Transport models in use by the European Commission

UNECE Global Conference - 24th April 2012 Geneva

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Joint Research Centre
The European Commission's in-house science service
One Directorate-General of the European Commission

7 institutes in 5 countries: Italy, Belgium, Germany, The Netherlands, Spain

Mission: to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of EU policies.

Unit ECCET on Economics of Climate Change, Energy and Transport
Impact assessment and models in the European Commission

Before the European Commission proposes new initiatives it assesses the potential economic, social and environmental consequences that they may have.

Impact assessment is a process that prepares evidence for political decision-makers on the advantages and disadvantages of possible policy options by assessing their potential impacts.

Analysing the impacts of the options and comparing the options are two important steps in this process.

=> Impact assessment needs quantitative tools and model-based analysis by the European Commission
Impact assessment and models in the European Commission

Requisites for assessing impacts of mitigation transport policies

**Time horizon** for Mitigation policies: 2030-2050

**Baseline scenario:**
- Macro-economic assumptions (GDP, population, oil prices,...)
- Investments (e.g. transport infrastructures)
- Policies in place (MS and EU)
- Technology market

... 

**Policy scenarios**
- Impacts of policies against baseline:
  - costs for the transport users, market changes, change in transport demand, energy use, GHG emissions, external costs, welfare

A coherent **modelling framework**
Impact assessment and models in the European Commission

A coherent modelling framework

*Input to transport model*

*Output from transport model*

**Macro-economic model**
- DG ECFIN projections, GEM-E3

**Transport Network model**
- Transtools (v2.6, v3)

**Transport demand**
- (pkm, tkm)

**Transport model**
- => Transport demand ex./endogenous
- => Fleet and technology market
- => Energy, environment
- => Other externalities
- => Welfare

**Energy market modelling**
- e.g. POLES, PRIMES

**Fossil and bio-fuel price, Carbon value (ETS)**

**GDP**

**TREMOVE, PRIMES-TREMOVE:**
- EU, Exogenous demand

**“Model T”:**
- EU+RoW, endogenous demand
Overall landscape of transport models used for IA

Two complementary models

**TRANSTOOLS**: network based, endogenous demand, v3 in 2014
http://energy.jrc.ec.europa.eu/transtools/

**TREMOVE**: fleets and emissions, applications for CO2 standards, gradually fading out of use (up to 2030)
www.tremove.org

**PRIMES-TREMOVE**: TREMOVE-based, soft-link with PRIMES, external provider (up to 2050)

**Model T**: based on TREMOVE + POLES modules, (up to 2050), endogenous demand, maintained and operated by EC (JRC)

Rk: Different EU-funding framework (FP7, supporting contracts...
Overview of model T

Transport demand

GDP, population, other factors

Transport activity (pkm, tkm)

Expected total fleet

Additions to the fleet

Fleet size and composition

Scrapage

Energy use and emissions

Vehicle features

Performance (utility)

Vehicle costs

Vehicle features

Fuel and other costs

GHG Emissions (optional: air emissions)

Fuel use

Externalities (accidents, noise, etc.)

Welfare cost and externalities

Fuel use

Economic surplus
(inland) Transport demand

Exogenous variables:
- population, GDP, Trade

Endogenous variable:
- Motorization rate

Total demand generation by purpose (base year and trend)

Split between inter-regional and intra-regional

Split between distances types

Split between urban and non rural

Split between periods

Split between modes

Split between network types

Endogenous variables:
- transport costs (€/pkm, €/tkm)
  => generalised costs
Fleet and user choice

Fleet per vehicle category in year $t$: Fleet($t$) = $pkm(t) / (occ. \ast mileage)$

Fleet($t$) = Fleet($t$-1) + **Sales ($t$)** - Scrap($t$)

Vehicle sales and technology market:

**Discrete choice modelling** taking into account:
- Technology costs (including technology learning)
- Fuel costs
- Other non monetary utility factors
- And constraints from **Fuel supply infrastructure availability** (function of density of refueling infrastructure, trip distance and region, technology performance - e.g. battery capacity)
Fleet demand and vehicle purchase

Coverage of transport modes and travel range by different alternative fuels


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<th>Road/freight</th>
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<th>Water</th>
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Calculating consumer surplus and quantifying the effects of policy and technological measures on welfare. It calculates the absolute value of each element:

- consumer surplus,
- external effects,
- distortion effect (due to taxes and subsidies).

The model also considers externalities linked to

- Air pollution,
- congestion
- accident,
- noise,
- wear and tear
Example of transport policies

- CO2 / fuel efficiency standards (1, 2)
- Fuel/CO2 taxation (2)
- Vehicle taxation (ownership, circulation tax, feebate) (2, 3)
- Road charging and internalisation (+ Transtools) (2)
- Logistics efficiency measures (changing load / occupancy)
- R&D (technology learning) (4)
- Fuel supply Infrastructure (4)
- Speed limits

(1) Impact assessment of CO2 & car, CO2& van regulations
(2) Impact assessment Transport White Paper

Thank You!

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### Modes available in each transport context

#### Passenger transport

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<tr>
<th></th>
<th>Car</th>
<th>Moped and motorcycle</th>
<th>Bus</th>
<th>Tram and metro</th>
<th>train</th>
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#### Freight transport

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<th>Inland navigation</th>
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