2. Where to start:

Understanding and improving the energy efficiency of transport services

Transport: Session 2

Jakarta, 17 July 2018

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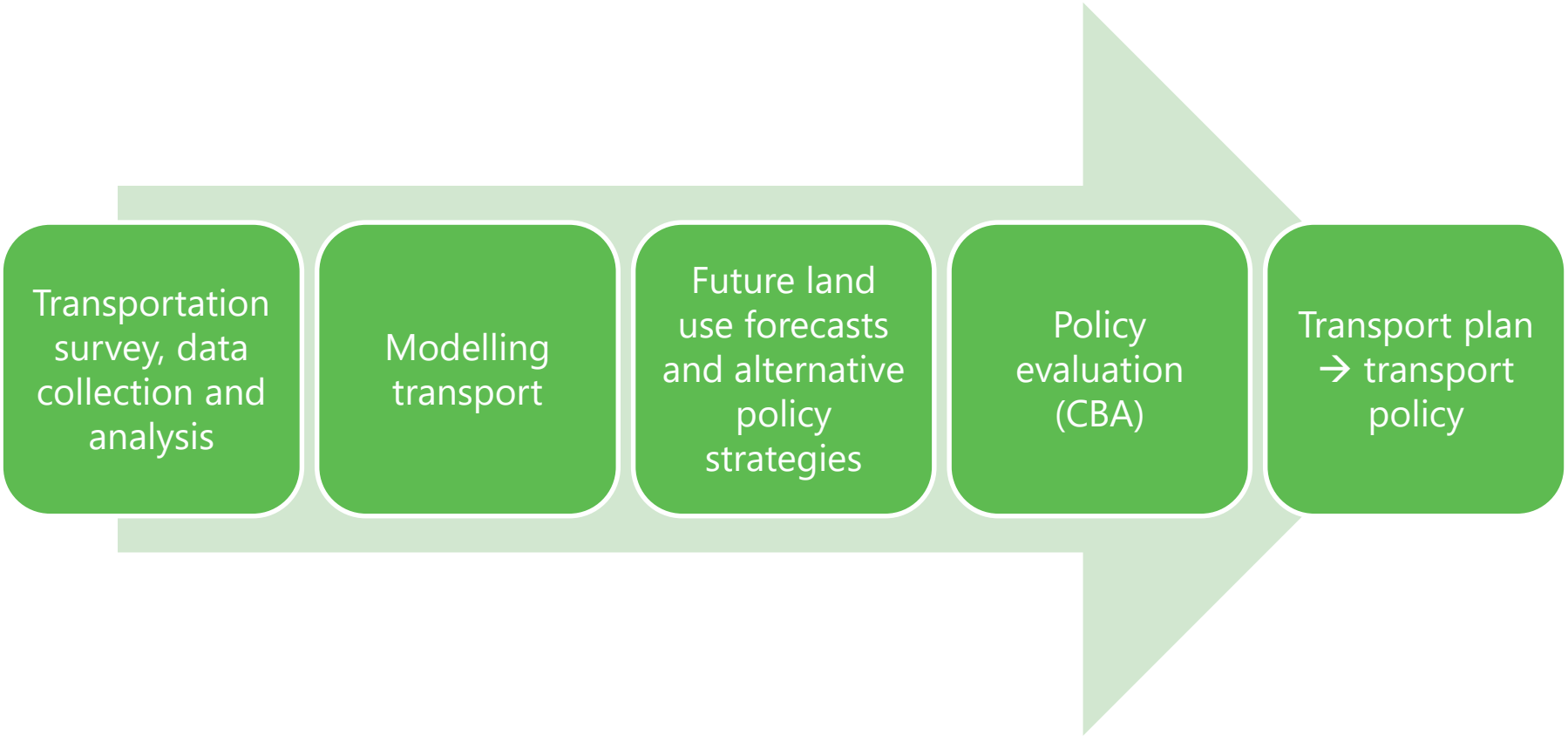
Overview

- The planning and policy making process
- Data to support policy and planning
- Policy options, including the ASIF model
- Policy evaluation
- Activity

Improving the energy efficiency of transport services

An overview of the planning process

Transport planning and policy making process



Calculating energy use in transport

- Data collection and modelling for evaluating transport energy efficiency indicators
- The ASIF approach for calculating transport energy use will be presented in session 3

Why calculate transport energy use?

Understanding characteristics of transport energy demand (and activity) across alternative transport modes is key to informed policy making

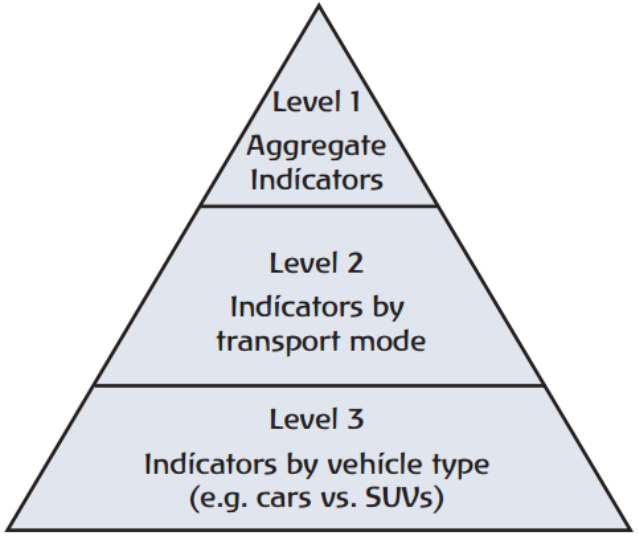
How much does the transport sector contribute to a country's energy demand?

Is freight transport more energy efficient by ship or by rail?

What are the implications from the trend to larger passenger cars for transport energy demand?

Using energy efficiency indicators for policy making

Figure 6.5 • Detailed indicators pyramid for passenger transport



How much does the transport sector contribute to a country's energy demand?

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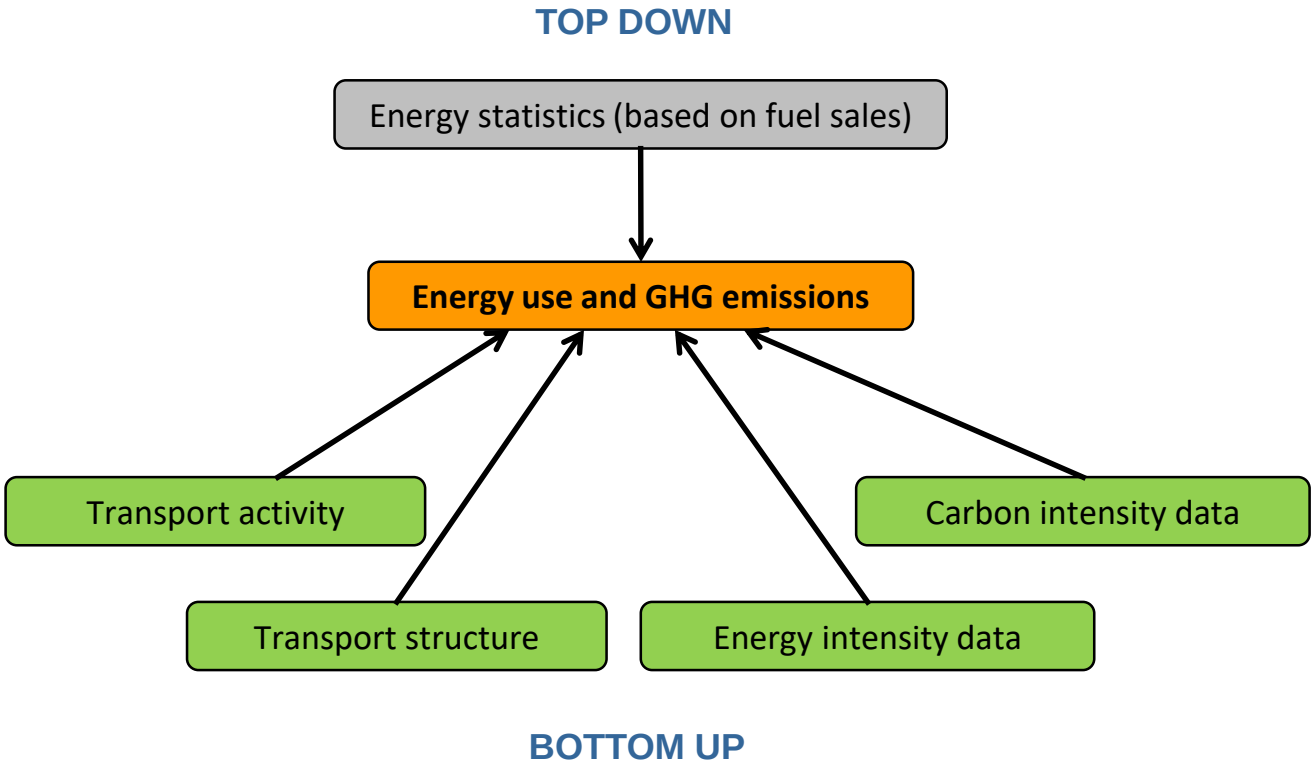
What are the implications from the trend to larger passenger cars for transport energy demand?

Using energy efficiency indicators faces a trade off between usefulness of information and data collection requirements

Transport modelling complements data collection



Transport modelling provides detailed insights of sector dynamics which can inform policy design

Understand the drivers and demands of energy use in transport

What factors drive trends over time for:

- Passenger activity demand (pkm)
- Shifts across modes
- Vehicle ownership
- Demand for freight (tkm)

In small groups, brainstorm the factors that drive transport energy demand globally

- *For passenger transport*
- *For freight transport*

Transport Demand Drivers

Transport activity (pkm, tkm), vehicle activity (vkm), and vehicle stock are largely determined by:

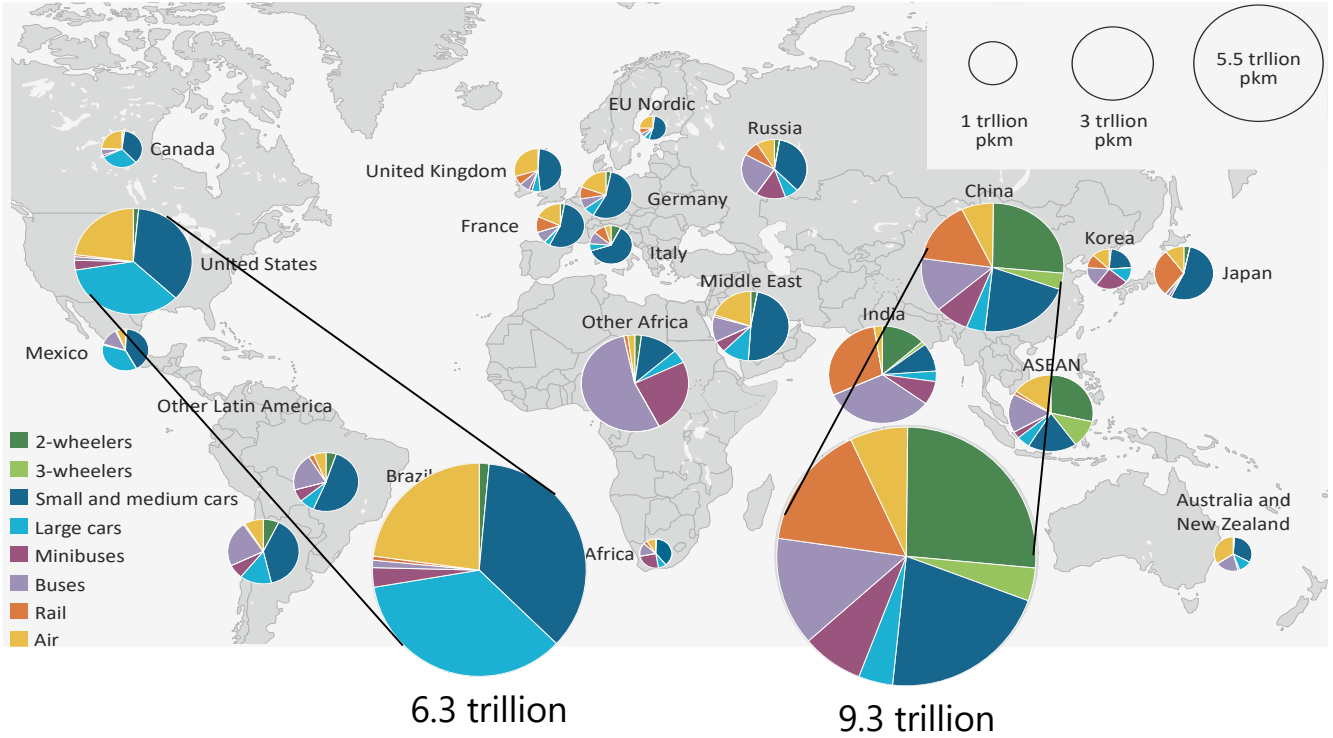
- GDP and population linked with transport activity and modal choice
  - GDP per capita ←→ personal vehicle ownership & modal choice
  - Economic output (GDP) ←→ tonnes transported

- The cost of driving and moving goods
  - ***Effects*** of price changes on average passenger travel and loads

- Structural elements in the transport system
  - ***Passenger***: role of public transport in urban areas
  - ***Freight***: economic and trade structures

- Transport demand/modal choices subject to a travel time budget (TTB) constraint

Transport Activity: Modal Choice



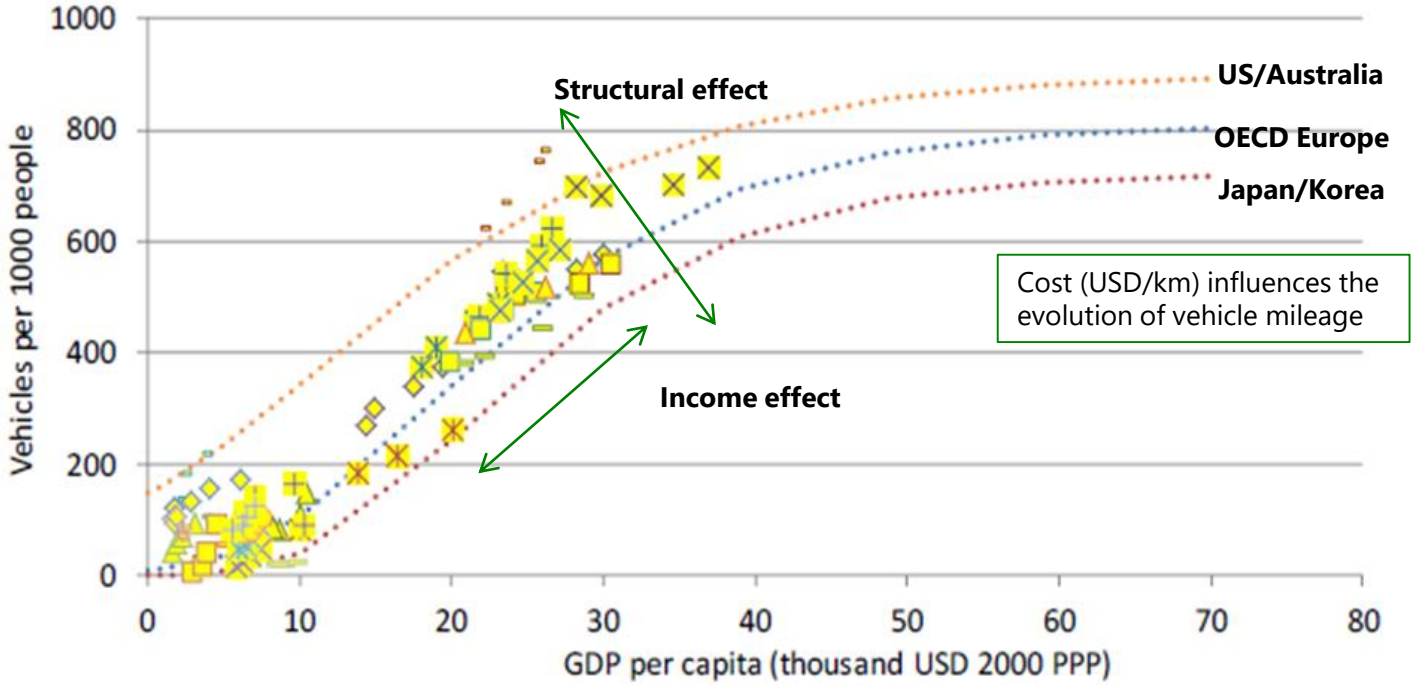
This map is without prejudice to the status of or sovereignty over any territory, to the delineation of international frontiers and boundaries, and to the name of any territory, city or area.

Source: Energy Technology Perspectives 2016

What (economic, geographic, political) characteristics drive the differences shown?

Transport Demand Drivers: Passenger vehicle ownership

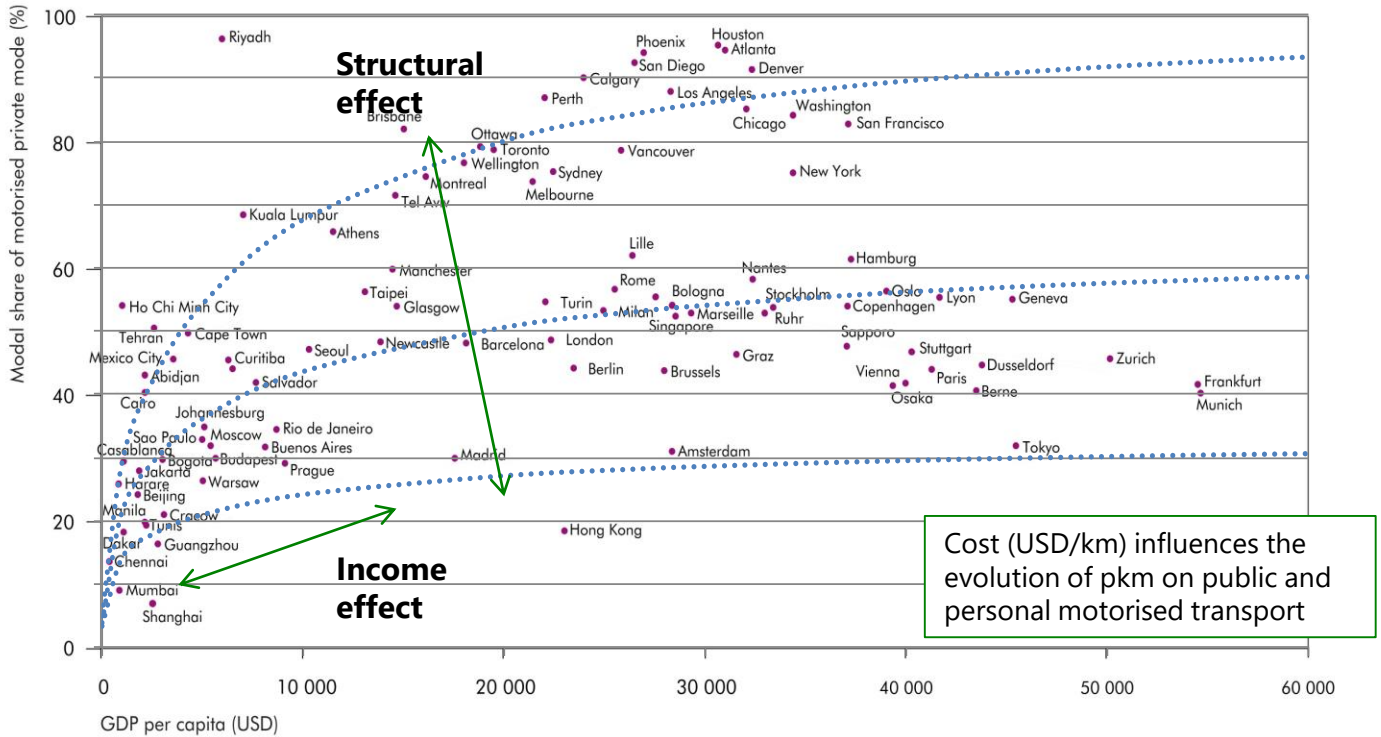
Motorised personal vehicles ownership and GDP



Sources: elaboration of national and international databases, building on the information referenced in UNECE, 2012

Transport Demand Drivers: Passenger vehicles modal choice

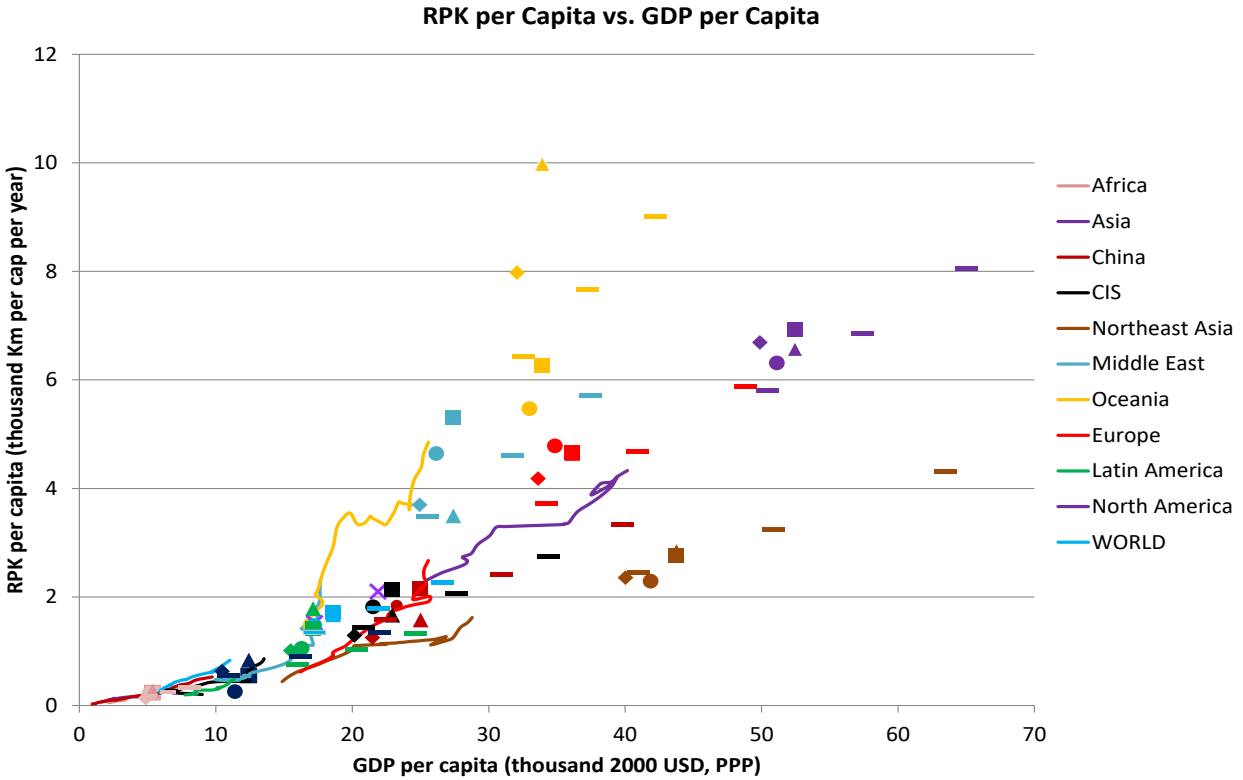
Modal share of personal vehicles in total personal and public transport



Source: elaboration of UITP, quoted by IEA, 2008

Transport Demand Drivers: Passenger aviation

Aviation: the fastest growing mode of passenger transport



Source: ETP 2017

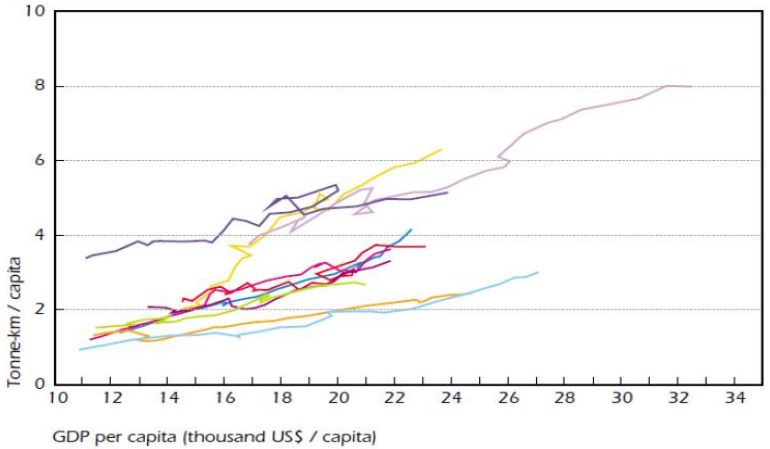
Transport Demand Drivers: Freight

Freight transport activity (tkm) proportional to GDP

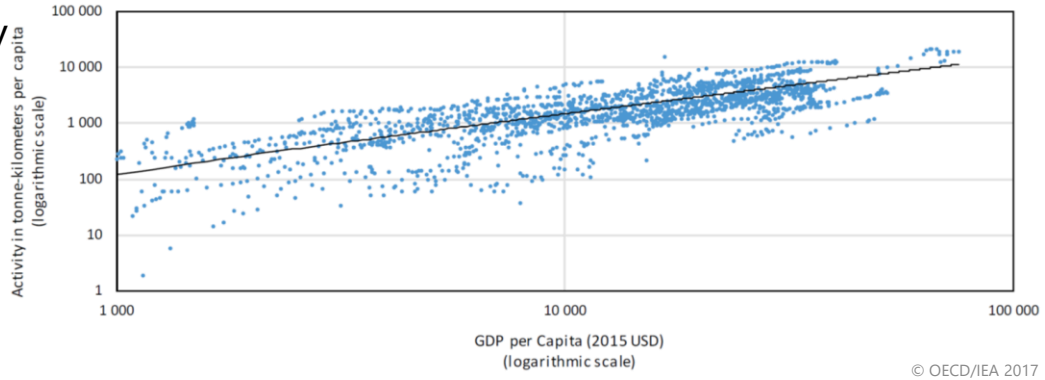
Driven by:

- the trade-related nature of the economy
(e.g. free trade vs. low imports and exports)
- the origin/destination of goods
(e.g. changes in destination of exports)
- the type of goods transported
(e.g. importance of manufacturing industry vs. primary material extraction and trade)
- Modal competitiveness
(e.g. availability of sea/water links)
- Cost of moving goods

Overall freight transport activity and GDP



Road freight transport activity and GDP



Transport Demand Drivers: Freight

Freight transport by mode

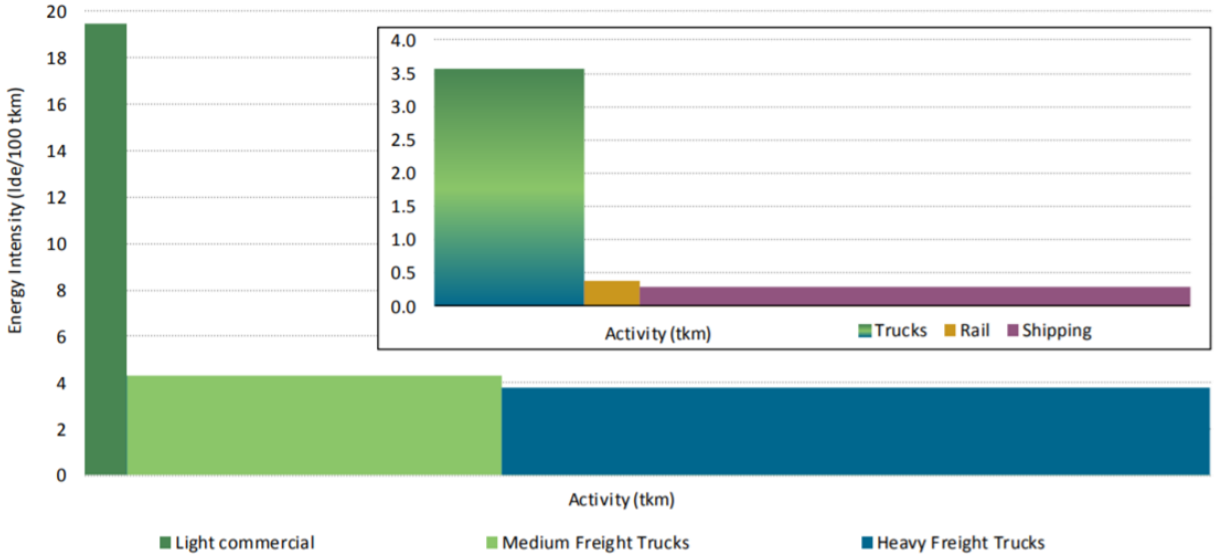
In terms of ***activity:***

- Shipping dominates over all other modes
- Rail is only highly used in a few countries

As a share of domestic land transport, rail constitutes a notable fraction in:

United States (33%)
China (35%)
Russia (58%)
India (32%)

(values derived from IEA Mobility Model)



Source: IEA Mobility Model, May 2018 version

The role of “Avoid-shift” policies for energy efficiency

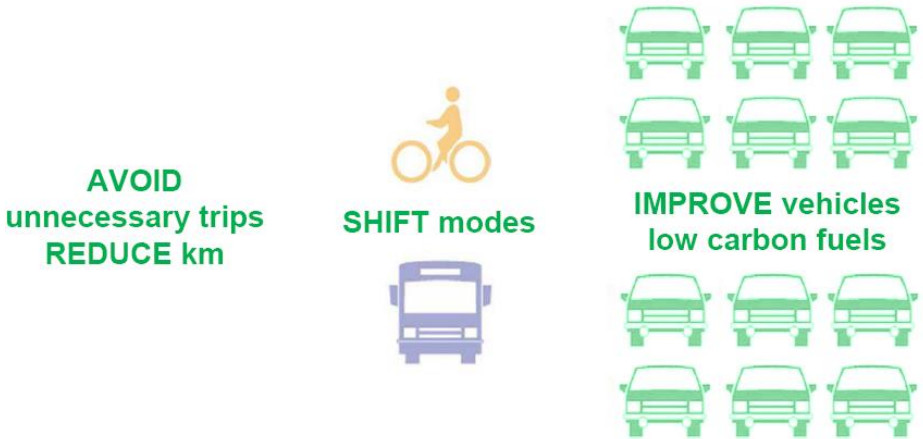
What avoid-shift policies have been tried in your country/city; what has worked, and what have been the barriers to success?

Supply or Demand problem?

Induced demand

"The great intellectual black hole in city planning, the one professional certainty that everyone thoughtful seems to acknowledge, yet almost no one is willing to act upon"

Jeff Speck (author of *Walkable City)*



Avoid unnecessary travel

- Urban design & transport integration in land use planning
  - Shorter trips in high density, mix-use cities
- Congestion pricing and other fees (e.g. parking): higher transport costs reduce total motorized travel
- Logistics: better use of available capacity reduces total vehicle mileage

https://www.itdp.org/what-we-do/eight-principles/

Shift travel to more efficient modes

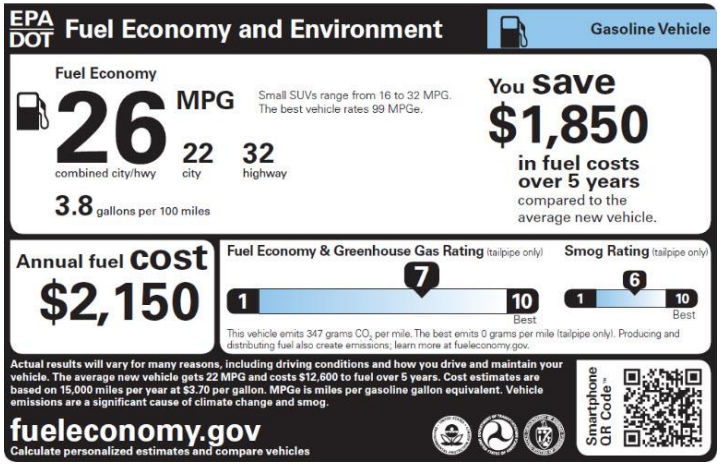
- Urban design & transport **integration in land use planning**
- Transit-oriented developments promoting walking, cycling, and the use of public transport
- Congestion pricing, access restrictions, parking fees targeting primarily more energy-intensive modes, combined with subsidies for public transport
- Travel demand management to avoid traffic peaks
- Logistics and intermodal terminals:
  wider potential for co-modal goods transport

Move Windhoek: http://www.sutp.org/en/projects/namibia-move-windhoek-sustainable-trban-transport.html

Transport & Energy Policies: Fundamental Concepts

Improve the energy efficiency of each mode

- **Standards/regulations** (e.g. on fuel economy, pollutant emissions, vehicle speed) and **fiscal charges/incentives** to promote the introduction of energy efficient and more sustainable technologies on vehicles in all modes (market pull)
- Support **research** to reduce the costs of advanced vehicle technologies (technology push)
- Support **behavioral changes** resulting in more efficient use of vehicles (high occupancy, energy efficient driving) and virtuous consumer choices to contain costs (e.g. smaller vehicles)



https://www.fueleconomy.gov/feg/Find.do?action=bt1

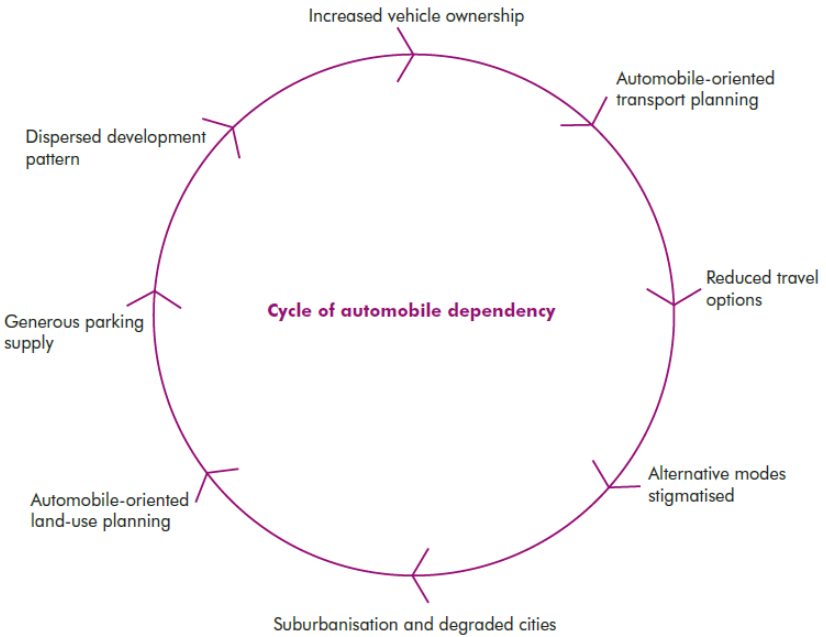
Transport and Energy Policies: Avoid/Shift

- Urban design & transport integration in land use planning
- Compact development policy
- Long-term goal but near-term planning



Transport and Energy Policies for Avoid/Shift

- Road/congestion pricing
- Environment zones
- Parking fees



- **Support measures**
  - IT infrastructure to coordinate existing public transport by increasing ridership and reducing empty running
  - Support for teleworking/distance-working

Transport and Energy Policies: Land use planning for avoid/shift

Example: Carbon footprints (residential emissions only) in different neighborhoods in Toronto, Canada

East York - 1.31 tCO2e/cap (residential only)

High-density apartment complexes within walking distance to a shopping center and public transit:
1,31 tCO2e/capita

Etobicoke - 6.62 tCO2e/cap (residential only)

High-density single family homes close to the city center and accessible by public transit:
6,62 tCO2e/capita

Whitby 13.02 tCO2e/cap (residential only)

Suburbs with large, low-density single family homes that are distant from commercial activity and public transit:
13,02 tCO2e/capita

Transport and Energy Policies: Shift to public transport and NMT

- Increasing the public transport capacity (BRT, MRT)
- Improving the quality of public transport
- Pricing policies targeting primarily more energy-intensive modes can be combined with subsidies for public transport
- Shift to non-motorized transport (walking and cycling)

Transport and Energy Policies: Summary

- High-density environments with good transit use less energy
- Building cities from scratch is not possible
- Fast-growing countries can (and need to) do that (leapfrogging)
- Time frame to alter urban design is very long: > 50 years
- Integrated measures needed for effective results
- Bigger effects to be seen over the long term
- Local regulations should not inhibit beneficial forms of teleworking

↳ In-depth action takes time but the investment is worth it!

Transport Policy Evaluation

- Did it work?
  - Evaluate efficiency: How well was money spend?
  - Evaluate effectiveness: Was the intended outcome reached?
  - Identify remaining priorities: What to do next?

- Session 3 for more detailed evaluation methodology.

Activity

Transport and Energy Policies

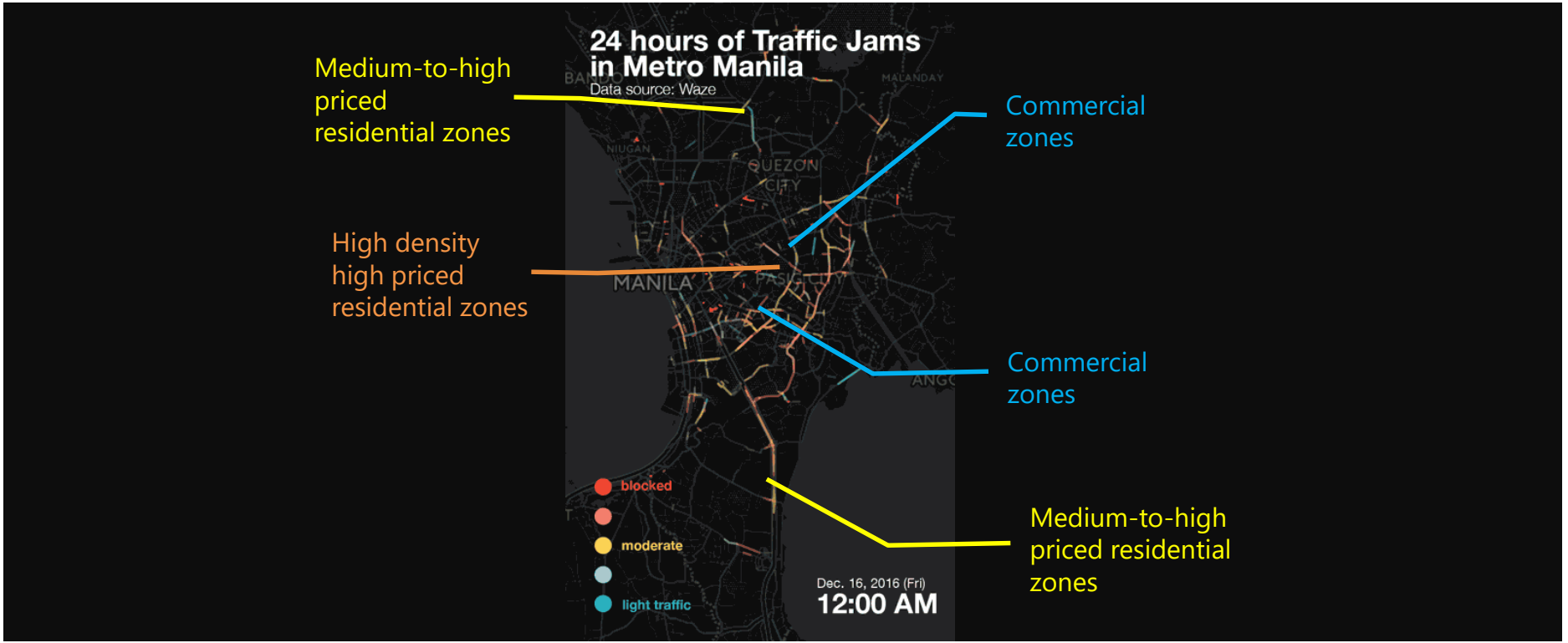
		Regulation	Monetary incentive	Information
National	Avoid			
	Shift			
	Improve			
Local level	Avoid			
	Shift			
	Improve			
Tried within your country	Avoid			
	Shift			
	Improve			

Transport and Energy Policies

		Regulation	Monetary incentive	Information
National	Avoid			Promotion of teleconferencing and provision of IT infrastructure to support
	Shift			
	Improve	Fuel efficiency standards Pollutant emission regulations	Tax incentives for purchase of efficient vehicles Fuel taxation/removal of subsidies	Car labelling based on fuel use or emissions Eco-driving campaigns
Local level	Avoid	Land use planning regulation Optimising logistics for freight		
	Shift	Subsidies for public transport	Congestion pricing Parking fees	
	Improve	Speed limits	Inclusion/exclusion from congestion charging	
Tried within your country	Avoid			
	Shift			
	Improve			

Examples of ASIF policies in Southeast Asia

Avoid/shift Examples: Land use planning



Lack of land-use planning can lead to regular traffic jams: Metro Manila (average of 66 minutes in traffic)

Avoid/shift Examples: Land use planning

Example of lack of planning

- Simple market based approach increased property values around the major lane (EDSA) increased
  - Virtually only large commercial buildings and expensive residential units can afford this real estate
  - Concentration of large commercial buildings led to heavier traffic around the area from people living at the outskirts (cannot afford prime residential units)

- Along with lack of investment in efficient public transport and growing purchasing power, private cars started to plug the road

Avoid/shift Examples: Land use planning

Kuala Lumpur embraces Transit-Oriented Development in its 2020 City Plan. Mixed-use planning to be done around stations to promote public transport

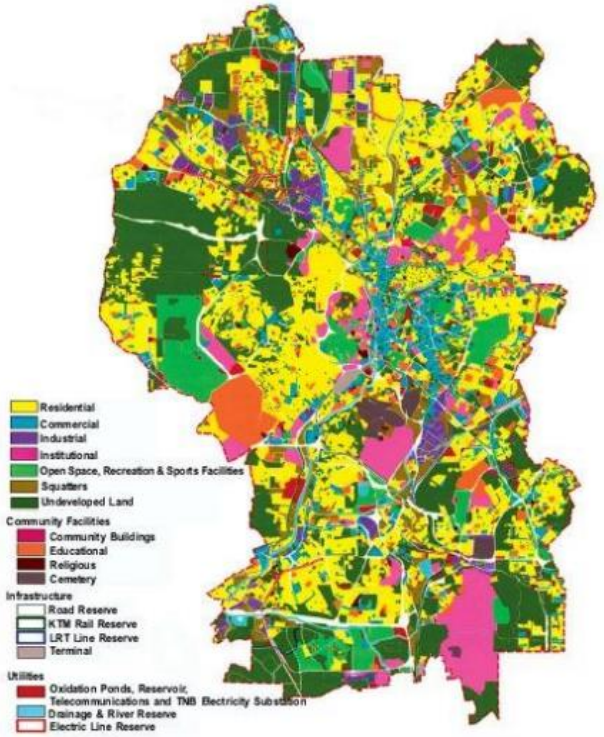
Source: http://www.mlit.go.jp/common/001059854.pdf, http://www.starproperty.my/index.php/articles/investment/booming-brickfields-and-bangsar/

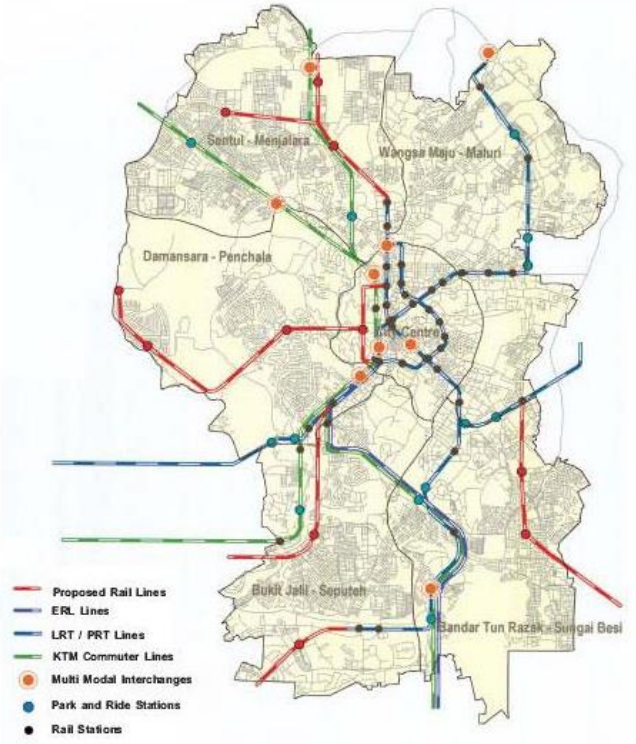
Avoid/shift Examples: Land use planning

Example of good planning (KL Sentral)

- 2008/2009: massive traffic jams in KL, currently 30% public transport 70% private-> goal set is 60% public to 40% private,
- **Park and ride schemes:** 30% developer discount on zones near train stations if they build parking areas to encourage Park and Ride
- **Direct planning requirements:** Zones must be placed between 200m to 400m of the train stations (similar to Singapore model)
- **Direct development guidlines:** Residential zones to build homes at 800 sq. ft. (~75sq. m), at USD 112 600
- More Transit-Oriented-Development Focus for Bandar: although recently there has been **no successful bids** so far

Transport and Energy Policies: Land use planning for avoid/shift

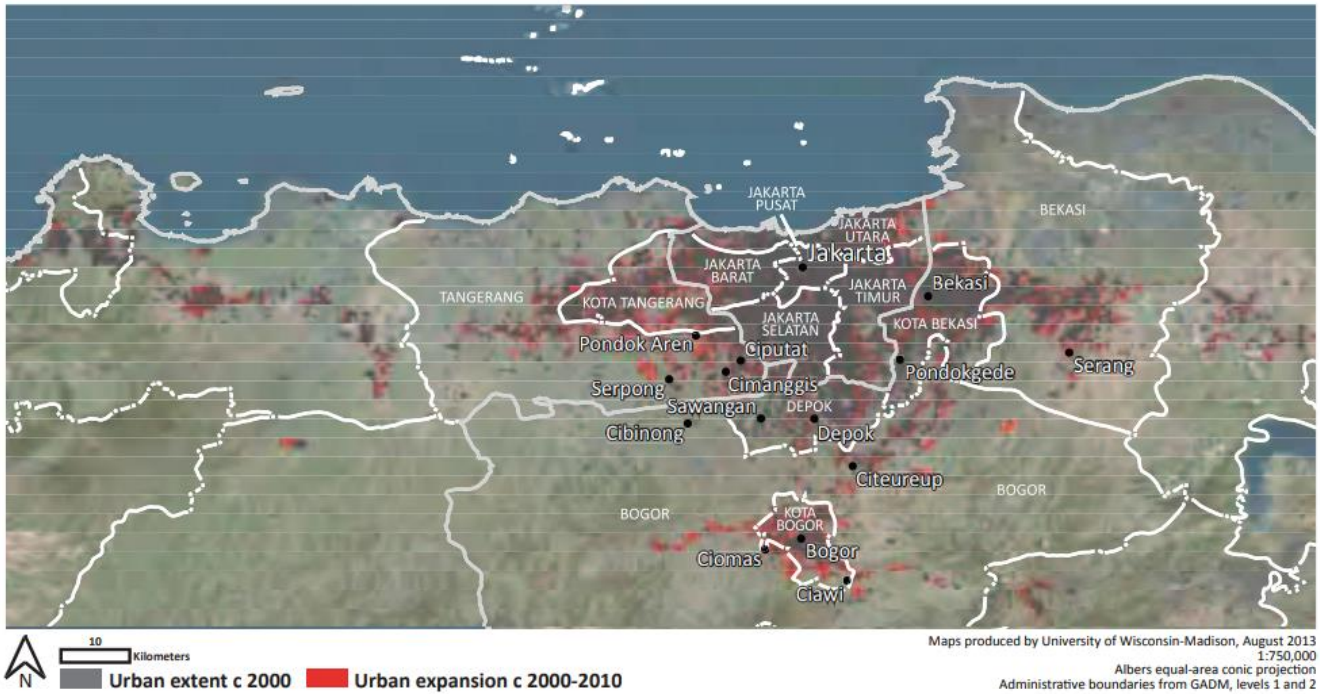




Kuala Lumpur embraces Transit-Oriented Development in its 2020 City Plan. Mixed-use planning to be done around stations to promote public transport.

Challenges of transport policies

Challenges of public transport planning - Jurisdiction

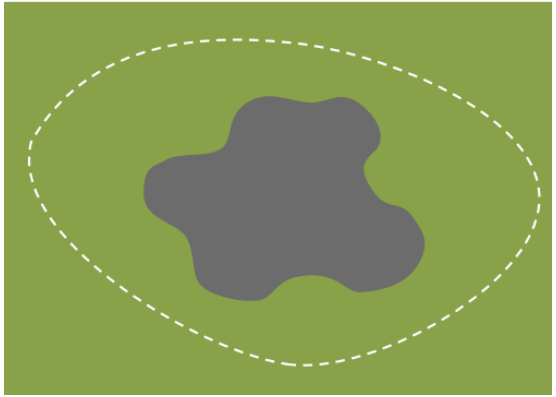


Note: In this map, only labeled areas are counted as part of the Jakarta urban area.

Jakarta's urban area covers 12 different jurisdictions, classified as a spillover urban area. Different jurisdiction setups lead to different challenges, as will be shown in the following slides.

Source: World Bank Report on East Asia's Urban Landscape, 2015

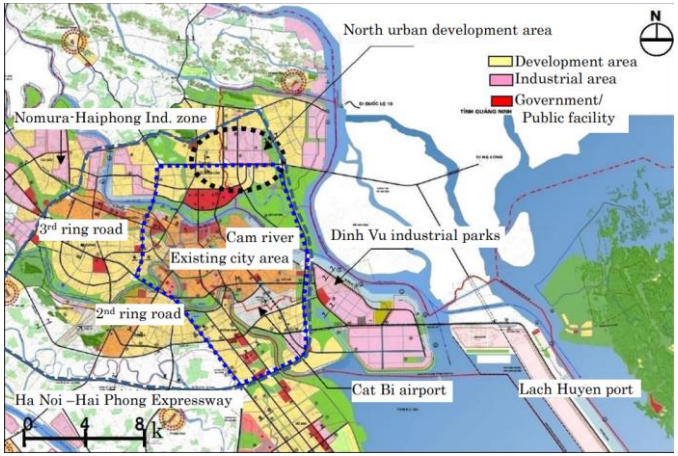
Challenges of public transport planning - Jurisdiction



Contained Urban Area
- Within one jurisdiction
- Contains both rural and urban areas

Challenges

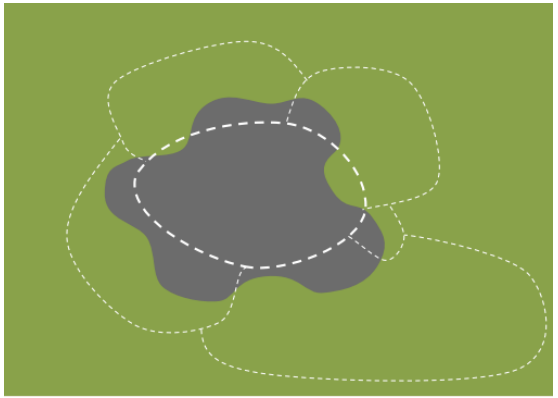
- Challenge of balancing urban and rural interests (more governance concern than a public transport concern)
- Since negative externalities like pollution are likely contained in one jurisdiction, there's a stronger incentive for action



Example: Hai Phong, Vietnam
- Relatively recent city, established 1888
- 2.2 million inhabitants
- Public transport decisions taken by the city government

Source: World Bank Report on East Asia's Urban Landscape, 2015

Challenges of public transport planning - Jurisdiction



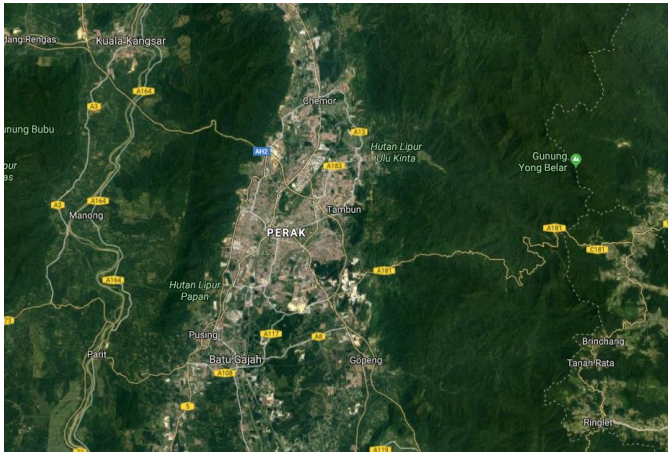
Spillover Urban Area

- Main "city center" spills out of the surrounding jurisdiction
- Main urban region acts as a single entity with regard to its economy and transport patterns

Challenges

- Decision making of the city center curtailed when it extends to the peri-urban areas
  - Ex: Difficulty of deciding who to pay for a bus terminal in a peri-urban area to connect with the metro lines of the main urban agglomeration

- Negative externalities generated by central city can affect peri-urban areas which may not have enough resources to curtail them

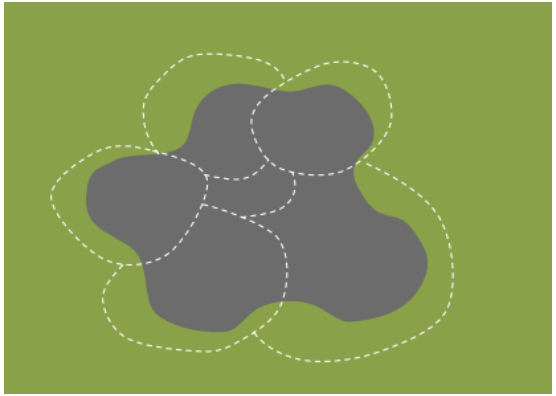


Example: Ipoh, Perak, Malaysia

- Third largest city by population in Malaysia
- Dominated by bus transport
- Designated bus routes can often run empty (not optimized)
- Railways only to serve the regional transit

Source: World Bank Report on East Asia's Urban Landscape, 2015

Challenges of public transport planning - Jurisdiction

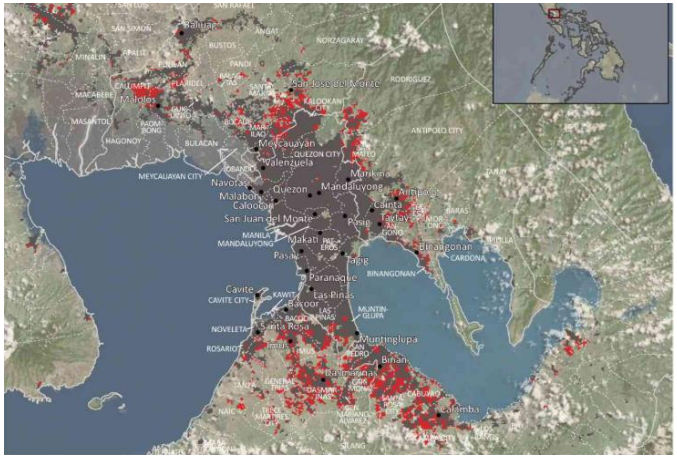


Fragmented Urban Area

- Urban areas from different neighbouring jurisdictions agglomerate
- Too large to be administered as a single entity
- There's no distinct city center

Challenges

- Most difficult, as possible competition between the jurisdiction can lead to underinvestment
- Uncoordinated planning leading to suboptimal results (e.g. underused terminals built for political benefit)
- Consensus exists in curtailing issues like pollution, but may suffer difficulty in implementation
- Higher levels of government may be necessary (state or province), or establishment of metropolitan development authorities



Example: Metro Manila, Philippines

- Agglomeration of 16 cities
- 24 million inhabitants
- 3 existing lines of light rail transit, dominated mostly by bus transport
- Frequently experiences severe traffic

Source: World Bank Report on East Asia's Urban Landscape, 2015

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