AUSTRIAN ENERGY AGENCY

# Austrian Energy Agency

## Developing Indicators: From Energy Balances to Policy Development

Going beyond the balance: The transport sector

Reinhard Jellinek

# Content

- Importance of data on transport
- Data included in energy balance vs. data needed
- Overview of different data sources available
- The Austrian way of calculating data on road transport
- Means of transport other than road transport
- Fuel tourism
- Policies and measures

# Why data on transport is important

Data can be used for

- creating transport policies at national and international level
- traffic and transport management
- spatial planning and infrastructure management
- planning of public and intermodal transport
- environmental issues (pollution, $CO_2$ emissions, scrap, …)
- safety issues (accidents)
- taxation
- international comparisons

# Transport data included in the Austrian energy balance

Final energy consumption (in terrajoule or tons) for

- Railways
- Road transport
- Transport in pipelines
- Maritime and inland waterway transport
- Air transport

↳ Differentiation between fuel types
(petrol, diesel, LPG, gas, electricity, biofuels)

# Data not included in the energy balance

- Passenger or freight transport?
- Vehicles or mobile machines and appliances?
- Differentiation between types of vehicles
  (passenger car, van, lorry, road tractor, bus, motorbike, others)
- Differentiation between classes of vehicles
  (engine power, cylinder capacity classes, weight, …)
- Fuel consumption on the national territory or abroad?

⇘ so the need to go beyond the balance

# The starting point

- No common practice for collecting information on transport
- Methods differ and depend on the available and usable data sources
- Available information has to be combined from different sources
- Growing need for comparable and harmonised information

# Most important data for calculating indicators

- Stock of vehicles
- Vehicle kilometres
- Passenger kilometres
- Ton kilometres
- Energy consumption
- Fuel consumption

by

- Mode of transport
- Energy source
- Engine power
- Fuel efficiency
- Vehicle weight
- …

# Four general methods for compiling road traffic statistics

Methods can be based on:

- Vehicles
  – e.g. information about fleet, odometer readings
- Passengers
  – surveys
- Road
  – traffic counts
- Fuel consumption

A fifth method could be information from border controls

# (1) Data on vehicles

- Vehicle stock
  - Age (using data on registration of vehicles)
  - Propulsion systems
  - Cylinder capacity classes
  - Specific consumption values
  - Emission factors

→ Structural effects are very important e.g. impact of the increasing share of diesel cars

- In some countries odometer readings are taken as part of roadworthiness tests (vehicle inspections) and can be used for various statistical purposes

# (2) Data on passengers – mobility surveys

- Respondents are asked to describe very precisely where they went on a specific “travel day” and which means of transport they used
- Each trip is split into segments (e.g. cycling → going by train → walking)
- Indication of
  - points of departure and arrival
  - departure and arrival times
  - means of transport used (e.g. walked, cycled, drove the car, rode as a car passenger, etc.)
  - distance travelled for each segment

# Limitation to surveys

- Complete annual data is available only for non-road transport (e.g. railway)
  - For passenger cars or other vehicles, detailed surveys are carried out every five (or ten) years
  - The figures are established for the base year and adjusted annually via smaller surveys
- The sample is often drawn from a register of households or resident persons.
- ↳ No information is gathered about business traffic, e.g. from professional drivers; taxis, lorries, buses

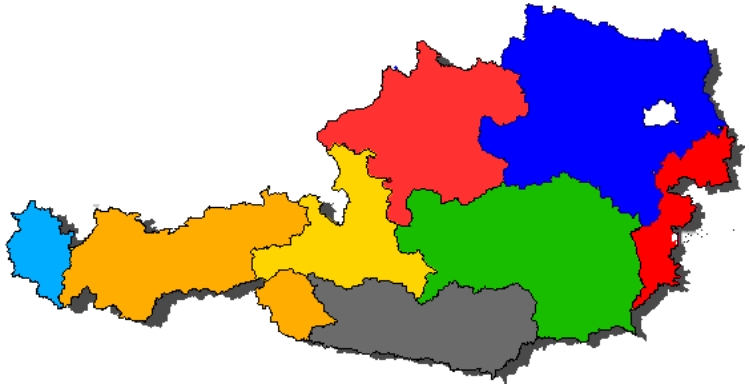
# (3) Data from roads

- Manual and/or automatic traffic counts on selected road segments
- Should include urban roads, high roads and motorways
- Including classification of vehicles:
  - Motor vehicles with 2 or 3 wheels
  - Passenger and light goods vehicles
  - Heavy goods vehicles
  - Buses and coaches

# (4) Data on fuel consumption

- Fuel deliveries (or sales) of petrol and diesel
- Alternative energy sources to be included if their shares become significant: CNG, ethanol, biodiesel, electricity
- If biofuels are blended with diesel or petrol they must be included
- The method generally does not replace direct sources of traffic information, but can be used as a control variable in order to obtain a more consistent set of traffic data and to minimise errors

# Main data sources used in Austria



- Fuel consumption data
- Data from road counts (only on major roads)
- Surveys (e.g. “Austrian Mobility Panel“, microcensus)
- GLOBEMI model
- “Nutzenergieanalyse” (useful energy calculation)
- “Verkehrsmodell Österreich“ (Austrian National Transport Model)

The main idea is to take into account multiple data sources to estimate, in an iterative process, both traffic and fuel consumption on national territory

# Data on fuel consumption

Data on fuel supply

- is collected in a detailed manner by the Austrian Statistical Office
- is the main input for calculations on total road traffic in Austria
- has to be allocated to the various modes of transport
- concerns the volume of fuel purchased on national territory only (not including fuel tourism)

# Data from road counts

- Stationary counters for permanent automatic traffic counting have been installed on sites across the national road network
- Several hundred permanent counters are installed
- Parameters collected:
  - Direction of traffic
  - Type of vehicle (cars, heavy goods vehicles, cars with trailers, HGV with trailers, buses)
  - Mean daily traffic for each day of the week
  - Mean hourly traffic

# Data from surveys

- The Austrian Mobility Survey 1995 (20,000 households) is used as basis
- The annual Austrian Mobility Panel (3,000 households) is used to monitor behavioural changes
- Results are adjusted with data from traffic counts
- For heavy goods vehicles an annual survey is carried out (26,000 vehicles are monitored for one week)
- Results are processed by the Austrian Statistical Office and the ministry of transport

# GLOBEMI model (1)

- Compiled by the Technical University of Graz (1997)
- Was developed for the calculation of emission inventories in larger areas
- Is used to allocate the given fuel consumption to the individual types of vehicles and machines

Two versions:

1. based exclusively on the amount of fuel sold in Austria (to meet the requirements of the follow-up to the Kyoto Protocol)
2. relating to the traffic volume within Austria

# GLOBEMI model (2)

Main input data:

- Vehicle stock, split into segments according to the propulsion system, cylinder capacity classes and vehicle mass
- Emission factors of the vehicles according to the year of first registration and the above-mentioned segments
- Passengers per vehicle and tons payload per vehicle
- Total fuel consumption

# GLOBEMI model (3)

Additional input data:

- Data on specific modes such as road freight transport
- Data on consumption of mobile machines and appliances used in industry, agriculture and forestry (from company surveys)

The total set of input data cannot be described here in detail.

# GLOBEMI model (4)

Output data:

- km driven per vehicle and year
- total vehicle mileages
- total passenger-km and ton-km
- emissions from transport (CO, HC, $NO_x$, particulate matter, $CO_2$, $SO_2$ and several unregulated pollutants)
  - specific emission values (g/t-km, g/pass-km)
  - total emissions

All results are available for the vehicle segments according to the vehicle types and the year of first registration.

# Transport data other than road traffic data

Specific circumstances apply to

- Heavy goods vehicles
- Railways
- Air transport
- Navigation
- Off-road consumption
- Pipeline transport
- Cycling
- Walking

# Fuel tourism – causes and definition

- Fuel is currently somewhat less expensive in Austria than in some neighbouring countries (mainly due to lower excise duties)
- For this reason, many foreigners cross the border just to purchase fuel at the closest filling station in Austria
- The term also includes fuel purchases on holiday and business trips and cross-border freight traffic

Vehicles tanking in the national territory but driving abroad

# Fuel tourism – effects

- Effects on the market, on tax revenues, side effects (e.g. shopping in foreign countries)
- The energy balance is based on the volume of fuel purchased on national territory
  - ➔ The share of fuel tourism must be adjusted
- Fuel tourism is influenced by many country-specific factors:
  - length of borders
  - population living close to border
  - fuel price differences

# Fuel tourism – Austrian approach (1)

- For a reference year, the traffic volume within Austria is calculated by means of the Austrian National Transport Model VMOe
  - A multi-modal transport model covering traffic movements between approx. 2,400 “transport zones” (the Austrian communities)
  - Data is consistent with the data from road counts and GLOBEMI
- Though the total traffic from both Austrian and foreign vehicles within Austria is covered
- In addition, fuel consumption of mobile machines and appliances is calculated

# Fuel tourism – Austrian approach (2)

- The results are used to calculate the total fuel consumption (and emissions) of traffic within the national territory of Austria
- The difference between the domestic fuel consumption and the total petrol and diesel sales is assumed to reflect the trends in fuel tourism
- Fuel tourism is estimated separately both for petrol and diesel, and for passenger and freight traffic

# Fuel tourism – Austrian approach (3)

- For validation Austria has developed another model which estimates the fuel tourism effect
- It is based on independent variables such as
  - fuel price differences between Austria and neighbouring countries,
  - EU accession,
  - introduction of the Euro, …
- This model has been calibrated with driver surveys and other sources

➔ Both models showed similar results

# Fuel tourism in Austria

Results:

- It is estimated that currently 26% of the fuel purchased in Austria for vehicles is due to fuel tourism
- 80% of which is diesel
- Of which two thirds are used by heavy goods vehicles
- The biggest share is used by German drivers due to many border crossings and a large population living in the border region

# Data from roads – future prospects

- In connection with new technology development better information on traffic volume will be available
  - E.g. Electronic Fee Collection (EFC) systems could become a source of very precise data
  - It will also be possible to get information on vehicle nationality from the EFC source, which would then enable the separation between national and foreign traffic

# Conclusion

- Lots of efforts have been made in Austria to improve statistics on transport
- Involvement of the Statistical Office, ministry of environment, ministry of transport, technical universities, traffic consultants
- Austria now has a very comprehensive coverage of the transport sector
- However, energy efficiency indicators are not really used to create policies and measures
- This might change in connection with the ESD directive

# Policies and measures in Austria

- Although energy efficiency indicators have not been used yet to create policies and measures, a lot of measures have been implemented independently
- e.g. the climate protection programme "klima:aktiv mobil", launched by the ministry of environment:
  - Mobility management for cities and regions, companies, public administrations, schools and tourism
  - Eco-driving