

# Clean and Efficient Urban Transportation – Singapore’s Approach versus Transport tragedies in Beijing, Jakarta, Bangkok, Santiago\*

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*In 2018, ACI was ranked 14<sup>th</sup> globally, 2<sup>nd</sup> in Asia and 1<sup>st</sup> in Singapore amongst 90 think tanks worldwide under the “Best University Affiliated Think Tank” category by the Think Tanks and Civil Societies Program at the University of Pennsylvania, USA.*

## Presentation Outline

1. Managing congestion
2. Controlling car ownership
3. Managing car usage
4. Implementing vehicle management policies
5. Public Transport
6. Regulation to safeguard commuters' interests
7. Introducing competition to BUS and MRT services
8. Transport tragedies: Congestion in other major cities

# Singapore's public transport among the most efficient in the world!



Source: LTA Annual Report 2016-17

# Transport Tragedies: Beijing, Jakarta Bangkok and Santiago



## Sharing the Singapore Experience: Managing congestion

- *“In Singapore, we have tried to explicitly consider the economic principles and logic involved. The cost and benefits of a particular course of action, the incentives and disincentives created by policy measures, the consequences of government action or inaction, the externalities that need to be considered. ... For example, we analyse how traffic congestion is ultimately a problem of externalities, and why the right policy approach is to price usage of roads. We are not flinched from pointing out where economic considerations were weighed against political and social considerations in shaping the final policies”* --- Lee Hsien long, Prime Minister, Republic of Singapore , 2009
- *“Singapore offers an unusual set of conditions: Limited land area, a small but highly urbanized population, political stability and continuity, a high connectivity to the rest of the world, for the review and refinement of public policies. From these conditions, policies have sprung that are usually effective, occasionally controversial, and often considered pioneering efforts that are subsequently adapted and use by other countries”* – “Economics in Public Policies: The Singapore Story”, 2009 (The Singapore transportation approach discussed is entirely drawn from Chapter 3 of the excellent book)
- Individual motorist only considers cost that affect him or her individually such as fuel and parking costs, and would not consider the negative spill-over effects of their driving including the congestion costs and environmental pollution, which would result in excessive use of cars. Such problems can be resolved by imposing taxes on ownership or use of car, or both. **Building more roads and better public transport system are not, by themselves, sustainable solutions.**

## Sharing the Singapore Experience: Controlling car ownership

- Singapore started in 1970 by imposing heavy upfront taxes and fees on car ownership to manage the demand for cars. **Additional Registration Fee (ARF)** which were based on a percentage of the **Open market Value (OMV)** of the car is to influence people to buy smaller cars but not against car ownership.
- In early 1990s, Singapore introduced the **Vehicle Quota System (VQS)**, which sets up to cap on the number of vehicles that can be added to the road each year, determined by a targeted vehicle growth rate of 3% in 1990s and gradually lowered to 1.5% in 2009 and below 1% in 2017. Under VQS, any one wants to register any motor vehicle must first obtain a **Certificate of Entitlement (COE)** which would last for ten years issued by the government through open online bidding with prices set at the lowest successful bid.
- The cost of the COE, together with upfront taxes and fees can bring the final car price to a few multiple of the OMV of the car thus making **car ownership a very expensive proposition in Singapore** which has helped to moderate car demand and in run mitigate congestion to some extend.
- However, the **restrictive car ownership measures are blunt instrument** to tackle traffic congestion as the latter is large due to care usage and not the mere possession of cars. Moreover, high car ownership costs may have the perverse effect of increasing car usage as evident by car usage in Singapore as the most intensively used amongst world's major cities, averaging a mileage of 21,000 km a year as compared to 9,100 km in London, 13,900 in Melbourne and 19,800 in Chicago.

## Sharing the Singapore Experience: Implementing vehicle management policies

- Imposing high car ownership taxes in an **indirect and practical way** to price out the negative externalities of private car use, however, **taxation would have to very severe to be effective and would be politically adverse**. Policy makers also recognized that **usage pricing** would be more efficient and effective in moderating car usage, hence the introduction of manual road pricing schemes since 1975 and the introduction of **Electronic Road Pricing (ERP)** since early 1990s as ERP coverage becomes more extensive.
- Thus the answer to implementing vehicle management policies lies in a **combination of factors** that include political stability, acceptability, evolving insight into economics, and motorist' behaviour and technical feasibility, which many administrators of cities found them too difficult to deal with, if not most at least some of these factors.
- On **behavioural economics of motorists**, it is easier to charge motorists a lump sum before they get into the car than charging them a small fee each time they get into ERP gantry, and hence if ERP is solely used to control traffic, it would have to be so high that would pose political problems.
- **Public opinions** and **equity** are important consideration too when applying economic principles hence the progressive nature of the car ownership taxes where ARP is expressed as a percentage of OMV of the care so that more expensive cars attract higher taxes, road tax rate per cc of engine capacity are higher for larger-capacity cars and COE bidding system also falls into different categories based on cc of car engine capacity.

## Sharing the Singapore Experience: Public transport and Regulations to safeguard commuters' Interests

- As a city-state, high reliance on is key to managing congestion and preserving a high quality of environment, hence the key objective of the government is to develop a efficient, reliable and affordable public transport system, which consist of the rail-based **Massive Rapid Transit (MRT)**., *Light Rapid Transit (LRT)*, **public buses** and **taxi**, and public transportation accounts for more than 50% of all daily commuter trips.
- To keep public transport affordable to the majority of commuters, a **hybrid model** where development of transport infrastructure such as train stations and bus interchangers are entirely funded by the government, while the public transport operators (where most are publicly listed) bear the operating and maintaining costs of trains and buses as well as investments in service improvements where revenues generated from the services provided must cover the operating costs in order to be financially viable in the longer-run.
- In Singapore, public transport operators are regulated by the **Land Transport Authority (LTA)** and **Public Transport Council (PTC)** which in an independent body with members from a cross-section of the society. Regulations covers service standards such as their coverage, frequency, reliability and comfort and fares for affordability through a price-cap formula linking cost-efficiency, productivity and competitiveness with international benchmarking.

# Better Rail Reliability



- Shorter Waiting Time
- Increase rail reliability

Mean Kilometre between Failure(MKBF)\*: Kilometres travelled by trains before experiencing a delay > 5 minutes

MRT

LRT

393,000km,  
10 times  
around the  
Earth's  
equator\*\*

65,000 Km,  
6 times  
from  
Singapore to  
London\*\*

Source: LTA Annual Report 2016-17

\*International benchmark to measure rail reliability

\*\*Before train experience downtime

# Smarter Systems to Predict Faults

## Automatic Track Inspection

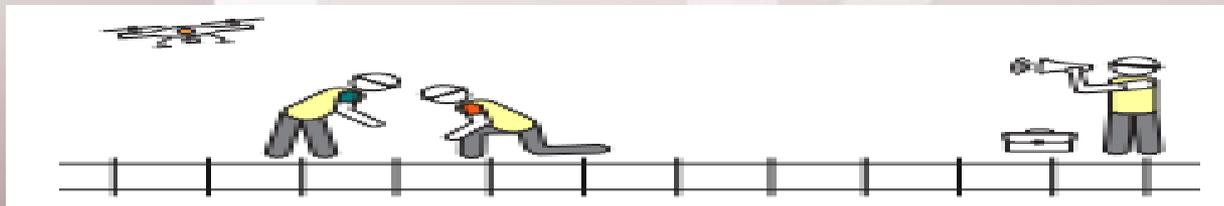
- To help predict and forecast faults making maintenance easier

## Drones

- Ariel Inspection of MRT tunnels
- Manual inspections by engineers are both time consuming and labour intensive

## Rail Enterprise Asset Management System(REAMS)

- Database of train line information to analyse trends and predict faults.



## Sharing the Singapore Experience: Introducing competition to BUS and MRT services

- Competition improves efficiency, keeps costs competitive and raise service standard. There are arguments not to duplicate services since public transport services tend to have elements of **natural monopoly** as economies of scale matters for minimizing unit costs. Seamless transfers between buses and MRT network are paramount.
- Singapore has opted to have two MRT operators and multiple bus operators to cover bus routes in different regions of the city-state where by multiple public transport operators are being **benchmarked as kind of proxy competition** and also to reduce **information asymmetry between the regulator and operators**.
- However, notwithstanding benchmarking for competition, deficiency remained. Since 2008, the government announced and introduced competition “**for the market**” where operators can be selected based on the costs, the quality of service they offer or both to bid for to operate an MRT line or packages of bus routes for a fixed period of time. Operators who failed to meet those requirements may risk losing their licences at the end of the fixed term thus introduced the concept of contestability, unlike competition “**in the market**” where different operator compete on the same routes simultaneously.
- High vehicle ownership and usage charges in Singapore are different ways of accounting for the social costs of congestion, and gradual shift is to be expected from the former to the latter. In the area of public transport, the **Singapore solution is a hybrid mix** of government funding of infrastructure and private provision of public services based on recovery of operating costs from the commuters. The latest transportation scene will see greater government involvement in <sup>11</sup>planning an integrated public transport system, along with more competition the public transport industry.

# Buses and Beyond



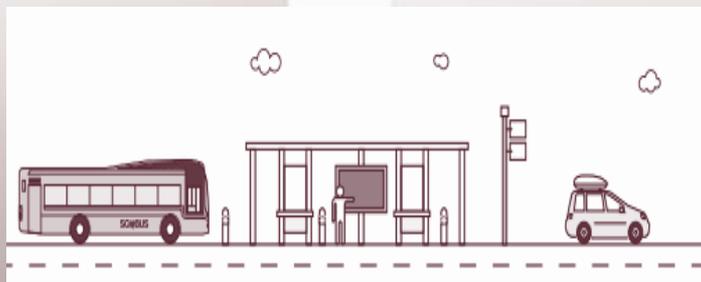
Source: LTA Annual Report 2016-17

- Better bus services:
  - 75% of bus services less crowded
  - 114 services improved with injection of 96 buses to increase service levels

# Using Big Data for Better Services

## Common Fleet Management System (CFMS)

- Allows real time tracking of bus fleets, traffic accidents and bus location and arrivals
- Boosts efficiency by allowing operators to make quick adjustments



## Fusion Analytics for Public Transport Emergency Response (FASTER)

- LTA is developing FASTER to enhance transport planning
- The system will help to improve responses to public transport incidents and special events.



# New-Age Buses



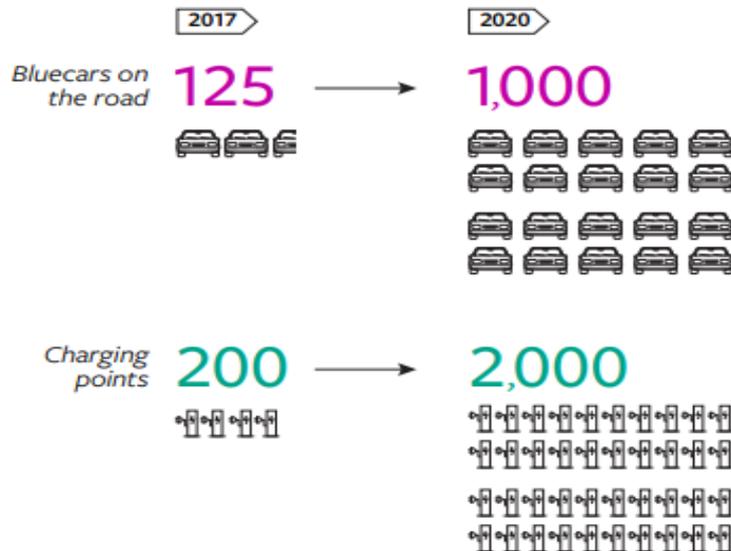
- **Autonomous Buses**
  - Driverless buses will soon be a reality in Singapore
  - Singapore has identified three new towns to ride driverless vehicles as part of their daily commute from 2022.
- **Hybrid and Electric Buses**
  - More environmentally friendly bus fleet. There will soon be three bus services fully served by electric buses.

Source: Strait Times, 2017. Available from <http://www.straitstimes.com/singapore/transport/centre-for-self-driving-vehicles-opens-in-jurong-west>, last accessed on March 06, 2018.

# Travel Smart



- **Electric Cars Sharing and Electric Taxis**
  - Drivers can pick up a car at the starting point and return it at their destinations
  - Operated by HDT Singapore, an all-electric taxi fleet, is part of an eight-year trial to test the viability of electric transportation in Singapore
- **Autonomous Vehicles**
  - Self-driving vehicles have been tested in various neighbourhood since 2015.
  - If the pilot is successful, commuters will one day be able to book a pod through their mobile phones, have it come to their doorstep, hop on, and be driven to nearby amenities and train stations in air-conditioned comfort!



# Transport Tragedies: Beijing, Jakarta Bangkok and Santiago

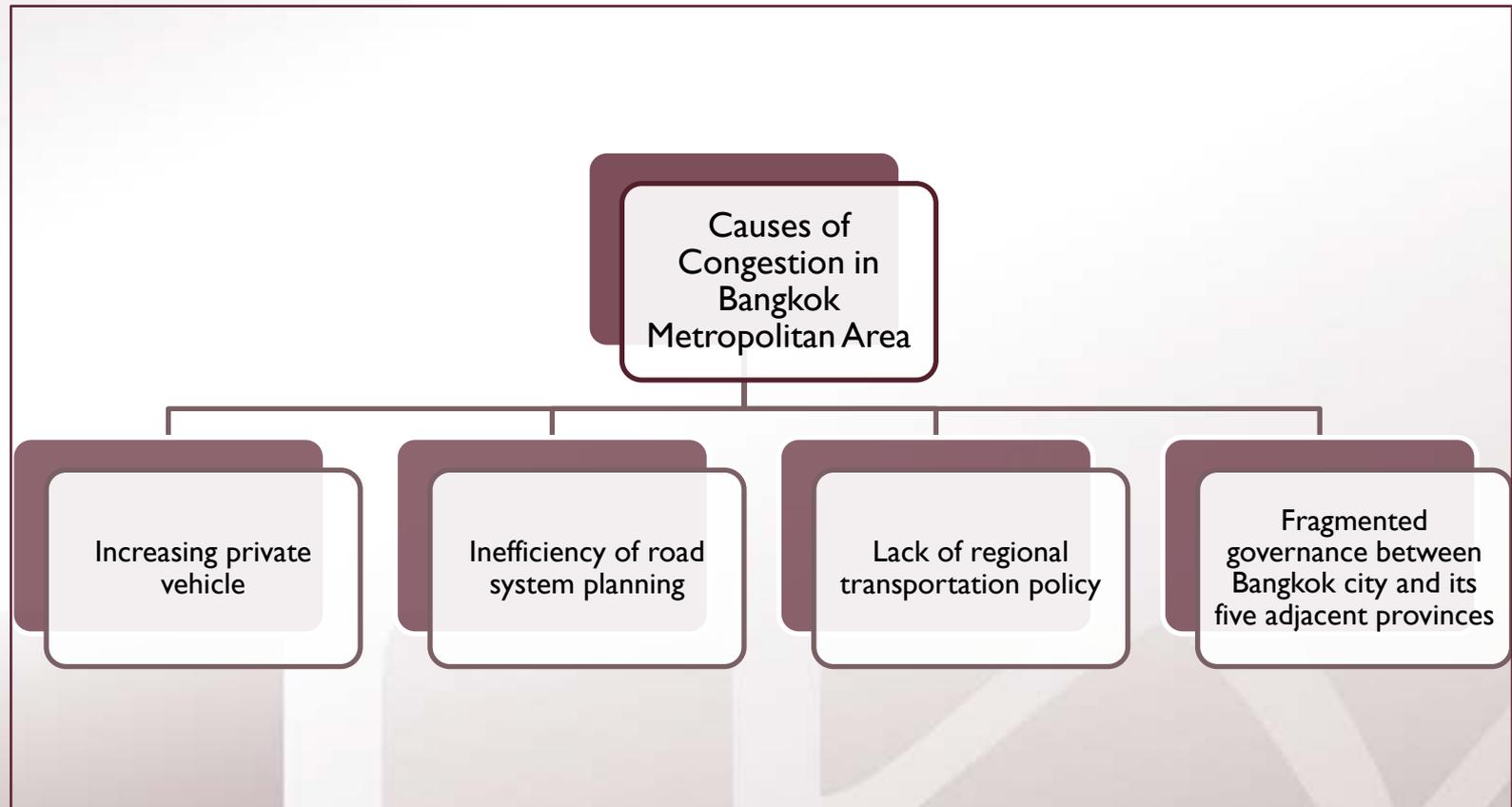


# Tom Tom Traffic Index

- The index provides unbiased information about congestion levels in urban areas worldwide.
- **BANGKOK**
  - Ranked as the **2<sup>nd</sup>** most congested city in the world with a congestion level\* of 61%.
  - Commuters spend **244hrs** of extra travel time per year due to congestion.
- **JAKARTA**
  - Ranked the **3<sup>rd</sup>** most congested city in the world with a congestion level of 58%.
  - Commuters spend **184hrs** of extra travel time per year due to congestion.
- **BEIJING**
  - Ranked the **10<sup>th</sup>** most congested city in the world with a congestion level of 46%.
  - Commuters spend **179hrs** of extra travel time per year due to congestion.
- **SANTIAGO**
  - Ranked the **17<sup>th</sup>** most congested city in the world with a congestion level of 43%.
  - Commuters spend **187hrs** of extra travel time per year due to congestion.

\*Tom Tom Index defines congestion level as the increase in overall travel time when compared to a free flow (uncongested) situation.

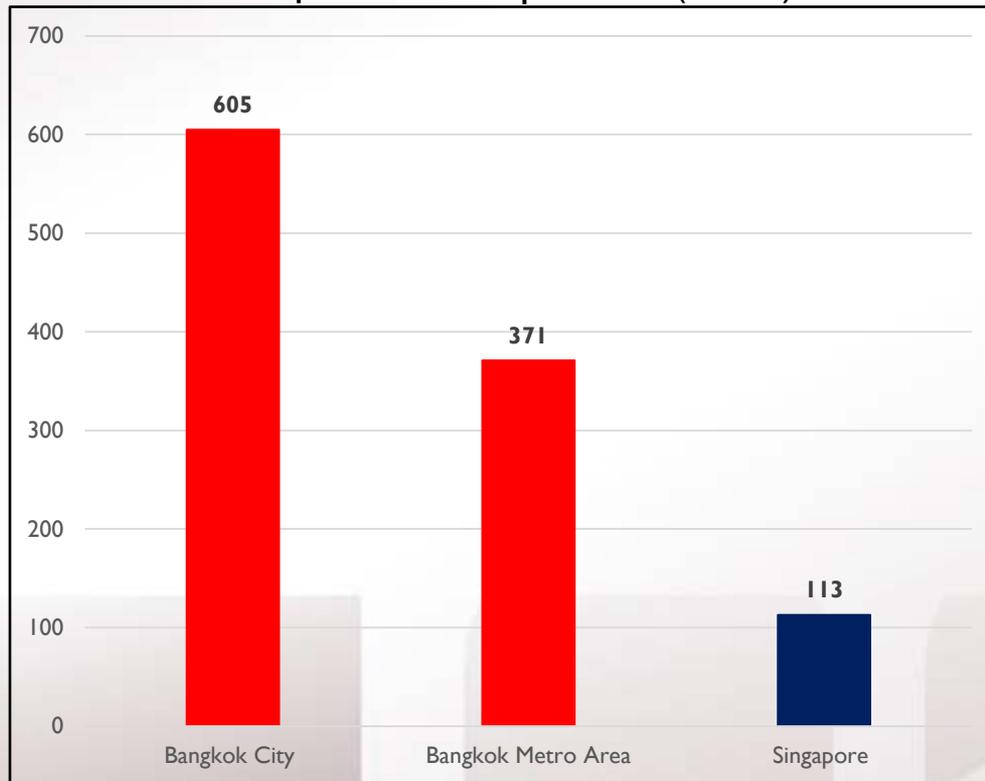
# Why is Bangkok congested?



Source: Phannisa N. 2015, available from [https://phannisan.files.wordpress.com/2016/05/phannisa\\_congestion-in-bangkok.pdf](https://phannisan.files.wordpress.com/2016/05/phannisa_congestion-in-bangkok.pdf).

# High Rate of Vehicle per Capita

Cars per 1000 Population (2014)

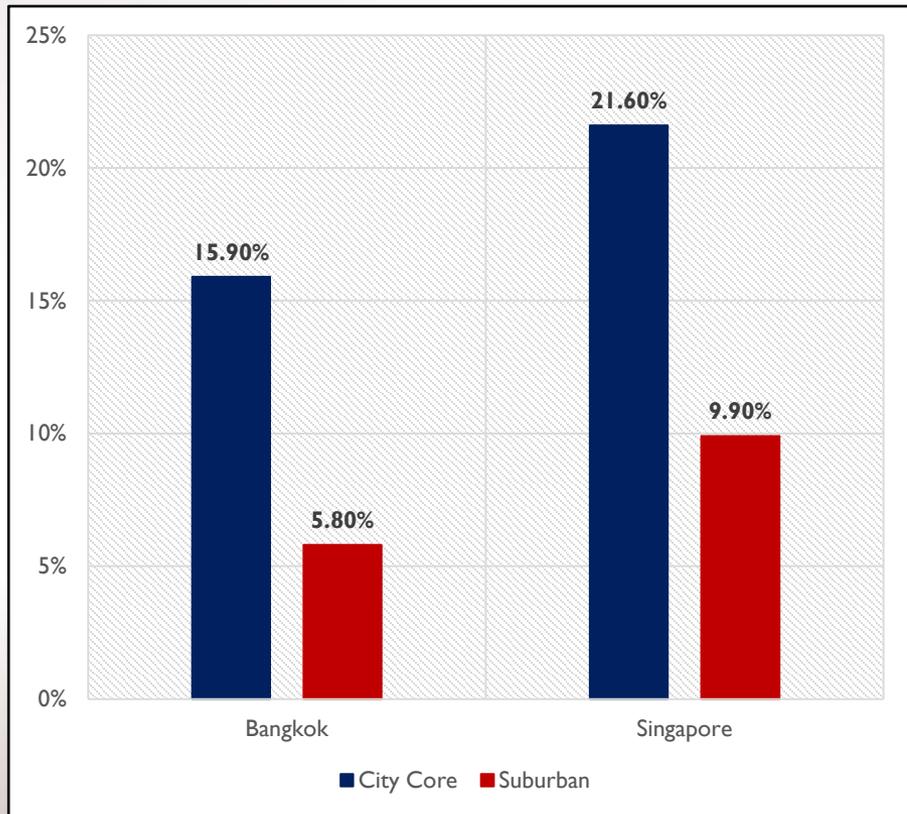


- **Bangkok City**
  - Cars per 1000 population was 665 as of 2014.
  - The number is 6 times higher than that for Singapore
- **Bangkok Metro Area**
  - Cars per 1000 population was 371 as of 2014.
  - It was 3 times higher than Singapore

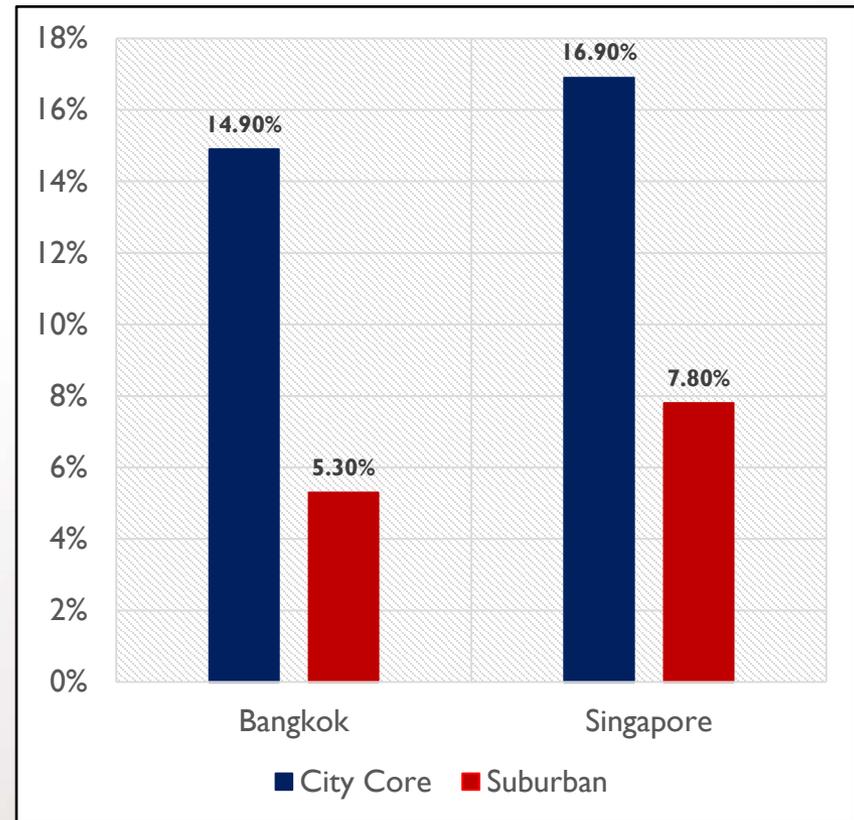
Source: Phannisa N. 2015, available from  
[https://phannisan.files.wordpress.com/2016/05/phannisa\\_congestion-in-bangkok.pdf](https://phannisan.files.wordpress.com/2016/05/phannisa_congestion-in-bangkok.pdf).

# Inefficiency of Road System Planning

Proportion of Land Allocated to Street (2013)



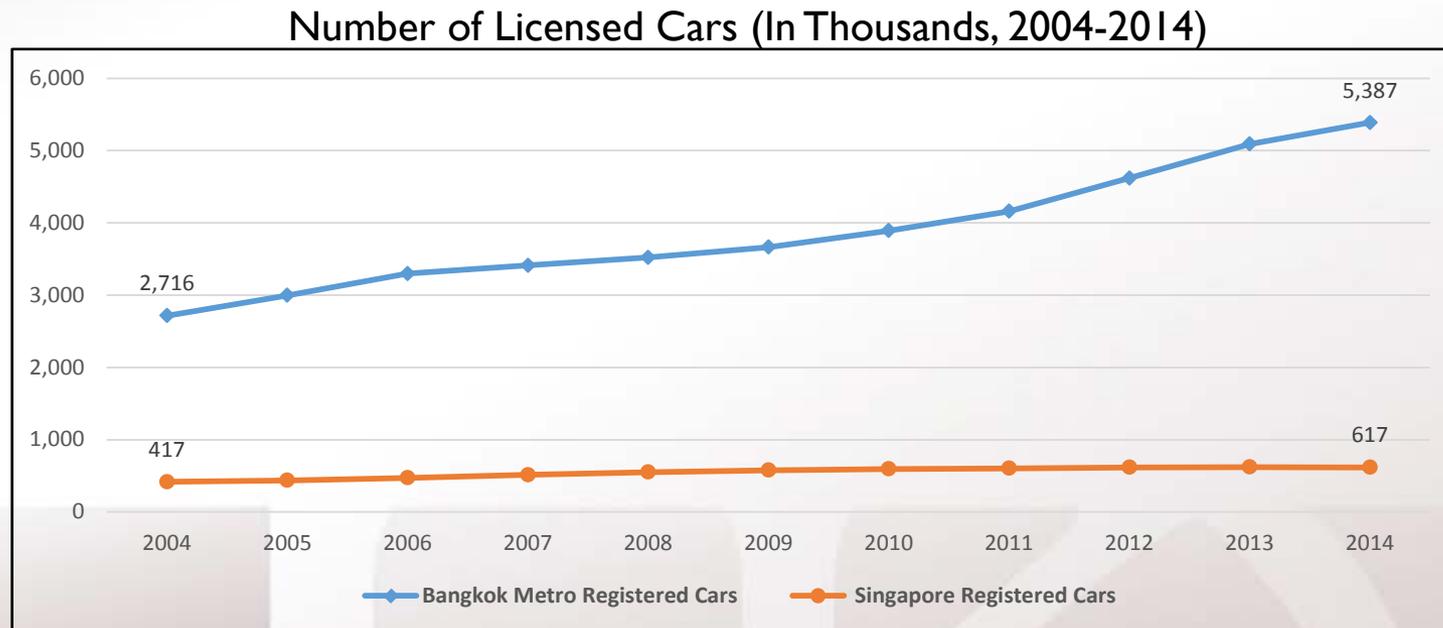
Composite Street Connectivity Index (2013)



Source: Phannisa N. 2015, available from [https://phannisan.files.wordpress.com/2016/05/phannisa\\_congestion-in-bangkok.pdf](https://phannisan.files.wordpress.com/2016/05/phannisa_congestion-in-bangkok.pdf).

# Lack of Regional Transportation Policy

- No effective transportation policy in place to curb increasing number of vehicles.



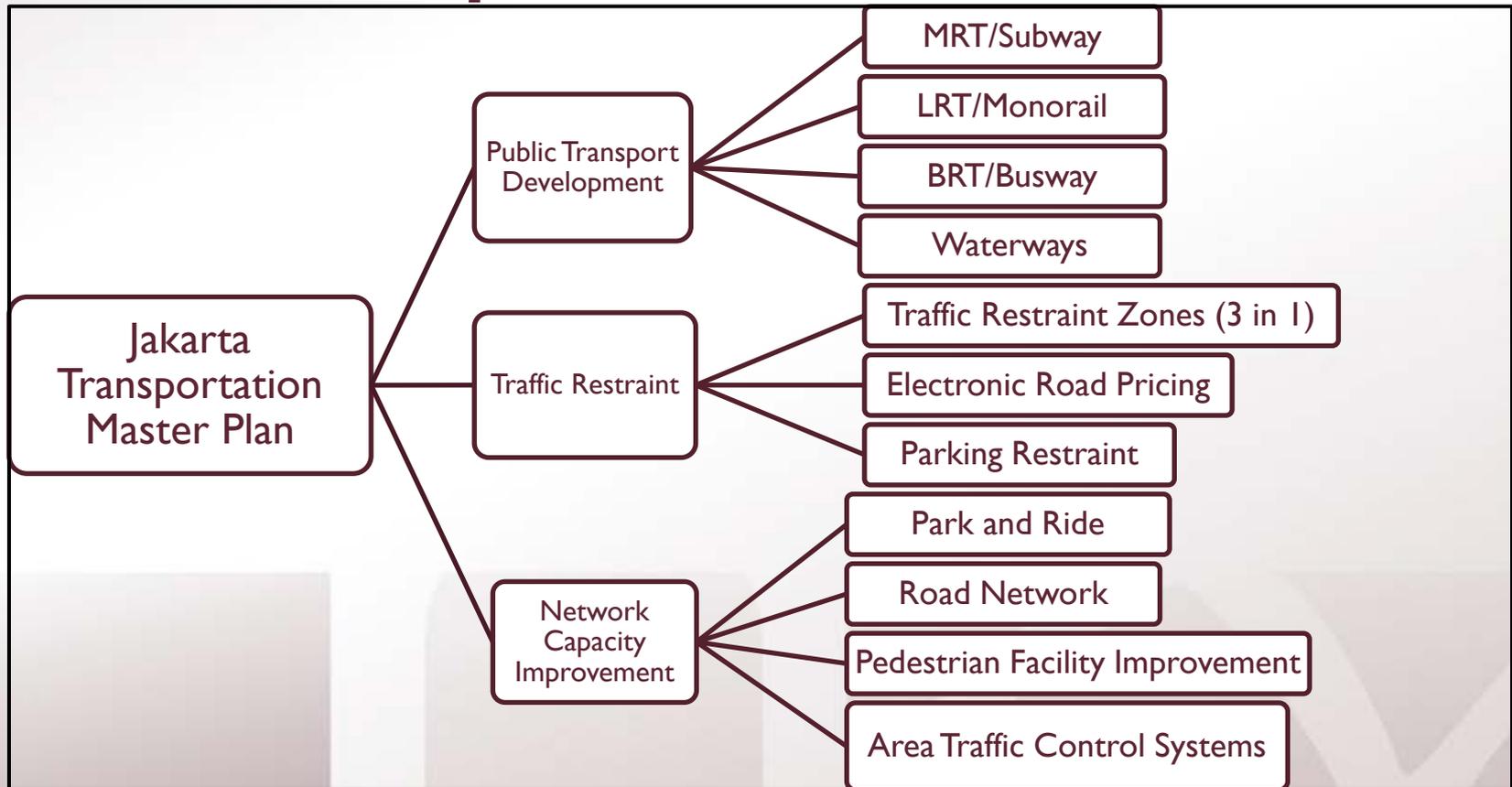
Source: Phannisa N. 2015, available from [https://phannisan.files.wordpress.com/2016/05/phannisa\\_congestion-in-bangkok.pdf](https://phannisan.files.wordpress.com/2016/05/phannisa_congestion-in-bangkok.pdf).

- The number of licensed cars in Bangkok increased by around 100 percent in over a decade from 2004 to 2014.

# Fragmented Governance

- Transport planning for the region is done by the National and Regional Planning Bureau, Department of Public Works and Town & Country Planning, Ministry of Interior. Office of Transportation and Traffic Policy and Planning, Ministry of Transport compiles strategic plans for transportation and transit systems.
- Lack of cooperation, authority and fragmented governance has caused conflicts over the rail system since 2011.
- Bangkok Metropolitan Authority (BMA) does not have authority over the metro areas outside of Bangkok, and the inter-governmental implementation processes are struggled between the BMA and the provincial authorities.
- Other conflicts include issues over extensions and fare charges.

# Three Strategies in Jakarta's Transportation Master Plan



Source: Jakarta Local Government. "Jakarta Urban Transport Problems and Their Environmental Impacts" Available from <https://www.ui.ac.id/download/apru-awi/jakarta-local-goverment.pdf>.

## References

- Tan et al (2009), “Economics in Public Policies: The Singapore Story, published by Marshall Cavendish Education
- LTA Annual Report 2016-17. “New Journeys.” Available from <https://www.lta.gov.sg/content/dam/ltaweb/corp/PublicationsResearch/files/AnnualReports/1617/LTA%20ANNUAL%20REPORT%202016-2017.pdf>, last accessed on March 03, 2018.
- Phannisa N. 2015. “Congestion in Bangkok And Lessons from London and Singapore” University of Wisconsin Madison, available from <https://phannisan.wordpress.com/2016/05/12/congestion-in-bangkok-lessons-from-london-and-singapore/>, last accessed on March 11, 2018.
- Jakarta Local Government.2014. “Jakarta Urban Transport Problems and Their Environmental Impacts ” Available from <https://www.ui.ac.id/download/apru-awi/jakarta-local-goverment.pdf>, last accessed on March 10, 2018.
- Strait Times, 2017. “Driverless bus rides for commuters at three new towns from 2022.” Available from <http://www.straitstimes.com/singapore/transport/centre-for-self-driving-vehicles-opens-in-jurong-west>, last accessed on March 06, 2018.