Energy Technology Perspectives 2016

IEA Mobility Model

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ITF workshop

Decarbonising urban transport

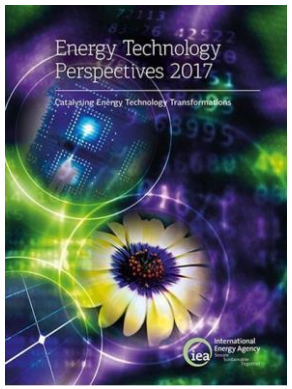
Paris, 19 April 2018

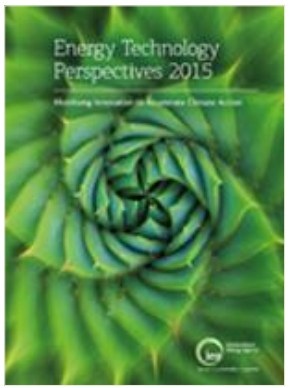
International Energy Agency
Secure Sustainable Together

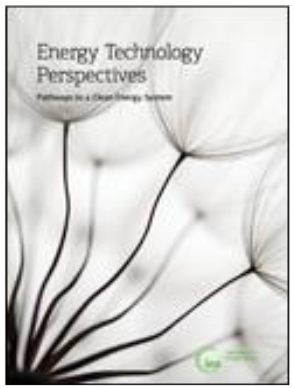
Energy Technology Perspectives series

ETP 2016

- Published since 2006 in several editions
- Analyzing economy-wide energy and GHG emissions
- ETP 2016:
  - focus on urban energy systems
  - addition of urban analysis capability in the Mobility Model
- ETP 2017:
  - Beyond 2 Degree Scenario (B2DS): net-0 GHG emissions by 2060







ETP Urban analysis

ETP 2016

Focus on sustainable urban energy systems

- Policy objectives: environmental sustainability, energy security, and economic development
- Analysis of how local and national energy policies can be more effectively aligned

Transport chapter

- Estimate of global transportation activity, energy demand and GHG emissions in urban areas
- Projections under the different ETP model scenarios
- Analysis of the sustainable energy technology options, looking primarily at urban transportation
- Identification of policy solutions

ETP Urban analysis

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- Total transport energy demand, 2015:
  - 107 EJ
  - 40% in urban areas
- Passenger, urban:
  - 1: cars
  - 2: 2-3 wheelers (emerging economies)
- Freight, urban:
  - 1% of urban activity (trucks)
  - But 20% of urban energy use (higher energy and GHG intensity of road freight, especially in the urban environment)

GHG emissions
Mostly from cars (also urban), trucks and air

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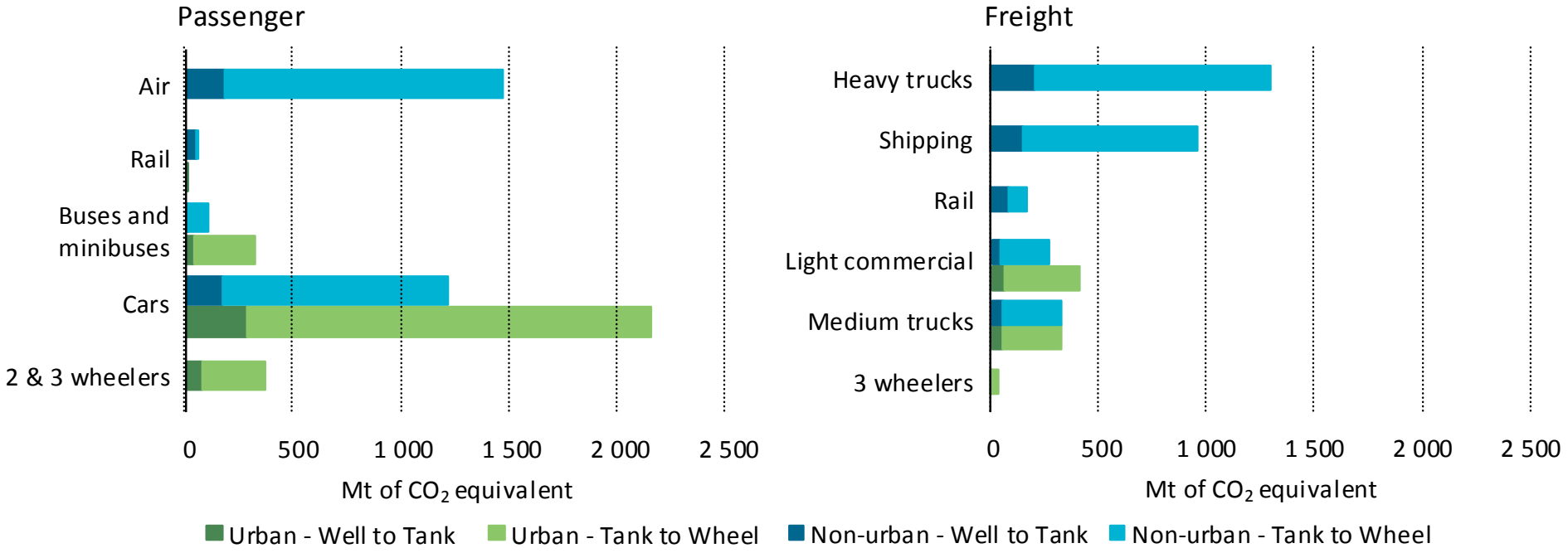

2015 total estimate (well to wheel): 9.5 Gt of CO_2 equivalent

- Transport is the least diversified energy demand sector
- Oil products: more than 90% of the energy consumed
- GHG emission distribution mirrors closely energy demand

Need to decouple activity & emissions
Avoid/shift, efficiency, low carbon fuels

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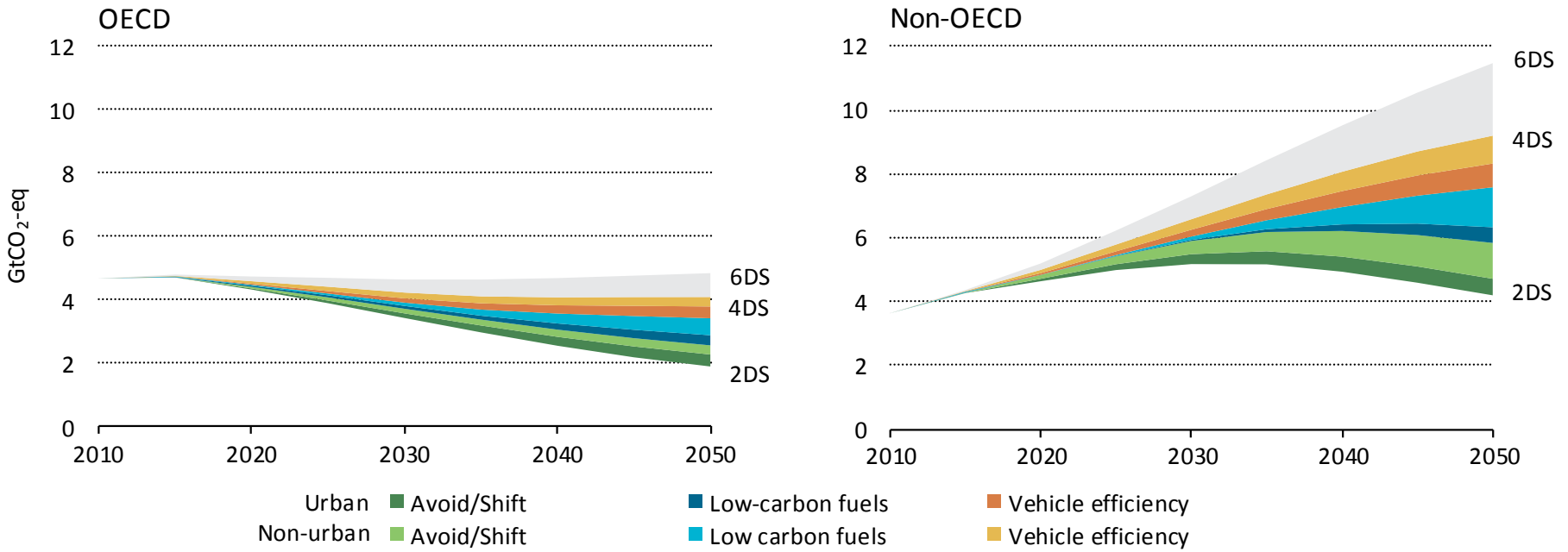
Urban transport activity, 2DS, 2050: passenger +70%, freight + 40%

➢ Need to decouple activity and emissions



OECD transport emissions have peaked

Non-OECD transport emissions can be brought back to current levels in 2050

Technologies

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Technologies capable of delivering the changes required by the 2DS scenario can be categorized as follows:

- Technologies allowing to manage travel demand (avoiding travel needs and shifting mobility to the most efficient modes) - closely linked to the deployment of information and communication technologies (ICT)
- Technologies improving the energy efficiency of vehicles
- Technologies reducing the carbon intensity of fuels

- MaaS and Autonomous, Connected and Shared vehicles:
  - Effect on urban mobility?

Focus on vehicle technologies
Cars and LCVs

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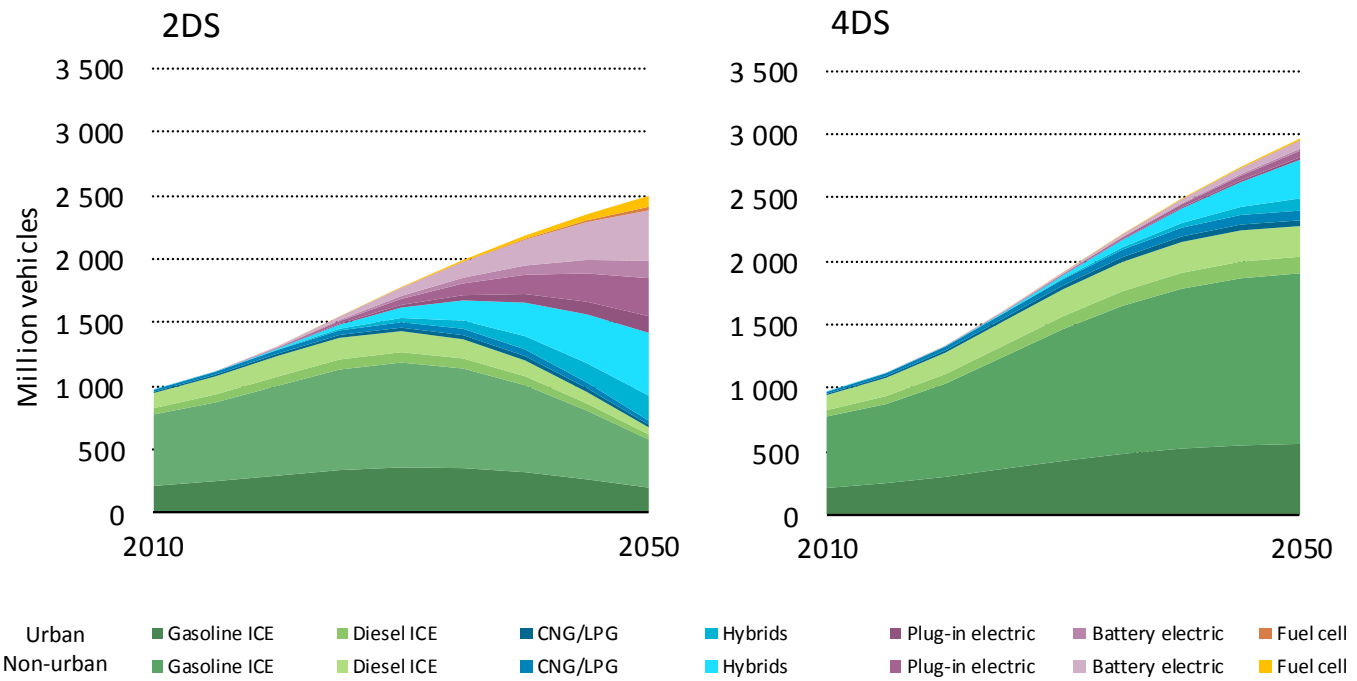

- 2DS sees large penetration of electric vehicles on the market
- Policies limit LDVs below 2.5 billion in 2050 in 2DS
  - (Update ETP 2017, B2DS: 1.9 billion)
- Electric cars nearly 10% of LDVs stock by 2030, 40% by 2050.
  - (Update ETP 2017, B2DS: 70% by 2050)
- Leading markets are in OECD and China

Rationale for the policy portfolio

Drivers of modal choices in cities

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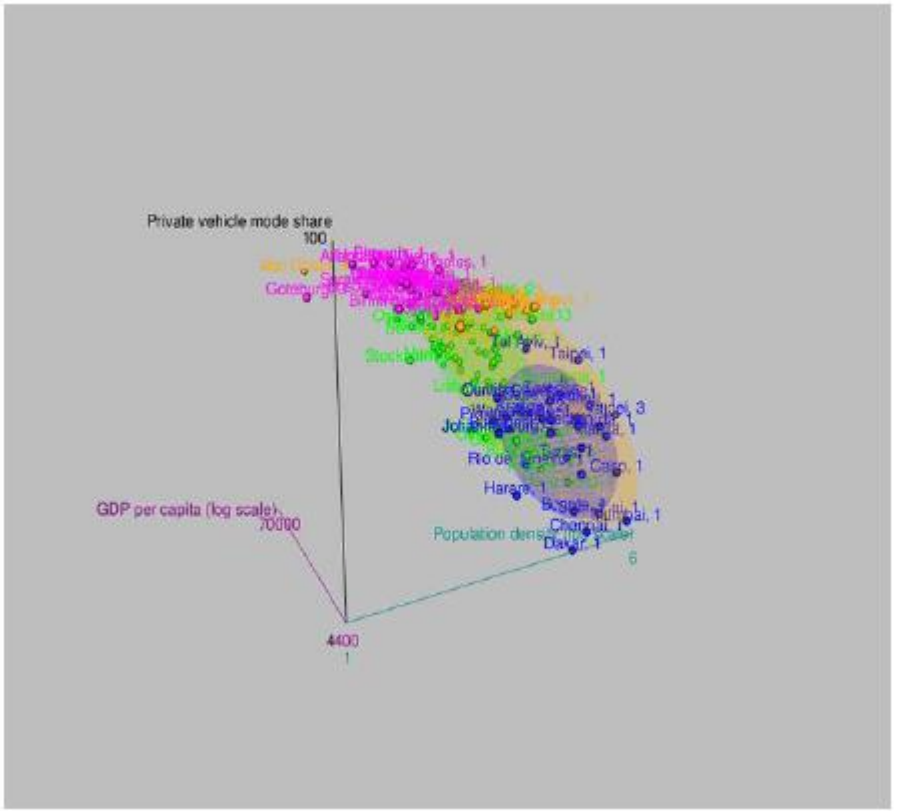
- Income growth tends to be coupled with growing shares of pkm on cars
- Public transport shares in high income countries are clustered in different groups
- Fuel taxation and vehicle taxation, as well as local polices, influence the results
- Urban density emerges as a key prerequisite to provide mobility options alternative to cars and make sure that public transport maintains relevant shares



Transport Demand Drivers - Passenger

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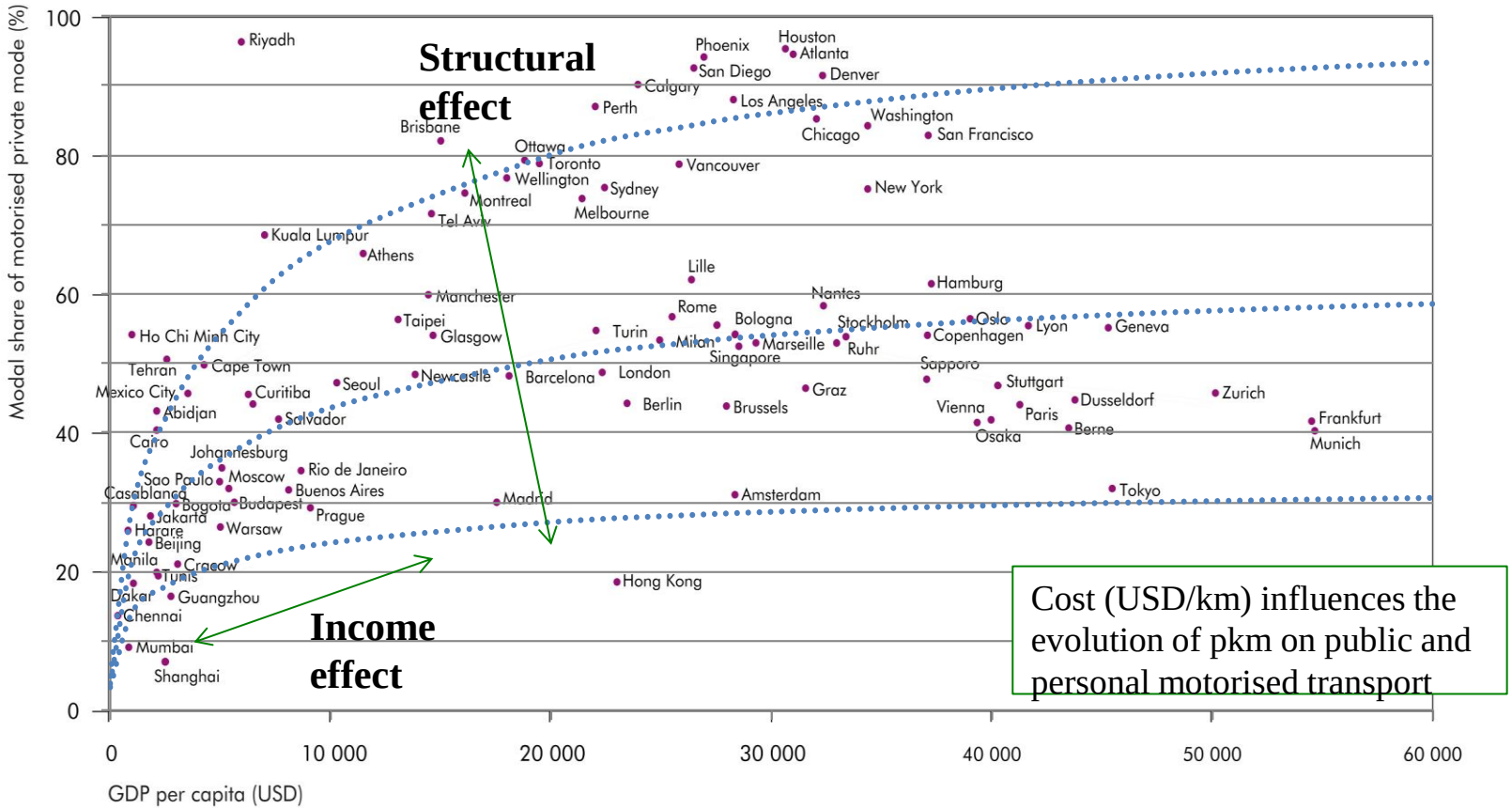
- Modal share of personal vehicles in total personal and public transport



Source: elaboration of UITP, quoted by IEA, 2008

Policy recommendations
Use a coherent portfolio of instruments

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National/Supra-national policies

- Fuel taxes
- Removal of fuel subsidies
- Introduction of CO_2 taxation on fuels
- Fuel economy standards
- Vehicle taxes, including feebates/bonus-malus schemes
- RD&D support

Local measures

- Compact city (e.g. densification, integrating land use and transport planning, promotion of brownfield development and TOD)
- Pricing (congestion charges, tolls parking fees)
- Regulatory (access & parking restrictions, low emission zones)
- Public transport investments (e.g. network development, subsidies

Policy portfolio

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Scope	Policy category	Impact		
		Avoid/Shift	Vehicle efficiency	Low carbon fuels
Local	Pricing (congestion charges, tolls parking fees)		Possible	
	Regulatory (access & parking restrictions, low emission zones)		Possible	Minor
	Public transport investments		Possible	
	Compact city			
National	Fuel taxation			Possible
	Fuel economy regulations			Possible
	Vehicle taxation, feebates	Possible		Possible
	Low carbon fuel standards			
	Alternative fuel mandates			
	RD&D support			

Local policies
Examples of measures already in use

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Pricing	Regulatory instruments	Public transport and walking and cycling support
Congestion charging, cordon pricing, tolls (e.g. London, Milan, Singapore, Stockholm).	Access restrictions (e.g. "yellow label" restrictions in Chinese cities).	Shared bicycle systems and bicycle parking (e.g. *Vélib'* in Paris, Citi Bike in New York).
Parking pricing (widespread in North American, European and Japanese cities, most prevalent in the central business districts of densely populated cities).	Low-emission zones (e.g. time-of-day restricted access for freight trucks, as in many European cities).	Investments in cycling and walking paths, and sidewalks.
	Registration caps (e.g. in Singapore, Shanghai and other Chinese cities).	Transit infrastructure projects/ extensions (e.g. the Paris *Métro*; Bogotá's *Transmilenio*).
	Parking restrictions/reductions in parking supply (e.g. progressive elimination of off-street parking in Copenhagen, Paris and other European cities).	Transit fare subsidies (e.g. local, regional and federal subsidies pay for roughly half of fares on systems in many European and Chinese cities).

- Front runners exist amongst cities
- Effects observed in these cities were instrumental to assess the impact of these policies and generalize it in our projections

Sustainable transport systems: a cheaper way to provide service

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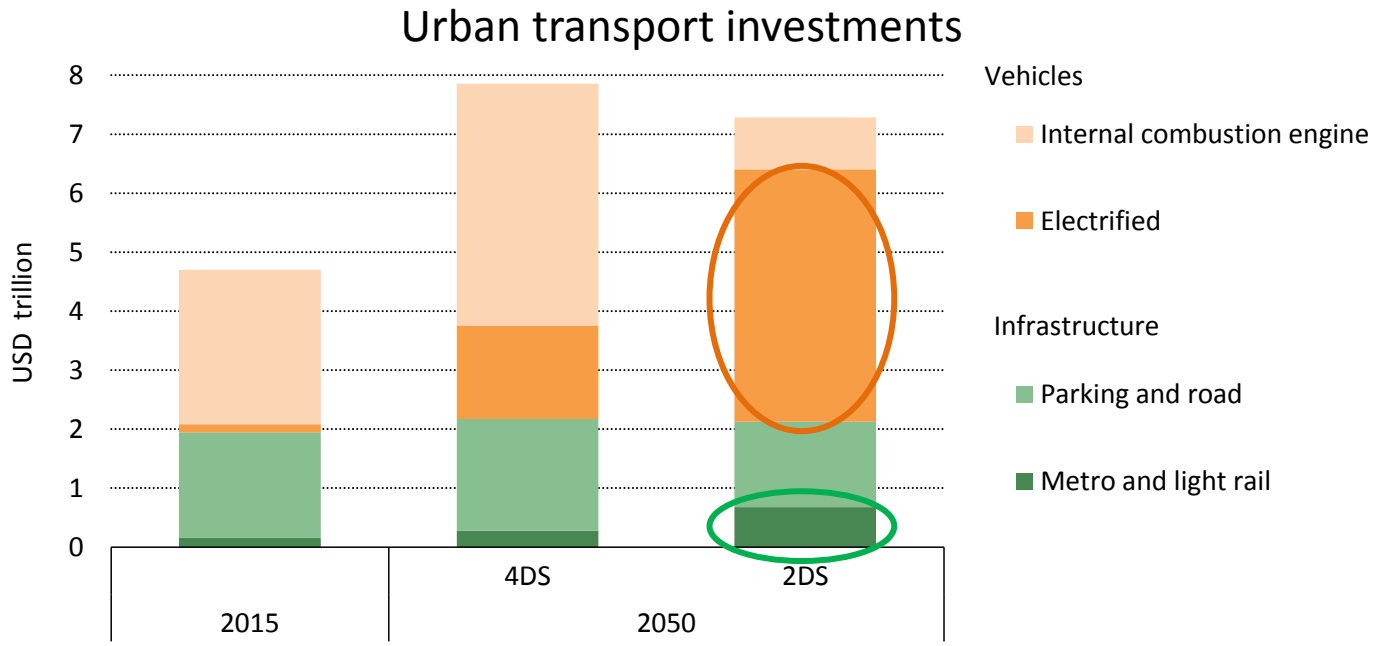

In the 2DS, by 2050 one billion cars are electric vehicles while public transport travel activity more than doubles

- Lower expenditure on the purchase of passenger cars overwhelms the higher costs of low-carbon vehicles
- Reduced fuel demand due to avoid + shift + improve
- Increase in global infrastructure costs for the scale up of public transport networks is almost entirely offset by the savings from less road building & maintenance

Thank you for your attention

Additional slides

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Passenger transport
Urban/non-urban analysis

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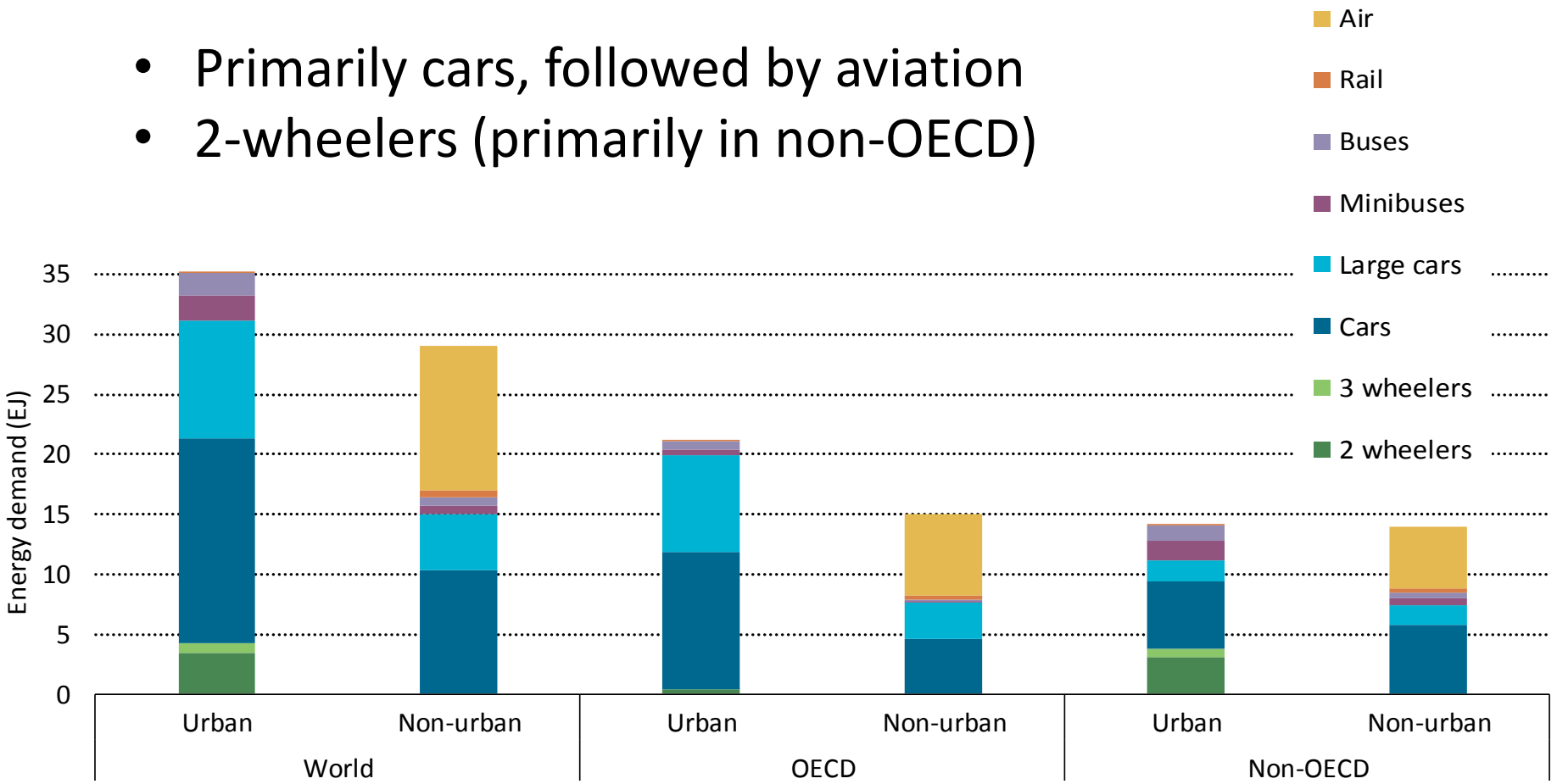
Global passenger transport energy demand in 2015, by mode

- Primarily cars, followed by aviation
- 2-wheelers (primarily in non-OECD)



Freoght transport
Urban/non-urban analysis

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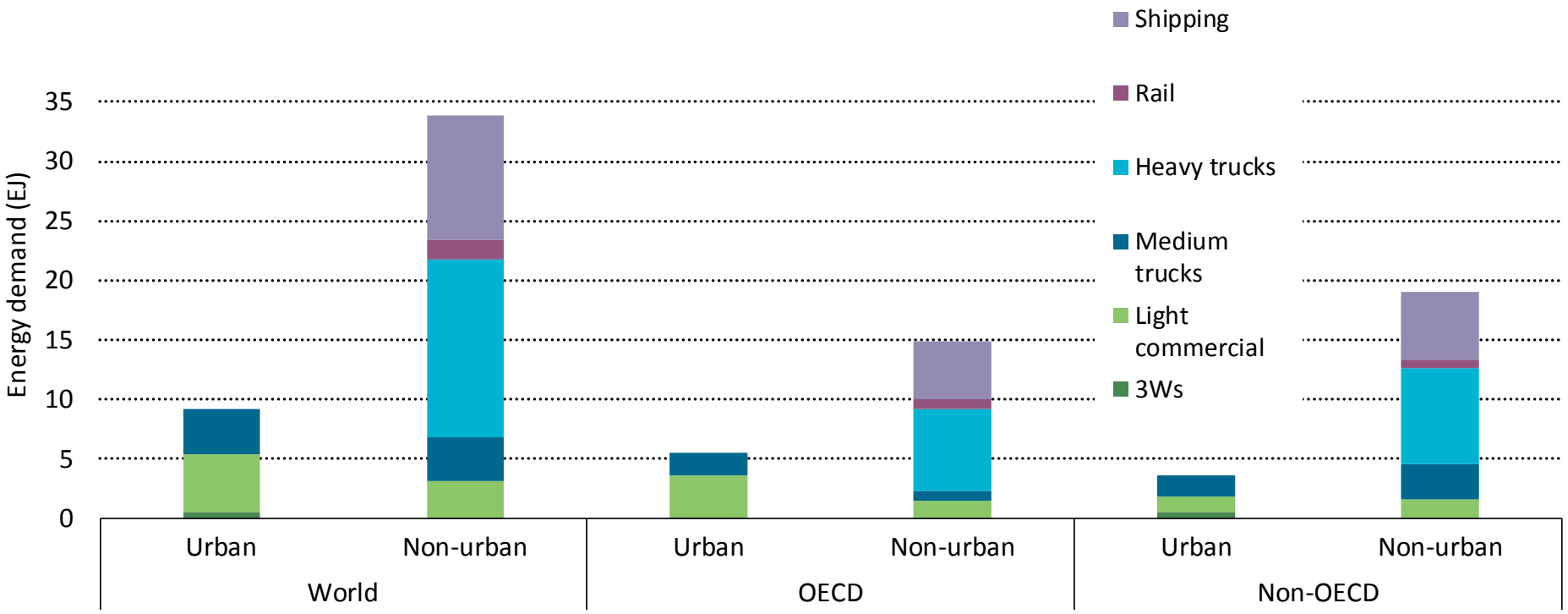
Global freight transport energy demand in 2015, by mode



- Shipping accounts for 81% of all tkm, urban trucks for 1%
- But trucks account for the majority of energy use

Energy demand
Global results

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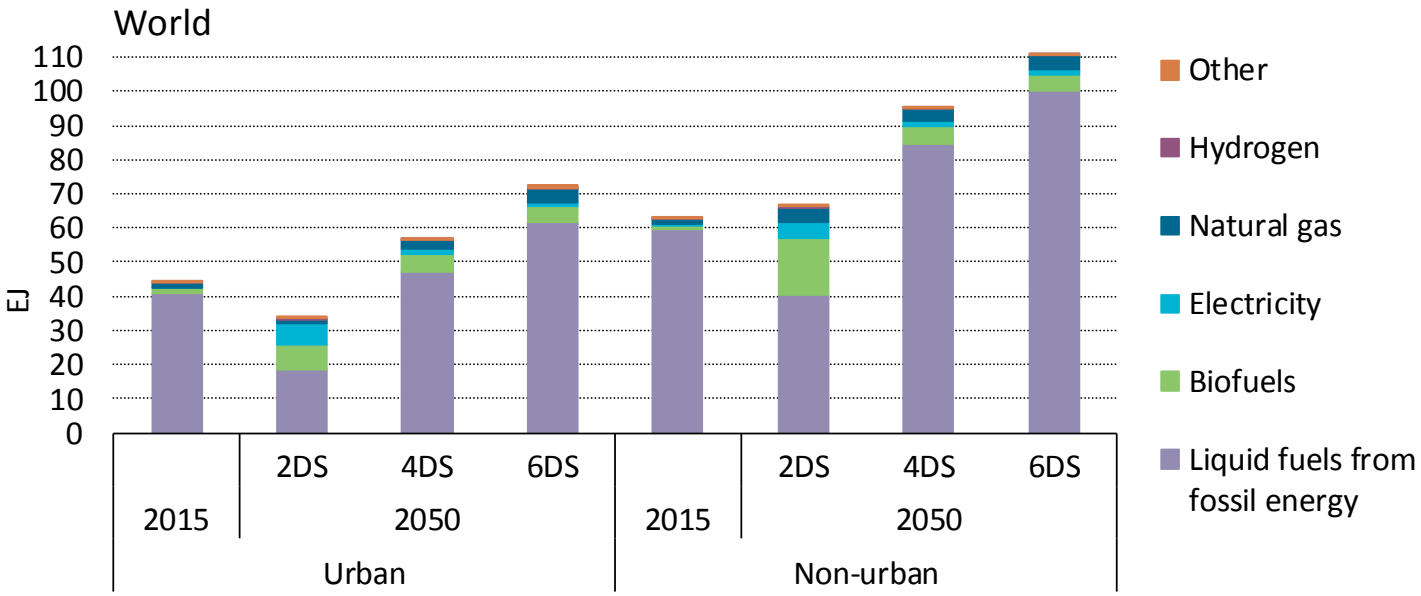

Transport energy demand **2015** **107 EJ**

2050 **100 (2DS) - 184 EJ (6DS)**

- 2DS sees a net global decline, but not in all regions
- 2050: increased diversification in all scenarios (far more in 2DS)
- Electricity and biofuels needed as substitutes for oil-based fuels

Energy demand
Regional details

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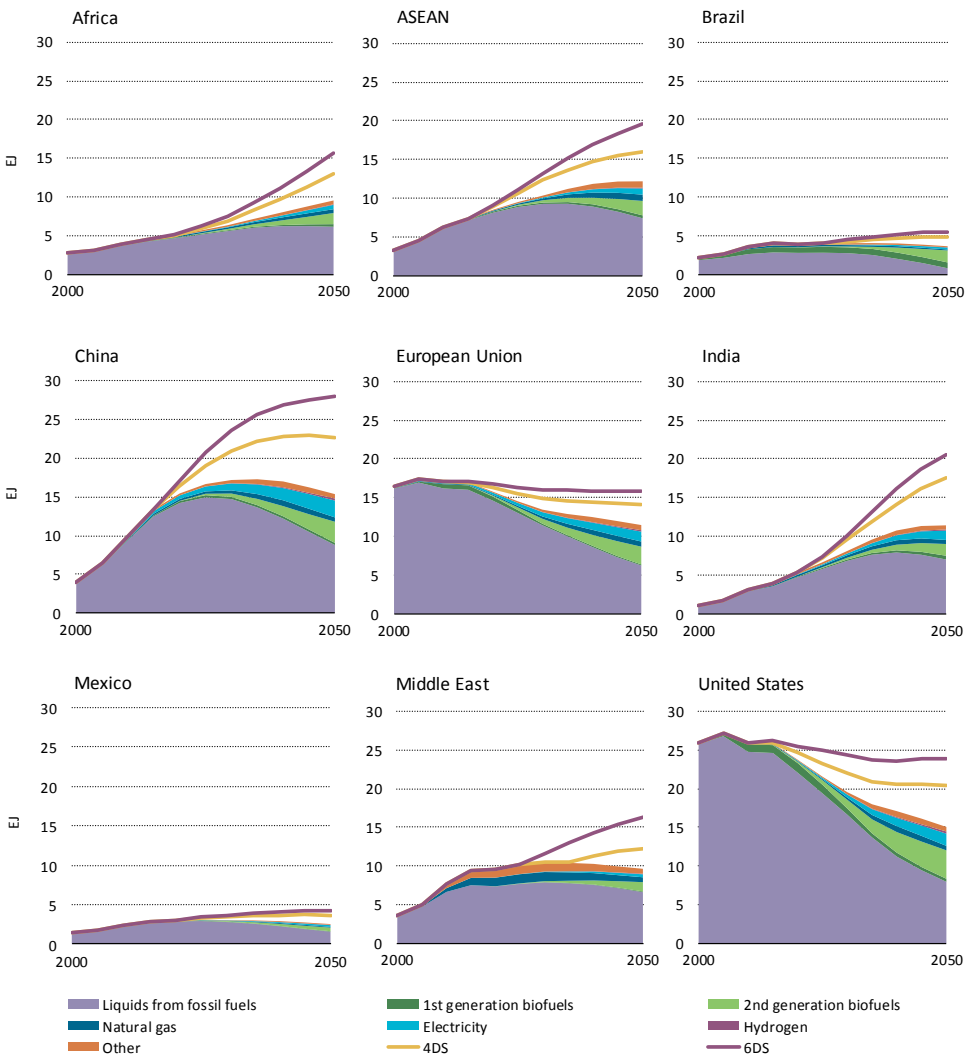

- Absolute reductions in OECD, starting within the coming decade, even in 4DS
- Absolute increases in energy use of major developing and emerging regions
- Even in 2DS, energy use in Africa grows up to 2050, begins to level off in ASEAN and India in the late 2030s to 2040s, and peaks in 2035 in China

Modelling avoid and shifts
Link with policy drivers

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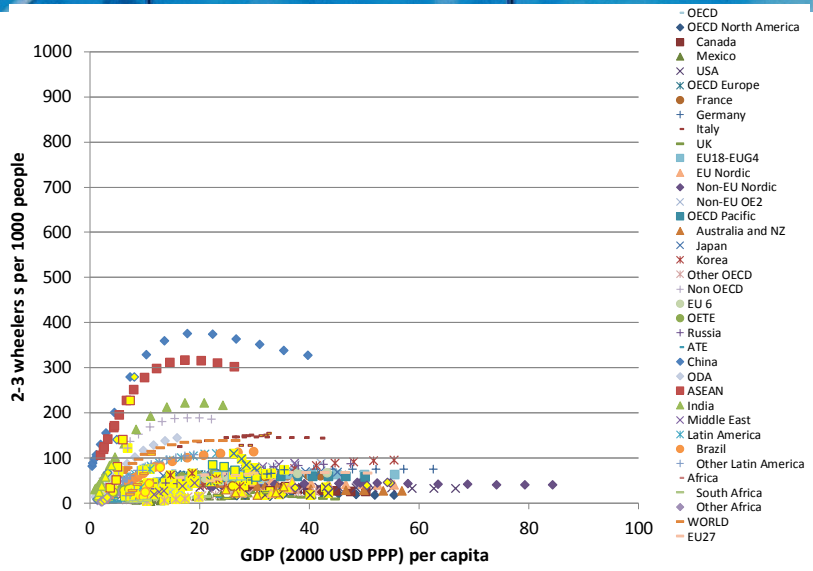

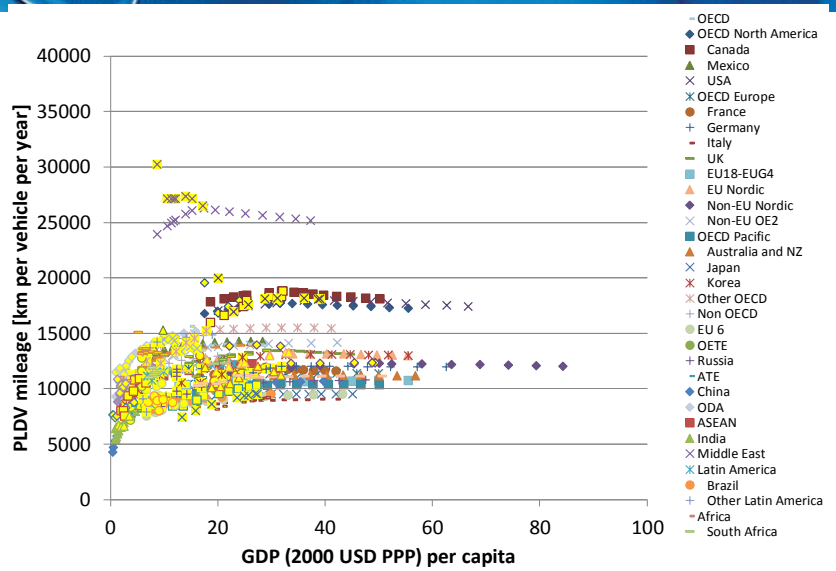

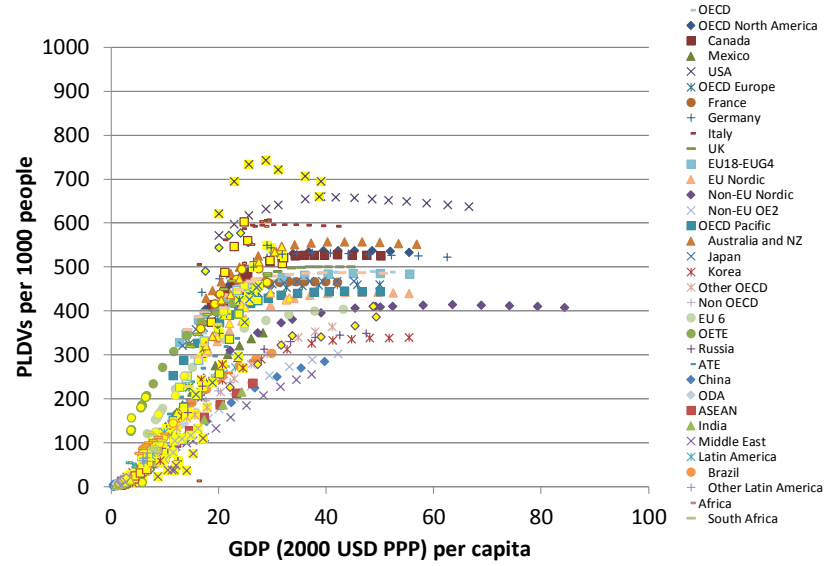

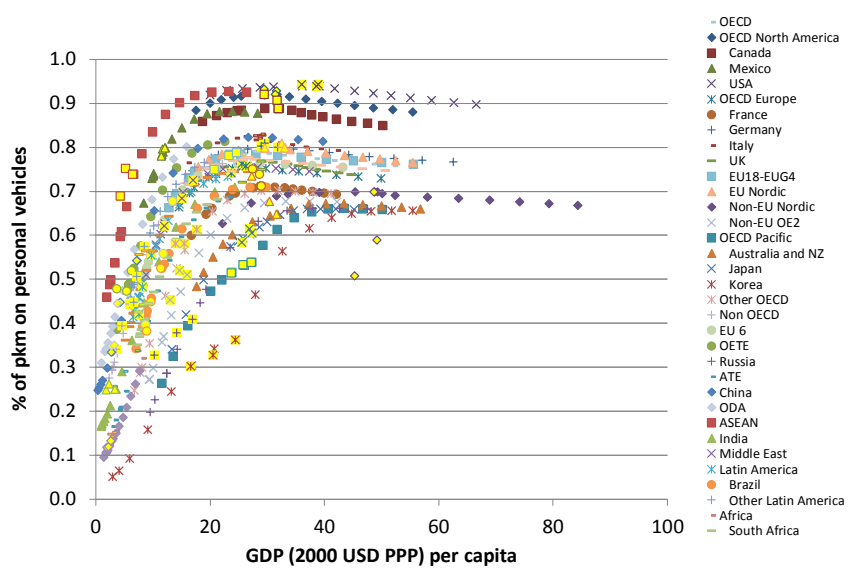

Policy deployment needs
Quantitative examples

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- 25% of all cities above 0.5 M inhabitants use extensively, in 2050, at least two out of three of the following instruments
  - Pricing policies: congestion charges, cordon pricing, dynamic parking pricing or other forms of road charging
  - Regulatory limitations: low-emission zones, access restrictions, parking restrictions, registration caps
  - Compact city policy incentives allowing investment in public transport, walking and cycling
- Alternatively, 75% of all cities with more than 0.5 M residents need to roll out a more modest but still comprehensive and co-ordinated portfolio of policies in these three main categories