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TGP-EEDP
Thai - German Programme on Energy Efficiency Development Plan

Energy Policy and Planning Office
MINISTRY OF ENERGY

Final Results of Energy Data Analysis Phase 2:
Energy Efficiency Indicators Development
Organised by EPPO and GIZ on behalf of Thai-German Programme
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Energy efficiency trends in transport

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Prepared with the support of GIZ

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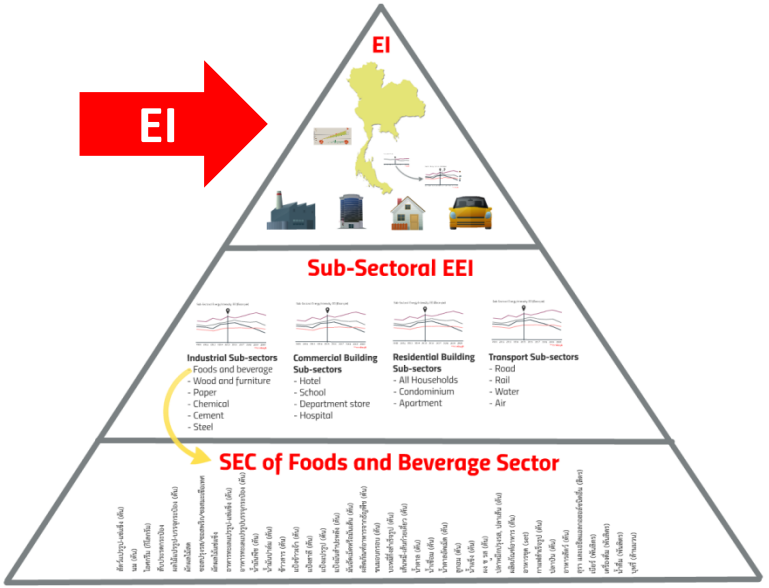
Outline

1. **Global trends**
2. Specific consumption by mode
3. Indicators of modal shift



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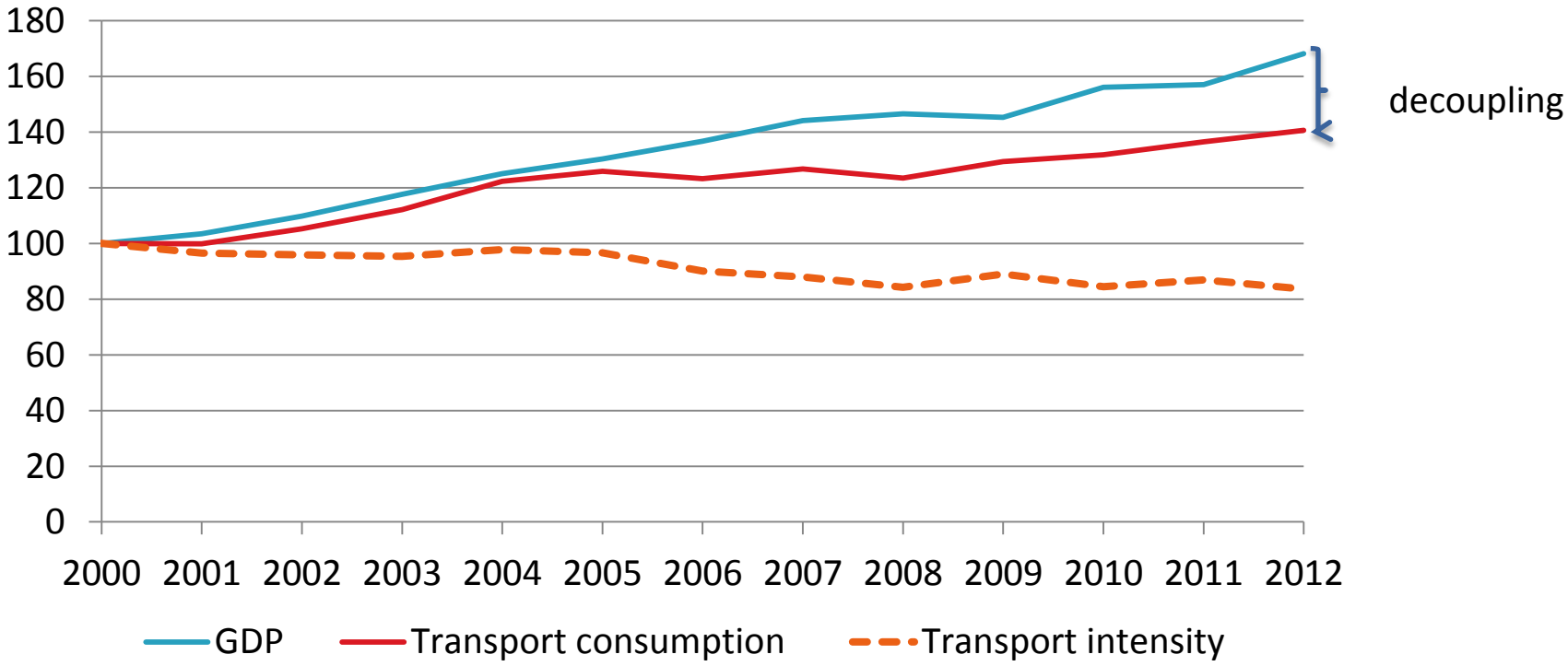
Global trends in transport sector

- Since 2004 energy consumption of transport has been growing slower than GDP : growth in energy consumption has been **"decoupled"** from the GDP
- This resulted in a decrease of the transport energy intensity, the energy consumption of transport per unit of GDP.

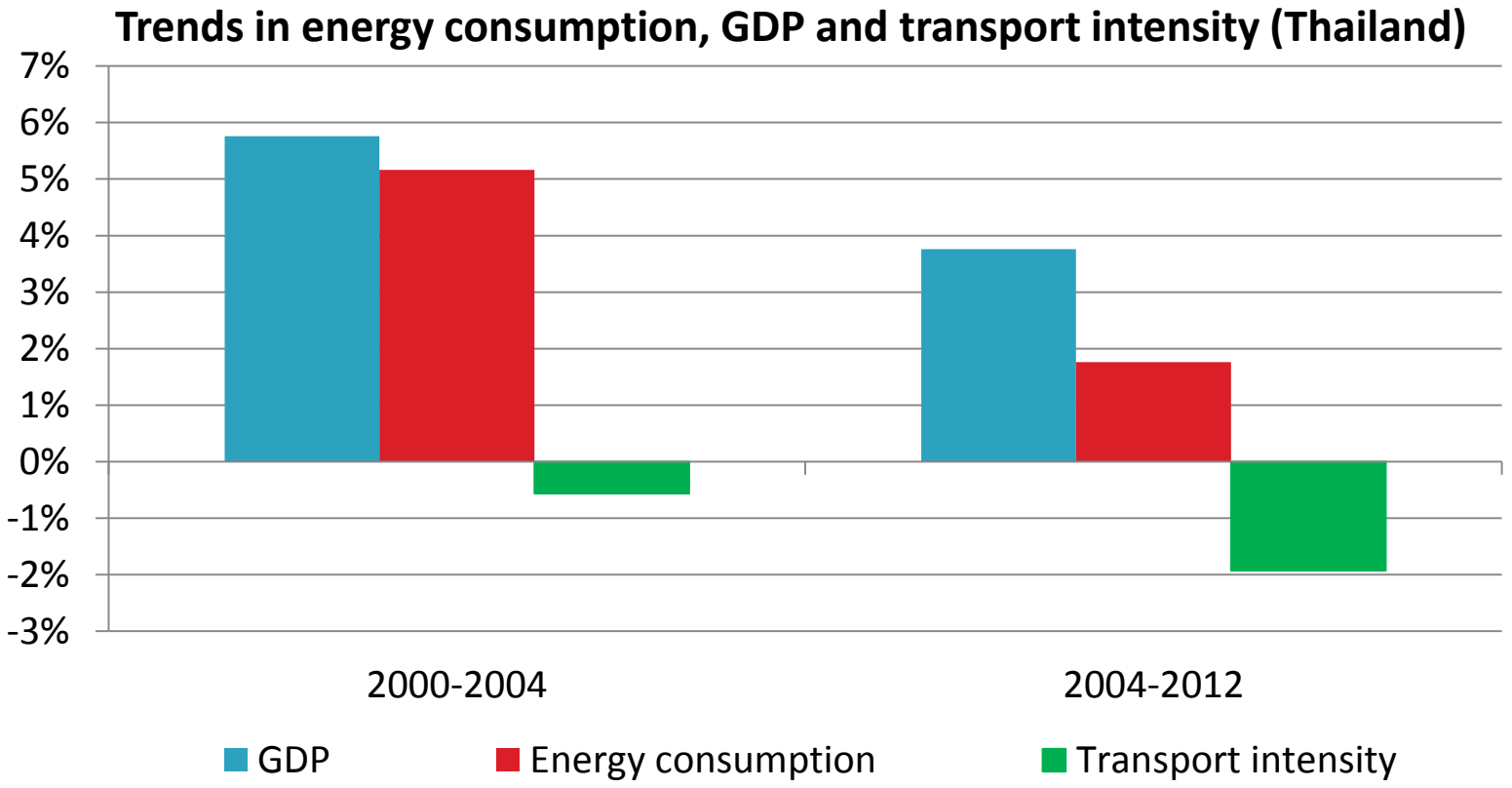
Energy consumption trends in transport, GDP and transport intensity: Thailand



Sources: energy consumption: DEDE; GDP: NESDB

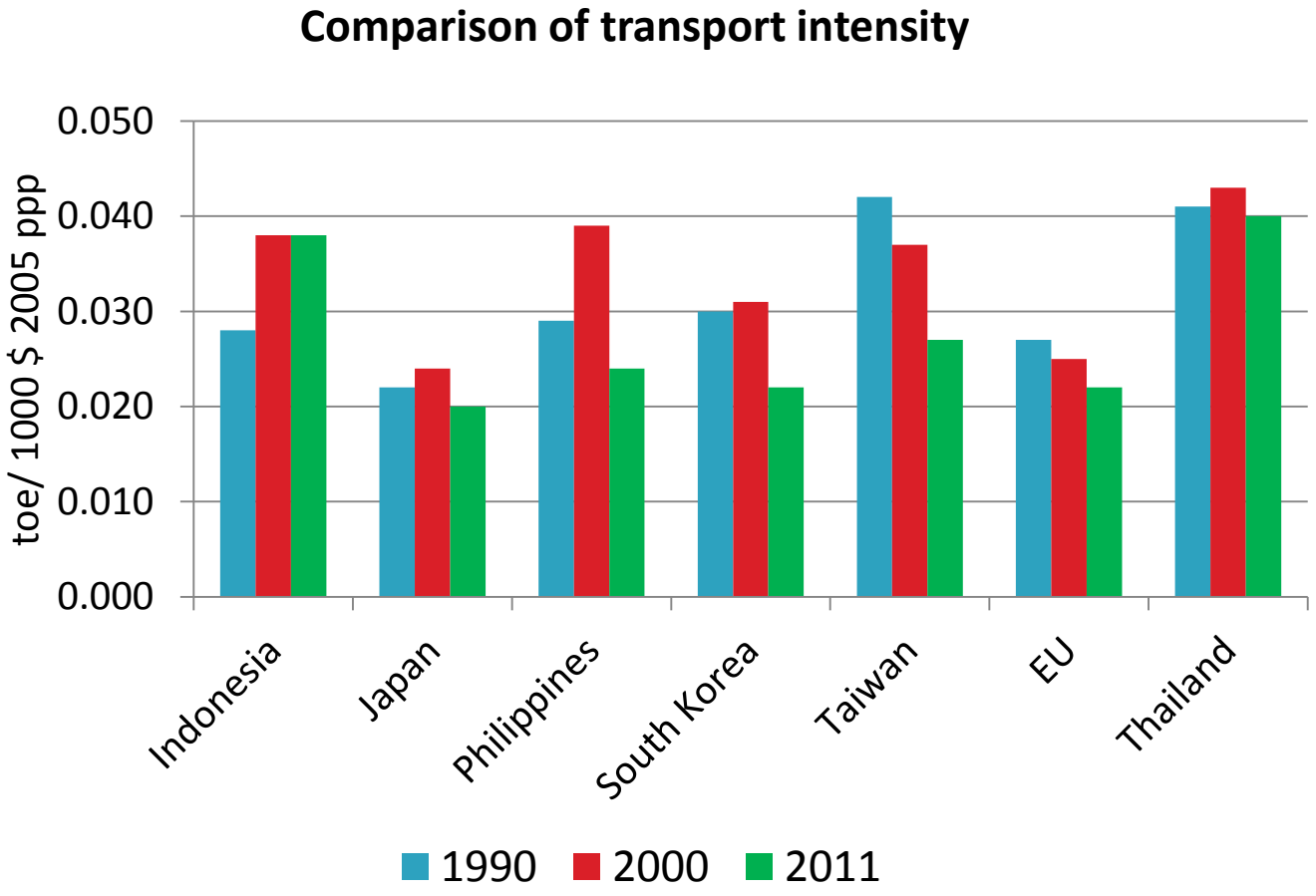
Global trends in transport : summary

- Since 2005, transport consumption has increased twice slower than GDP, resulting in a decrease in the transport intensity of 1.9%/year (i.e. -15%);
- Without that decrease, transport consumption would have been 15% higher in 2012, which represents a saving of 4400 ktoe



Comparison of energy intensity trends in transport

- Transport intensity in Thailand is higher than in other Asian countries
- Transport intensity is also decreasing in other Asian countries

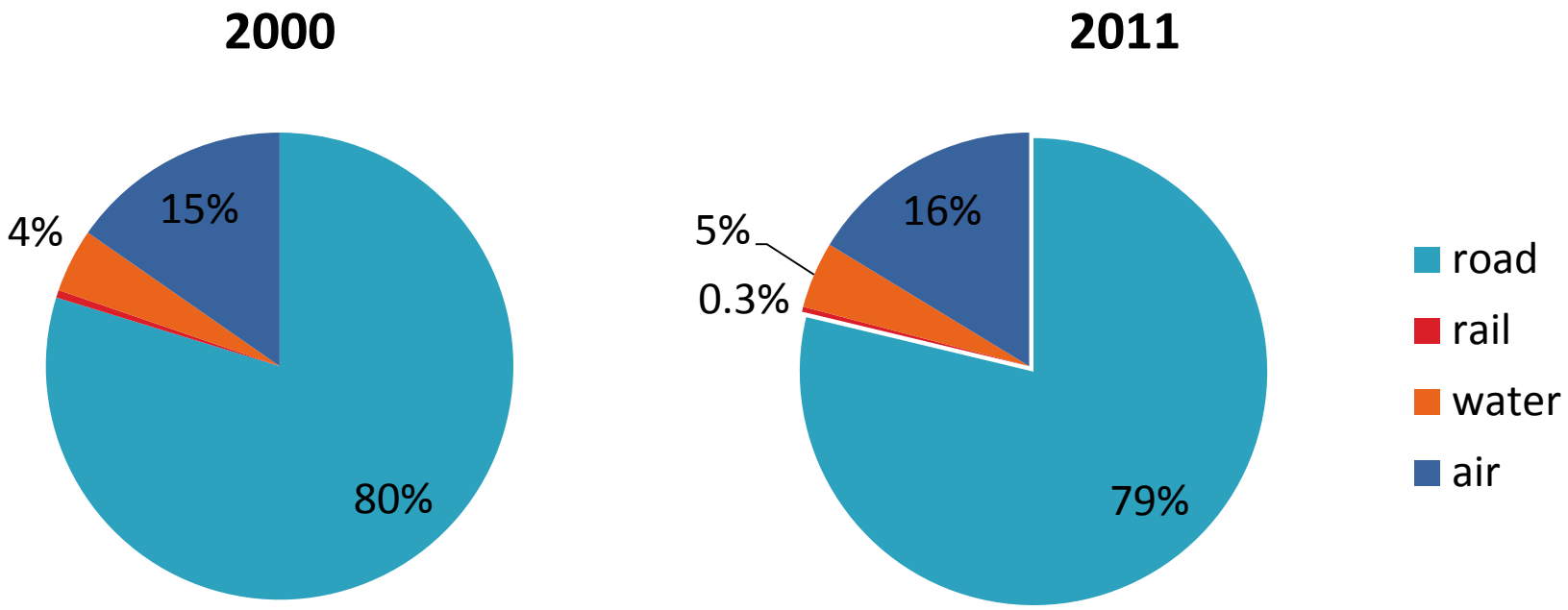


Source WEC energy efficiency indicators data base http://www.worldenergy.org/data/
$2005 ppp: GDP converted at 2005 purchasing power parities

Transport consumption by mode

- Road is dominant with around 80% of total transport energy consumption;
- Air transport arrives in second position with a round 15%, followed by water transport (5%)
- Stable shares by mode since 2000

Distribution of transport energy consumption by mode in Thailand

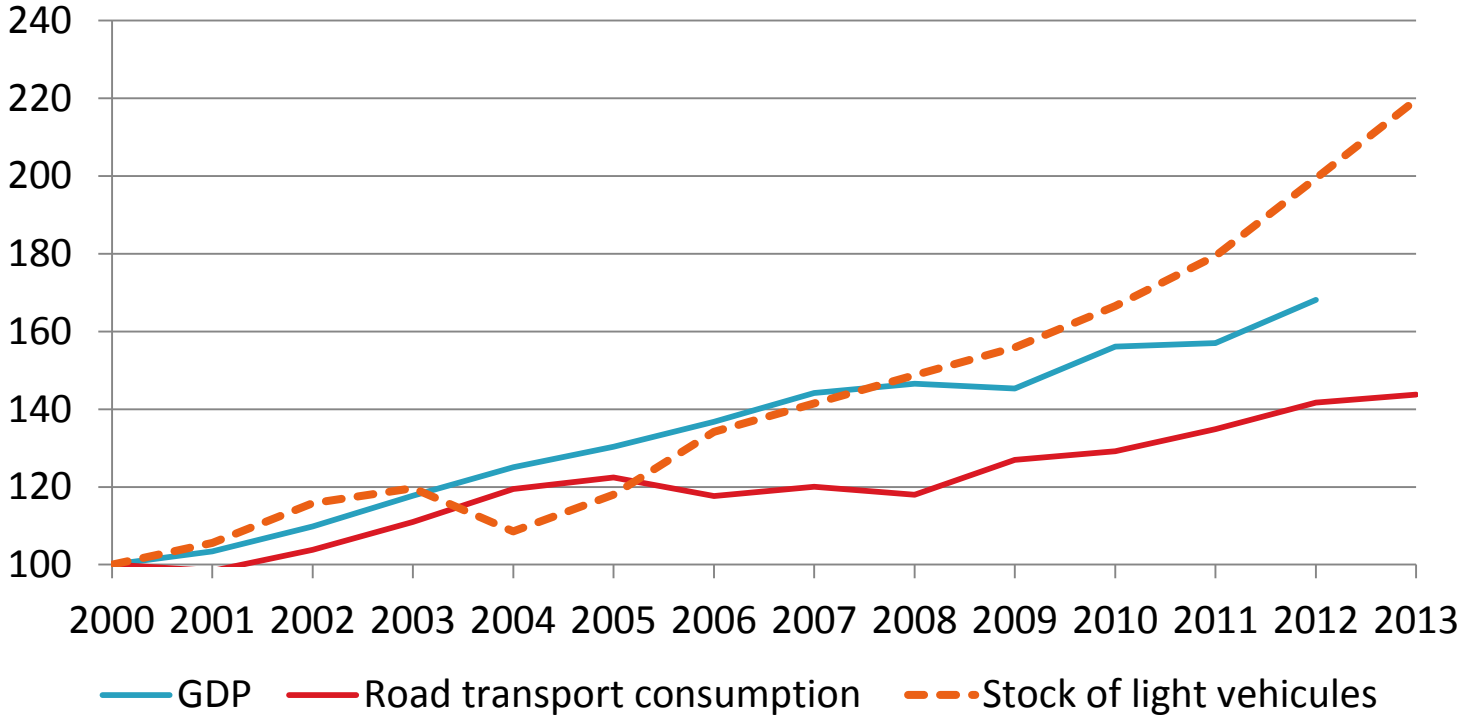


Source: DEDE

Road transport trends

- The stock of light vehicles (cars and pick up) is growing much faster than the GDP since 2006 (disruption of data in 2004);
- The consumption of road transport is increasing much slower than the stock of light vehicles.

Road energy consumption trends, GDP and stock of light vehicles: Thailand

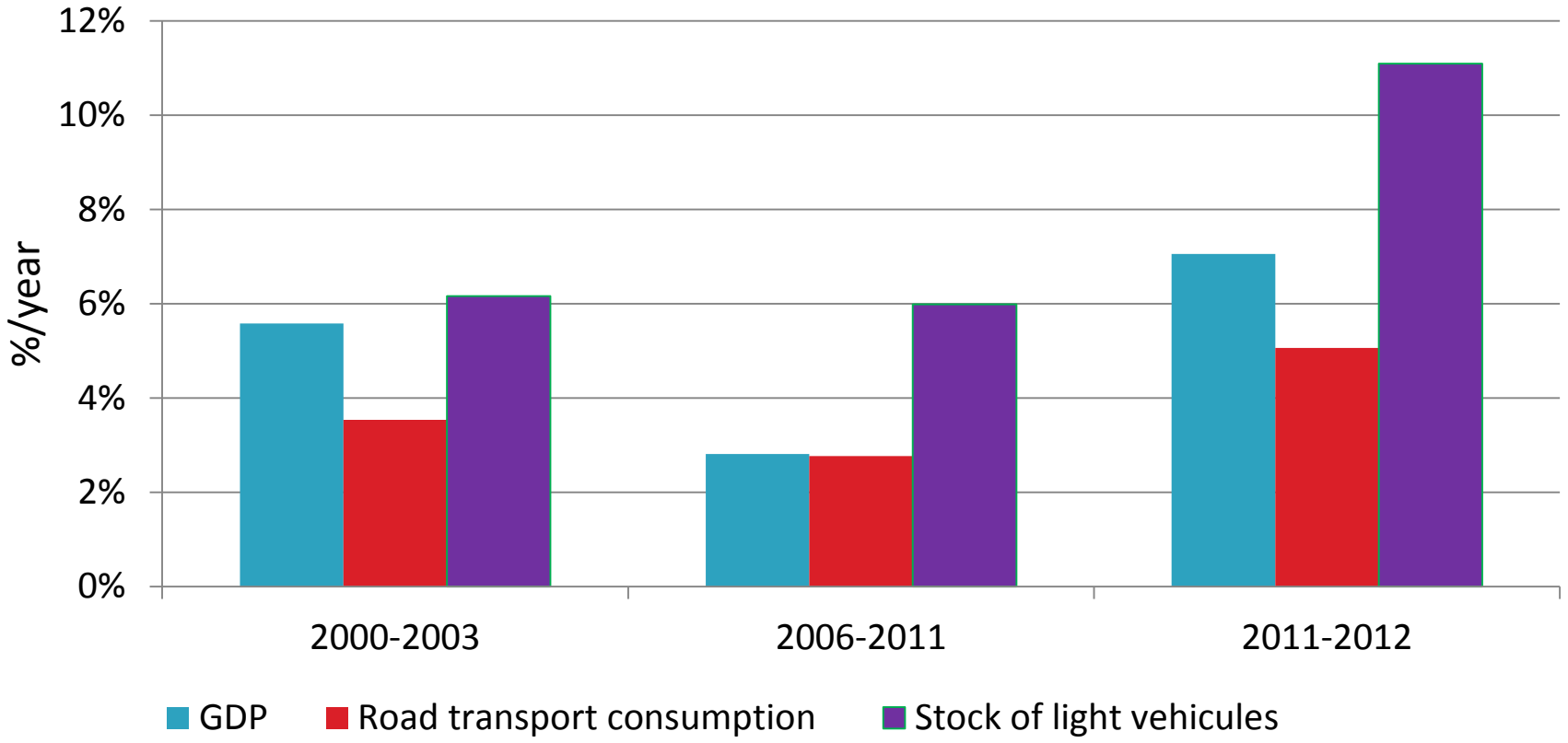


Light vehicles: cars, vans and pick-up;

Road transport trends: summary

- The consumption of road transport is increasing twice slower than the stock of light vehicles .

Road energy consumption trends in transport, GDP and stock of light vehicles: Thailand



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Light vehicles: cars, vans and pick-up;
Sources: energy consumption : DEDE, GDP:NESDB; stock of vehicles DLT

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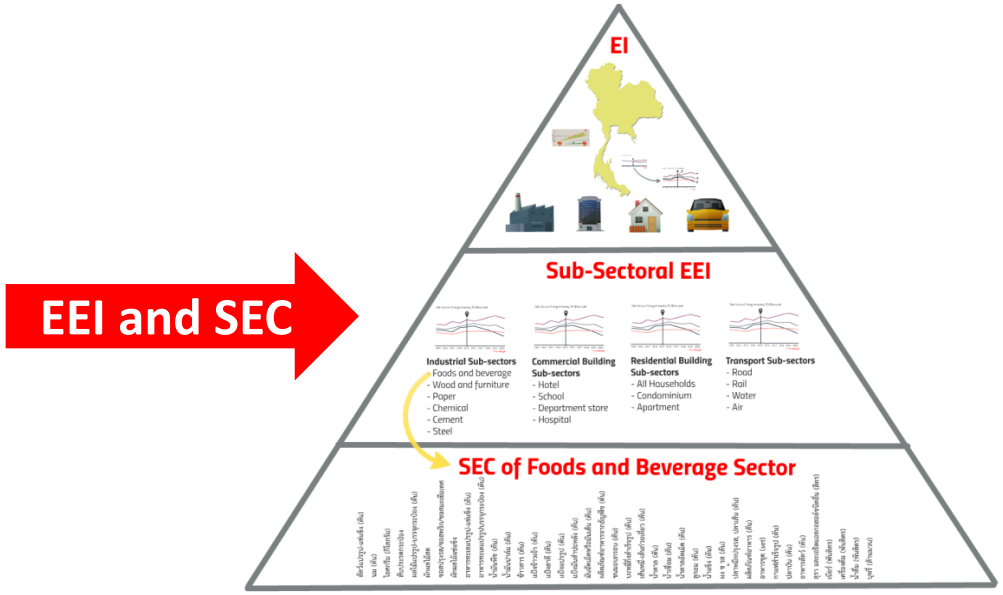

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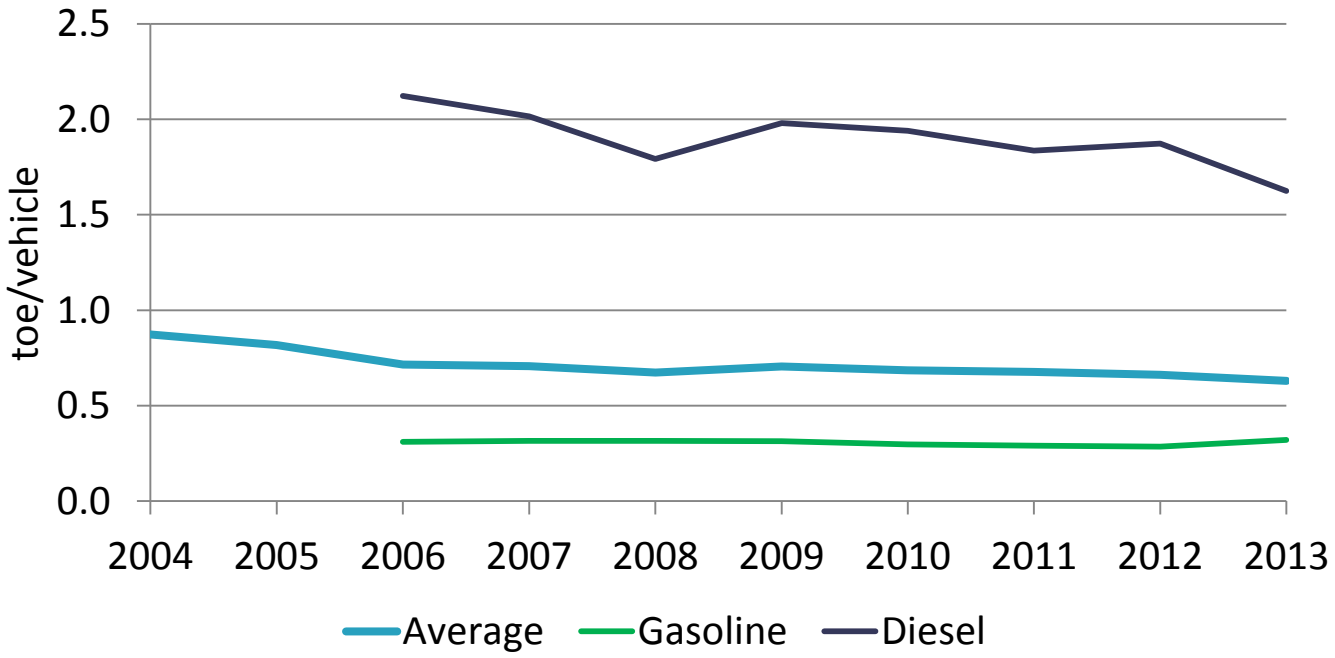
Consumption of road transport per vehicle

- Slight decrease in the average specific energy consumption of road transport per vehicle
- Strong decrease for diesel vehicles (-3%/year), partly linked to the rapid growth of the stock of light vehicles.
- Low value for gasoline due to the importance of motorcycles

Trends in specific consumption of road transport per vehicle : Thailand



LPG included with gasoline; CNG included with diesel

Consumption of road transport per vehicle and per car equivalent to assess the energy efficiency of road transport

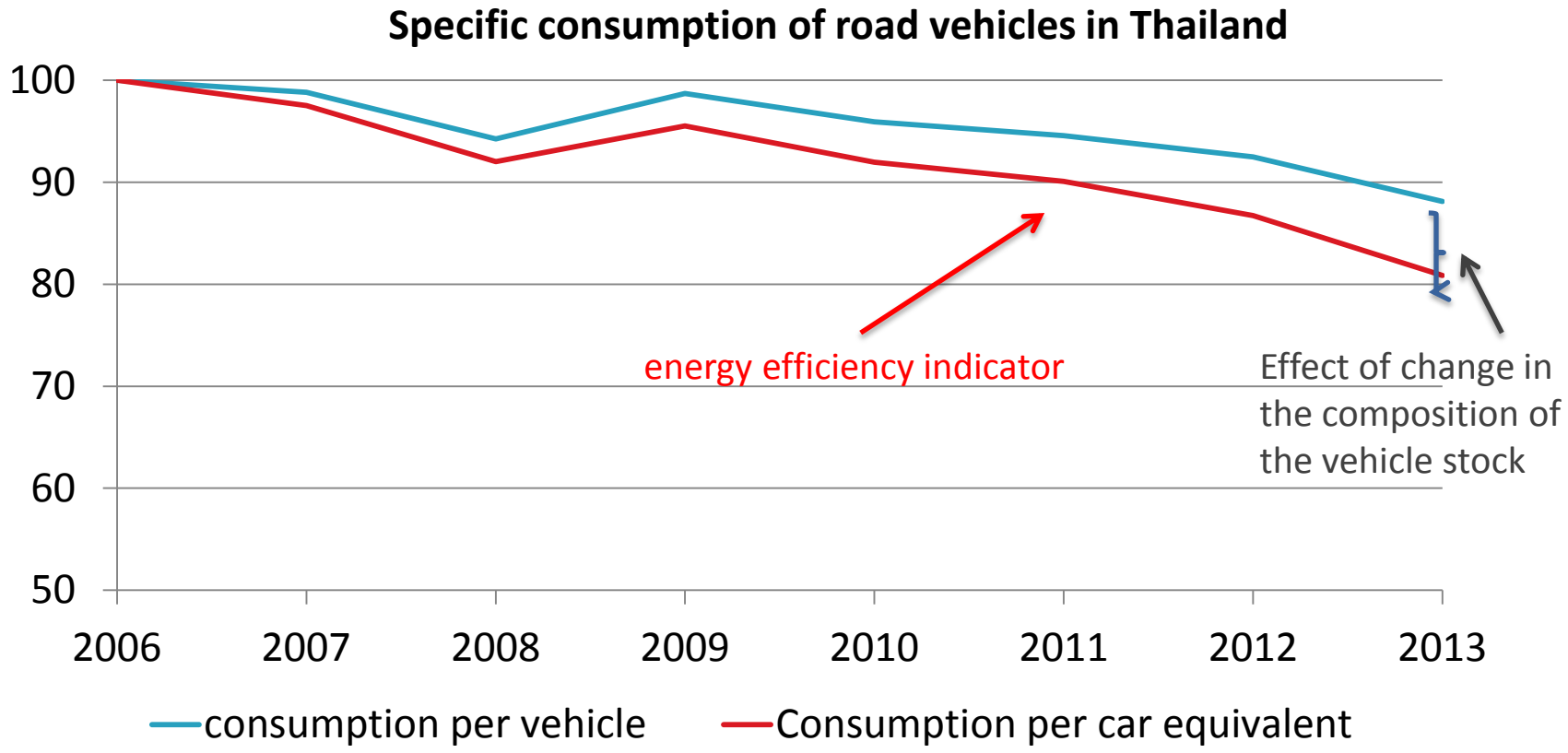
- The consumption of road transport per vehicle is not a good indicator of energy efficiency as it may be influenced by a shift in the composition of the vehicle stock;
- For instance, if the share of motorcycles increases this will decrease the average consumption per vehicle all things being equal... and this is not linked to energy efficiency improvements.
- To get a better assessment of energy efficiency trends, we need indicators by type of vehicle (cars, trucks) and transport (passenger, goods), which cannot yet be produced for Thailand, mainly because of a lack of data on the consumption of road transport by type of vehicle.
- With the existing data, a better indicator is the **specific consumption of road transport per equivalent car**.

Specific consumption of road transport per equivalent car

- The indicator of **unit consumption of road transport per equivalent car** relates the total consumption of road transport to a fictitious stock of vehicles, measured in terms of number of equivalent cars.
- Converting the actual stock of vehicles into a stock of equivalent cars is based on coefficients reflecting the difference in the average yearly consumption of each type of vehicle compared to a car:
  - If, for instance, a motorcycle consumes 0.2 toe/year on average and a car 1 toe/year, one motorcycle is considered to be equivalent to 0.2 cars.
  - In the same way if light vehicles and trucks consume on average 5 toe/ year each vehicle for road transport of goods is equivalent to 5 cars
- The variation of this indicator is independent on the change in the composition of the stock of vehicles and thus is a better indicator to assess energy efficiency
- Default values can be used for these coefficients or national data if national surveys or evaluation exist on the consumption of cars, trucks…

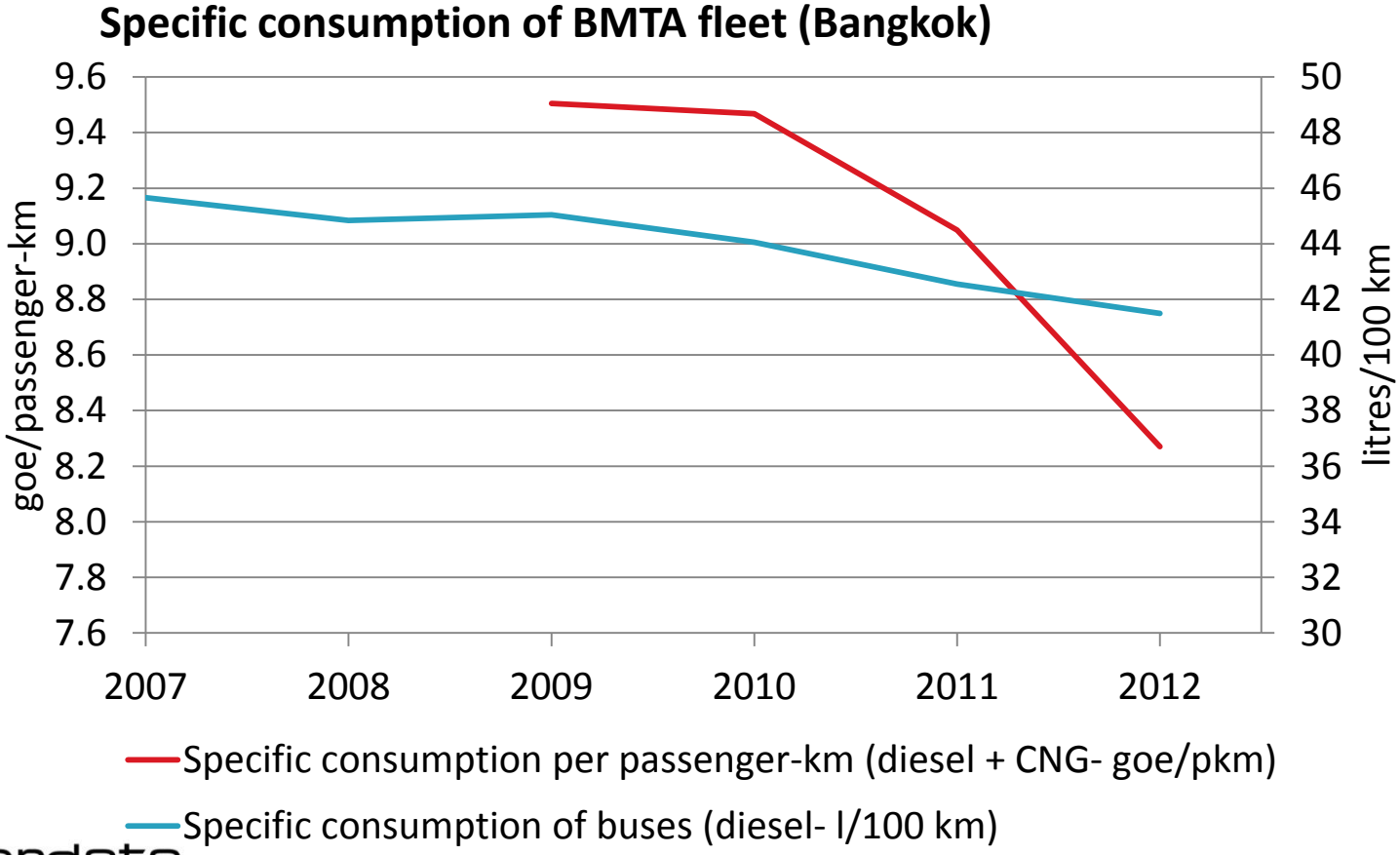
Energy efficiency of road transport

The specific consumption of road transport per car equivalent decreased by 0.8%/year since 2006 ➔ the energy efficiency of vehicles improved by 0.8%/year since 2006
The consumption of road transport per car equivalent has been decreasing twice more rapidly than the consumption per vehicle (1.5%/year compared to 0.8%/year) ; this means that over this period the growth of the number of heavy vehicles has been larger than the growth of light vehicles;



Urban bus transport : Bangkok

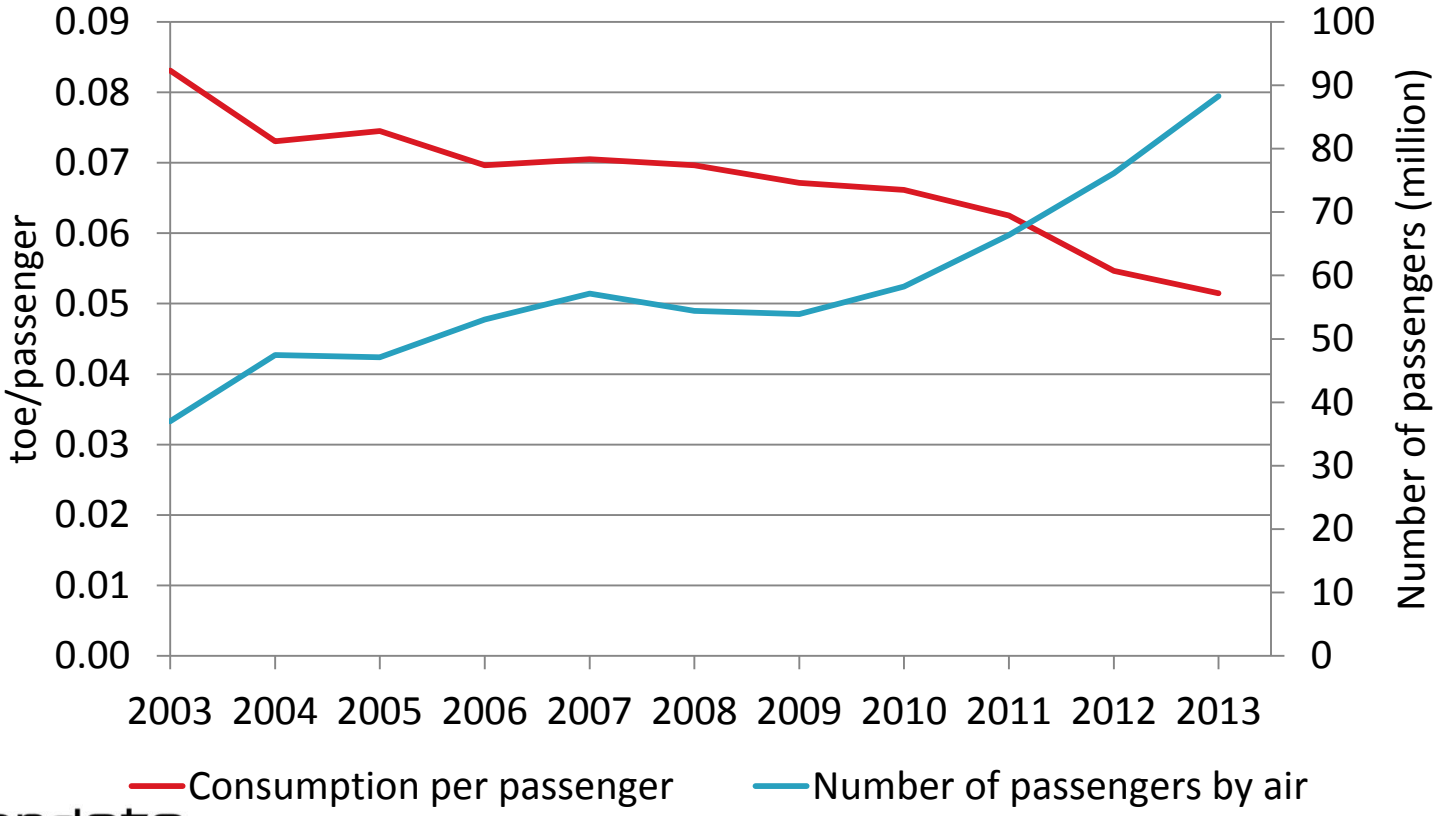
- The specific energy consumption of diesel urban buses in Bangkok (BMTA) decreased by 4 l/100 km between 2007 to 2012 (from 45.7 to 41.5 l/100 km (i.e. Increase from 2.2 to 2.4 km/litre);
- The specific consumption per passenger–km of diesel and CNG buses also decreased by 13% since 2009.



Air transport

- The specific energy consumption of air transport is decreasing regularly and rapidly by 3.5%/year on average since 2003;
- Trend in this specific consumption is usually negatively correlated with the traffic (i.e. rapid decrease with a rapid growth in traffic and vice versa)

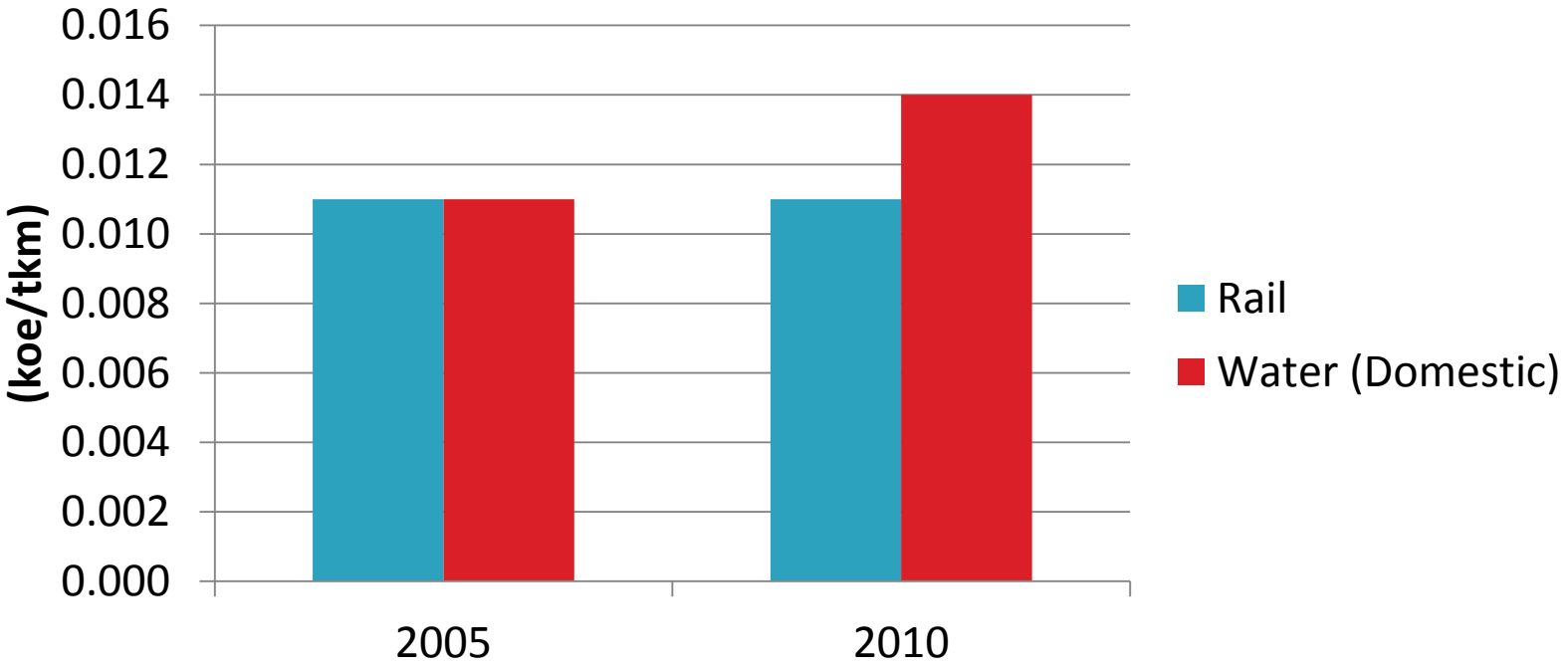
Specific consumption of air transport and passenger traffic in Thailand



Rail and water transport

- The specific energy consumption of rail transport is constant while the specific energy consumption of water transport is increasing by 5%/year on average since 2005;

Specific consumption of goods transport by rail and water in Thailand



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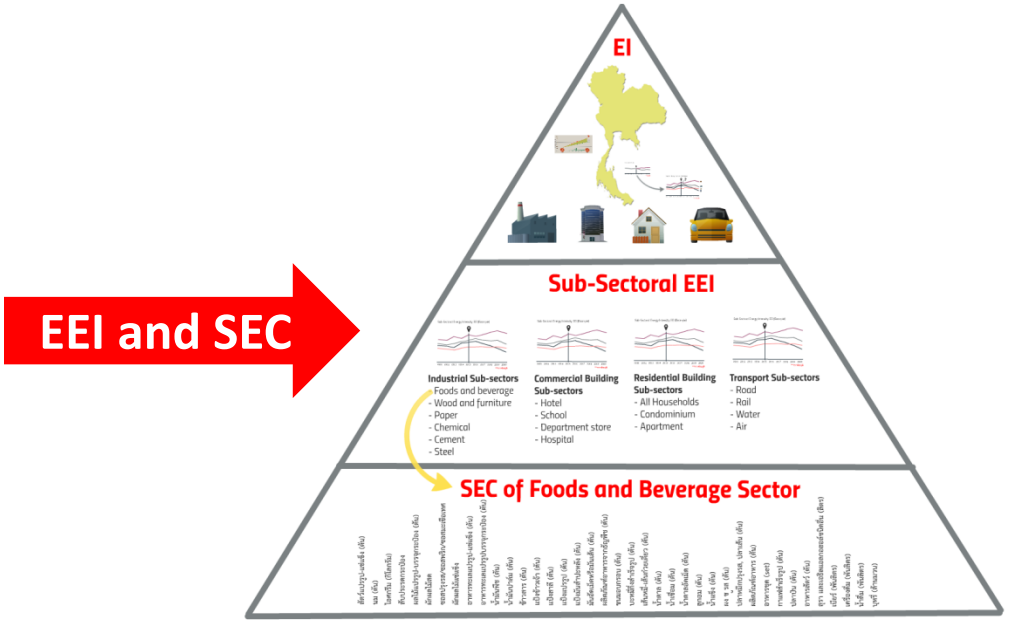

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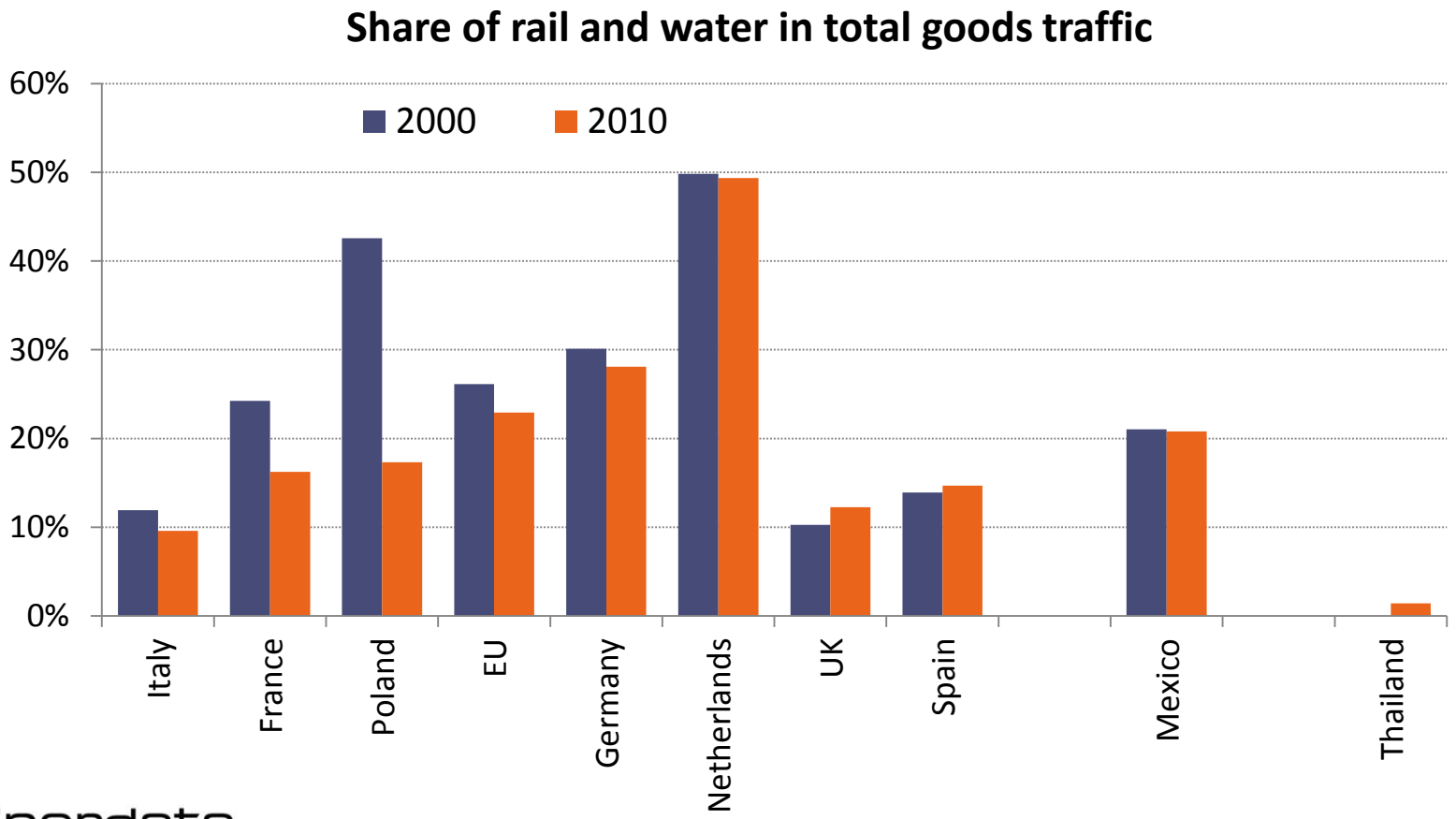
Share of efficient modes of transport

- Energy efficiency in transport can also come from an increasing share of efficient modes of transport (public transport,, rail or water) and there are policy measures to promote public transport

- To measure the impact of these policies and calculate the savings linked to modal shih, one can consider indicators of modal shift:
  - Share of rail and water transport for transport of goods
  - Share of public transport for passenger transport

Share of efficient modes of transport

- Traffic predominantly carried by road in Thailand
- Decreasing share of rail and water in 20 of the 28 EU countries despite policies implemented ➔ shift to efficient modes in only 8 countries



Conclusion

•Efficiency is clearly improving in transport and for the different modes as shown for road transport, Bangkok buses or air transport.

•The disruption in data on the stock of vehicles limit the analysis since 2004.

•The data situation is quite good in the sector ... but could still be improved :

- •By data on the specific consumption of new vehicles, as monitored in many countries now, based on test valued provided by vehicles manufacturers
- •By data on the use of vehicles (km driven per year)
- •By more detailed data on the traffic of passenger vehicles to monitor trends in modal shift

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4. **Annex**

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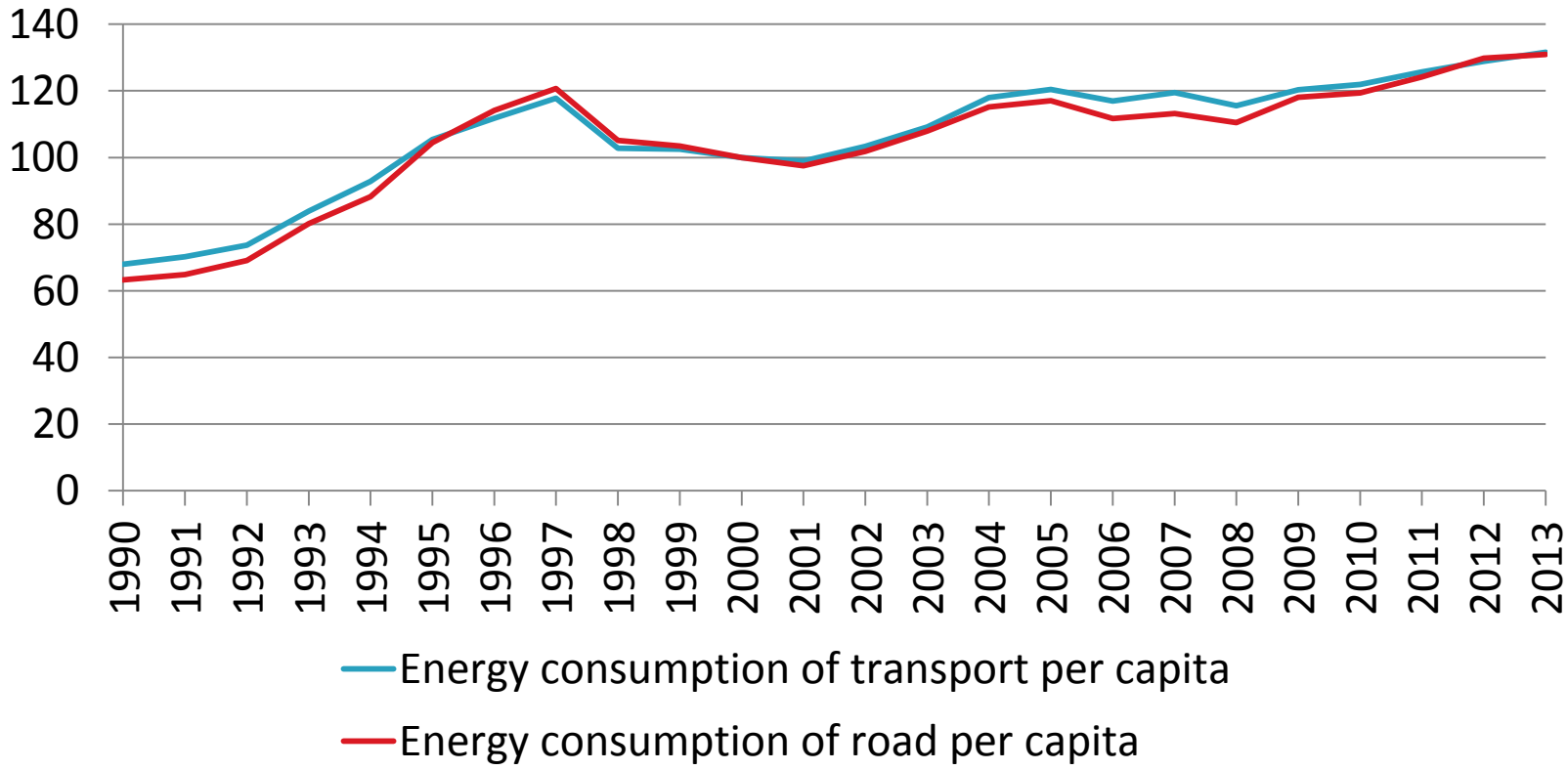
Energy consumption per capita



Energy consumption per capita

- Before 1998, energy consumption of transport per capita is higher than after 1998.
- The energy per capita is increasing again since 2011.