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# Role for Pricing and Congestion Management in Reducing Urban Transport Times and Energy Use: High Efficiency Transportation Networks

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**14–16 September 2011**

# Role for Pricing and Congestion Management in Reducing Urban Transport Times and Energy Use: High Efficiency Transportation Networks

## 14 September 2011


**Presenter**

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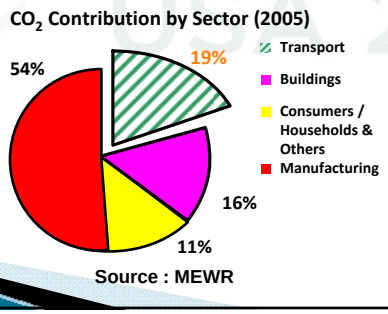
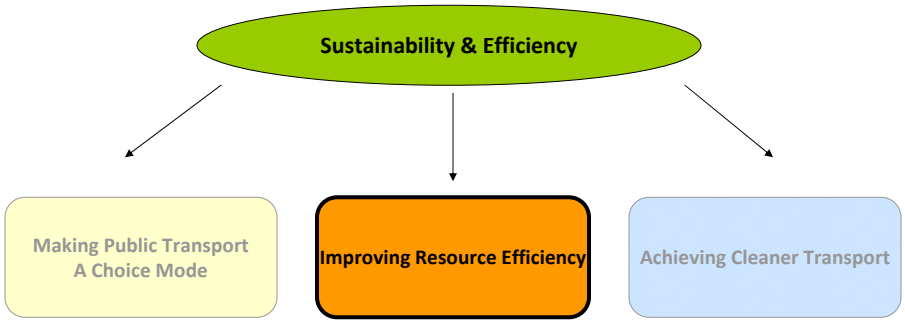
## Land Transport in Singapore

- As presented by Singapore, land transport plays significant role in contributing to sustainable living environment
  - 2nd largest source of $CO_2$ emissions (19%), behind industry sector
  - 3rd largest consumer of energy (13%), behind industry and building sectors



## Framework for Land Transport Network in Singapore




## OVERVIEW

- Introduction
- Role of ownership & usage pricing in Singapore
- Intelligent Transport Systems (ITS): Leveraging on technologies in congestion management
- Going forward: Importance of public transport

## Improving Resource Efficiency: Management of Road Demand

A key strategy of Singapore is the management of road demand via:

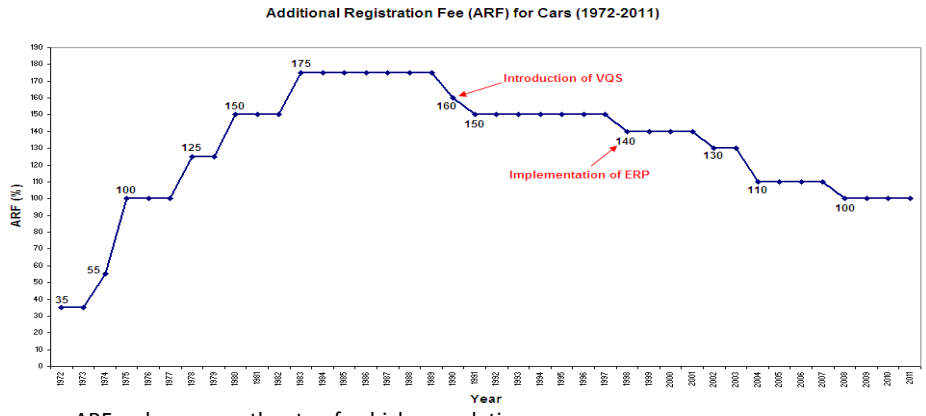
- Ownership pricing
- Usage pricing

| Ownership Control | Usage Restraint |
|---|---|
| • Vehicle Quota System<br>• Other ownership costs<br>  - Additional Registration Fee (ARF)<br>  - Excise duty<br>  - Road tax | • Electronic Road Pricing (ERP)<br>• Off-Peak Car (OPC) scheme<br>• Petrol duty<br>• Parking policies |

## Ownership Pricing: Additional Registration Fee (ARF)

- Introduced in 1972 to deter vehicle ownership
  - Raised gradually by 9% p.a. from 1972-1989
- Based on percentage of Open Market Value (OMV) of vehicles
  - Cars and taxis: 100%
  - Motorcycles: 15%
  - Commercial vehicles & buses: 5%

## ARF Structure in Singapore

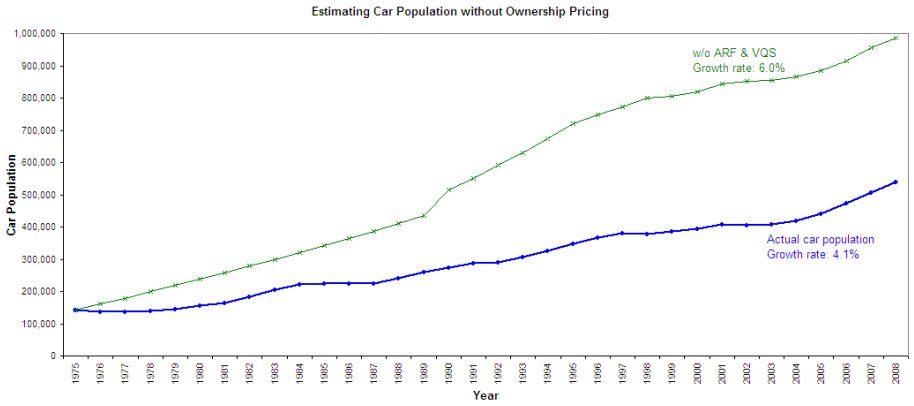



- ARF reduces growth rate of vehicle population
- Need for Vehicle Quota System (VQS) to limit growth at desired rate

## Ownership Pricing: Vehicle Quota System (VQS)

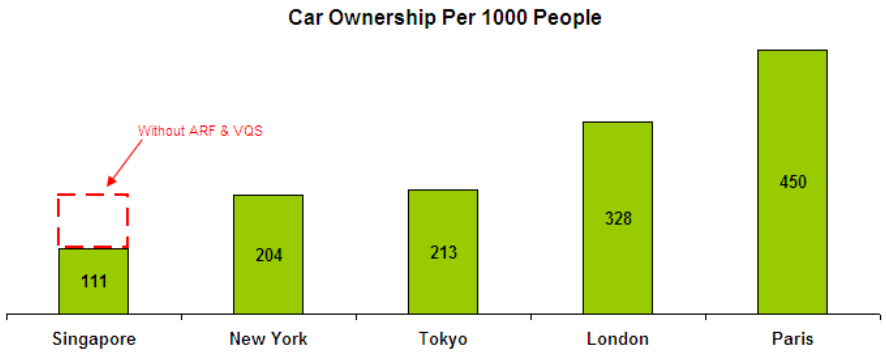
- Introduced in 1990 to control growth rate of vehicle population
  - 3% p.a. from 1990-2008
  - 1.5% p.a. from 2009
- Certificate of Entitlement (COE) required to own vehicle
  - 10-year tenure
  - Open Bidding System
  - 5 quota categories for social equity considerations

# Impact of Ownership Pricing on Car Population




- Without ARF & VQS, car population would have grown an additional 83% by 2008

# Comparison of Car Ownership with Major Cities




- Ownership pricing resulted in lower car ownership per capita compared to major cities
  - Accords greater flexibility in managing congestion

## Energy Use Reduction from Ownership Pricing

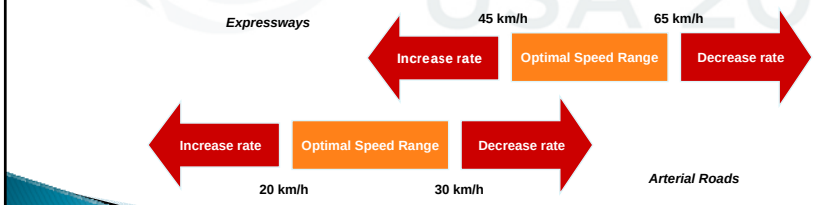
- Smaller car population due to ARF & VQS saves energy consumption from 1975-2008
  - Reduction in 14,500 ktonnes of oil equivalent (ktoe)
  - Equivalent to 42,500 ktonnes (3.8% annual reduction) of $CO_2$ emission

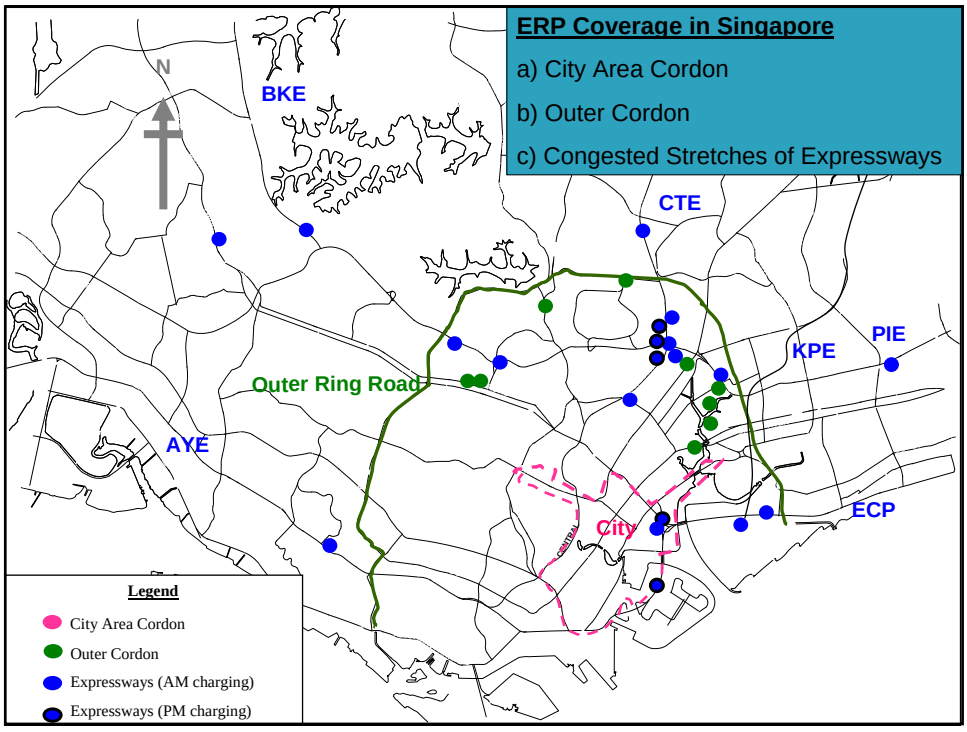
## Usage Pricing: Area Licensing Scheme (ALS)

- Implemented since 1975
  - Motorists required to purchase license to enter Restricted Zone (RZ)
  - Reduces congestion in Central Business District (CBD)
  - Volume of cars entering CBD decreased by 44% during 1st year of implementation

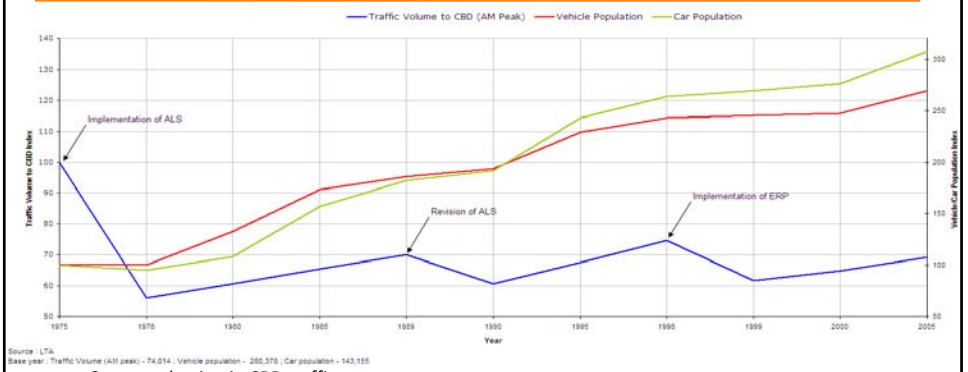
# Usage Pricing: Electronic Road Pricing (ERP)

- Introduced in 1998 to replace Area Licensing Scheme (ALS)
  - Caters to changing traffic patterns
- ERP rates determined based on local traffic conditions and time
  - 85th percentile speed measurement method
  - Reviewed every 3 months



## Impact of Road Pricing on CBD Traffic




- 3-step reduction in CBD traffic:
  - Implementation of ALS in 1975 – 44%
  - Revision of ALS in 1989 – 13.4%
  - Implementation of ERP in 1998 – 17.2%
- Despite 173% growth in vehicle population from 1975-2005, usage pricing reduces CBD & city area traffic by average of 35%

## Transport Times & Energy Use Reduction from Ownership Pricing

From 1975 to 2008:

- Lower traffic volume in CBD
  - Reduces energy use by 700 ktoe
  - Equivalent to 2,000 ktonnes (0.16% annual reduction) of $CO_2$ emission
- Reduced congestion on expressways & arterial roads
  - Reduces energy use by 1,300 ktoe
  - Equivalent to 3,700 ktonnes (0.85% annual reduction) of $CO_2$ emission
  - Reduces average transport times by 33%

## International Experience with Road Pricing

- London:
  - Area pricing in Central London
  - Traffic entering charging zone reduced by 25%
  - 14% reduction in transport times


- Stockholm:
  - Cordon pricing in city centre
  - Traffic in city centre reduced by 10% - 15%

## Future of Road Pricing in Singapore

- Singapore studying next generation ERP
  - System Evaluation Test (SET) to identify suitable technology
  - Use of Global Positioning System (GPS) makes possible distance-based road pricing

## Usage Pricing: Off-Peak Car (OPC) Scheme

- OPC cars constitute about 8.1% of Singapore's total car population
- Motorists receive rebates in exchange for restricted usage of vehicles during restricted hours (7am–7pm)
- Reduction in 50 ktonnes of oil equivalent (ktoe)
- Equivalent to 150 ktonnes (0.12% annual reduction) of CO2 emission


## Intelligent Transport Systems (ITS): Leveraging on Technologies

- Green Link Determining System (GLIDE)
- Expressway Monitoring Advisory System (EMAS)
- Junction Electronic Eyes (J-Eyes)
- Parking Guidance System

## Green Link Determining System (GLIDE)

- Controls all traffic signals in Singapore
  - Detects presence of vehicles and pedestrians at junctions of major roads
  - Allocates green time for motorists and pedestrians based on demand
  - Provides "green wave" link between adjacent junctions to minimise number of stops by vehicles

## Expressway Monitoring & Advisory System (EMAS)

- Manages traffic along expressways
  - Detects incidents & provides prompt response to restore normal traffic flow
  - Provides real-time information of incident locations & travelling times along expressways
  - Cost of time saving due to shorter delays estimated at S$40 million p.a.

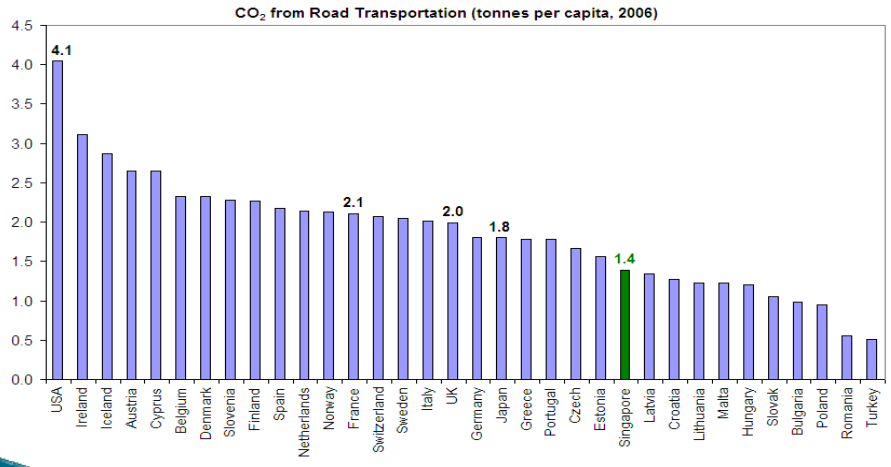

## Junction Electronic Eyes (J-Eyes)

- Enhances traffic flow at major road junctions
  - System of surveillance cameras allows spotting and rectification of traffic congestion
  - Deters illegal parking and loading/unloading along major roads
  - More than 320 cameras on roads


## Parking Guidance System (PGS)

- Provides information on available parking facilities
  - Promotes more efficient use of existing parking facilities
  - Reduces unnecessary circulating traffic
  - 27 electronic panels in city area and key shopping districts

## International Comparison of $CO_2$ Emissions from Road Transportation

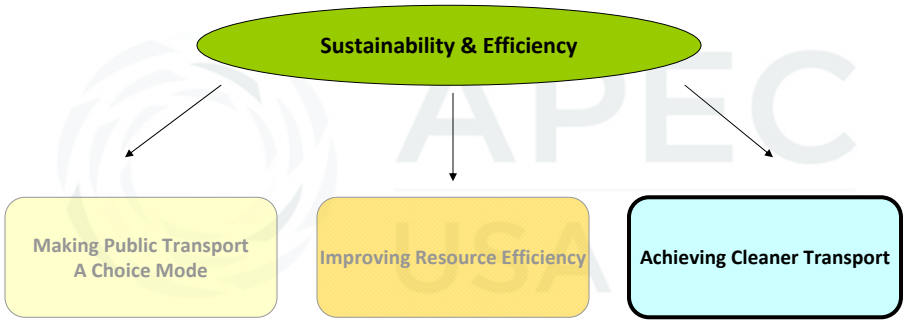



Sources:
European Commission, 2009. "EU energy and transport in figures - Statistical pocketbook 2009", 4.2. Environment, CO2 Emissions
US Energy Information Agency (EIA), 2009 "Carbon Dioxide Emissions from Transportation Sector Energy Consumption"
Atsushi Fukuda, "Current Efforts to Reduce CO2 Emission from Urban Transport in Japan and Thailand"

## Other Initiatives to Improve Resource Efficiency

- Green Framework for rail systems:
  - Use of equipment & technology that regenerates energy
- Encouraging fuel-efficient vehicles

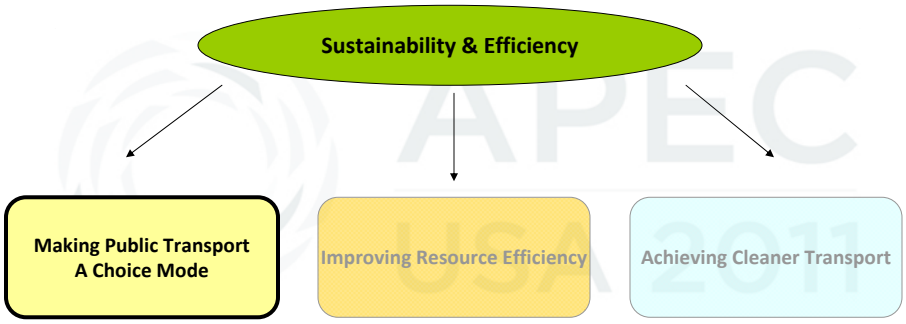
## Framework for Land Transport Network in Singapore




## Initiatives to Achieve Cleaner Transport

- Adopting cleaner diesel vehicles
- Establishment of vehicle emission test laboratory
- Encouraging non-motorised transport through investments in infrastructure

## Framework for Land Transport Network in Singapore




## Conclusion: Public Transport as Main Pillar of Sustainability & Efficiency

- Public transport is most efficient mode of transport, both in terms of land & energy use
- Target modal share of 70% of journeys made during morning peak hours via public transport by 2020

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## Efficient Transportation Network: Making Public Transport A Choice Mode

**Target PT mode share: 70% by 2020**


**Enhance the PT Experience**

**Integrated Transport & Land Use Planning**

**Expanding Rail Infrastructure**

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## Questions or Comments?

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