Energy efficiency indicators in the transport sector

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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.
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?
In Thailand, road transport dominates final consumption with about 95% share.

Source: IEA World Energy Balances, 2018
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 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

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

Source: IEA Energy Efficiency Indicators
Energy intensities in passenger transport: examples

Source: IEA Energy Efficiency Indicators, 2016
Transport activity by mode/vehicle type: examples

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.
Energy intensities in passenger transport: examples

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

Generic Energy Efficiency Indicator

Energy Consumption

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

<table>
<thead>
<tr>
<th>Sub-sector</th>
<th>Segment</th>
<th>Passenger</th>
<th>Freight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road</td>
<td>Powered 2- to 4- wheelers</td>
<td>Freight light-duty vehicles</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Passenger light-duty vehicles (PLDVs)</td>
<td>Heavy-duty vehicles (HDV)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Buses</td>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>Rail</td>
<td>Passenger trains</td>
<td>Freight trains</td>
<td></td>
</tr>
<tr>
<td>Air</td>
<td>Passenger airplanes</td>
<td>Freight airplanes</td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>Passenger ships</td>
<td>Freight ships</td>
<td></td>
</tr>
</tbody>
</table>
Calculation of transport activity data
Activity data for efficiency calculation in transport

*Passenger-km* or *tonne-km*

- **Occupancy**
- **Load factor**
- **Vehicle stock**
- **Distance travelled**

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:

\[ \text{vkm} = \text{number of vehicles} \times \text{average distance per vehicle} \text{ (km)} \]
\[ \text{pkm} = \text{vkm} \times \text{average occupancy} \]
\[ \text{tkm} = \text{vkm} \times \text{average load} \]

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.
Activity data for efficiency calculation in transport

\[ V_{km} = 5\text{km} + 5\text{km} = 10\text{ v-km} \]

\[ P_{km} = 6\text{ passengers} \times 5\text{ km} = 30\text{ pkm} \]

\[ \text{Avg. load} = \frac{\text{pkm/}v_{km}}{\text{pkm/}km} = \frac{30}{10} = 3\text{ p/v} \]