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TML's vehicle park prediction tool

TML is currently developing a tool able to make projection of world vehicle stocks of all transport modes up to the year 2050. Some preliminary results of its baseline scenario projection show significant growths in world transport vehicle fleet during the observed period.

The tool generates transport demand from exogenous economic and demographic inputs, in line with the most recent estimations from the European Commission, United Nations, and International Monetary Fund. In the first step, it segments transport demand in a sequence of splits, i.e. by origin and destination, purpose, distance band, network level, and period and in the second step, by mode. On one hand, generalized costs of transport influence both demand generation and segmentation steps. On the other hand, total transport demand and the composition of the different vehicle fleets influence also these generalized costs of transport.

The baseline projection can be considered as *a policy free scenario*. Vehicle stock growth is driven first of all by the generated transport demand which is based on several main exogenous demographic, and economic consumptions (trade, costs taxes,…), i.e.:

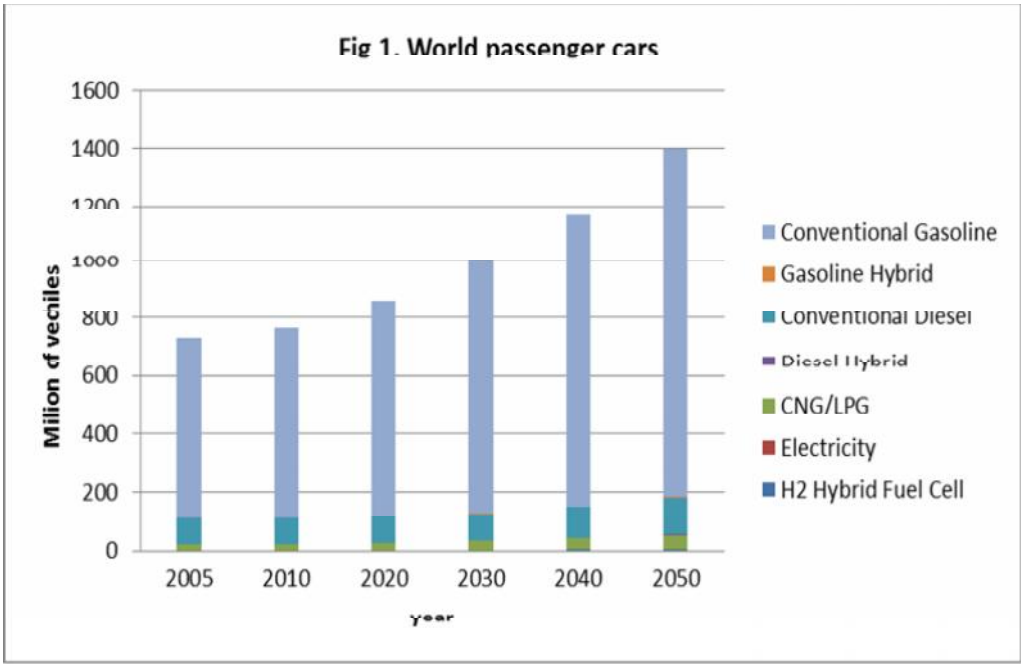
- *Demographic:* World population grows steadily from 6.3 billion people in the year 2005 to 8.9 billion in 2050 with the strongest increase taking place in developing regions, especially in Africa (149%), Middle East (98%) and South West Asia (66%).
- *Economic:* expressed in constant rate of euros of 2005, the total world GDP would rise from 31.5 T€ in 2000 to 128 T€ in 2050. In 2000, 82% of word GDP was produced in developed regions, but by 2050 those regions would generate mere 56% of GDP. Asia share in global GDP would increase from 8% in 2000 to 25 in 2050.
- *Energy:* oil price would rise according to World Energy Outlook (2008) from USD 100/bbl in 2010 to USD 120/bbl in 2030 to USD 300/bbl in 2050 (in term of nominal price).
- *Greenhouse gas:* carbon tax in the 33 European countries is assumed to increase linearly from 1€/tCO_2 in 2013 to 38 €/tCO_2 in 2050. This tax is assumed to be zero in the rest of the world.

Based on the above assumptions world passenger transport demand is projected to increase by 120% between 2005 and 2050 from 36356 Gtkm to 79950 Gpkm. Car would meet around 45% of this demand during the whole period, while bus share would slightly decrease from 30% at 2005 to 25% at 2050. Aviation industry share would increase from 11% at 2005 to 17% at 2050 while rail modes would capture the rest of the share, i.e. from 6% in 2005 up to 8% in 2050.

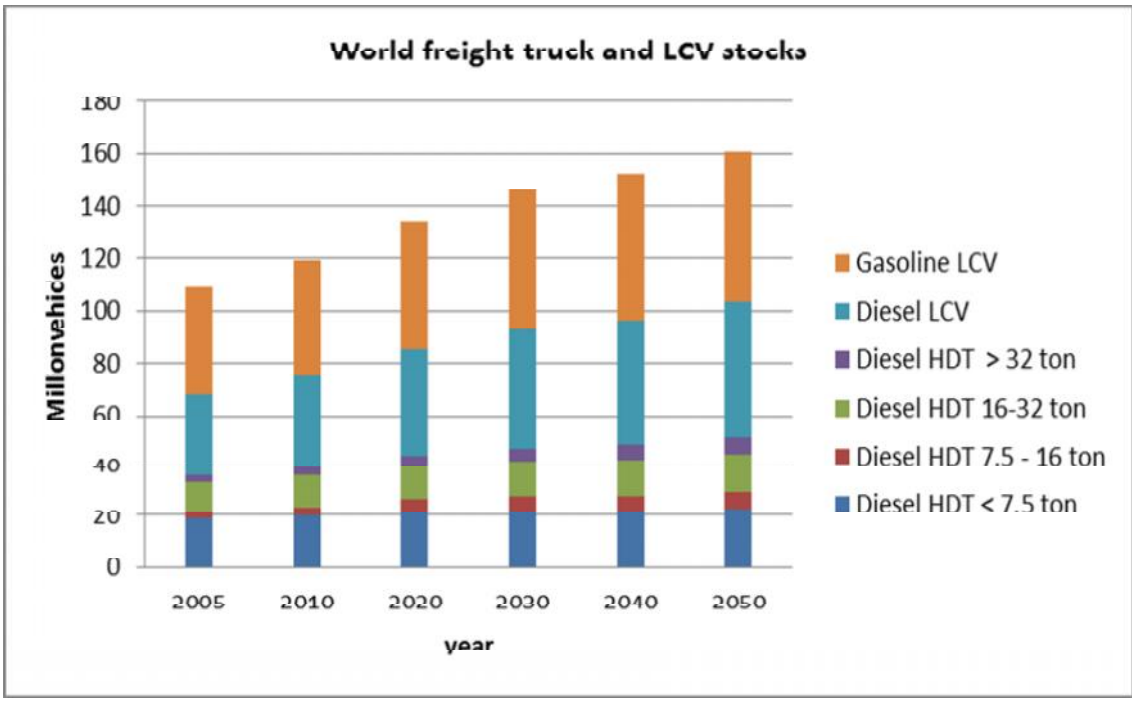
Freight transport demand is also expected to grow remarkably, increasing globally from 75260 Gtkm in 2050 to 161355 Gtkm in 2050. More than 75% of the world freight demand would be satisfied by the shipping industry. The shares of road and rail freight are comparable during the whole projection period, i.e. around 10%-11% of the total each. The share of the inland waterways freight transport demand would remain slightly higher than 2% during the whole period. Air freight is expected to grow as well, although negligibly in comparison with other modes.

In order to satisfy the increasing transport demand the global fleets would need to grow.

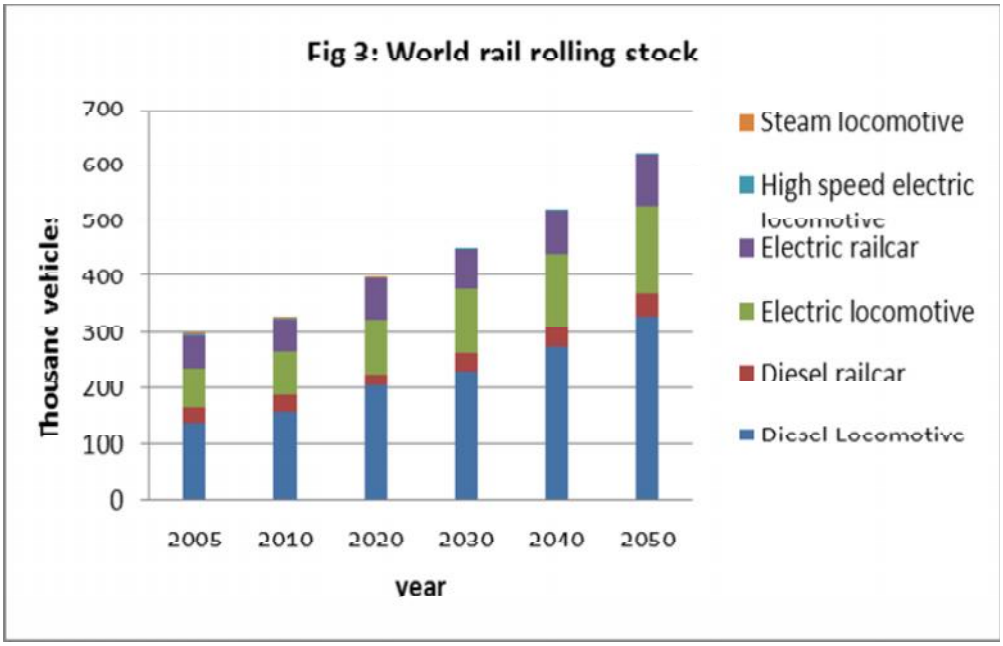
The world fleet of passenger cars would double, changing from 735 million vehicles in 2005 to 1400 million vehicles in 2050. Most of them (around 85%) would be gasoline-powered. Only diesel (10%-11%) and natural gas (3%) engines are expected to be present in sizeable proportions. New vehicle technologies (electric and hydrogen based) would begin to appear only from 2030 onwards and they are expected to account for less than 0.5% of the global fleet by 2050.



In the case of road freight vehicles, the model foresees a growth in the global fleet from 107 million in 2005 to 160 million vehicles in 2050. More than two-third of that fleet would consist of light commercial vehicles (LCV) while the share of heavy duty trucks would remain around one third. Diesel-powered engines would dominate this sector, accounting for around 64% during the whole projection period.

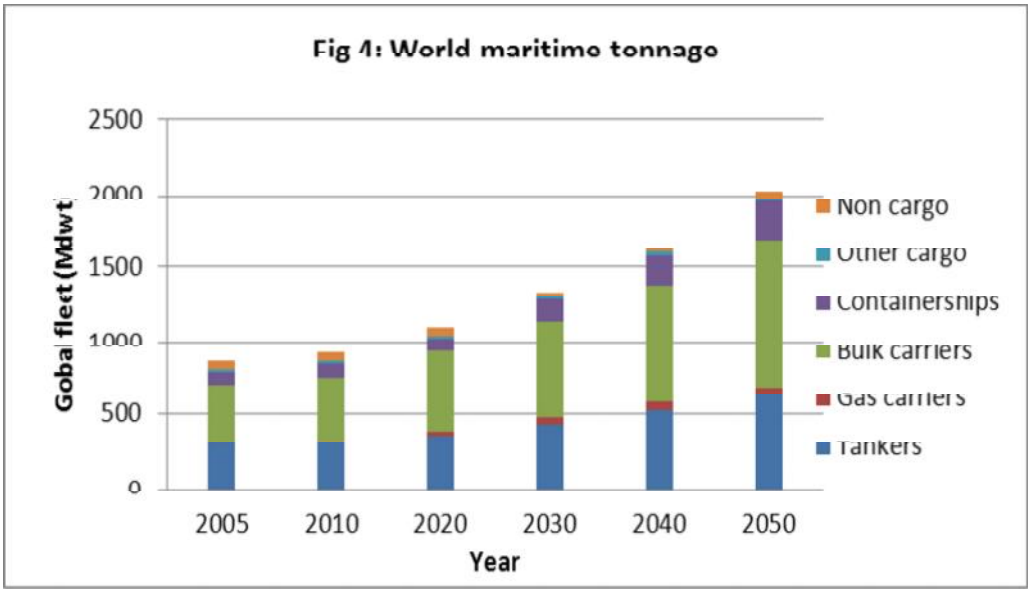


As regards rail transport, growth in passenger and freight transport demand would double the amount of rail vehicles, changing from 297 thousand vehicles in 2005 to 622 thousand in 2050. Locomotives, which currently account for around 74% of the global fleet, would increase their share to nearly 80% by 2050, while the amount of railcars is expected to diminish markedly (from 26% to 20% of the world total). Around 58% of the global rail fleet would be diesel-powered, being most of the remaining fleet electric-powered. Obsolete steam-powered locomotives would disappear completely around 2020.

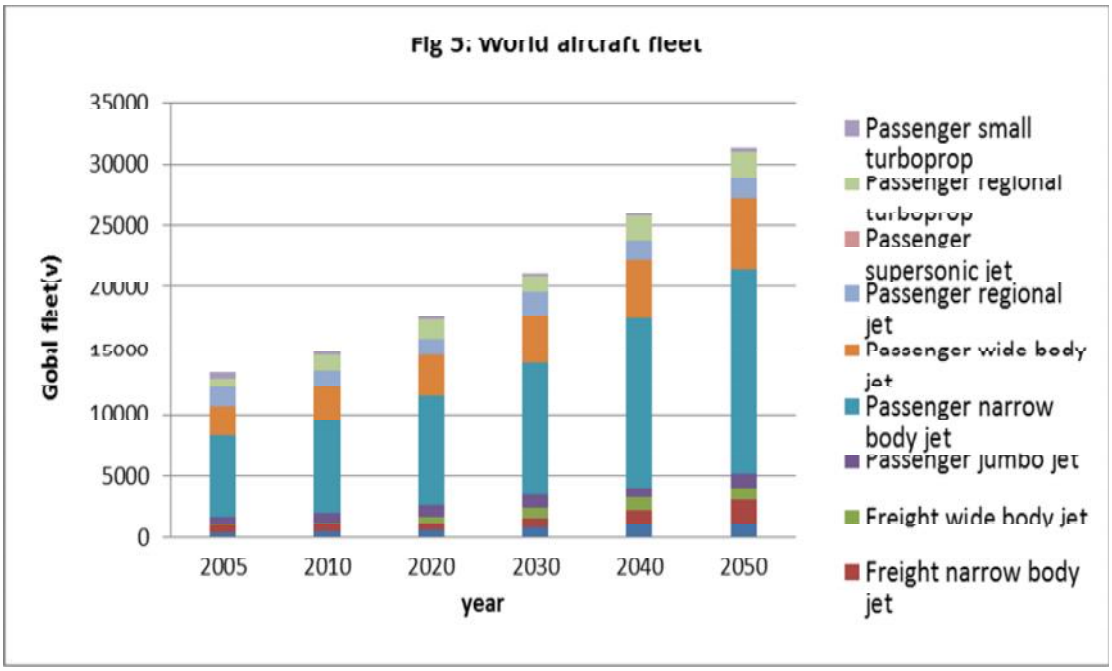


Growth in maritime transport demand is expected to induce an increment in global tonnage from 901 Mdwt in 2005 to 2027 Mdwt in 2050. Oil tanker tonnage, currently a third of the world fleet, would change from 287 Mdwt in 2005 to 1002 Mdwt in 2050, i.e. remains one-third of the total share. The share of bulk carriers in total tonnage would increase from around 47% in 2005 to nearly 50% in 2050. Gas carriers would increase from 2.2% in 2005 to 3% in 2050. The fleet of containerships would expand from

9% to 12% of the world total, displacing other obsolete cargo vessels. The proportion of non-cargo vessels (a mixture of fishing boats, barges, and other service vessels) would diminish from 6% to around 2.7% of the global total.



The evolution of air transport demand would increment the amount of aircrafts in service from 13410 aircrafts in 2005 to around 21335 aircrafts in 2050. Most of those aircraft (91% in 2005, 86% in 2050) would be employed to meet airborne passenger transport demand. As regards aircraft size, there are no significant changes to be expected. Narrow-body aircraft would make up most of the fleet (51% in 2005 vs. 58% in 2050). The share of wide-body and regional jets is expected to be around 28% of the total, while jumbo jets would account for approximately 7.5% of the global fleet. In terms of propulsion technology, most aircraft (88% in 2005 and 93% in 2050) are expected to be jet-engined.



Further steps of the tool development will include data updating up to 2010, alignment of the main exogenous assumptions with assumptions used in the reference scenario of the World Transport Outlook

produced by the International Transport Forum (ITF) followed by calibration and validation, comparison with results of other stock projections (e.g Outlooks from Boeing and Airbus for aircraft, Panama Canal Authority for maritime,…) .

APPLICATIONS

The main aim of this new tool is to estimate medium to long term transport fleet projection on world scale. In this sense, the tool can support strategy of global manufacturers of transport equipment and infrastructure providers as well as support for strategic policy development for international governmental institutes.

The tool allows for fleet projections in great detail, namely

- Spatial resolution: Country-level (or groups of countries)
- Vehicle segmentation (e.g. 5 aircraft size-classes: small, regional, narrow body, wide body, jumbo)
- Technology types (e.g. diesel/gasoline/CNG/electric/…)

As the tool is designed specifically for fleet projections, it includes complex dynamic fleet turn-over mechanics, replicating real world fleet behavior. These mechanics are essential to determine medium to long turn fleet projections and are a key aspect of this new tool.