

Environmentally Sustainable Transport in Singapore



5th Regional EST Forum
Bangkok, Thailand
23-25 August 2010


Land Transport Authority



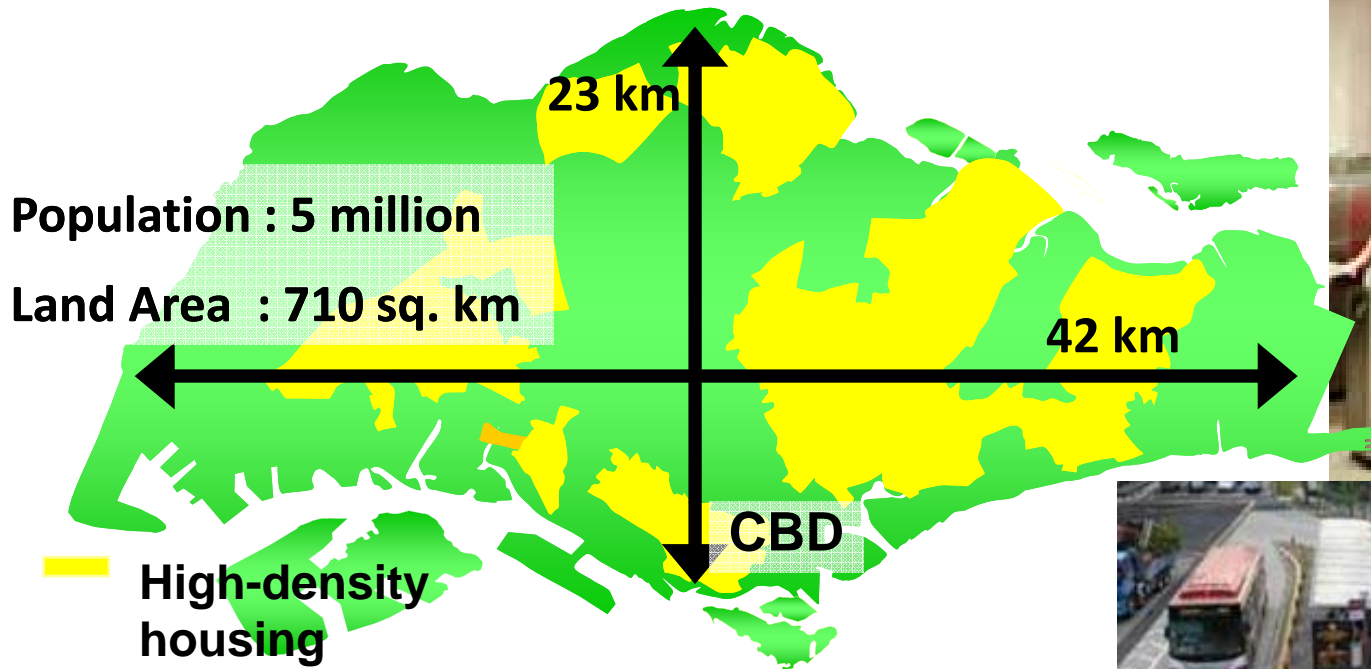
Presented by:
Sharon Wong,
Deputy Director, LTA



Outline

- Introduction
 - Advances & Achievements in EST areas
 - Future EST Strategies & Policies
- 

Singapore

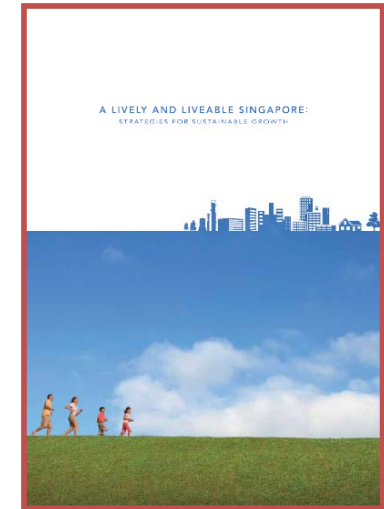


- Densely populated City State
- 11 million Daily Journeys
- 12% of Land used for roads

Key Targets

IMCSD Targets (Apr 2009)

- **20%** Overall Energy Efficiency Target by 2020
- Reduce PM2.5 levels to **12 μ g/m³** by 2020



Copenhagen Accord (Dec 2009)

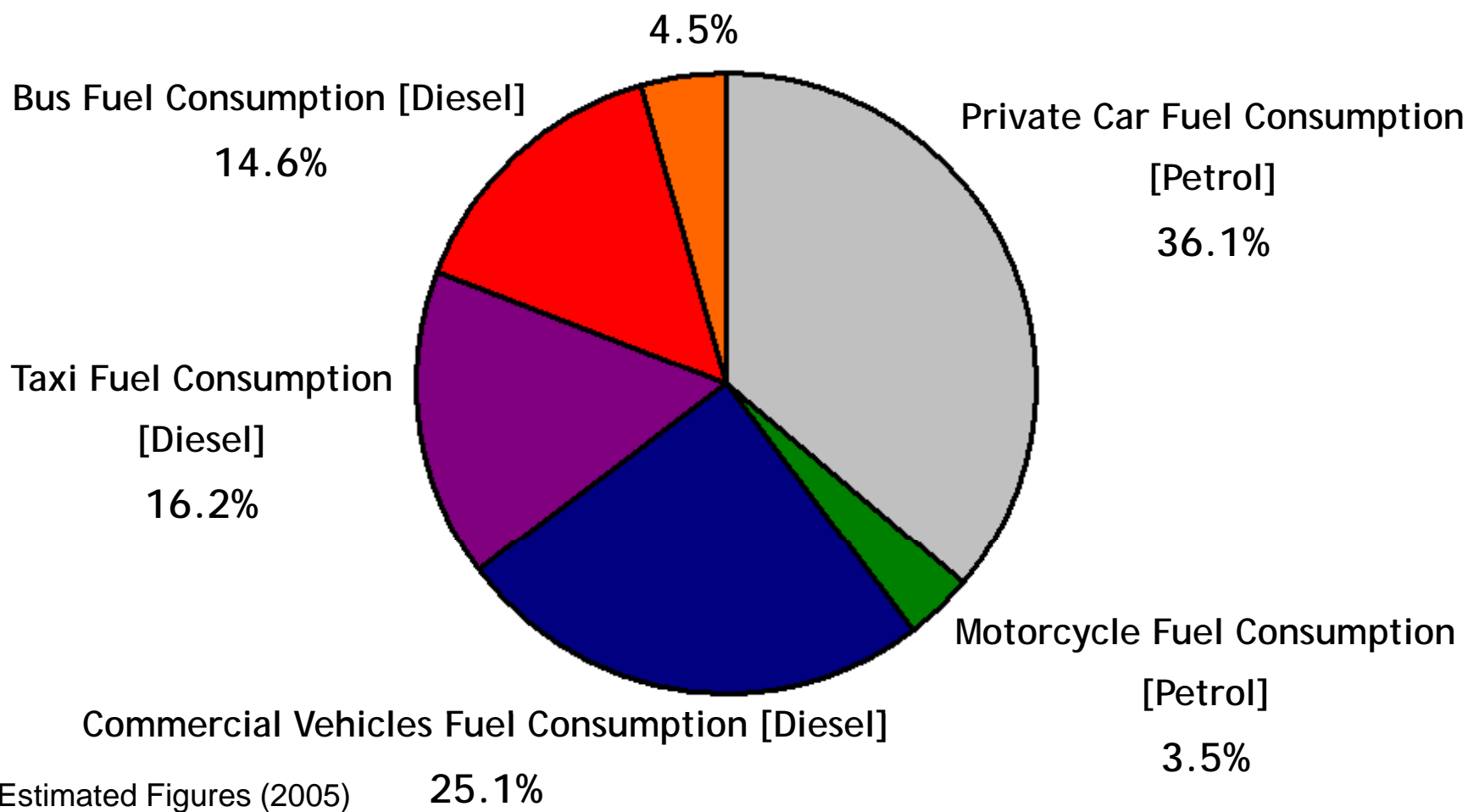
- Singapore pledged to cut CO2 emissions by **16%** from Business-As-Usual (BAU) by 2020



Energy Consumption (%) in Transport Sector

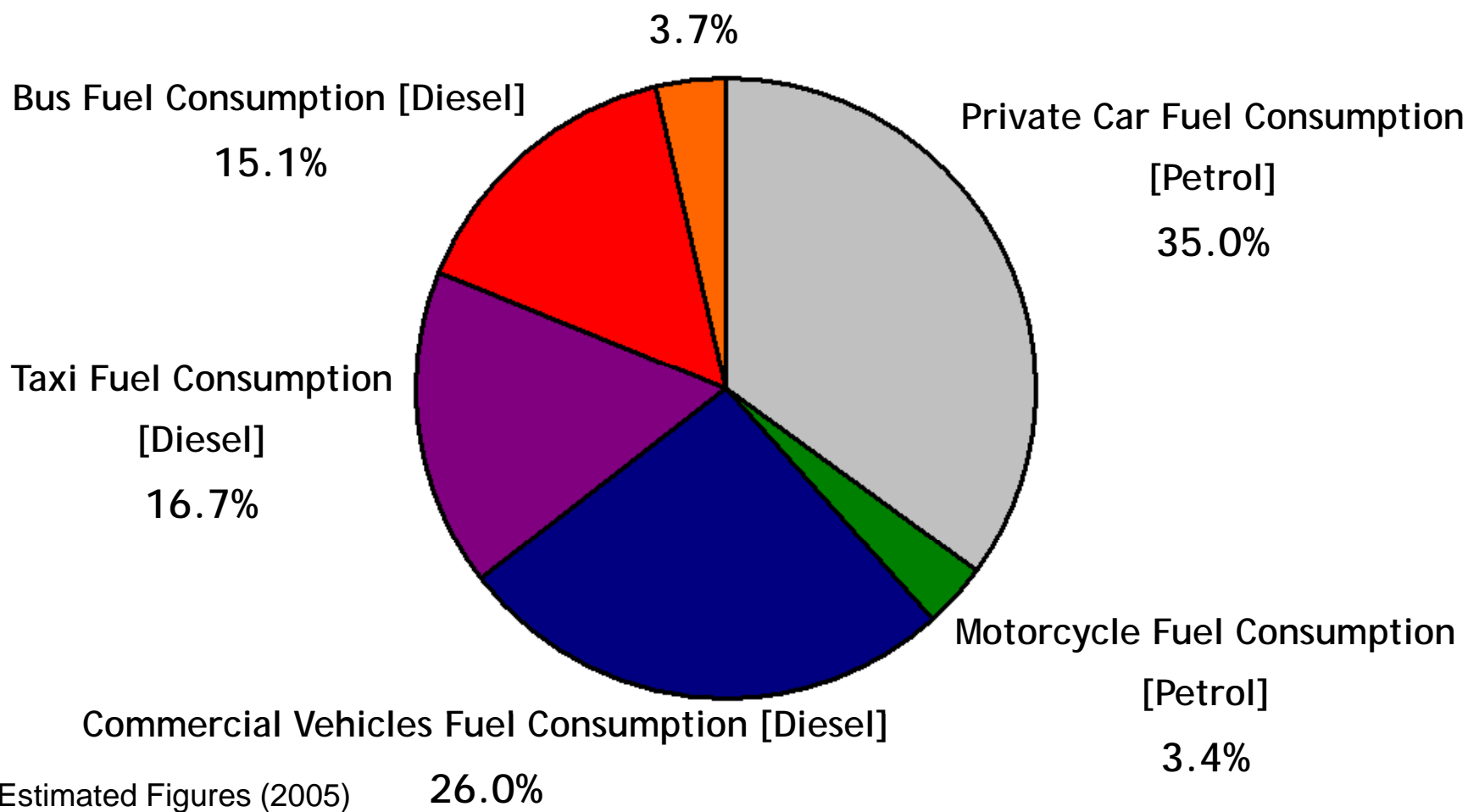
Energy Consumption by Vehicle Type*

Rail Transit System (RTS) Electricity Consumption



CO2 Emission (%) in Transport Sector

CO2 Emission by Vehicle Type*
Rail Transit System (RTS) Electricity Consumption



Key Strategies for EST

A People-Centred Land Transport System



- ✓ CLEANER ✓ GREENER
- ✓ ENERGY EFFICIENT



CONGESTION → POLLUTION



S1: Make Public Transport a Choice Mode

- Integrated Public Transport System
- Greater Priority for Buses on roads
- Expand the Rapid Transit System (RTS) Network and Capacity
- Greater Contestability in the Public Transport Industry
- Enhance Travel Experience and Safety

S2: Manage Road Usage

- Lower Vehicle Population Growth Rate
- Expand Road Network and Enhance Road Safety
- Leverage on Technology to Optimise Road Capacity



S3: Meeting Diverse Needs

- Ensure Physical Accessibility for all
- Affordable Public Transport for Lower-Income
- Facilitate Cycling
- Promote Environmental Sustainability and a High Quality Living Environment
- Engage the Community

S1

Make Public Transport A Choice Mode



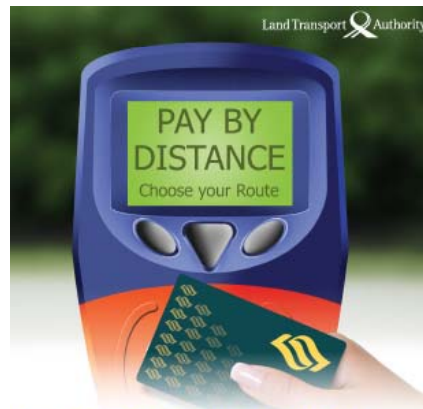
Enhance Integration of PT System

Centralized
Bus Network
Planning
(2010)



Distance Fares
(July 2010)

Enhance
Integration of
our PT system

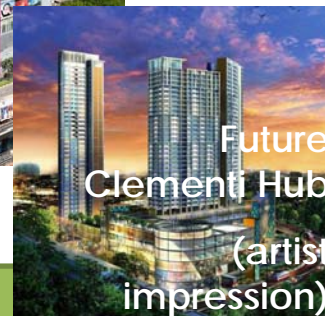


Distance Fares from 3 July 2010

Integrated
Transport and Land Use
Planning



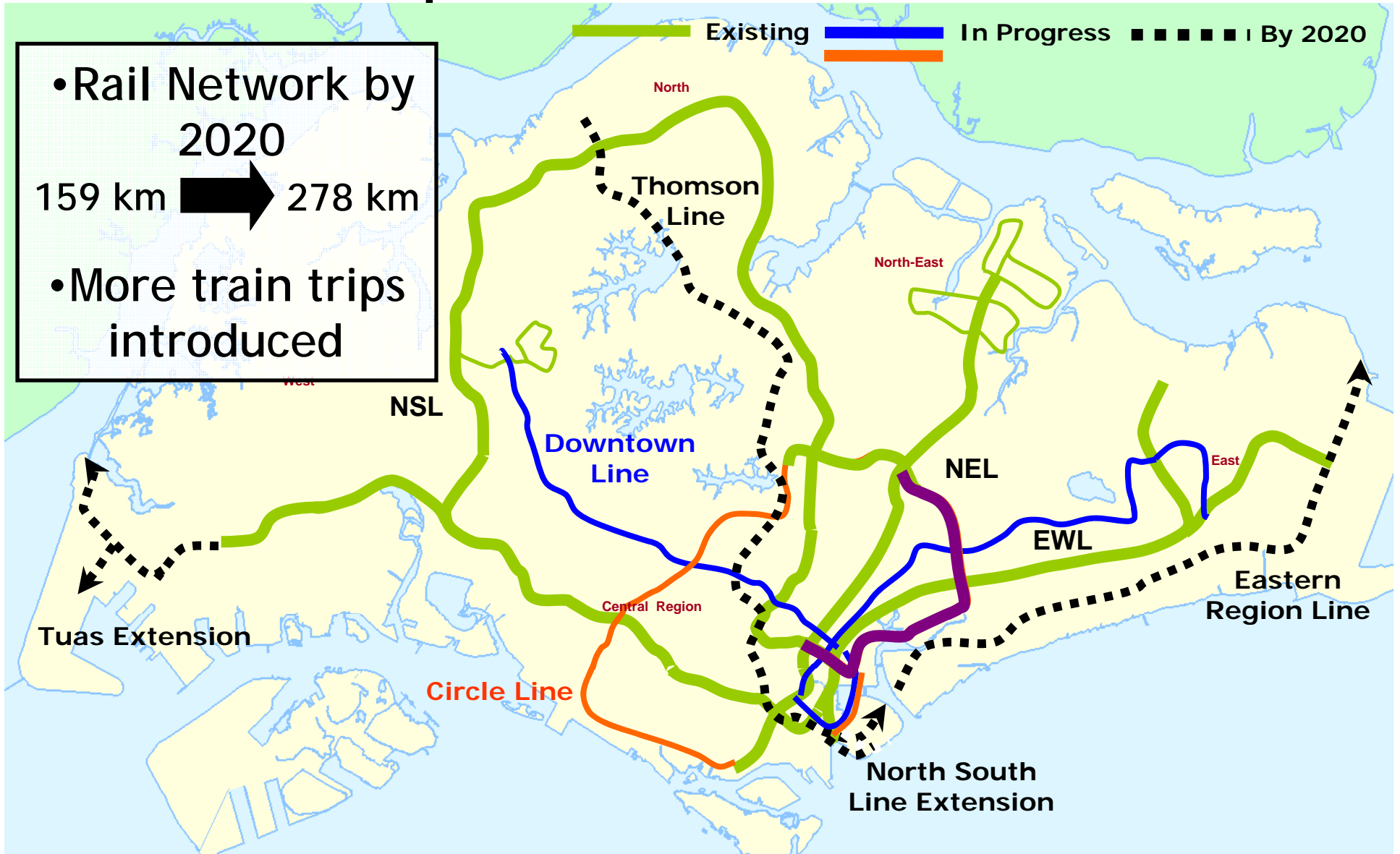
Ang Mo Kio Hub



Future
Clementi Hub
(artist
impression)

Integrated
PT hubs

Expand Rail Network



Enhance Commuter Experience



S1: Make Public Transport A Choice Mode

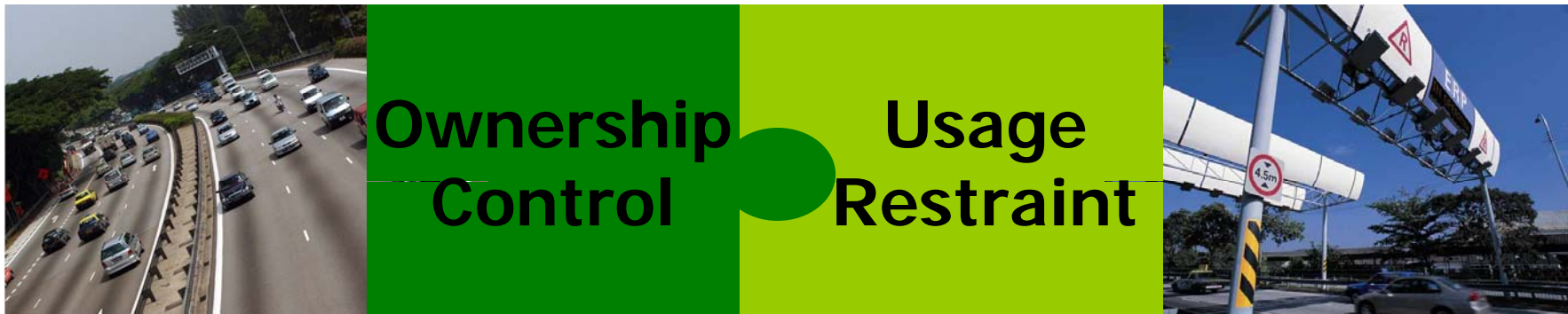
S2

Manage Road Use



Transport Management Policy

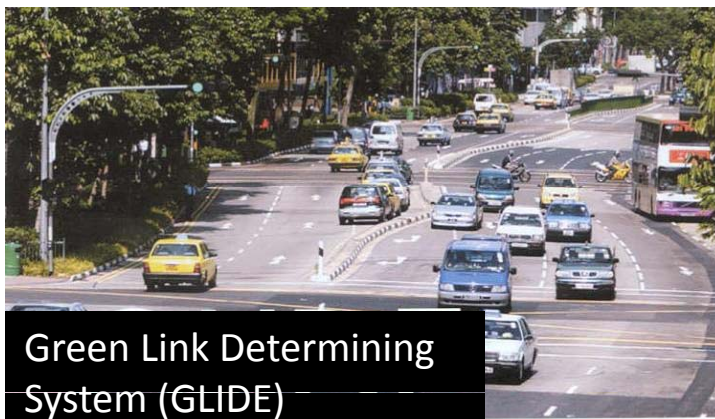
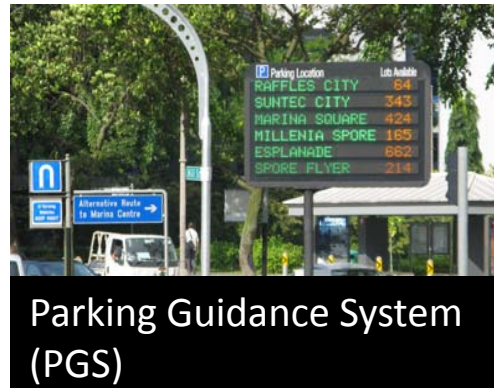
DEMAND MANAGEMENT MEASURES



- Reviewed Vehicle Quota System methodology
- Enhanced Off Peak Car System in 2010
- Study new technologies for Electronic Road Pricing (ERP)

Intelligent Transport Innovation

LEVERAGING ON TECHNOLOGY



S3

Meeting Diverse Needs



3 Broad Thrusts

Sustainable Development



T1

**Improve
Transport
Mobility &
Accessibility**



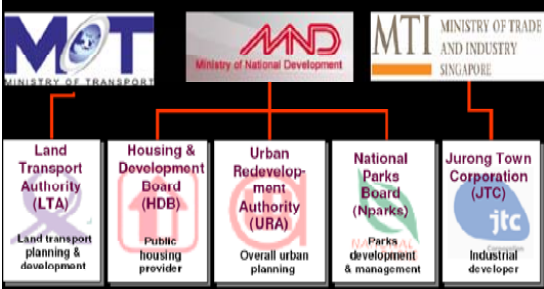


T2

**Improve
Resource
Conservation**

T3

**Improve
Living
Environment**

T1: Improve Transport Mobility & Accessibility

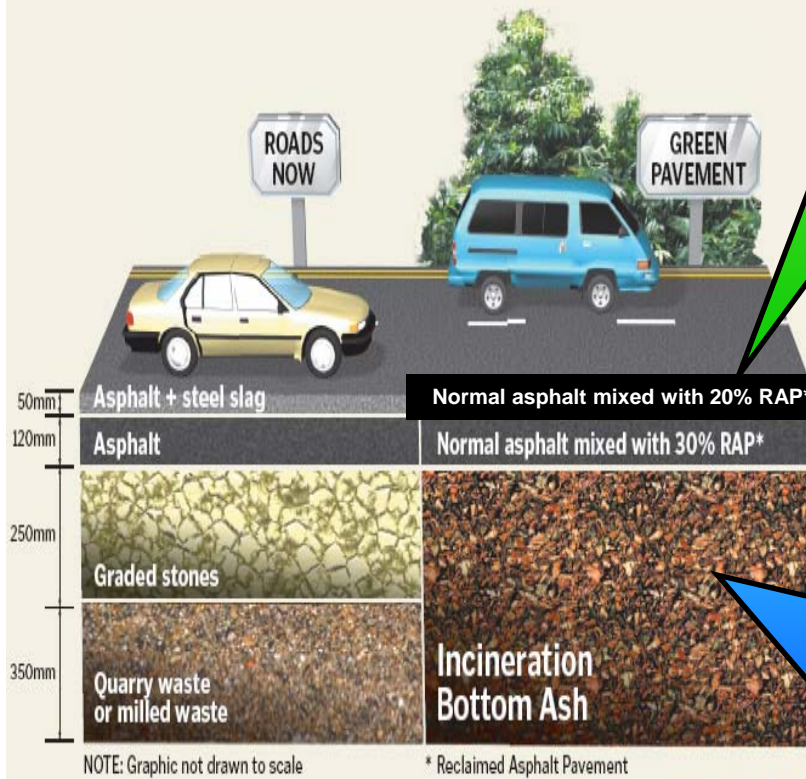
MOBILITY	ACCESSIBILITY
<p>Non-Motorized Transport - Cycling</p> <ul style="list-style-type: none"> • Foldable bicycles on MRT/bus • Bicycle Parking Facilities at PT hubs • Cyclists tracks/lanes • Safety signs • 7 Cycling Towns 	<p>Enhance & Upgrade MRT Stations</p> <ul style="list-style-type: none"> • Half-height Platform Screen Doors • Increase Frequency of Trains • Jurong East Modification Project (JEMP) 
<p>Integrated Planning</p> <ul style="list-style-type: none"> • Easy access with PT • Cycling Facilities • Walking 	<p>Barrier-Free Accessibility</p> <ul style="list-style-type: none"> • Wheelchair Accessible Buses • Barrier-free road facilities  <p>Commuter & Pedestrian Facilities</p> <ul style="list-style-type: none"> • Pedestrian Overhead Bridges • Pedestrian Crossings • Covered Linkways 

T2: Improve Resource Conservation

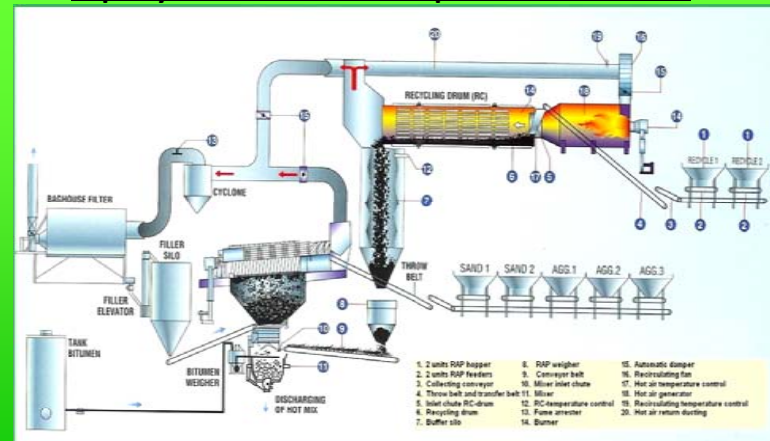
GREEN INITIATIVES

Green Pavement

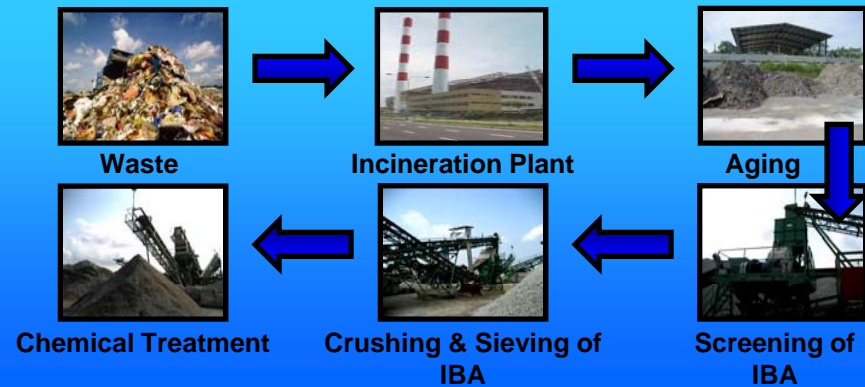
- Trial on the use of Recycled Materials for road pavement



Top Layer: Production of Asphalt Mix with RAP



Below Layer: Production of Incineration Bottom Ash (IBA)

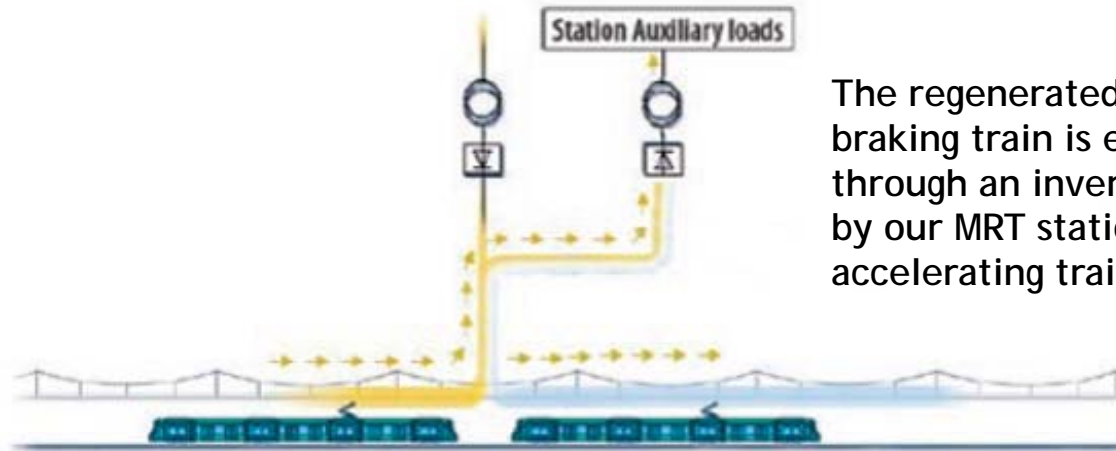


T2: Improve Resource Conservation

GREEN INITIATIVES

Green Rail Transit System

- Energy Saving Measures in MRT Stations
- Regenerative Braking
 - Energy channelled through an inverter to be utilized by MRT stations or by an accelerating train
- Trial on Use of Double Converter System for North South Line Extension (NSLE)



The regenerated energy from the braking train is either channelled through an inverter to be utilized by our MRT stations or by an accelerating train.

At time t_1 , train is braking and hence regenerating energy into the system

T3: Improve Living Environment

ACHIEVING CLEANER TRANSPORT

Vehicle Emission Test Laboratory (VETL)

- In operation since Oct 2009 to measure emission levels & energy efficiency vehicles



Diesel Particulate Filter (DPF)

- Trial in 2010 on the use of DPF on pre-Euro IV diesel vehicles to reduce air pollutants



T3: Improve Living Environment

ACHIEVING CLEANER TRANSPORT

Diesel-Hybrid Buses

- To trial on Diesel Hybrid Bus Technology



Green Transport Research

- E.g. Development of Fuel Cell Bus, Transport Energy Efficiency and Cycling Behaviour




Electric Vehicles (EVs)

- Set up EV Taskforce
- Tax exemptions to facilitate EV Test-Bed
- To conduct feasibility study on setting up the infrastructure for Electric Vehicles (EV)





Future Strategies & Policies

- Use of Cleaner Fuels (e.g. 10ppm sulphur diesel)
 - Adoption of more stringent emission standards for vehicles (e.g. Euro V for diesel)
 - Performance-based Vehicular Taxation & Rebate
 - Use of more efficient options for Bus & Taxi fleet
 - Others (e.g. cycling, eco-driving)
- 

THANK YOU

**Towards a Sustainable and Green Land
Transport System that makes Our City More
Liveable**



9/2/2010

Improving Fuel Economy

- The Fuel Economy Labelling Scheme (FELS) was launched as a voluntary programme in 2003
- Aim to provide buyers of passenger cars with fuel economy information
- From Apr 2009 - mandatory for car retailers to display fuel economy labels on cars in their showrooms

FUEL ECONOMY LABEL

Fuel Consumption

① → **7.0**
L/100km

② → Make: ABCD

③ → Model: XYZ09

Capacity: 1800 cc ← ④

Fuel Type: Petrol ← ⑤

⑥ → Tested in accordance with UN ECE R 101 (Revision 2) with amendment 1 or equivalent under combined driving cycle

⑦ → The actual fuel consumption will depend on driving habits and how the vehicle is used and maintained

⑧ → For more information and to compare models, visit www.nea.gov.sg
XXXX-XXX-XXXXXXX

Mandatory Periodic Inspection

- In-use vehicles called up for mandatory periodic inspection
- Introduced chassis dynamometer smoke test



Enforcement

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

