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# Power up the future

Energy and Mobility of tomorrow



**FUTURE ENERGY , SMARTER MOBILITY**

Era of Volatile Transitions

8th July 2011 | Sunway Resort Hotel and Spa

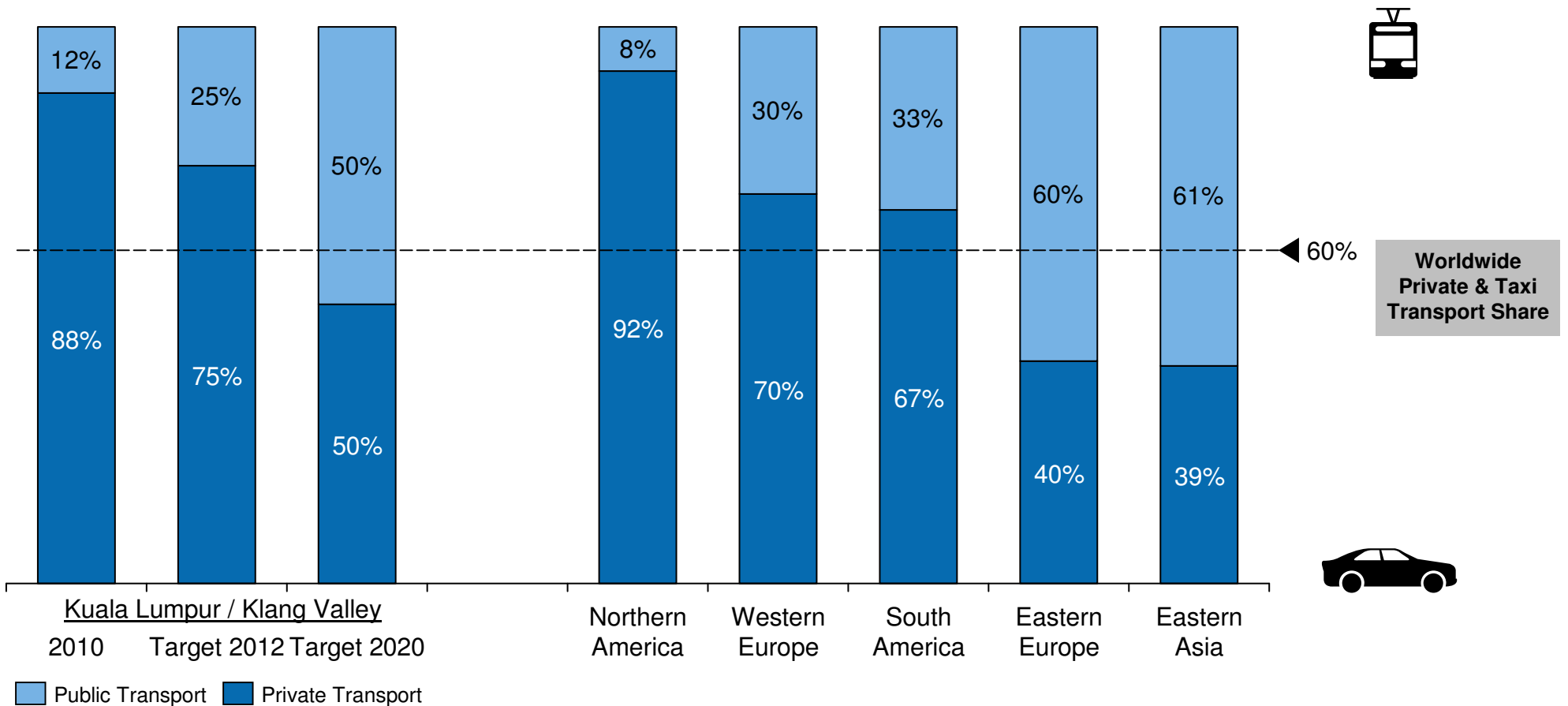
Edward Clayton, Head of SE Asia, Booz & Company

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# Here in Kuala Lumpur, public transport plays a marginal role, private cars cater for mobility needs

Split of Total Motorized Passenger Trips between Public and Private Transport

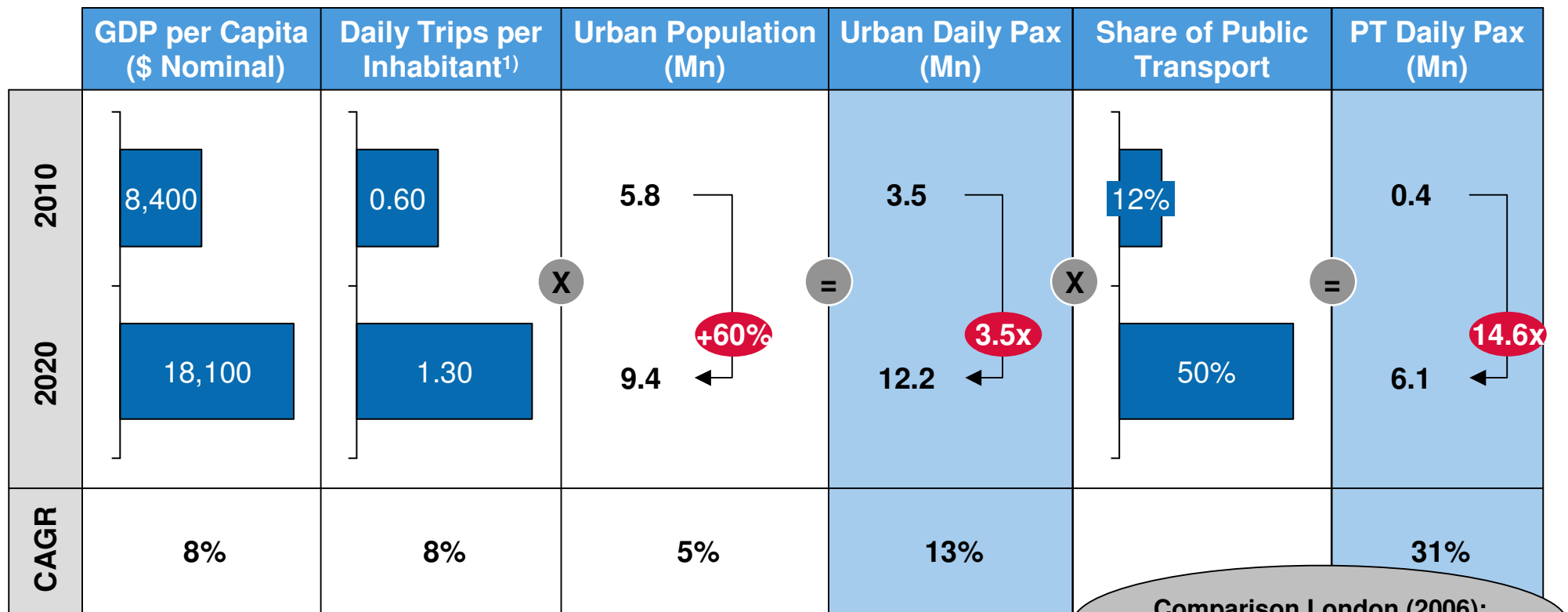


Source: UITP Cities Database (2001); Booz & Company Public Transport Database

# Greater KL is growing rapidly, mobility demand and public transport trips could increase much faster than population

HIGH LEVEL ESTIMATES

Greater Kuala Lumpur / Klang Valley Metropolitan Area – Projected Demand Evolution  
(2010-2020)

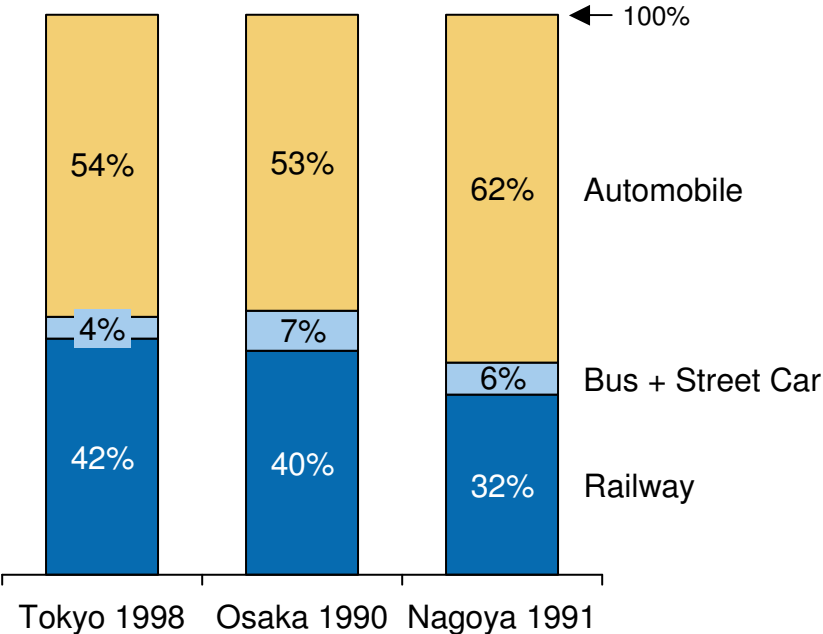


**Comparison London (2006):  
7.2 Mn. PT Daily Pax (30% Share)**

1) Motorized Trips - Estimated based on correlation between the increase in GDP per capita and the number of daily trips per inhabitant observed through data comparison in multiple countries  
Sources: Booz & Company Public Transport Database; UITP Mobility in Cities 2001; IMF World Economic Outlook Database; Economist Intelligence Unit; Global Insight, Economic Transformation Programme, Booz & Company analysis

# However, modal shift to public transport is not easy - people love cars as seen in Japan in the past generation

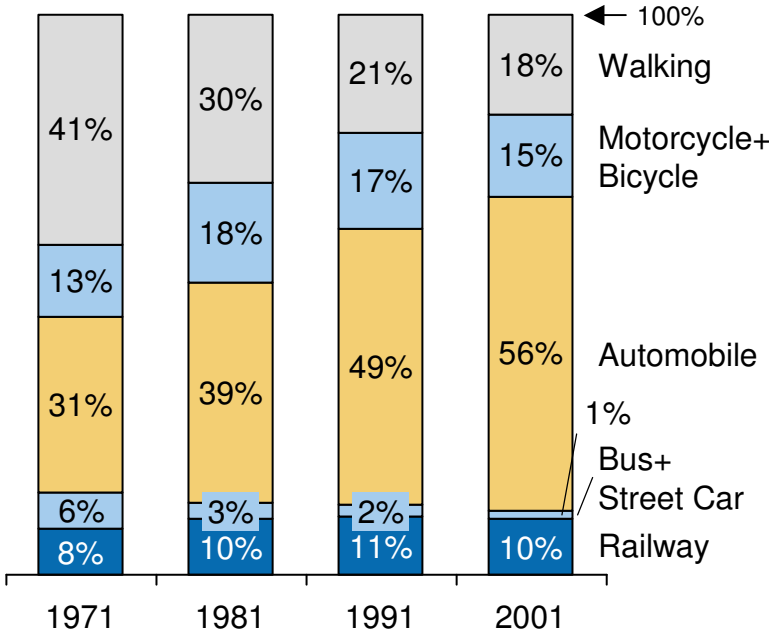
**Modal Share in Japanese Cities**



Population 1995 (Million)	7.9	2.6	2.2
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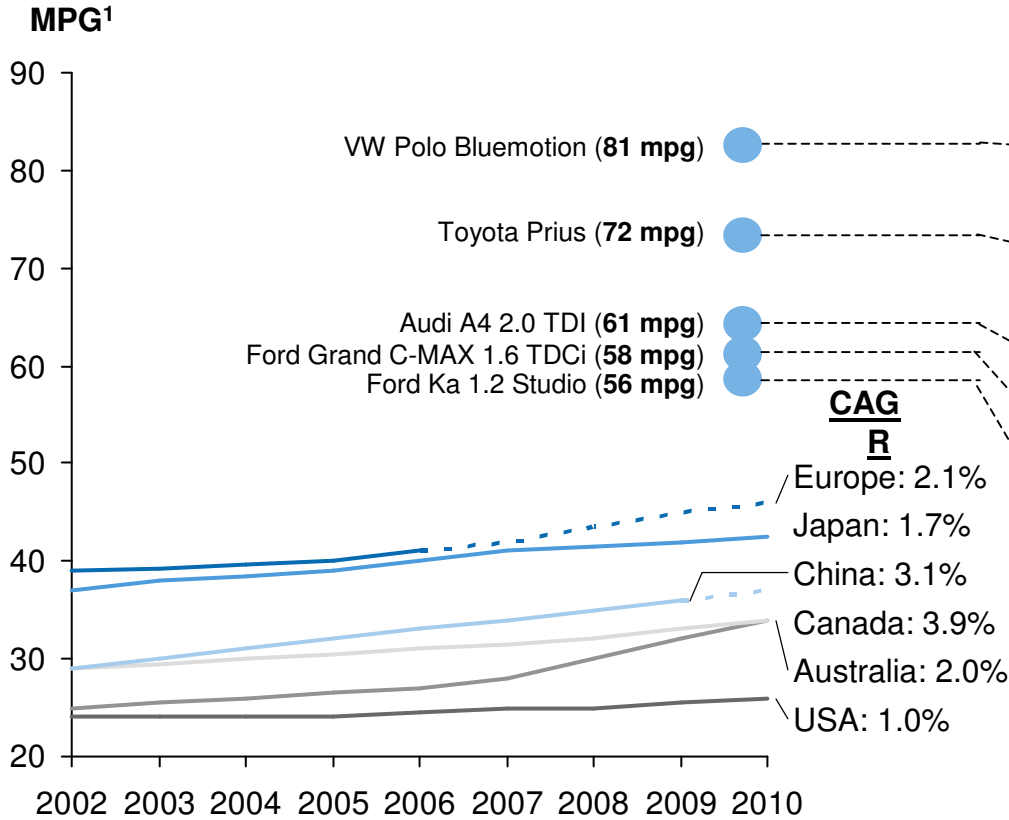
Source: Urban Transportation Policy, Hirohide Konami






**Modal Share in Nagoya**



# Fuel use should grow slower than traffic - economy has improved rapidly over the last decade and new cars show future potential

**Global Fuel Economy**  
Country averages compared with best-in-class cars

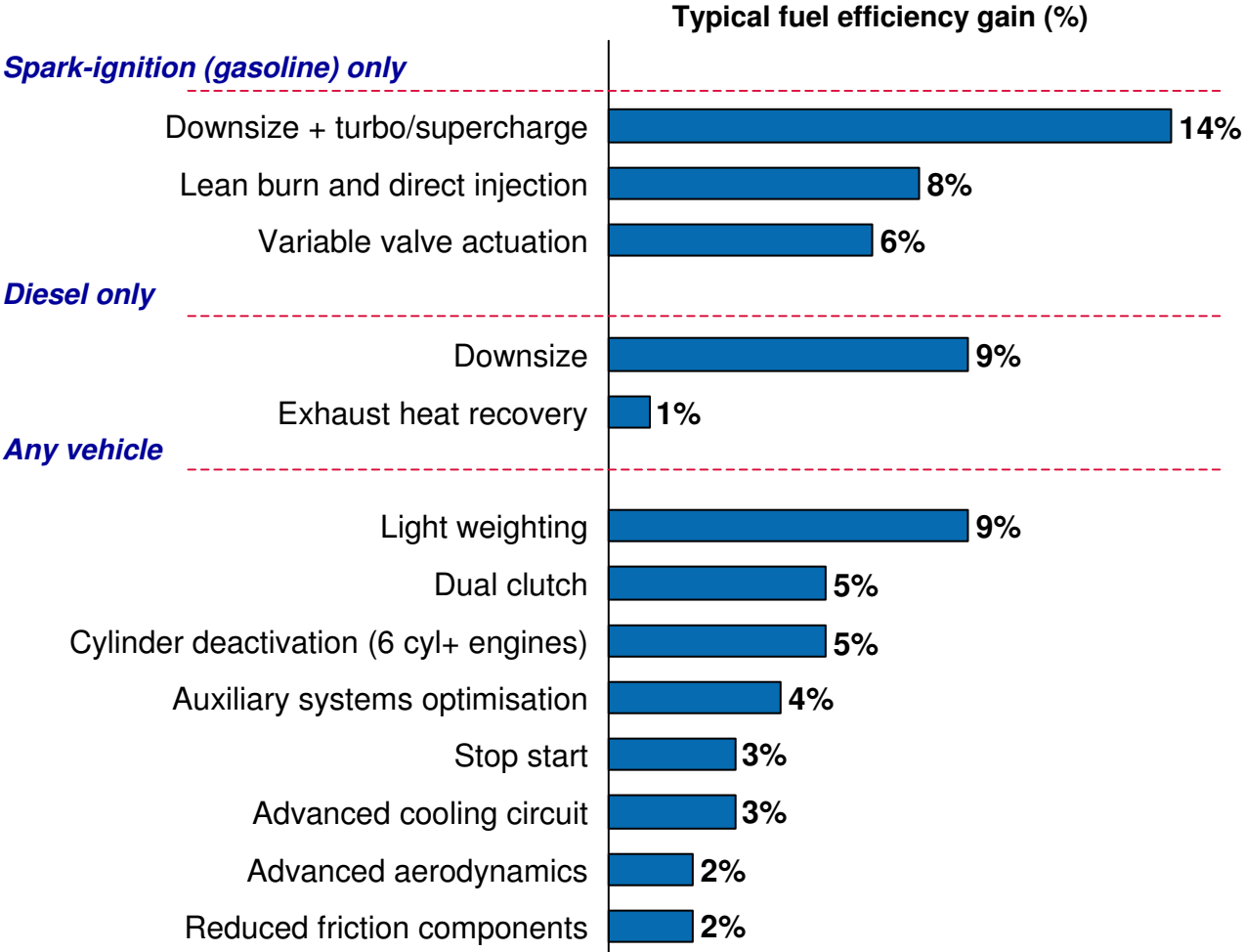


	<u>Cost<sup>2</sup></u>	<u>Seats</u>	<u>Fuel</u>
	£14,445	5	Diesel
	£20,265	5	Petrol Hybrid
	£23,665	5	Diesel
	£18,745	7	Diesel
	£7,995	5	Petrol

1) MPGs all converted to US CAFE Test Cycle  
2) List price in the UK, October 2010

Source: Parkers; International Council on Clean Transportation - Passenger Vehicle Greenhouse Gas and Fuel Economy Standards; Booz & Company analysis

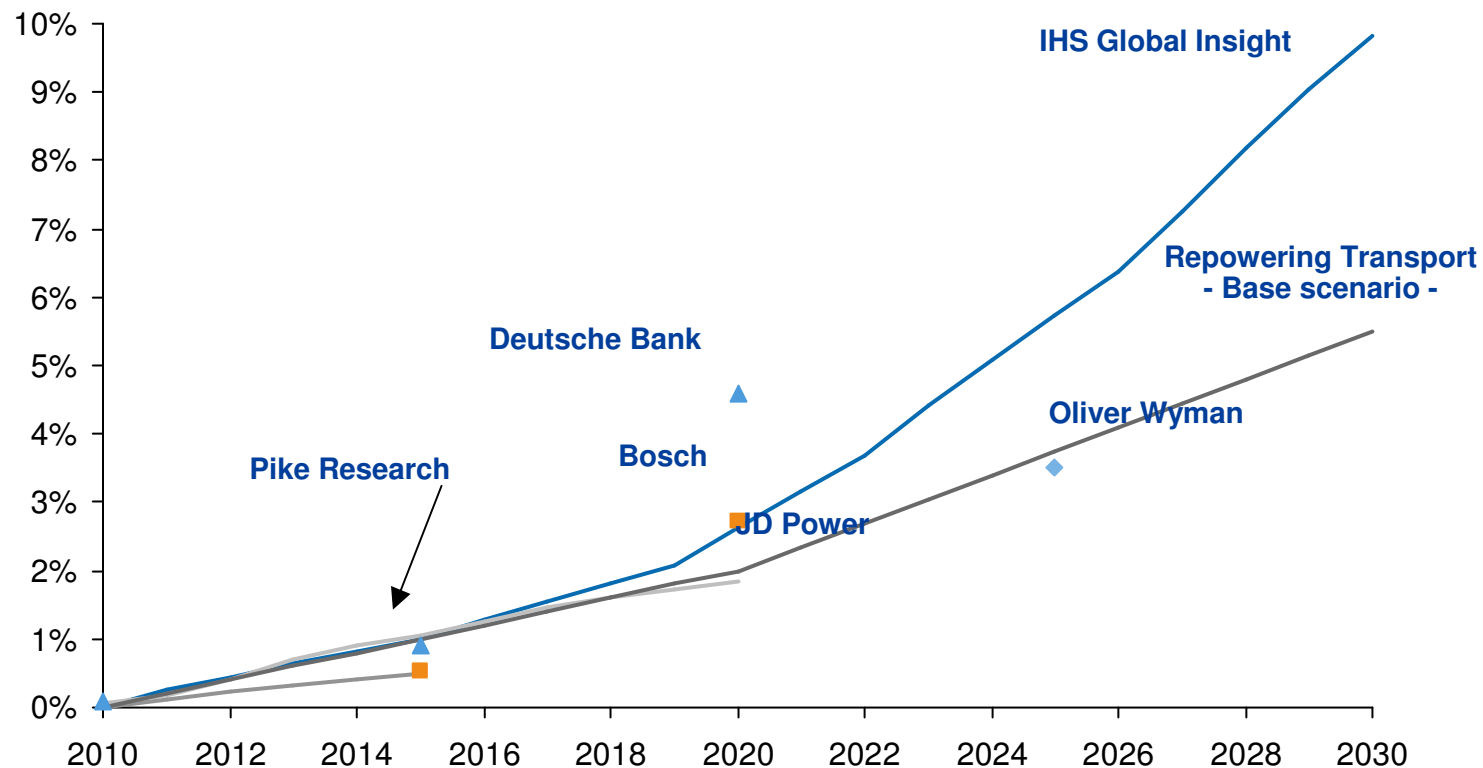
# There are many ways in which fuel economy can be improved with LDVs (light duty vehicles)



# We also see battery powered vehicles increasing - but even in 2030 they will be a minority of new vehicles

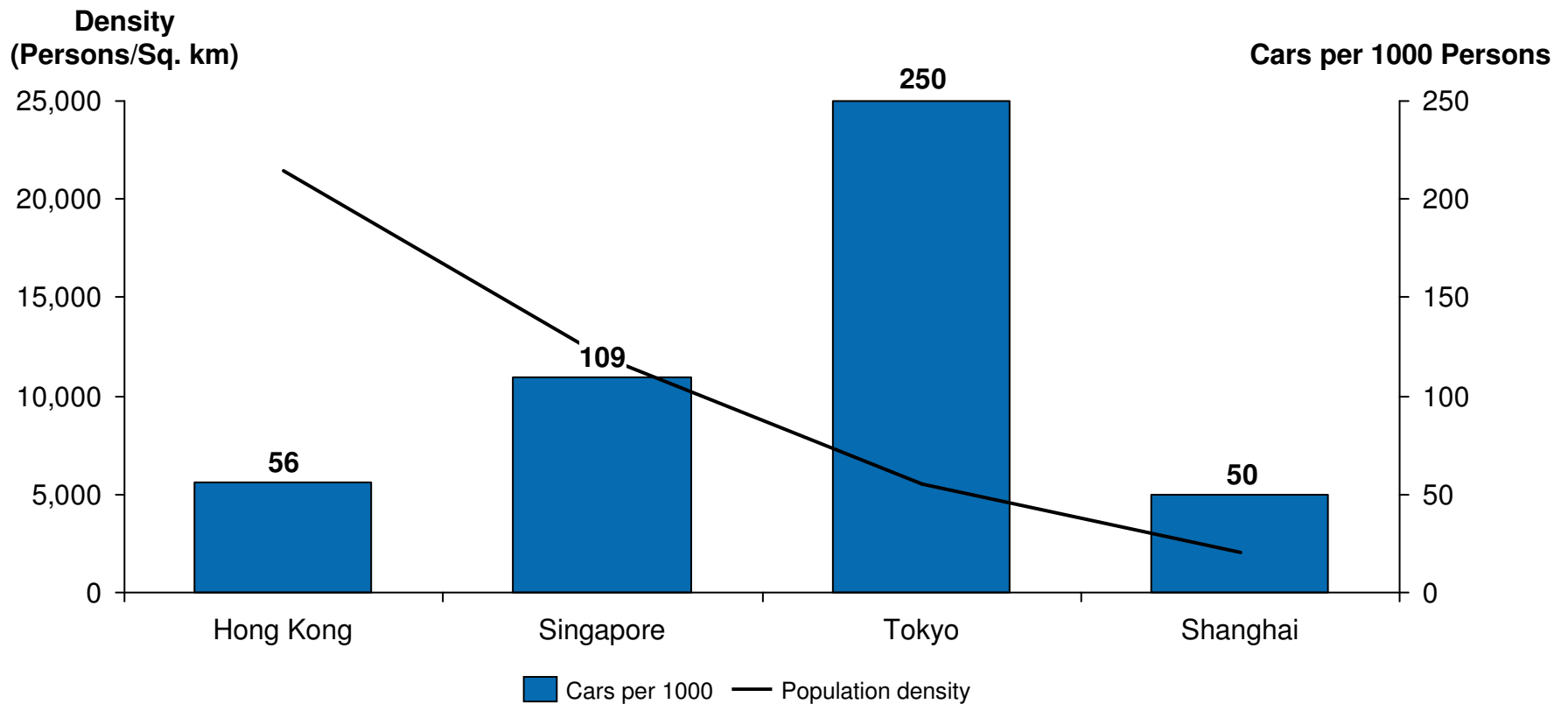
**Global battery electric vehicle sales forecasts**  
2010 – 2030, % of global new vehicle sales

Share of new vehicle sales



# As an alternative to rapid motorisation - other Asian cities have a dense population and operate successfully with far fewer cars

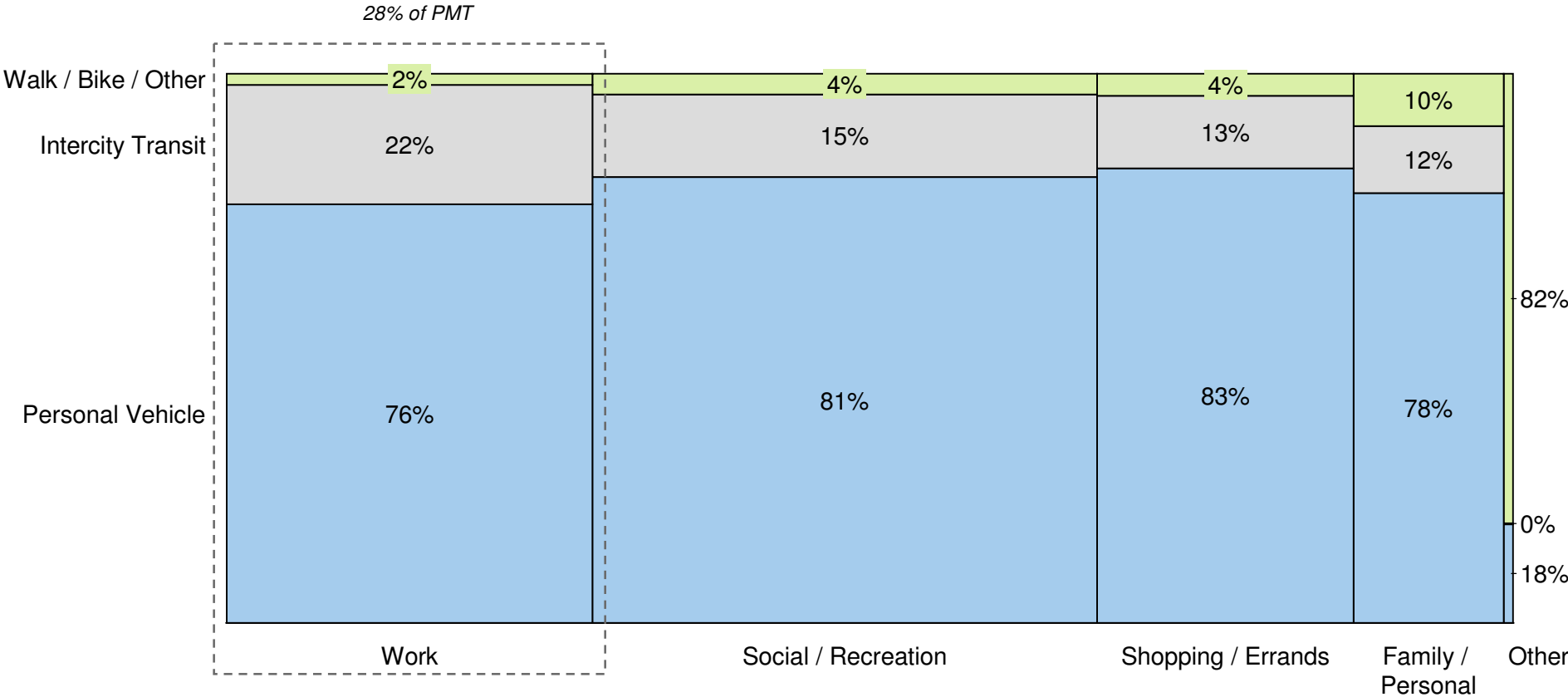
Comparison of Asian Cities



Source: World Cities or Great Cities? A comparative study of five Asian metropolises, Mee Kam Ng and Peter Hills, Centre of Urban Planning & Environmental Management, 2003; Singapore Government Statistics, Hong Kong Census Bureau, Tokyo Metropolitan Government

# Work commutes represent over one quarter of passenger miles travelled in the UK

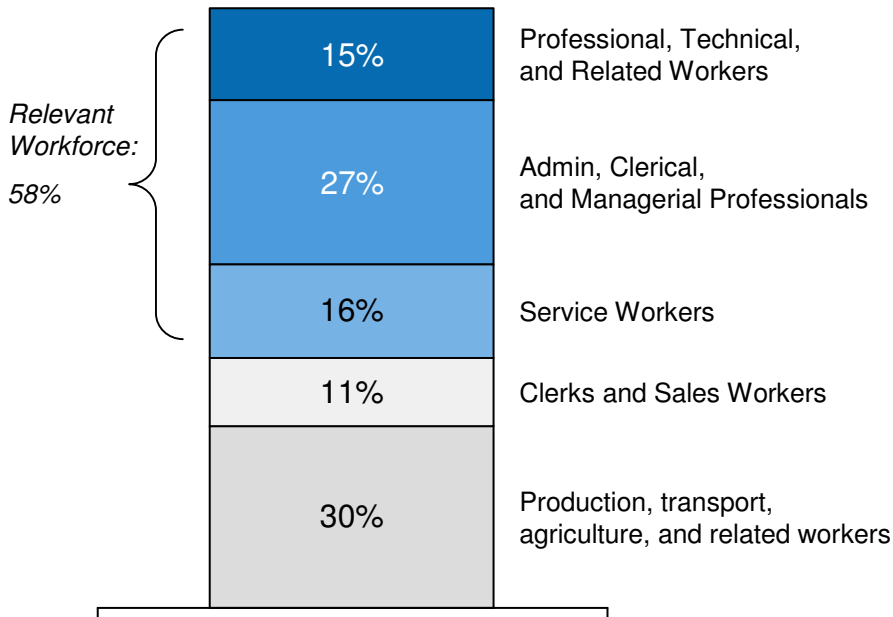
**UK Passenger Miles Travelled**  
By Purpose and Mode



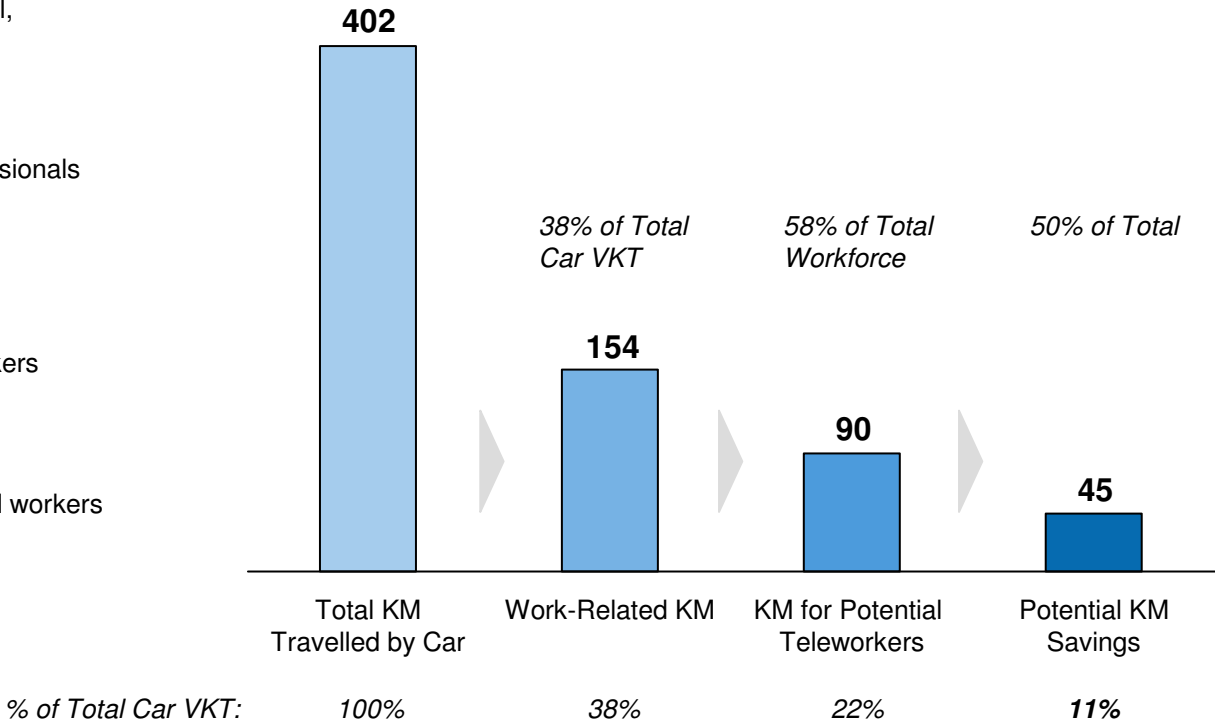
Source: UK Dept of Transport

# Telecommuting may one day save about 10% of total miles travelled in some developed countries

**UK Employment by Occupation**  
2008



**Potential Vehicle Kilometres Travelled (VKT) Impact - UK**  
Billions of Kilometres (KM)



Source: LABORSTA, Transport Statistics Great Britain, Booz & Company Analysis

# But IT is also pushing in the other direction - technology advances are making vehicles increasingly “self-driving”

- **Sensors:** Today, consumers can buy cars equipped with sensing technology (e.g., radar, cameras) that interacts with the driver’s surrounding environment
  - High-end cars currently have ~100 sensors
  - Cars can parallel park; accelerate and brake to maintain a safe driving distance from cars ahead; and detect and avoid side collisions
- **Telematics:** Researchers beginning to combine sensing technology with telematics to navigate without driver assistance; able to keep cars within two cm of desired location
  - In 2007 DARPA Urban Challenge, teams completed a 60 mile race driving in an urban environment, alongside conventional vehicles driven by people
  - This fall, Stanford will run a driverless Audi at racing speeds up a winding mountain road in Colorado
- **Vehicle-to-Vehicle (V2V):** V2V technology provides an alternative, complementary approach to ‘sensing’ surrounding objects through wireless communications, including roadside objects, pedestrians, and other vehicles
  - Each vehicle broadcasts its position and velocity to its neighbourhood, and continuously monitors the status of surrounding objects
- Remaining technical challenges include building the intelligence to process all sensor information in real-time and plan routes in highly dynamic settings



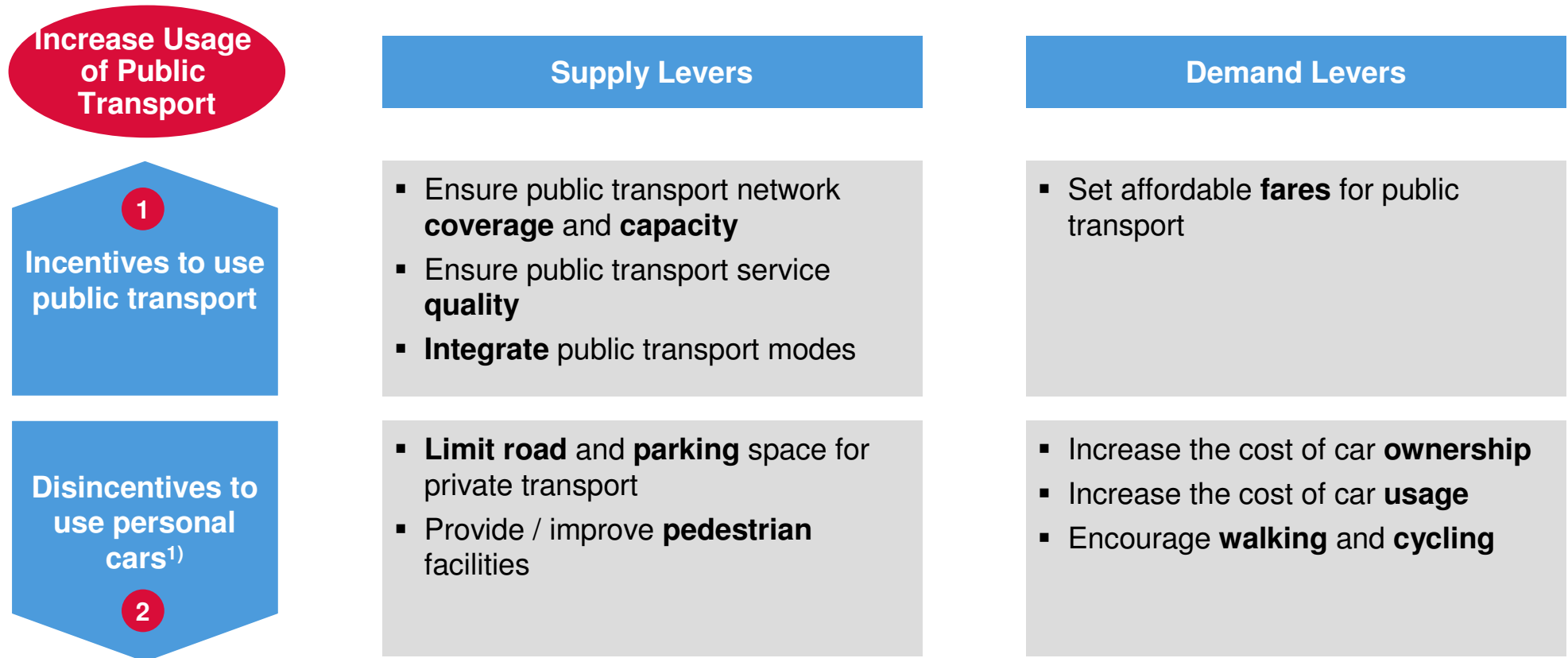
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## **This could make driving far more attractive - imagine being able to work, eat and rest whilst being driven around by your car**

- Currently, driving a car consumes about an hour a day - requiring the driver's (more or less) full attention.
- A generation from now (2030), advancing technology could make cars substantially self-driving
  - A driver puts his/her vehicle into a controlled traffic flow ...
  - ... then auto-pilot navigation via GPS, radar collision detection, etc. take over
  - At the other end of the journey, the driver resumes manual control
- As a result, drivers can use travel time as effectively as time spent at home/work
  - Concentrate as uninterruptedly as in a chauffeured vehicle
  - Maintain full productivity/access with the broadband wireless connections
- Consequently, increasing number of drivers would find the time cost of auto-travel to be much lower than in the past and therefore, travel much more than they otherwise would

# The alternative - driving higher public transport use - can be done with a comprehensive approach of incentives and disincentives

## Incentives / Disincentives to Increase Public Transport Usage







Note: 1) Measures covered in the Congestion section

Source: Booz & Company analysis

# Several supply and demand levers are typically adopted to incentivize the use of public transport

## Incentives to Use Public Transport Usage – Benchmarks

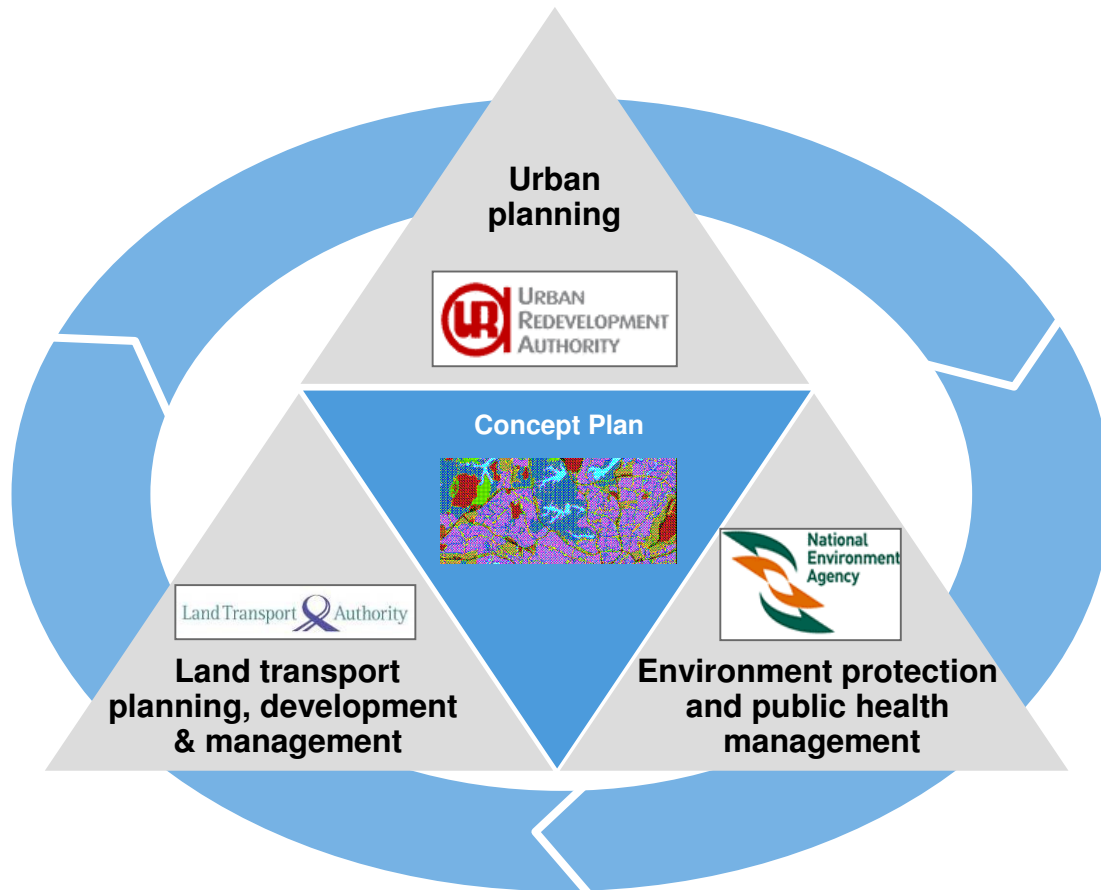
			Singapore 	Hong Kong 	London 	Berlin 
Supply Levers	Ensure public transport network coverage and capacity	▪ Constantly expand network to reach newly developed areas and increase connectivity of suburbs	✓	✓	✓	✓
		▪ Optimize network layout and density according to demand	✓	✓		✓
	Ensure service quality (for 3rd party operators)	▪ Set and enforce quality standards	✓	✓	✓	✓
		▪ Encourage competition between service providers (e.g. competitive bidding, license duration)	✓	✓	✓	
Integrate public transport modes	<ul style="list-style-type: none"> <li>▪ Fare integration: integrated tickets and multi-mode smartcards</li> <li>▪ Network: feeder bus services to main corridors/metro</li> <li>▪ Physical: interchanges / park and ride facilities</li> <li>▪ Institutional: same entity responsible for all modes</li> </ul>	✓	✓	✓	✓	
Demand Levers	Set affordable fares	<ul style="list-style-type: none"> <li>▪ Public transport fares are set at affordable rates</li> <li>▪ Same entity sets fare policies (public transport fares vs. car usage fees and toll fees) to manage usage</li> </ul>	✓	✓	✓	
	Ensure access to public transport	<ul style="list-style-type: none"> <li>▪ Develop pedestrian and cycling access to public transport</li> <li>▪ Provide adequate waiting areas (e.g. shelters)</li> </ul>	✓	✓	✓	✓

Note: London has a some integration, e.g. ticketing and fare collection, but is less developed on the other integration dimensions

Source: Booz & Company analysis

# For example, on the supply side, Singapore successfully integrates PT planning and land use, thus facilitating intermodal integration

## Integrated Planning – Singapore Example



### Integrated Planning Process

- Integrated planning is conducted in close **cooperation** between relevant ministries and agencies - urban planning, housing, environment & transport
- **Long term** planning process that integrates land use and main transport corridors:
  - **Concept plan** (every 10 year): strategic long-term plan for next 40-50 years that guides city growth
  - **Master plan** (every 5 years): mid-term plan for next 10-15 years
  - Urban **design** and conservation plans
- Transport corridors are defined long before individual residential developments are planned

Source: Booz & Company analysis

# Also, integration is facilitated through integrated demand management and strategic transport planning of all modes

**BEST PRACTICE**

## Overview Hierarchy and Interdependency of Transport Strategies and Plans



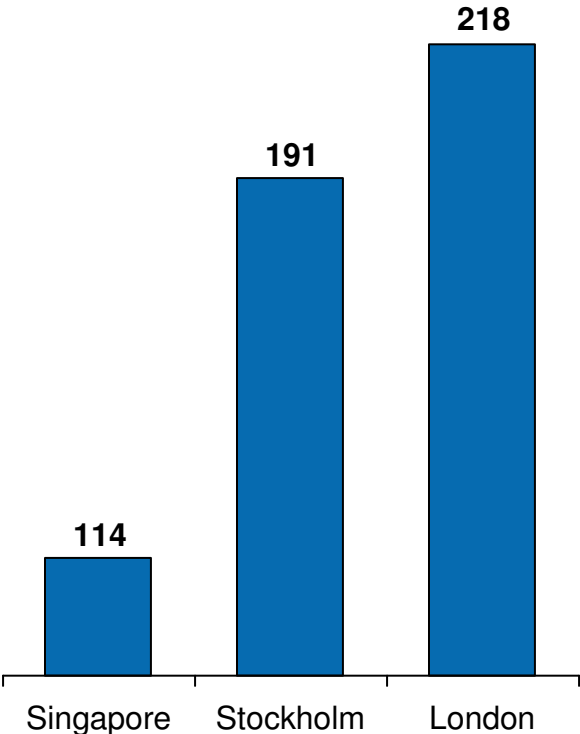
Source: Best Practice, Booz & Company analysis

# A broad range of charges and duties can be applied to discourage car ownership / use and hence promote use of public transport

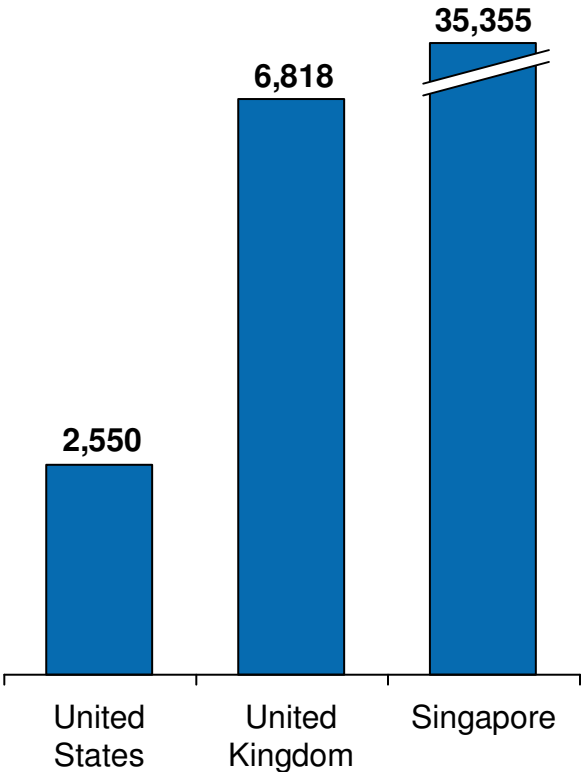
INDICATIVE

## Levers to Limit Car Ownership and Usage

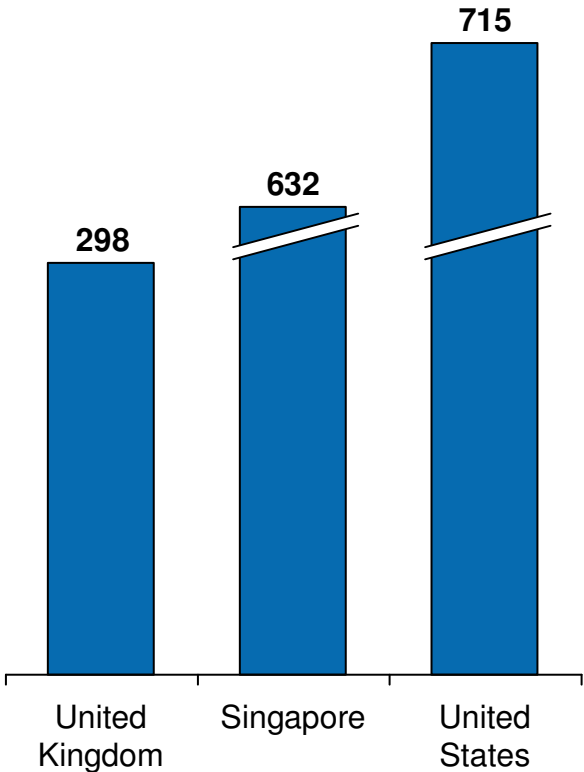
**Congestion Charging or Toll Revenue per Year, per Registered Vehicle**  
in PPP\$



**Taxes and Importation Duties on New Vehicles**  
Per Vehicle, in PPP\$



**Annual Charges on Registered Vehicles**  
Per Vehicle, in PPP\$



Note: Purchasing Power Parity exchange rates were used to normalize charges and fees in different countries  
Source: Booz & Company analysis

# Intelligent Transport System applications are critical enablers to limit road and parking space and promote public transport use

NON EXHAUSTIVE

## Example - Bus Transit ITS Applications

### Transit Traveller Information

- Provides transit users at transit stops and on-board transit vehicles with ready access to transit information
- Information services include
  - Transit stop annunciation
  - Imminent arrival signs and
  - Real-time transit schedule displays that are of general interest to transit users



### Transit Signal Priority

- Determines need for transit priority on routes and at certain intersections and requests transit vehicle priority at these locations
- Coordinate between transit management and traffic management centres, to improve on-time performance of the transit system without degrading overall performance of traffic network



### HOV Lane Management

- Preferential treatment given to HOV lanes using
  - Special bypasses
  - Reserved lanes and
  - Exclusive rights-of-way that may vary by time of day



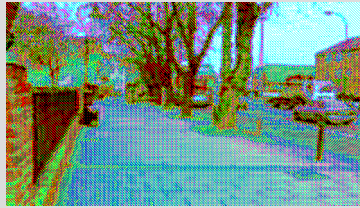
Source: Booz & Company analysis

# Finally, improvement of city walkability provides a number of mobility, social, safety and environmental benefits

## Benefits of a Pedestrian Policy and Standards

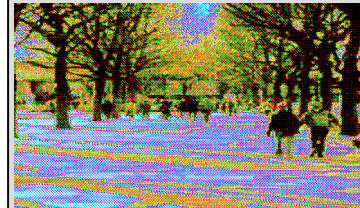
### Removes Barriers to Mobility

- Greater pedestrian accessibility and right of way
- Increased connectivity for non-motorized travellers
- Minimal steps, inclines and surface irregularities
- Accommodates all needs: wheelchairs, walkers, strollers



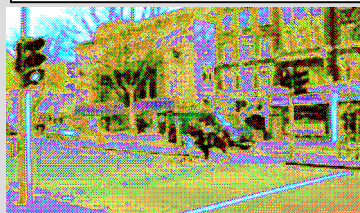
### Provides Social Benefits

- Greater community cohesion, vitality and network
- Promotes personal health and well being
- Increased recreation options
- Advocates equity
- More options for non drivers



### Benefits of a Pedestrian Friendly City

- Designated crossings reduce the need for jaywalking
- Non roadway paths and traffic calming reduces the risk of injury, death and conflict with motorists
- Tactile pavement, dropped curbs and barriers reduce accidents
- Improved lighting, and open areas can deter crime



### Improves Safety

- Positive impact on congestion
- No associated pollution
- Removes noise and air pollution associated with vehicular travel
- Requires less land space than roads
- Walking is sustainable



### Aids Environmental Sustainability