The IEA Mobility Model,
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Project development

2003
WBCSD project and **SMP model**
- scenarios exploring energy use, CO$_2$ and pollutant emissions, safety and materials use

2004-2005
SMP model developed further into the first version of the **MoMo model**
- MoMo data used for the IEA ETP analysis and ETP 2006

2006-2008
Second phase of model development
- Deeper analysis of vehicle technology potential (incl. PHEVs)
- Elasticities of travel & ownership w/respect to GDP and oil prices
- Significant amount of historical data integrated in the model
- Development of ETP 2008 scenarios

2008-2011
Third phase of model development
- Improved User Friendliness; detailed modular approach
- Expanded coverage of countries/regions
- Development of modal shift scenarios
- Vehicle, fuel and fuel infrastructure cost associated to each scenario
What is MoMo?

- It is based on the "ASIF" framework:
  \[ \text{Activity (passenger travel)} \times \text{Structure (travel by mode, load factors)} \times \text{Energy Intensity} = \text{Fuel use} \]

- It is a spreadsheet model of global transport, energy use, emissions, and materials use
  - analysis of multiple scenarios, projections to 2050
  - Based on hypotheses on GDP and population growth, fuel economy, costs, travel demand, vehicle and fuel market shares

- World divided in 29 regions, incl. a good number of specific countries, to 2050 using a 5-year step
  - USA, Canada, Mexico, Brazil, France, Germany, Italy, UK, Japan, Korea, China, India
  - Model suitable for handling regional and global issues

- Large amount of information (data) on technologies and fuel pathways available
  - Full evaluation of the life cycle GHG emissions
  - Detailed historical database for the global transport sector
Analytical capabilities

- **Modeling capabilities**
  - What-if
  - Back casting
  - Use of elasticities for ownership and mileage

- **Modal Shift**
  - Urban / non-urban travel split based on urban mobility surveys

- **Cost analysis**
  - Vehicle: purchase cost, O&M
  - Fuel: Cost, T&D, storage and distribution infrastructure
  - Infrastructure: Construction, reconstruction, O&M
Coverage of transport modes

- 2-3 wheelers

- Light duty vehicles
  - Spark ignition (SI) ICEs
  - Compression ignition (CI) ICEs
  - SI hybrid ICEs (including plug-ins)
  - CI hybrid ICEs (including plug-ins)
  - Hydrogen ICE hybrids (including plug-ins)
  - Fuel cell vehicles
  - Electric vehicles

- Heavy and duty vehicles
  - Passenger
    - Minibuses
    - Buses
    - BRT systems (to be added in 2012)
  - Freight
    - Medium freight trucks
    - Heavy freight trucks

- Rail (passenger, freight)
  - High-speed rail (to be added in 2012)

- Air (only passenger, new module under dev.)

- Water transport (only freight, new module under dev.)
Coverage of fuel pathways

- Liquid petroleum fuels
  - Gasoline
  - Diesel (high- and low-sulphur)

- Biofuels
  - Ethanol
  - Biodiesel
  - Biogas

- Synthetic fuels
  - GTL and CTL

- CNG/LPG
  - CNG, LPG, biogas

- Electricity
  - Separately for EVs and PHEVs, other modes; by generation mix, by region

- Hydrogen
  - from natural gas, with and without CO₂ sequestration
  - from electricity, point of use electrolysis, with and without CO₂ sequestration
  - from biomass gasification
  - advanced low GHG hydrogen production
Under Development

- Updated shipping module, due end 2012
  - Subcontracted to University College London
  - Will include ship type differentiation, world regions by maritime routes

- Updated Air Module, due end 2012
  - Subcontracted to Cranfield University
  - With distinguished domestic/international by region, by plane type

- New Vehicle infrastructure analysis/module, beta version
  - Calculates infrastructure needs for Road, Rail and Airports infrastructure according to traffic growth
  - Estimates the infrastructure costs expenditures needed
  - Embedded carbon of infrastructure also being developed

- More detailed database, delivered
  - Historical datafiles will be more detailed to cover more countries, more technologies
  - World database of road vehicle sales and stock by fuel type will be more flexible and have better user friendliness
Future plans

- Excel limits almost reached
- Need for a platform migration:
  - Model extension
  - User friendliness
- IEA common modeling framework
  - Consultation phase
- Platforms considered
  - Vensim
  - Scilab
  - R
Model upgrades for ETP 2012

- Add new regions:
  - EU-27
  - ASEAN
  - NORDIC
  - Israel, Chile

- Extend low-carbon scenario to 2075
- Multi-sector analysis of H₂
- Complete analysis of transport infrastructure requirements, cost

- Some ETP 2012 glimpse
Sales expected to triple by 2050

- Mainly in non-OECD countries
- Technology portfolio need to substantial evolve to reach 2DS
Vehicle technology is not enough

- Shifting away from GHG intensive modes help reaching 2DS
- Demand management and virtual mobility also providing some benefits to reduce energy use
Vehicle infrastructure requirements

- Road and rail requirements linked with
  - Vehicle.kilometre
  - Density limits
  - Construction rates limits

[Graph showing road and rail requirements for different years and regions]
L’addition s’il vous plait

- Summing up transport sector spendings over the next 40 years
- Efficiency gains, and alternative technologies bringing huge fuel savings
- Avoid/Shift reduces vehicle and infrastructure bill
Who supports this work?

- Now 11 partner institutions; 6 have been financing the project development since the end of the SMP.


There appears to be rapidly growing interest from other groups in using the Model. We are grappling with this and considering how we might structure cooperations in the future.
Conclusions

- MoMo has a long history,
- Long lasting interest from key players
- Partnership is growing, UNECE welcome to join
- ForFITS very ambitious project, needed to assist policy makers
THANK YOU  (AND GOOD LUCK)

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