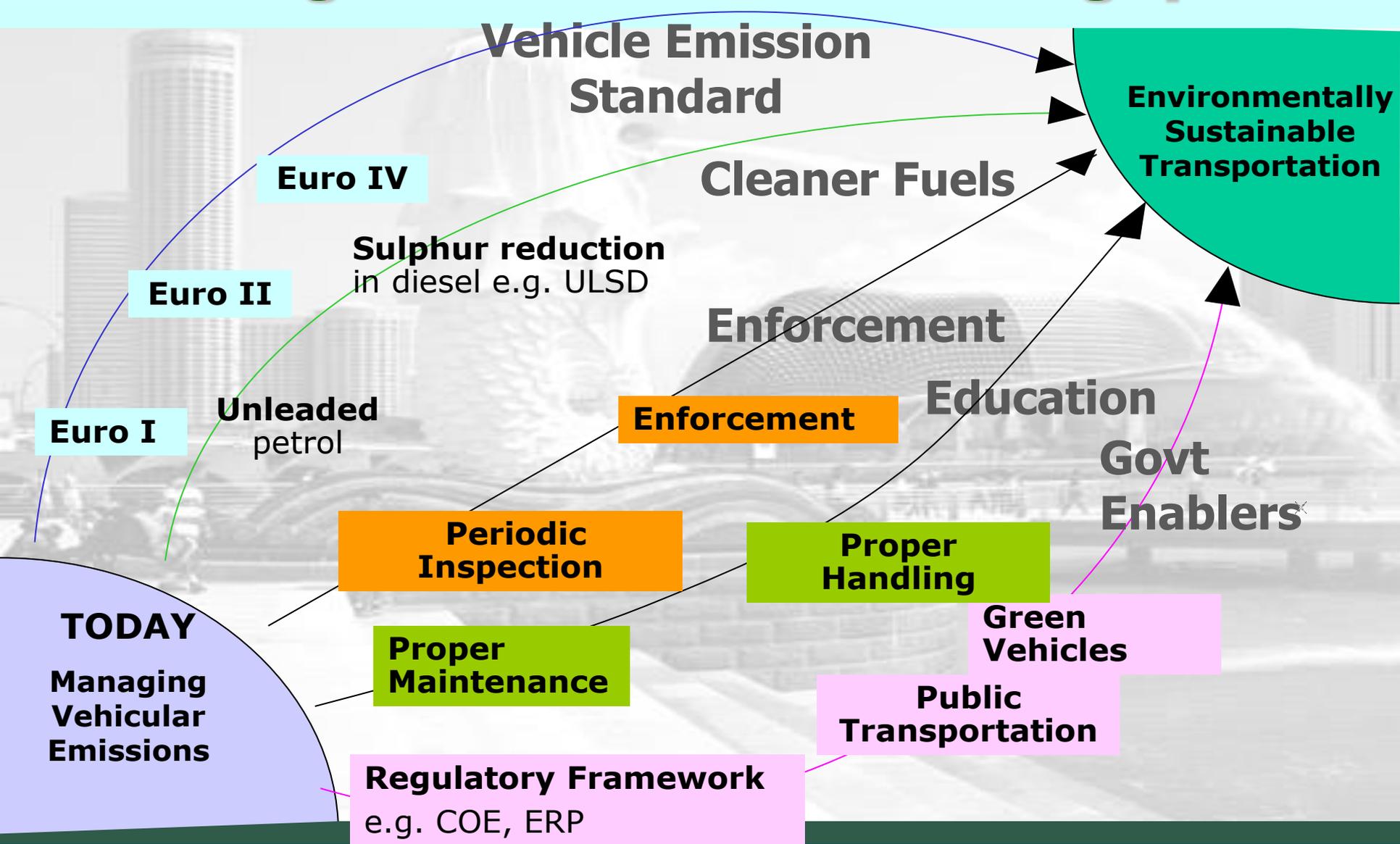
# Alternative Fuels CNG Pilot Project

## Strategies Towards EST

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



# Summary of Strategies Towards EST - Singapore



# Singapore's Vision ON EST

- **More low/zero emission vehicles**
  - Hybrid, electric, fuel cell
- **More cleaner fuel vehicles**
  - CNG
  - Hydrogen
- **Seamless public transportation**

An aerial view of a city street intersection. The street is wide and multi-laned, with a yellow diamond-shaped marking in the center. A river flows through the middle of the intersection. In the background, there are several tall buildings and a large, ornate building with a red roof. The sky is blue with white clouds. The text "In conclusion..." is overlaid in the center of the image.

**In conclusion...**

# Relevance of AICHI Statement to Singapore

- **Land-use planning**

- Integration of landuse 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

