Energy efficiency indicators in the transport sector

Mafalda Silva Energy efficiency indicators

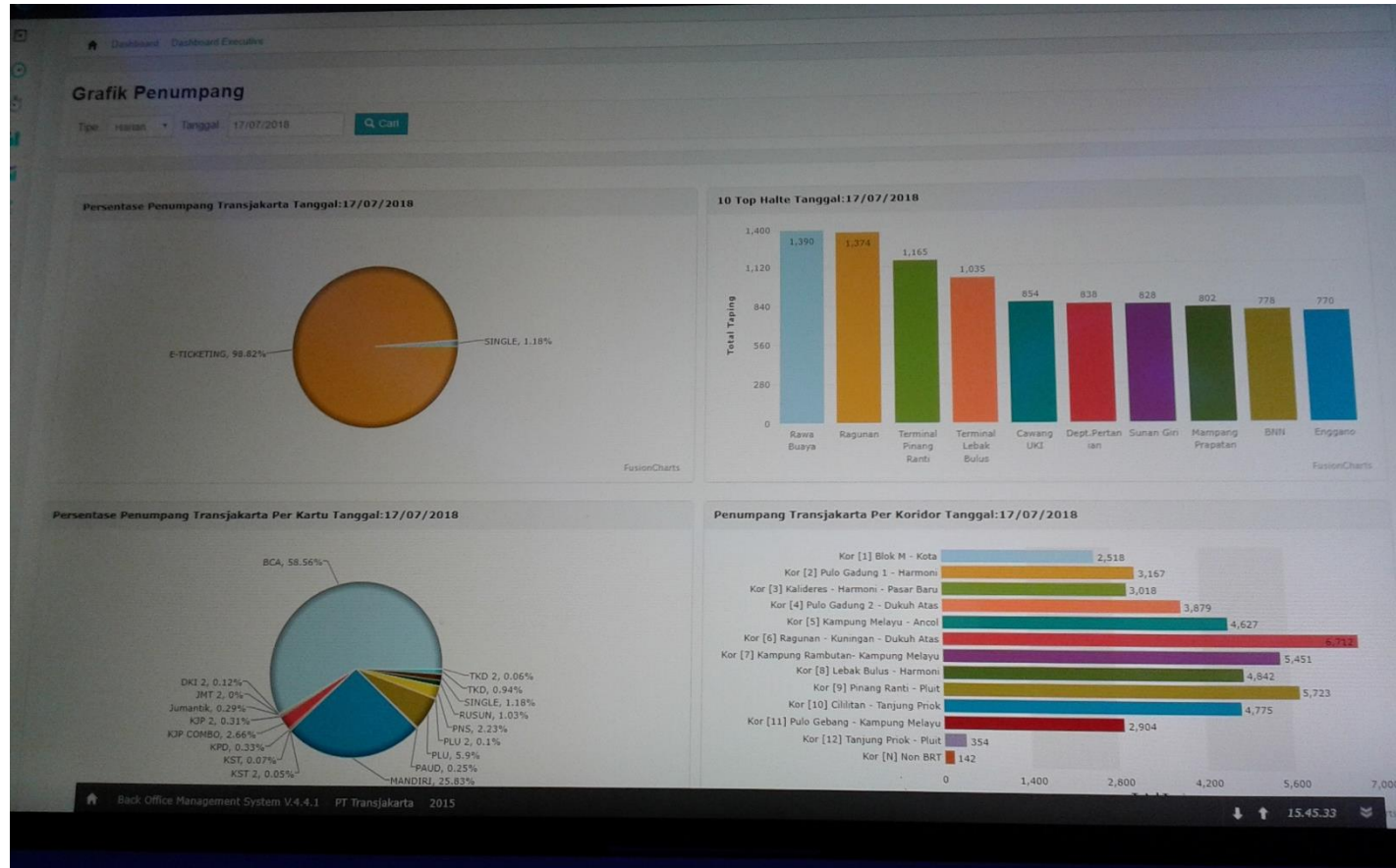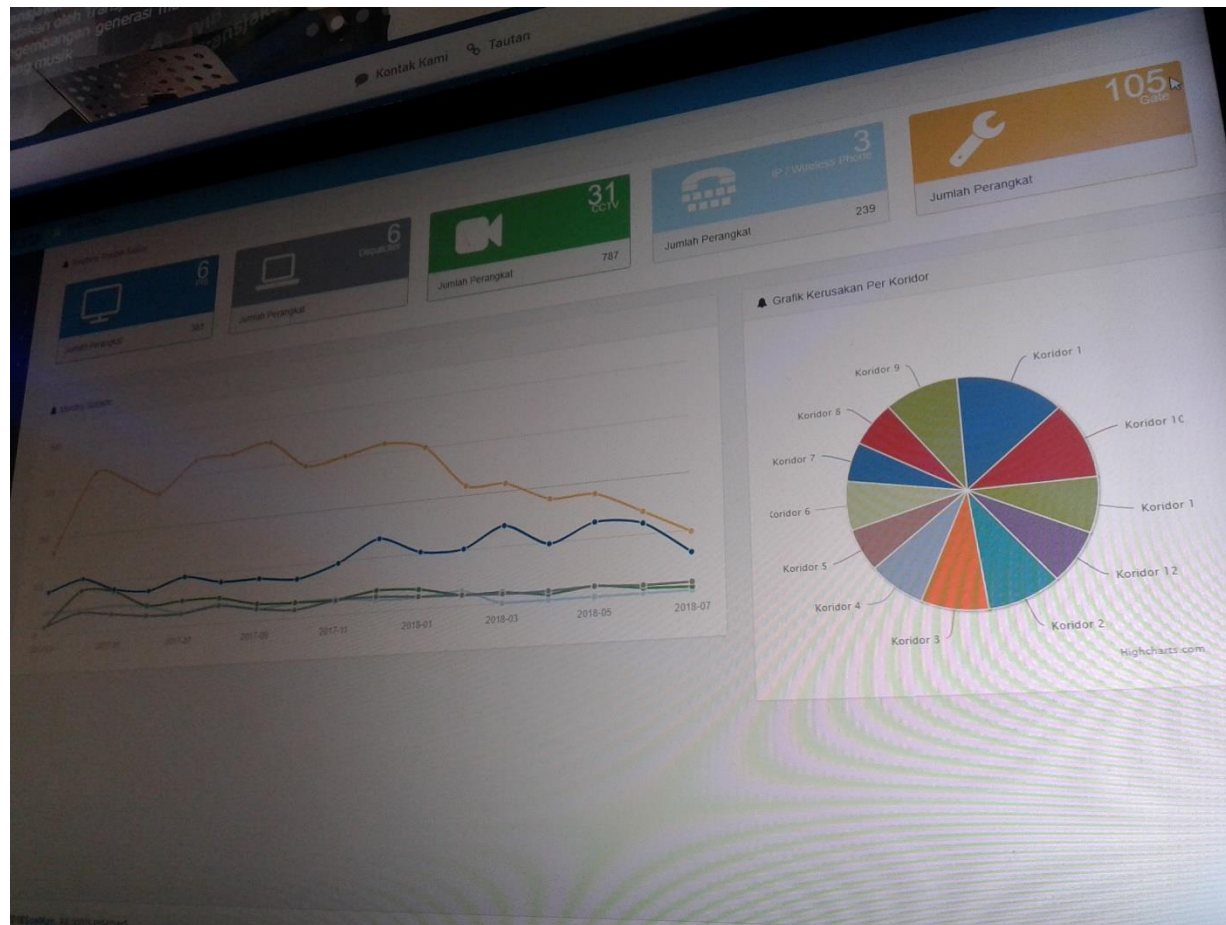Jakarta, 16-20 July 2018

IEA

Some data reflections from the site visit

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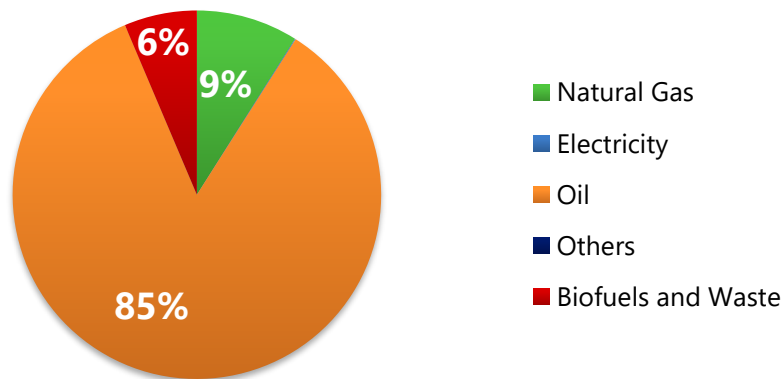# Why is the transport sector important?

Transportation is important for multiple reasons such as economic activity and mobility.

Content

1. What we can learn from **energy balances**?

2. What can we learn from **energy efficiency indicators**?

3. Developing energy efficiency **indicators** – discussion

What we can learn from energy balances?

Fuel mix in transport* sector

Thailand

- Natural Gas
- Electricity
- Oil
- Others
- Biofuels and Waste

9%
6%
85%

Thailand

- Road
- Domestic Aviation
- Rail
- Domestic Navigation
- Other

4%
95%
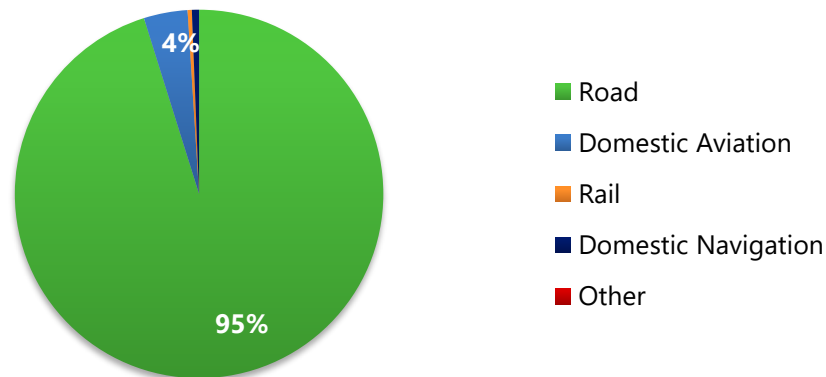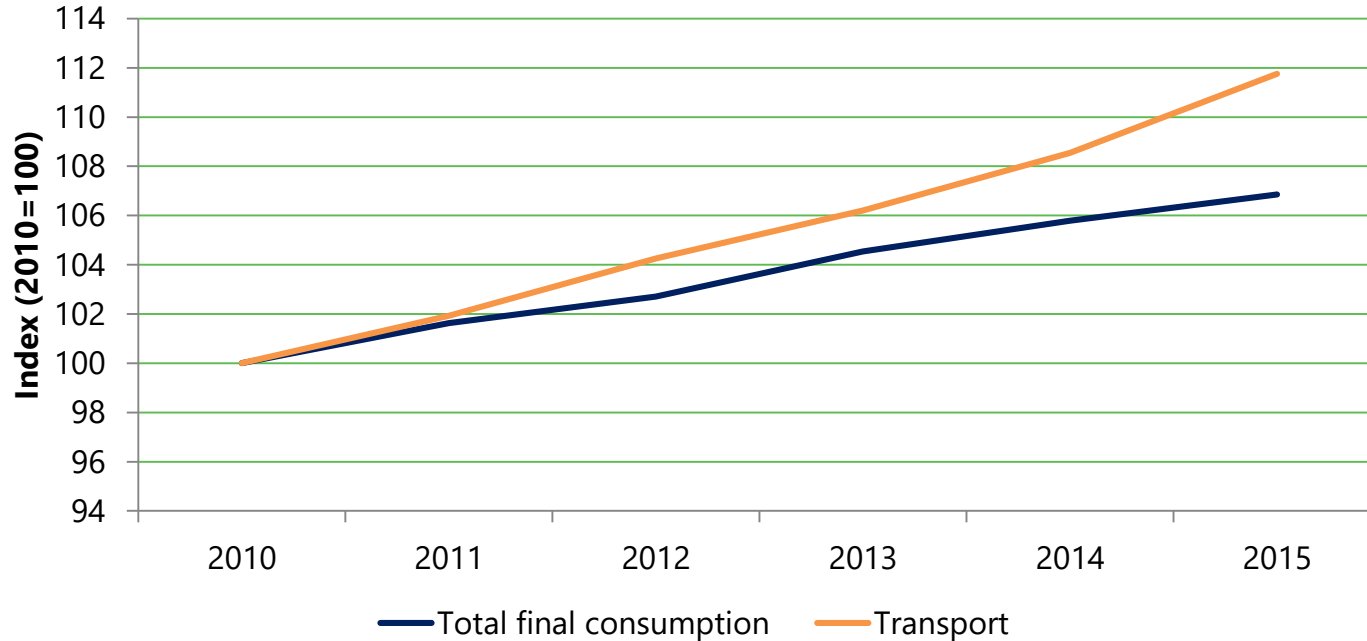
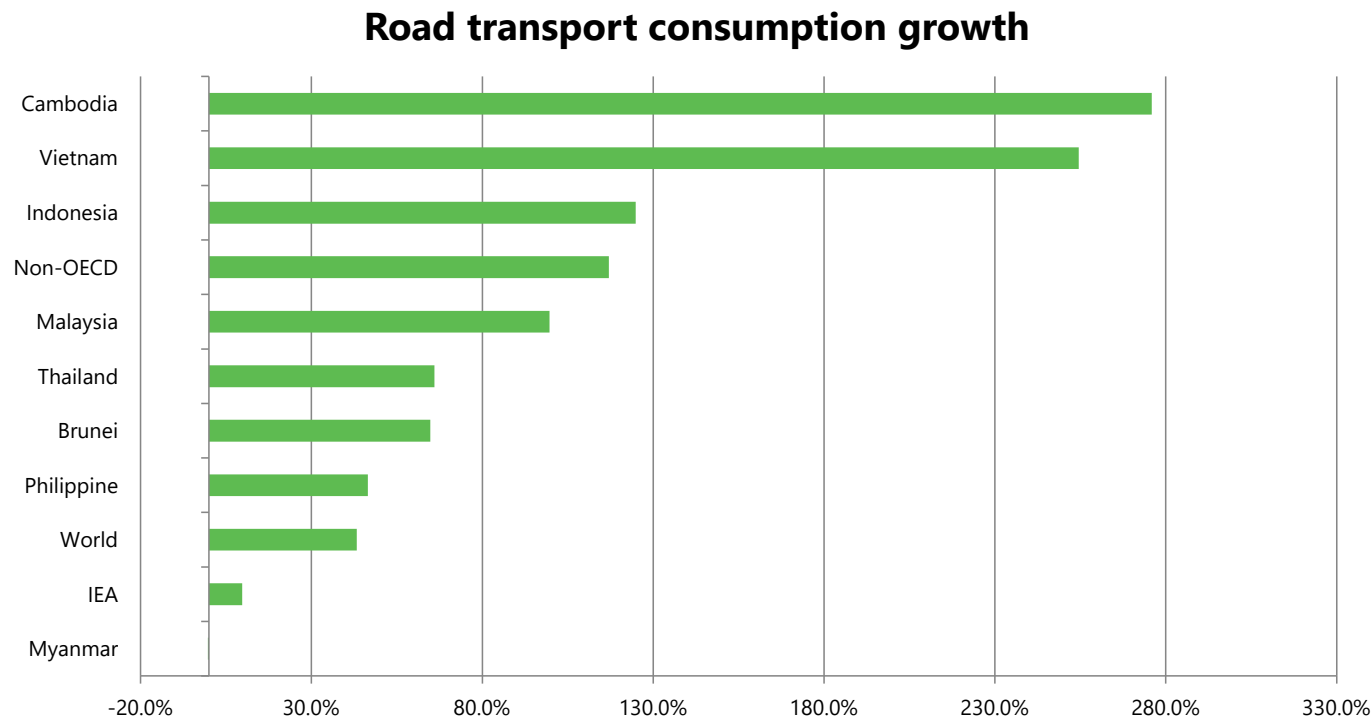**In Thailand, road transport dominates final consumption with about 95% share**

World energy consumption in transport* grows fast

Source: *IEA World Energy Balances, 2017*
* *Transport on this graph follows energy efficiency definitions and excludes pipeline transport*

Road transport consumption growth 2000-2015

Road transport consumption growth

Country	Growth
Cambodia	~275%
Vietnam	~255%
Indonesia	~125%
Non-OECD	~115%
Malaysia	~100%
Thailand	~65%
Brunei	~65%
Philippine	~50%
World	~45%
IEA	~10%
Myanmar	0%

X-axis: -20.0%, 30.0%, 80.0%, 130.0%, 180.0%, 230.0%, 280.0%, 330.0%

Road transport consumption is growing at fast pace in most focus countries

Source: *IEA World Energy Balances, 2018*

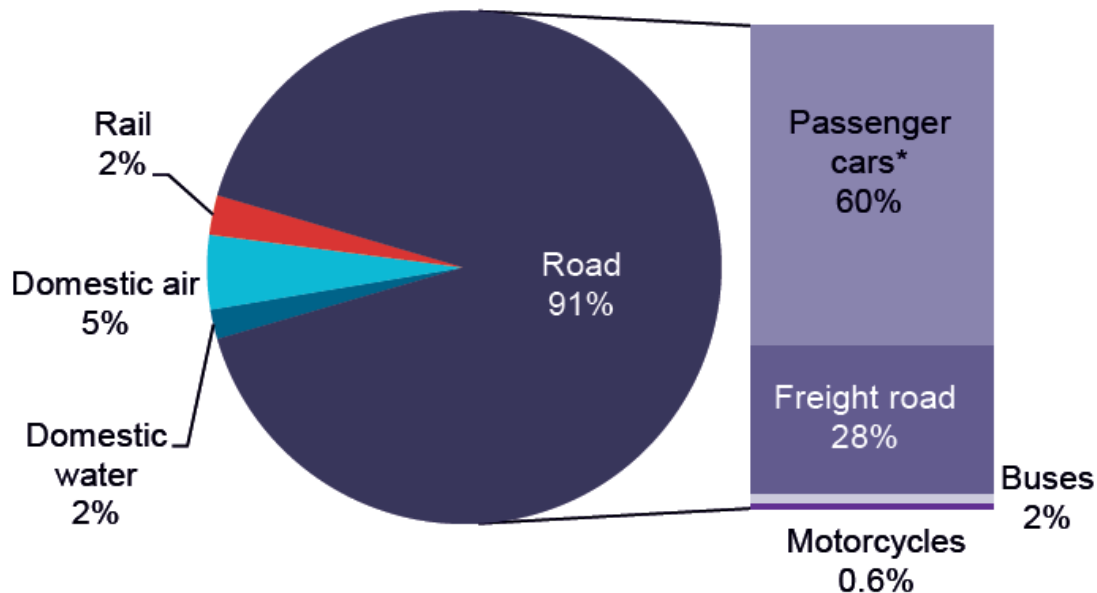# What else do we need to know to track efficiency in transports?

- ➢ What is the **split between passenger** transport **and freight** transport?

- ➢ How much **energy** is spent in my country to transport **one passenger on a distance of one kilometer**?

- ➢ Is it **more intensive** to travel in my country – by bus, car or train?

- ➢ How does it **compare** to other countries in my region?

What can we learn from energy efficiency indicators?
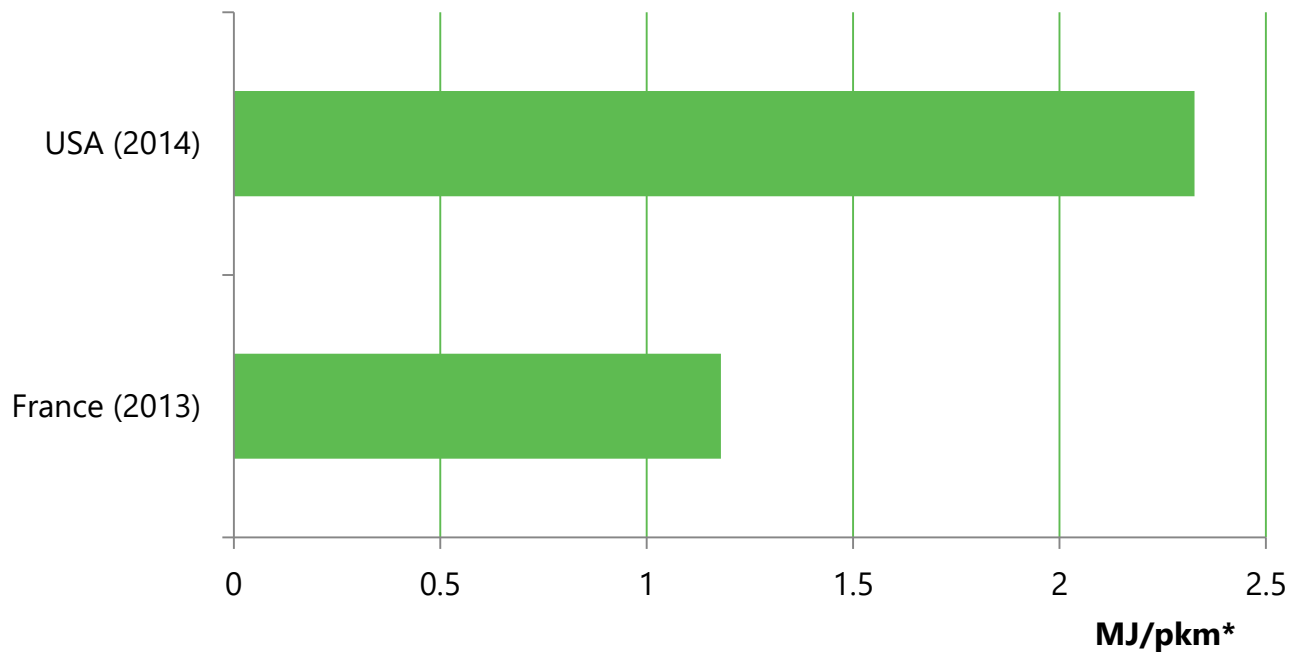
With additional data we can see where energy is used

Figure 12. Energy consumption in transport in IEA

Rail 2%
Domestic air 5%
Domestic water 2%
Road 91%
Passenger cars* 60%
Freight road 28%
Buses 2%
Motorcycles 0.6%

Energy intensities in passenger transport : examples

USA (2014)

France (2013)

MJ/pkm*

Transport activity by mode/vehicle type: examples

France — **United States**

Passengers (pkm*)

Legend: Passenger cars* · Motorcycles · Buses · Freight road · Rail · Air · Water

*Transport excludes international marine and aviation bunkers, pipelines, and when possible fuel tourism; pkm refers to; passenger cars includes cars, sport utility vehicles and personal trucks.

Energy intensities in passenger transport: examples

Legend: ■ USA (2014) ■ France (2013)

Categories (top to bottom): Air, Rail, Buses, Passenger cars*

X-axis: 0, 0.5, 1, 1.5, 2, 2.5, 3 — MJ/pkm*
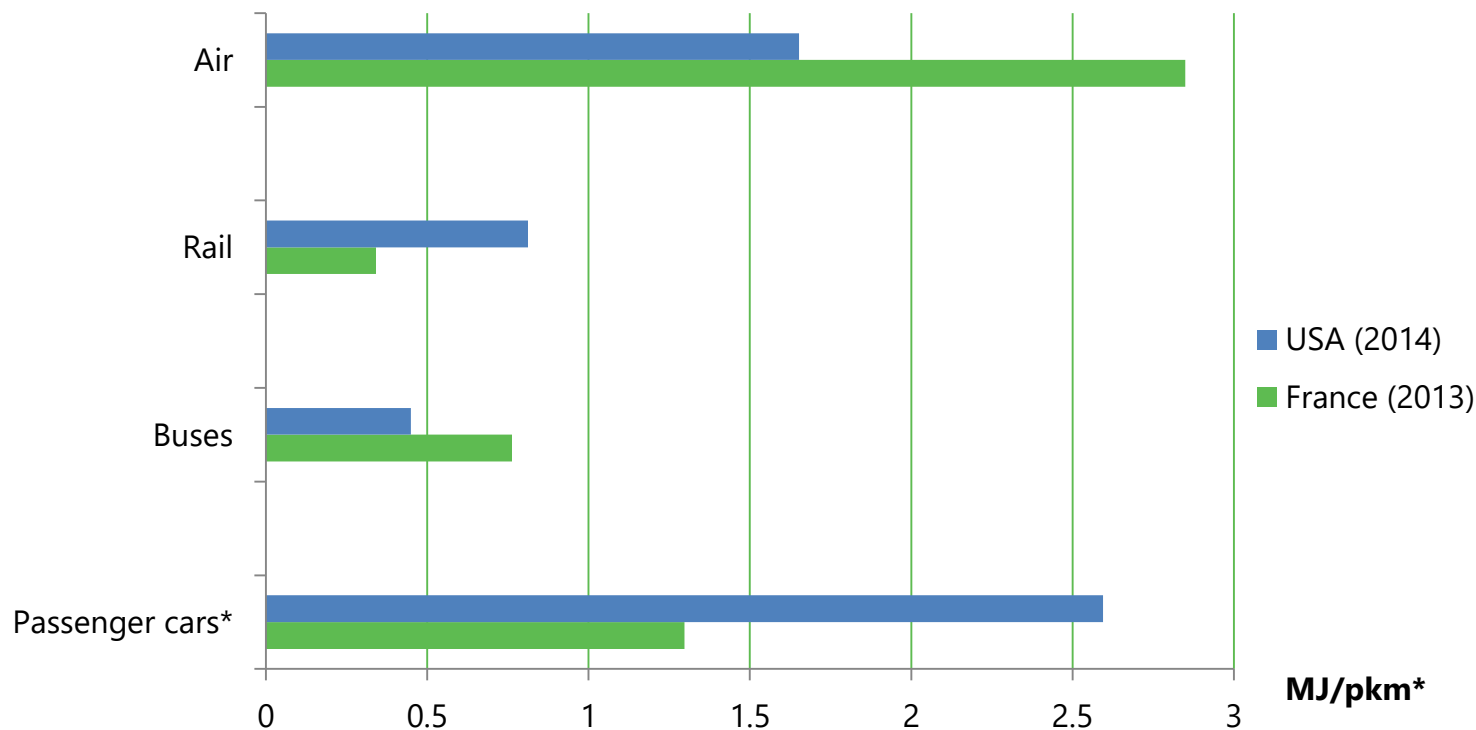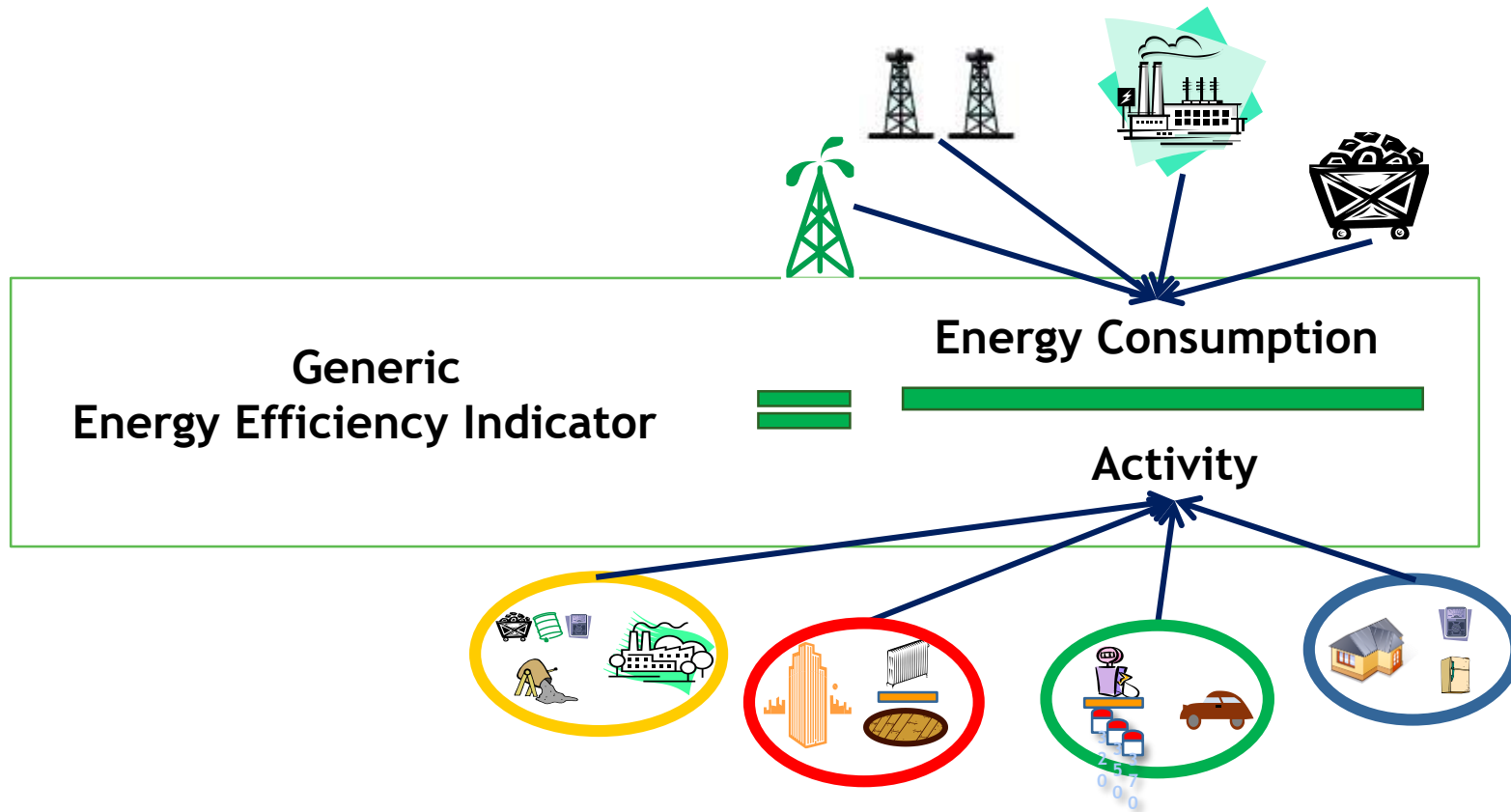
Source: *IEA Energy Efficiency Indicators, 2016*
*Transport excludes international marine and aviation bunkers, pipelines, and when possible fuel tourism; pkm refers to; passenger cars includes cars, sport utility vehicles and personal trucks;.

Developing energy efficiency indicators - discussion

Energy efficiency indicators: definition

$$\text{Generic Energy Efficiency Indicator} = \frac{\text{Energy Consumption}}{\text{Activity}}$$

Transport indicators: energy and activity data

Energy consumption data:
- Transport segment
  - passenger
  - freight
- Transport modes
  - road,
  - rail,
  - air,
  - water,
  - etc.

Activity data:
- Vehicle stocks
- Passenger-kilometers
- Tonne-kilometers

Vehicle stock

Distance travelled

Occupancy

Load

Selected modes/vehicle types by segment and sub-sector

Segment Sub-sector	Passenger	Freight
Road	Powered 2- to 4- wheelers Passenger light-duty vehicles (PLDVs) Buses	Freight light-duty vehicles Heavy-duty vehicles (HDV) Other
Rail	Passenger trains	Freight trains
Air	Passenger airplanes	Freight airplanes
Water	Passenger ships	Freight ships

IEA, *Energy Efficiency Indicators: Fundamentals on Statistics*, 2014

Calculation of transport activity data

Activity data for efficiency calculation in transport

Passenger-km or **tonne-km**

Occupancy

Load factor

✖

Vehicle stock

✖

Distance travelled

IEA, *Energy Efficiency Indicators: Fundamentals on Statistics*, 2014

Total vkm and total pkm calculation – example

For one vehicle, vkm is the total distance travelled in a given period.

For a stock of vehicles, the following relationships hold:

vkm = number of vehicles × average distance per vehicle (km)

pkm = vkm × average occupancy

tkm = vkm × average load

With average occupancy = average number of passengers per vehicle, and average load = average mass of goods transported per vehicle (in tonnes)

In other words, pkm (or tkm) can be higher due to either travelling longer distances or having more passengers (or weight of freight) per vehicle.

IEA, *Energy Efficiency Indicators: Fundamentals on Statistics*, 2014

Activity data for efficiency calculation in transport

5 km
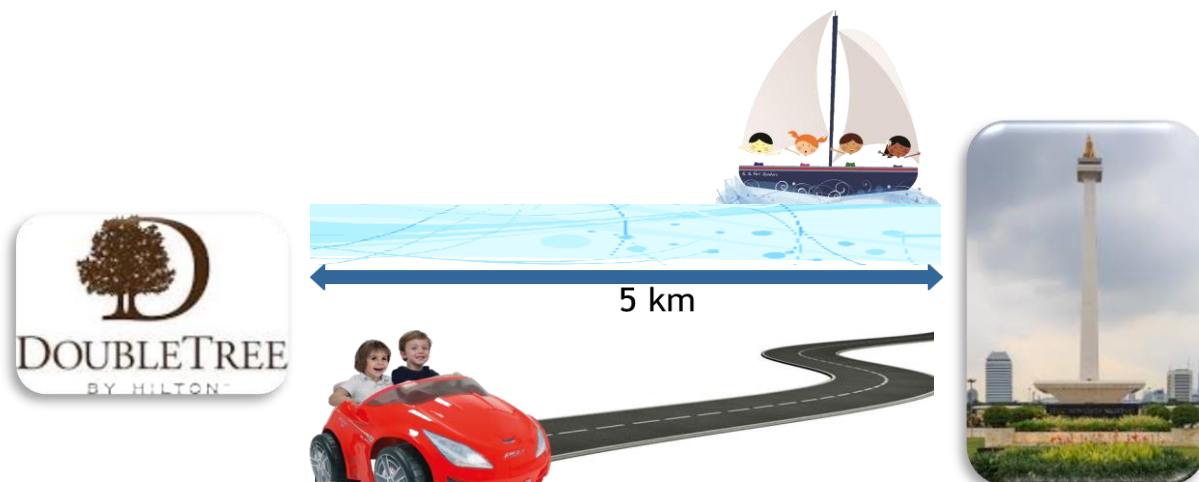
Vkm =   5km + 5 km = 10 v-km

Pkm =   6 passengers * 5 km = 30 pkm

Avg. load =   pkm/vkm = 30 / 10 = 3 p/v

www.iea.org/statistics

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