International Transport Forum

Transport Outlook

Meeting the Needs of 9 Billion People

OECD

Transport Outlook

Meeting the Needs of
9 Billion People

INTERNATIONAL TRANSPORT FORUM

The International Transport Forum at the OECD is an intergovernmental organisation with 52 member countries. It acts as a strategic think tank with the objective of helping shape the transport policy agenda on a global level and ensuring that it contributes to economic growth, environmental protection, social inclusion and the preservation of human life and well-being. The International Transport Forum organizes an annual summit of Ministers along with leading representatives from industry, civil society and academia.

The International Transport Forum was created under a Declaration issued by the Council of Ministers of the ECMT (European Conference of Ministers of Transport) at its Ministerial Session in May 2006 under the legal authority of the Protocol of the ECMT, signed in Brussels on 17 October 1953, and legal instruments of the OECD.

The Members of the Forum are: Albania, Armenia, Australia, Austria, Azerbaijan, Belarus, Belgium, Bosnia-Herzegovina, Bulgaria, Canada, Croatia, the Czech Republic, Denmark, Estonia, Finland, France, FYROM, Georgia, Germany, Greece, Hungary, Iceland, India, Ireland, Italy, Japan, Korea, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Mexico, Moldova, Montenegro, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, the United Kingdom and the United States.

The International Transport Forum’s Research Centre gathers statistics and conducts co-operative research programmes addressing all modes of transport. Its findings are widely disseminated and support policymaking in Member countries as well as contributing to the annual summit.

Further information about the International Transport Forum is available at
www.internationaltransportforum.org

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The long term evolution of global transport demand

Mobility to triple globally.

The world's population reached 6 billion in 2000 and will be around 9 billion in 2050. Coupled with rising incomes this will lead global mobility to expand strongly through 2050. If infrastructure and energy prices allow, there will be around 3 to 4 times as much global passenger mobility (passenger-kilometres travelled) as in 2000 and 2.5 to 3.5 as much freight activity, measured in ton-kilometres.

Rapid increase outside the OECD region.

Growth will be much stronger outside the OECD region than within it. OECD passenger-kms are expected to grow around 30 to 40% between 2000 and 2050 and ton-km by 60 to 90%. Outside the OECD region, passenger-kms could increase by a factor of 5 to 6.5, and ton-kms by a factor of 4 to 5. The high end of these ranges would be reached only if mobility aspirations in emerging economies mimic those of advanced economies and if prices and policies accommodate these aspirations. Full realisation of such a development path may be unlikely but this illustrates the significant upside risk associated with the lower, baseline projection. Accounting for population growth, passenger mobility per-capita outside the OECD grows three fold in our baseline scenario or four-fold in the high scenario.

Consequently, like economic mass, the centre of gravity for mobility will shift to non-OECD economies. In 2000, half of all passenger-kms were driven in OECD countries. According to our scenarios this declines to around a fifth in 2050. For ton-kms, the OECD share declines from a half to around a third.

Car ownership levels critical.

Projections this far ahead are fraught with uncertainty. For example, it is unclear to what levels car ownership per capita will rise in emerging economies. Very high levels, characteristic of the USA, are unlikely; somewhere between European and Japanese levels is conceivable. The range between these reference points is large but in either case the share of car-trips in total passenger mobility seems set to increase strongly, e.g. from less than 10% at present in China to more than 50% in 2050.

Peak car travel in advanced economies?

Peaking car travel is a risky assumption.

Travel by passenger vehicles has not grown much recently in a number of the highest income economies, or has even declined. The peak car travel hypothesis holds that this is because of a saturation effect, where more income no longer translates into more car travel when incomes are very high.

But peak car travel is just one among several potential explanations for the observed levelling off of car travel, so projections of future car travel demand should not take peaking for granted.

Other potential explanations include increases of fuel prices and uncertainty over future disposable income. Moreover, rising inequality in the distribution of incomes has meant that large parts of the population benefitted little from average growth in income, and this may explain part of the stagnation in travel by car in some countries. For the future, demographics (population size and age structure) as a driver for car travel demand will be increasingly important.

CO_2 Emissions

Doubling fuel economy to stabilise emissions.

CO_2 emissions will rise less strongly than mobility because of improving fuel economy. By 2050 global emissions from vehicle use might be 2.5 to 3 times as large as they were in 2000.

For emissions from cars and light trucks to remain at the 2010 level, average fleet fuel economy would need to improve quickly and strongly, from around 8 l/100km in 2008 to 5 l/100km in 2030 and less than 4 l/100km in 2050.

Fuel economy and fuel tax revenues

Falling fuel tax revenues.

Expected improvements in fuel economy will lead to reduced consumption of gasoline in, for example, the USA and OECD Europe (Diesel consumption would first increase and then decline in OECD Europe).

If fuel tax levels do not change, this means a strong reduction in revenues from the taxation of transport fuels. This prompts a need for revising transport tax structures, perhaps in the direction of distance-based charges.

To illustrate the point, a fuel economy improvement that reduces the CO_2 emissions of an average diesel car in France from 160g/km to 130g/km generates enough savings on fuel expenditures for most drivers to make the investment in more efficient technology worthwhile. But the loss of tax revenue would result in a bad deal for society if the shortfall were to be made up by additional labour taxes, despite the benefits of lower CO_2 emissions.

More km-based charges.

One way to avoid this tax cost is to turn to kilometre-based taxes. These can be designed so that both drivers and taxpayers benefit from improvement in fuel economy, at least if the kilometre-charging system is not too expensive to run.

© OECD/ITF 2011

The market for electric vehicles

Limits to subsidies.

To decarbonise transport radically a large proportion of the road vehicle fleet would have to use alternative energy carriers including electricity, probably with an accompanying change in models of vehicle ownership and patterns of vehicle use. Part of the strategy for opening up the possibilities for change is to subsidise the purchase of general purpose passenger cars by the public. Vehicle manufacturers need to count on such subsidy programmes being in place long enough to support investment in electric technologies.

In the longer term, however, vehicles will have to become competitive without subsidy, as the cost to public budgets would be excessive if subsidised electric vehicles were to become a large part of overall car sales.

At the same time, prices for some of the electric vehicles now on the market suggest that they are financially advantageous in some high mileage markets, such as delivery vans and taxis, even without subsidies. Policies to promote uptake through non-financial incentives and partnerships might make more sense than subsidies in these markets.

The global economy, trade, and freight transport by sea and air

Recovery characterised by downside risks.

The 2008 crisis led to a major disruption of global trade flows. But global trade has now surpassed pre-crisis volumes and is expected (by the WTO for example) to return quickly to growth at the pre-crisis rhythm.

The International Transport Forum accepts this as a reasonable expectation but points to downside risks that are far bigger than upside potential:

- The emerging economies are the driver of global economic expansion post-crisis. But their growth model, notably in China, relies heavily on exports and on domestic investment. Given weakening of export demand and reduced availability of near-term investment opportunities, the Chinese economy may increasingly need to turn to other sources of growth, e.g. domestic household demand.

- The upward pressure on energy prices and uncertainties related to geo-political events could put a brake on growth.

Trade figures underline the risks.

Data on external trade volumes for the EU and the USA reflect the shift in global economic mass to emerging economies through the composition of trade flows. The data reveal a reduction of trade deficits between the USA and China, between the USA and the EU and between Europe and China. But these reductions seem to be more a simple result of the 2008 shock than a fundamental change or a tendency to “rebalancing” trade. In that sense the trade figures contribute to our view that the current recovery is characterised mainly by downside risk.

1. INTRODUCTION

The International Transport Forum's Transport Outlook 2011 reviews recent developments in the transport sector and discusses future scenarios. It updates the work underlying earlier editions (2008 through 2010) and extends it in several directions. It is a "focused-Outlook", meaning that it does not provide a comprehensive treatment of the transport sector but instead discusses selected topics. The topics are:

- The development of global transport demand in the very long run – a macroscopic view (Section 2.1).
- The modal distribution of transport demand (Section 2.2).
- The interaction between transport demand, CO_2-emissions, and transport tax revenues (Section 2.3).
- Peak car travel in advanced economies: permanent or transitory phenomenon? (Section 3).
- International sea and air freight transport flows: pre- and post-crisis trends (Section 4).

2. TRENDS IN TRANSPORT OVER THE NEXT 40 YEARS – A MACROSCOPIC VIEW

This section presents very long run scenarios for the development of global transport volumes by region. The world's population reached 6 billion in 2000 and will be around 9 billion in 2050. Coupled with rising incomes this will lead global mobility to expand strongly through 2050. If infrastructure and energy prices allow, there will be around 3 to 4 times as much global passenger mobility (passenger-kilometres travelled) as in 2000 and 2.5 to 3.5 as much freight activity, measured in ton-kilometres.

Our discussion of scenarios focuses on two issues: the evolution of demand by mode and by region (Section 2.1) and the evolution of energy intensity and greenhouse gas emissions (Section 2.2). Our focus is as much on the discussion of possible futures for mobility as on issues related to energy use.

As in earlier editions of the Outlook, the scenarios are based on the MoMo-model developed at the International Energy Agency (IEA). The new scenarios are based on the 2011 version of the model whereas earlier editions used the 2008 version. The new model version is based on broader and more recent data and various model features have been refined. The projections are based on the latest IEA mid-term and long-term scenarios from the Energy Technology and World Energy Outlook scenarios.

© OECD/ITF 2011

2.1. Continued but uneven growth of transport demand

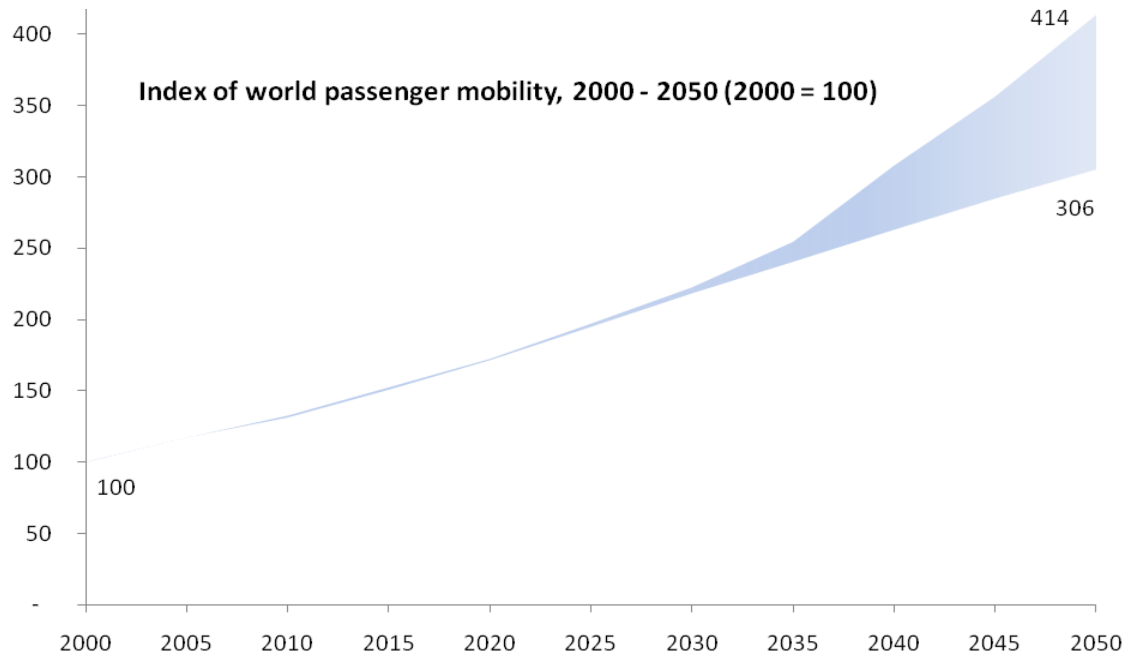
Figures 1 and 2 plot the expected evolution of global passenger (all modes) and surface freight activity, in the form of an index. The figures provide a range (blue area), of which the lower end corresponds to the transport base case projection underlying the IEA World Energy Outlook of 2008, and the upper end incorporates less conservative assumptions regarding the transport intensity of GDP (see below). The upper and lower scenarios are not intended as formal measures of the uncertainty regarding projections (if they were, they should be much farther apart). Instead, they illustrate how relatively small changes in underlying assumptions lead to sizeable differences between scenarios if the period under consideration is long enough. Given that the differences in underlying assumptions reflect different interpretations of recent evidence (see the discussion of peak travel below), it is clear that the projections are to be considered as scenarios that help grasp the long run impact of slow movements in mobility patterns, and not as predictions of what future is most likely.

Specifically, the lower and upper scenarios differ in assumptions regarding the evolution of private passenger vehicle transport and air passenger transport. For air passenger transport, the lower end is similar to the IEA World Energy Outlook of 2008. In this scenario, growth is in line with the medium term forecast from the International Air Transport Association (IATA) up to 2015. After 2015, growth slows down, but more so in the OECD than in emerging markets. For the high growth scenario, growth is the same as in the low growth case up to 2015, in line with the IATA medium term forecast. After 2015 growth remains at the same level as before in the OECD but is faster in non-OECD emerging markets. Growth accelerates in the longer future for emerging markets and part of the assumption is further deregulations and more widespread adoption of open sky agreements. Under this projection traffic grows considerably faster than in the low growth scenario but remains under the expectations of airplane constructors' outlooks.

For passenger transport by car and light truck, the lower scenario corresponds to a situation where the per-capita demand for car transport levels off in advanced economies and even declines in some of them: car ownership per capita reaches saturation levels and usage per vehicle is constant or declines lightly as there are more cars per household. Once car use levels off on a per capita basis, changes in aggregate travel demand are driven by demographics. In addition, there are three distinct orders of magnitude at which car ownership per capita saturates. They can loosely be described as a North-American, a European, and a Japanese pattern, with the saturation level of ownership highest in North-America and lowest in Japan. The main difference between the upper and lower end of the area depicted in Figure 1 is that ownership saturation levels in emerging economies, including Brazil and China, are similar to European levels for the upper end and to Japanese levels for the lower end, reflecting uncertainty on what pattern these countries will converge to in the coming decades. Another factor, of lesser importance, is the assumption of limited (1% per year or less) continued growth of usage levels in advanced economies in the high scenario versus zero growth in average use for the low scenario.

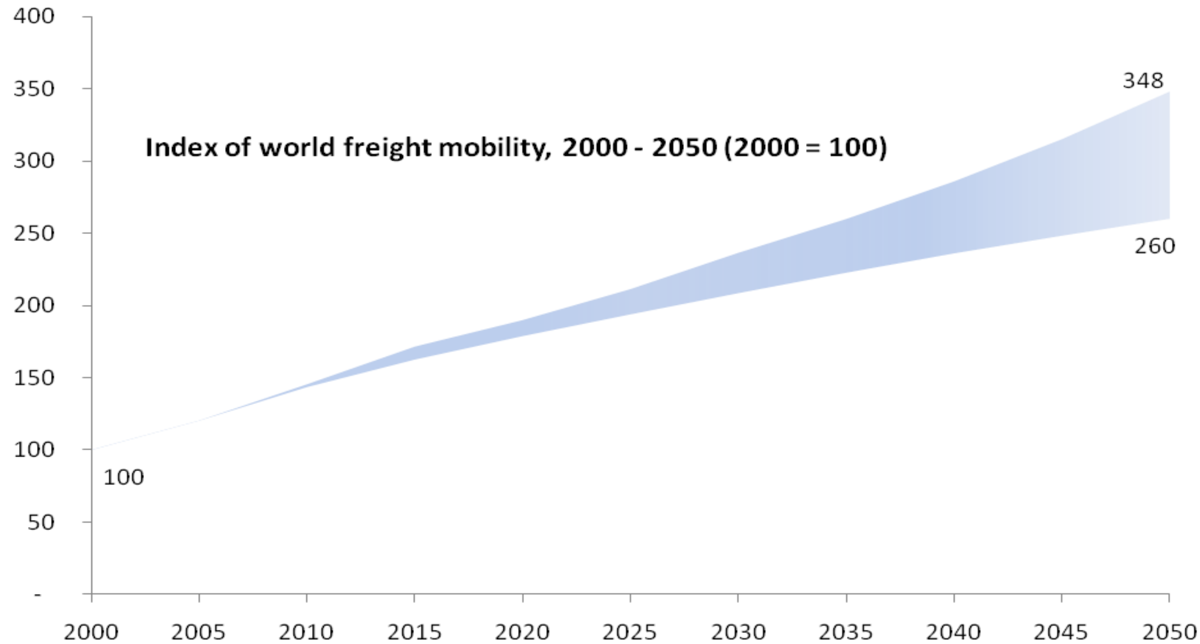
 © OECD/ITF 2011

Figure 1. **Index of global passenger transport activity, 2000 - 2050, index of pkm (2000 = 100)**



Source: International Transport Forum calculations using MoMo version 2011.

Figure 2. **Index of global freight transport activity, 2000 - 2050, index of tkm (2000 = 100)**



Source: International Transport Forum calculations using MoMo version 2011.

For surface freight transport activity (tkm), the low scenario assumes a gradual decline of the freight intensity of GDP in all regions, while the high scenarios assumes that freight intensity stays at the 2005 level in all regions through 2050. A declining freight intensity of GDP could be the consequence of “dematerialisation” of growth, i.e. a proportionally faster increase in those components of GDP that are not particularly freight-intensive, including many services and IT applications. A constant or increasing freight-intensity might be the consequence of continued globalisation, characterised by geographical fragmentation of supply chains. Moreover, countries at lower levels of economic development may be embarking upon a relatively freight-intensive growth path, so that in those regions the assumption of declining intensity is less straightforward than for regions where GDP is already very high.

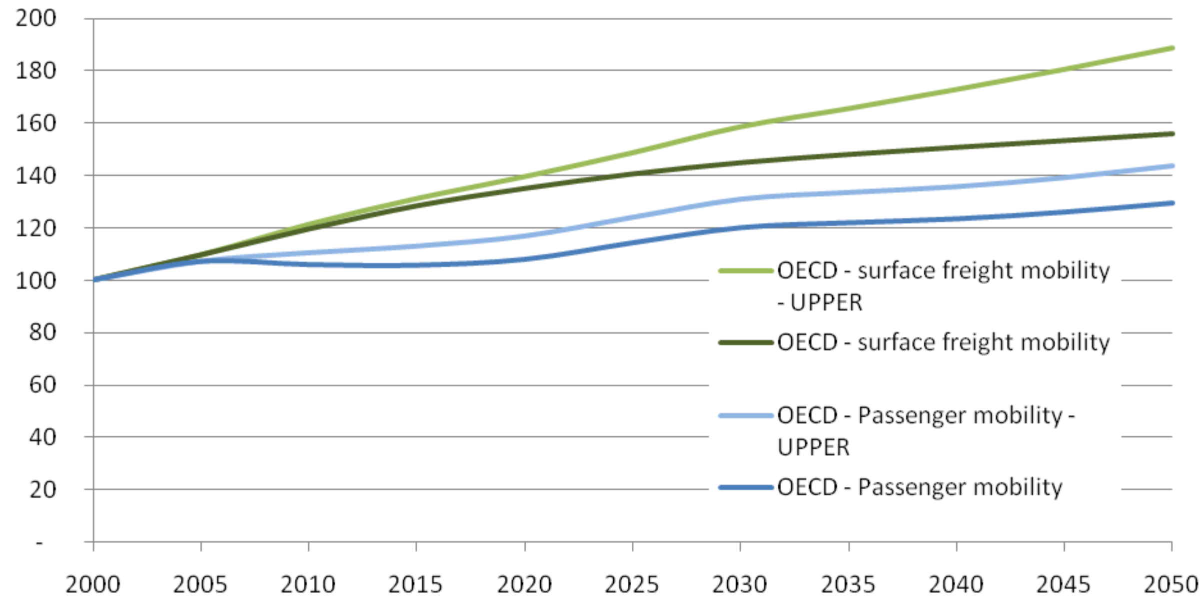
The picture emerging from Figures 1 and 2 reinforces that of earlier editions of the outlook. On the global level, we expect high and roughly constant growth rates that lead to a tripling or quadrupling of global passenger transport volumes by 2050 compared to 2000, while surface freight activity grows by a factor of 2.6 to 3.5 over the same period. Figures 3 and 4 highlight a direct consequence of the basic assumptions regarding the relation between economic development levels as measured by GDP and the development of passenger and freight transport volumes, namely that the regional distribution of this overall growth is highly uneven. Specifically, there will be limited growth in OECD economies and very strong growth outside of the OECD, notably in the emerging economies.

The strong demand increase in the high end scenario is driven to a large extent by continued fast growth of passenger mobility in emerging economies, as can be seen from the increase in the growth rate as of 2035 in Figures 1 and 4. This is most usefully interpreted as an indication of “where demand would like to go”, in the sense that it is assumed that the car ownership and usage patterns in emerging economies emulate those of European economies in the past. Whether this is a realistic assumption is uncertain, and whether such aspirations could materialise even if they existed is not straightforward either. For example, fast urbanisation might slow down the growth rate of private vehicle ownership and slow growth in the use of vehicles even more. Rising energy prices and less accommodating policies than have been observed in Europe in the past may also put a check on growth in car use. Nevertheless, the high growth scenario is not impossible and even in lower growth cases the increase in non-OECD mobility is strong.

Figure 5 illustrates the consequence for the distribution of global transport flows, with a strong shift of “mobility-mass” to non-OECD countries (for a scenario halfway between the low and high scenarios). It deserves emphasis that “limited growth” of mobility in the OECD does not mean “zero growth”, as even in the low scenario passenger mobility in 2050 is expected to be some 30% higher than it was in 2000, and freight mobility at the lower end is expected to grow by more than 50% over the same period. While this is the cumulative result of rather modest annual growth figures, it indicates that the strain on networks as a whole is likely to rise, so that meeting demand while maintaining reasonable service standards will require considerable financial and managerial effort.

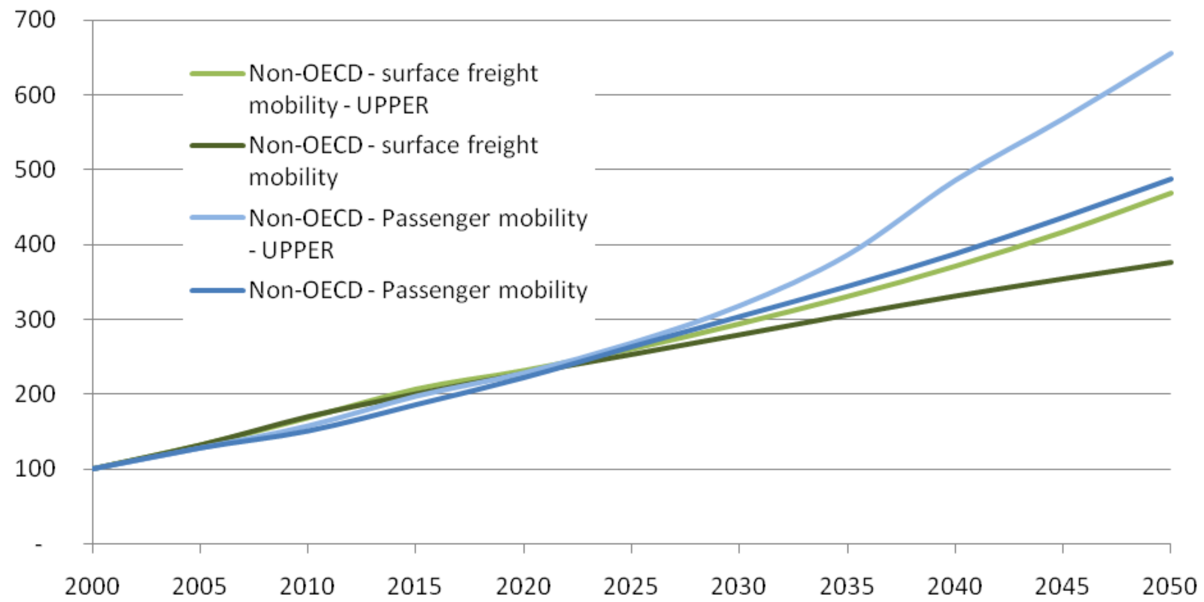
 © OECD/ITF 2011

Figure 3. **Index of OECD passenger and surface freight activity, 2000 - 2050, index of pkm and tkm (2000 = 100)**



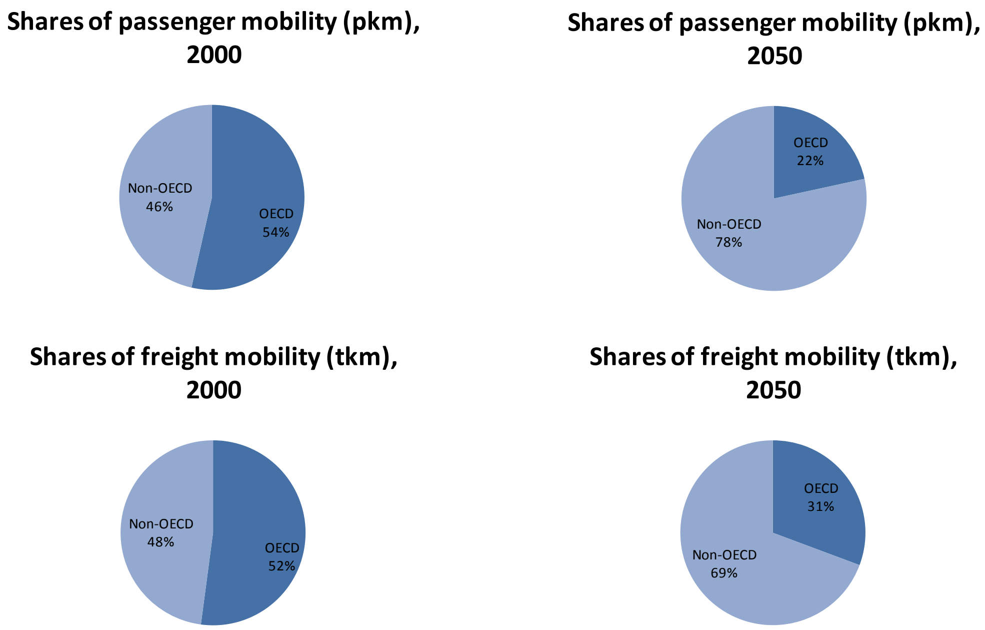
Source: International Transport Forum calculations using MoMo version 2011.

Figure 4. **Index of non-OECD passenger and surface freight activity, 2000 - 2050, index of pkm and tkm (2000 = 100)**



Source: International Transport Forum calculations using MoMo version 2011.

Figure 5. **Distribution of passenger and surface freight mobility in 2000 and 2050: share of OECD and non-OECD countries (halfway case between high and low scenarios shown in Figures 1 through 4)**



Source: International Transport Forum calculations using MoMo version 2011.

While mobility growth in the OECD can be expected to be slow and gradual, and even negative in some countries, Figure 4 shows that it could be very fast outside of the OECD. Freight volumes could increase by a factor of 4 to 5 compared to 2000 levels, while passenger mobility could increase 5 to more than 6-fold over the same period. The higher range for passenger mobility would be obtained if mobility patterns in emerging economies are more akin to those observed in Europe than those seen in Japan. The development of car ownership in large economies (e.g. China, Brazil, India) is of particular importance for the future development of global mobility volumes. The overall picture for non-OECD economies illustrates how mobility in these countries would change if the relation between economic and population growth in emerging economies is roughly similar[1] to patterns observed earlier in advanced economies. Casual observation of developments and policies in emerging economies suggest that the assumption of similarity is a reasonable one, as growing wealth translates into growing demand for high-quality transport services (including car ownership and use) and governments by and large adopt an accommodating stance towards the development of the demand for personal mobility (as has been true for OECD economies in the past, by and large). This means that if growing transport demand is both closely related to enabling economic growth and to its enjoyment then the prospects for achieving major downward changes in trends are slim. Consequently the negative impacts of mobility related to energy use will have to be managed to a large extent by changing energy use patterns or by mitigating

1. Roughly similar but not necessarily identical. The shift of mobility mass to non-OECD economies will take place even if economic development in the emerging economies is considerably less transport-intensive than in the OECD, as is assumed in the lower end of the ranges shown in Figures 1 through 4.

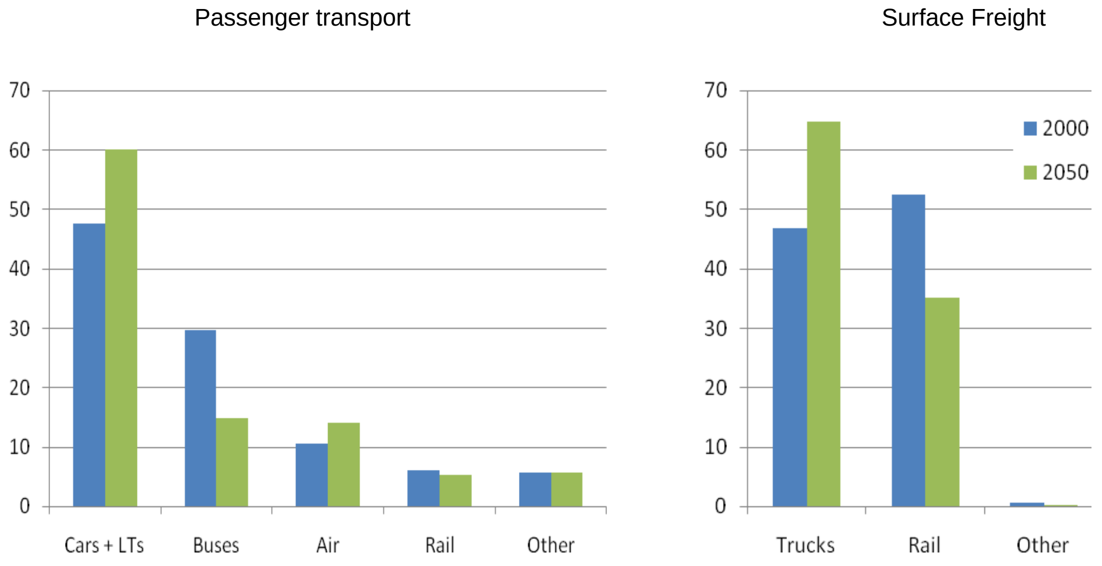
© OECD/ITF 2011

adverse consequences. The social costs of other negative impacts, including congestion and air pollution, are as important as greenhouse gas emissions and energy security concerns and these problems need to be addressed where they emerge, rather than attempting to curb mobility overall.[2]

2.2 Evolution of the modal distribution of transport services

Section 2.1 provided an overview of prospects for the future development of mobility, measured in ton-kilometres for freight and passenger-kilometres for passenger transport. This Section considers the modal breakdown of that overall evolution, examining the halfway case between the low and high scenarios considered before.

Figure 6. **Global modal split, 2000 and 2050, halfway case between high and low scenarios (%)**



Source: International Transport Forum calculations using MoMo version 2011.

Figure 6 summarizes the results for world mobility, and shows that the share of private passenger vehicles (cars and light trucks) is expected to rise strongly. Air travel for passengers is the fastest growing segment in absolute terms, but private passenger vehicles clearly remain the dominant mode. The strongest relative decline is expected for buses (including minibuses), not least because they are substituted by cars as incomes increase. Tables 1 and 2 provide regional details for 2005, 2030 and 2050. As can be seen in Table 1, the broad pattern in OECD economies is one of a shift from cars and light trucks towards air travel (the sum of these modes is roughly constant within OECD sub-regions), whereas outside the OECD the rise of the car is expected to continue throughout the model horizon. The share of air travel outside of the OECD is not expected to change strongly, but this of course implies a strong increase in travel volumes. For freight transport, table 3 reveals an expectation of increasing truck use across the globe (recalling that the freight scenarios are limited to surface modes). As indicated before, the results in Figure 6 are for an intermediate case, so dependent on the high

2. See e.g. Small and Van Dender, *Long run trends in transport demand, fuel price elasticities and implications of the oil outlook for transport policy*, ITF Discussion Paper 2007-16, Paris, 2007.

scenario in which it is assumed demand for car ownership and use in emerging economies aspires to and reaches European levels. If that is thought unlikely, then the high scenario and the intermediate scenario each move closer to the low scenario, where the shift in modal shares is still large but somewhat more muted.

Table 1. **Passenger modal split by region, 2005 – 2030 – 2050, halfway case between high and low scenarios**

		Car+LT	Air	Rail	Buses	Other	Total
2005	OECD North America	81	14	1	4	0	100
	OECD Europe	63	16	5	13	3	100
	OECD Pacific	56	13	9	16	7	100
	China	7	9	15	43	26	100
	Latin America	41	12	1	43	4	100
	ROW	22	6	9	55	9	100
2030	OECD North America	72	24	1	3	0	100
	OECD Europe	55	26	5	11	3	100
	OECD Pacific	50	21	10	14	5	100
	China	53	12	9	14	12	100
	Latin America	57	14	0	25	4	100
	ROW	46	8	6	31	8	100
2050	OECD North America	68	28	1	3	0	100
	OECD Europe	50	30	6	11	2	100
	OECD Pacific	44	28	11	13	4	100
	China	55	14	10	11	10	100
	Latin America	70	12	0	14	3	100
	ROW	64	7	4	18	6	100

Source: International Transport Forum calculations using MoMo version 2011.

Table 2. **Freight modal split by region, 2005 – 2030 – 2050, halfway case between high and low scenarios**

		Trucks	Rail
2005	OECD North America	40	60
	OECD Europe	86	14
	OECD Pacific	72	28
	China	25	75
	Latin America	84	16
	ROW	87	13
2030	OECD North America	48	52
	OECD Europe	89	11
	OECD Pacific	77	23
	China	46	54
	Latin America	89	11
	ROW	91	9
2050	OECD North America	54	46
	OECD Europe	90	10
	OECD Pacific	81	19
	China	56	44
	Latin America	92	8
	ROW	94	6

Source: International Transport Forum calculations using MoMo version 2011.

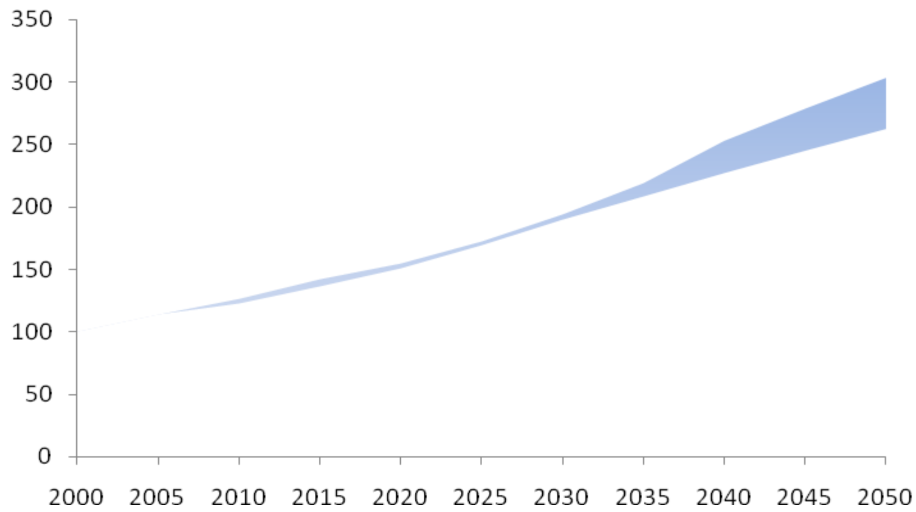
2.3 Transport demand, fuel economy, and CO_2-emissions

The high and low scenarios discussed in the previous sections differ only in terms of the growth of private passenger vehicle volumes, air passenger traffic, and surface freight volumes. Figure 7 shows the corresponding evolutions of CO_2-emissions from vehicle use, under the

 © OECD/ITF 2011

assumption that current and expected fuel economy policies are implemented and that the fleet is still dominated by internal combustion engines (gasoline and diesel). The remainder of the LDV fleet is essentially comprised of gasoline/diesel hybrids (including plug-in hybrids). Electric vehicles make little penetration in the fleet by 2050 in this scenario. Fuel consumption of new LDVs improves along current trends. Total emissions increase by a factor of 2.6 to 3, which is considerably slower than the growth of overall mobility, because of the fuel economy improvements expected to take place over the modelling horizon. Table 3 shows the evolution of the modal composition of emissions for the halfway case. As a result of the interaction between the growth paths of the separate modes and the expected technological evolution, the share of passenger light-duty vehicles (LDVs) rises over time and is around 50% by 2050. Consequently, efforts to reduce the carbon-intensity of passenger vehicle use will have large effects on overall CO_2 emissions, at least if technological improvements permeate throughout the global vehicle stock.

Figure 7. **Global CO_2 emissions from transport vehicle use, index (2000 = 100)**



Source: International Transport Forum calculations using MoMo version 2011.

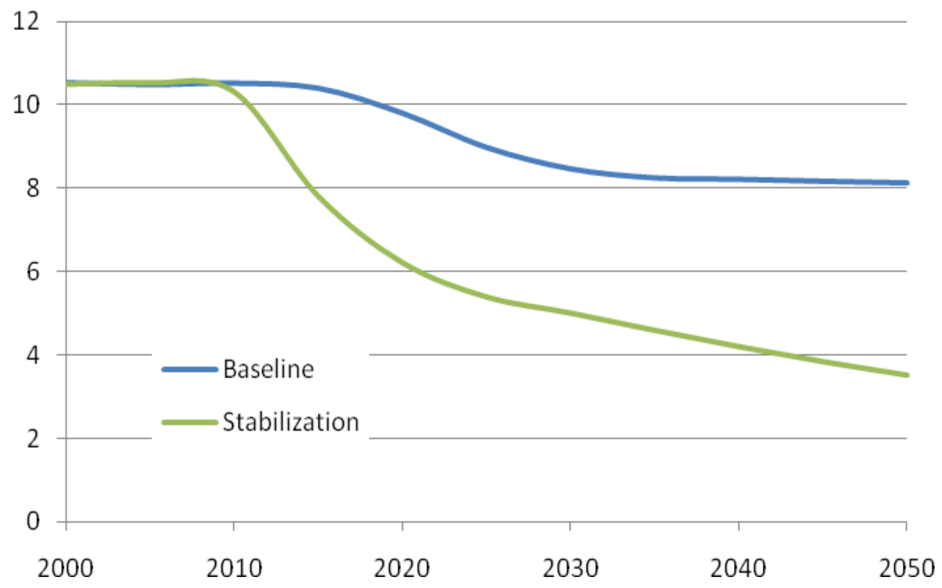
Table 4. **Modal composition of global CO_2 emissions from transport vehicle use**

	2000	2030	2050
Freight + Passenger rail	2.3	1.9	1.5
Buses	6.3	4.3	3.0
Air	12.4	13.8	12.0
Freight trucks	23.5	23.3	21.6
LDVs	42.5	45.2	52.1
2-3 wheelers	2.4	2.2	2.0
Water-borne	10.6	9.2	7.8
Total	100	100	100

Source: International Transport Forum calculations using MoMo version 2011.

Figure 8 illustrates the global average on-road fuel intensity path for light-duty vehicles that would be sufficient to maintain light-duty vehicle emissions of CO_2 approximately at their 2010 level, and how this compares with the baseline expectation of on-road fuel intensity. A strong shift in the use of technological potential towards improved fuel economy, or a shift to less carbon-intensive forms of transport energy, or a combination of both, will be needed in the near future to attain stabilization, and by 2050 fuel intensity on the fleet level will have to be only be half as large as expected in the baseline scenario.

Figure 8. **Average LDV on-road fuel-intensity, baseline and stabilization, litres gasoline equivalent per 100km**



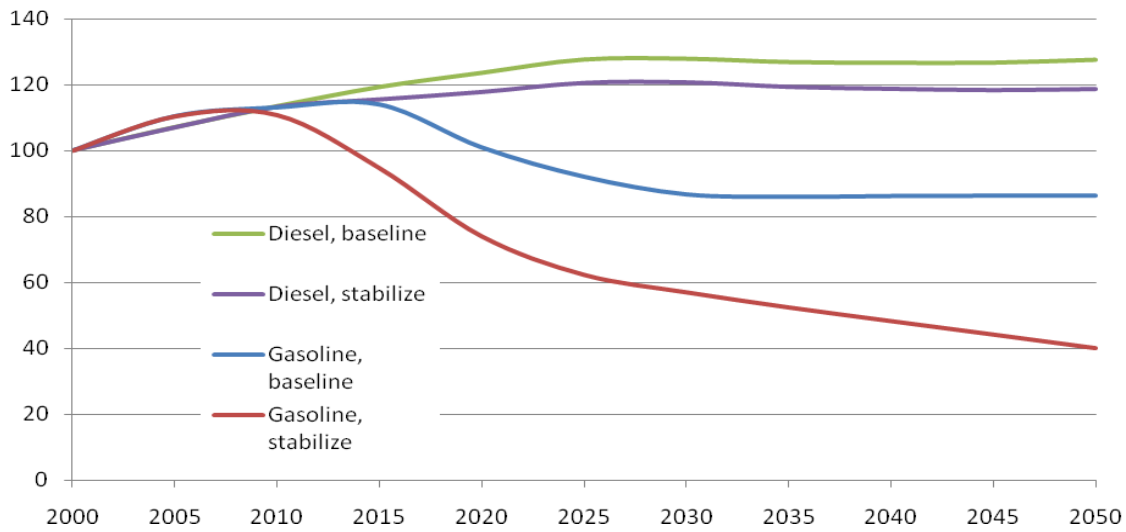
Source: International Transport Forum calculations using MoMo version 2011.

Figures 9 and 10 illustrate the consumption paths for gasoline and diesel associated with the baseline and emission-stabilization scenarios for fuel economy and transport demand depicted, for the USA and for OECD Europe. The evolution of gasoline and diesel consumption is highlighted because they are the main fossil fuels used in transportation at present and for the foreseeable future, and they are an important source of tax revenue in many countries. The figures show that even in the baseline scenario the gasoline tax base erodes, because of limited growth of travel demand and improvements in fuel economy. This trend is more pronounced in the stabilization scenario, where in OECD Europe the fuel tax base in 2050 might be only 1/5 of its size in 2000. The diesel consumption paths show increases or more limited declines.

The fuel consumption paths are very rough approximations, taking no account of relative price changes that may occur as absolute and relative demand levels change, nor of potential changes in supply conditions and of the transport tax structure. Nevertheless, the scenarios indicate that in at least some countries fuel consumption is likely to decline, possibly quite strongly, and even more so when stringent carbon abatement policies are introduced in the transport sector. While such reductions help reaching environmental objectives and reduce costs of energy dependence, they also carry a cost in terms of foregone tax revenue. Box 1 illustrates how the tax revenue impact of fuel economy improvements affects the social cost-benefit appraisal of such evolutions.

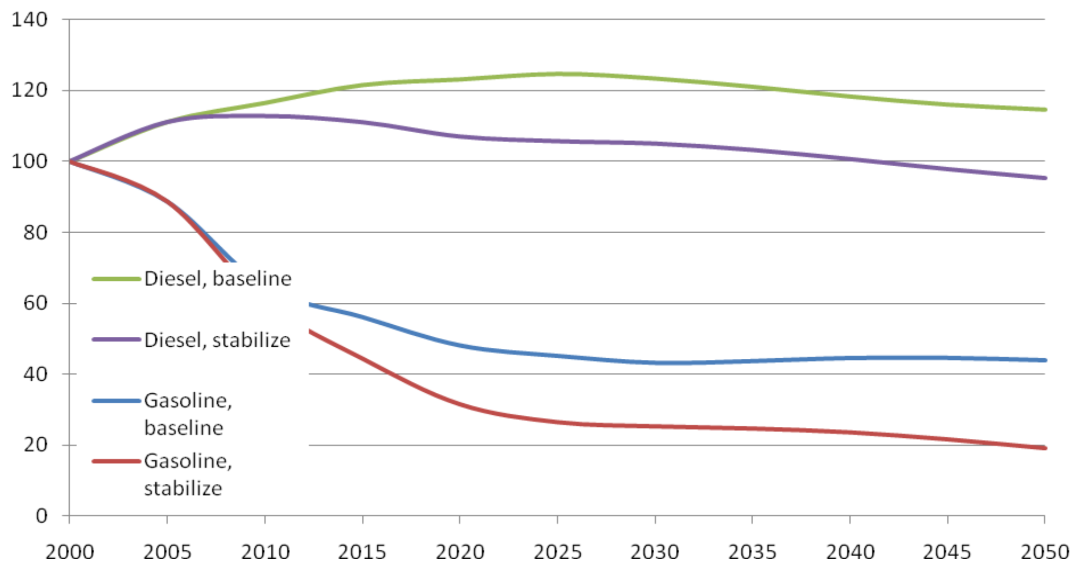
 © OECD/ITF 2011

Figure 9. **Index of light duty vehicle gasoline and diesel consumption, baseline and stabilization scenarios (2000 = 100): United States**



Source: International Transport Forum calculations using MoMo version 2011.

Figure 10. **Index of light duty vehicle gasoline and diesel consumption, baseline and stabilization scenarios (2000 = 100): OECD Europe**



Source: International Transport Forum calculations using MoMo version 2011.

The impact of reduced fossil fuel consumption on fuel tax revenue is one aspect of the fiscal impact of greenhouse gas mitigation policies in transport. Another issue concerns the subsidies that may, or may not, be needed for the introduction of alternative technologies. Many countries, for example, award subsidies for consumers purchasing electric vehicles. Box 2 illustrates the effect of such subsidies on the private and social viability of electric vehicles, and suggests that the market potential of electric vehicles may be large enough in some high mileage markets, such as delivery vans and taxis, to be attractive to buyers even without subsidies. Policies to promote uptake through non-financial incentives and partnerships might make more sense than subsidies in these markets. In the long term, electric vehicles will have to become competitive without subsidy, as the cost to public budgets would be excessive if subsidised electric vehicles were to become a large part of overall car sales.

With carbon-intensive electricity production the appeal of electric vehicles is reduced strongly (although the European CO_2 emissions permit trading system caps CO_2 emissions from power production in Europe) underlining the central importance of low carbon electricity production to climate change polices, including in the transport sector.

Box 1. **Fuel economy and tax revenues – the fiscal cost of reducing fuel consumption**

Better fuel economy means lower fuel consumption for the same amount of driving. For drivers this is beneficial as long as the higher vehicle costs for improved fuel economy do not outweigh the savings on fuel expenditures. There is an environmental benefit in the form of lower greenhouse gas emissions and for net oil importing countries the reduction in oil dependence can bring benefits – these are indeed the main impetus behind policy initiatives to boost the fuel economy of new vehicles. There are benefits in terms of other pollutant emissions but these will be limited because, for light duty vehicles, these emissions are regulated on a per-kilometre basis. At constant fuel taxes, lower fuel consumption means lower revenues from taxation. This represents a social cost in the sense (a) that tax revenues have a social value and (b) replacing fuel tax revenues by revenues from other taxes may very well increase the economic cost (i.e. the efficiency loss) of raising the same amount of revenue.

How do these various factors affect the appeal of policies to improve fuel economy? And is it a good idea to try to replace fuel taxes, or more broadly transport energy taxes, by taxes on driving? These questions are addressed by Crist and Van Dender[3] in a paper for a 2010 seminar organised by the International Transport Forum with the Korean Transport Institute, of which some key insights are summarized here. The exercise considers an improvement in fuel economy from 160g/km to 130g/km, in line with European Union regulation, and investigates impacts *without* accounting for the environmental benefit of reduced greenhouse gas emissions. The impacts on *drivers and taxpayers* are as follows (in present values):

- drivers' fuel expenditures decline by € 450 to € 1 800, the precise sum depending on how far into the future they look (3 to 15 years);
- fuel tax revenues decline by € 1 100 and if the increased efficiency costs of compensating lost revenue through taxes with larger efficiency costs (e.g. labour taxes) is accounted for, the social cost of lost tax revenue rises to € 1 400 per driver (over 15 years);
- adding these two components, the fuel economy improvement can cost drivers and taxpayers up to € 950 or generate benefits up to € 730.

If drivers were to respond to lower fuel costs per kilometre by driving a bit more (rebound effect of 20%), then the maximal cost to drivers and taxpayers reduce € 690 and the maximal

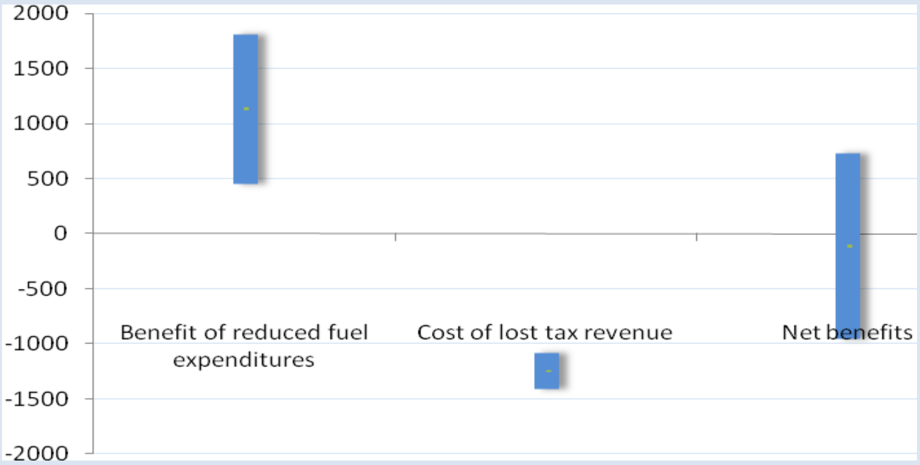
3. Crist P. and K. Van Dender, *What does improved fuel economy cost consumers and taxpayers? Some illustrations*, ITF Discussion Paper 2011-16.

 © OECD/ITF 2011

benefit € 970 per driver (over 15 years).

The calculation has abstracted from the *cost of the technology*, which initially might be between €1 000 and €2 500. With a cost of around €1 000, the gains for drivers in terms of lower fuel expenditures largely outweigh the technology cost if drivers look far enough into the future. But when account is taken of the cost of lost fuel tax revenue, the project is no longer worth it from a social perspective (still abstracting from the benefit of lower CO_2-emissions).

Impact of improved fuel economy on fuel expenditures and tax revenues – range between higher and lower bounds



Thus far the illustration indicates that accounting for lost tax revenues and for the cost of replacing them by other, more costly sources can have a major effect on the social appeal of a project. But what if a tax on energy consumption in transport were replaced by a tax on transport activity, i.e. on driving? Introducing a kilometre-tax that maintains transport tax revenues at just the level obtained before the fuel economy improvement makes improved fuel economy beneficial to both drivers and taxpayers under all scenarios under this model (before accounting for technology costs and for reduced emissions). The increase in drivers' benefits is of course lower than without the kilometre-tax, but it remains positive, and the project is fiscally neutral by design. So, if introducing kilometre-taxes is not too expensive, it should be considered as an option to replace the slowly eroding fuel tax base. Driving is less elastic than fuel consumption, so the efficiency costs of taxing driving are likely lower than those of taxing fuel consumption. In addition, kilometre-taxes are more flexible tools for addressing the main transport externalities, notably congestion. The use of kilometre-taxes of course does not exclude fuel taxes that promote the deployment of low carbon alternative fuels. Alternatively the climate change impact of these fuels could be covered via carbon cap and trade schemes.

Box 2. **Prospects for electric vehicles.**

Using publicly available data for the French market, we compare battery electric vehicles (BEVs) and internal combustion engine vehicles (ICEs) with similar characteristics so as to provide an indication of how a typical BEV might compare to its ICE pair from private and social points of view. Sales prices for several BEVs were announced in 2011 for France. The models examined here are a four-door sedan, a 5-door compact and a 2-seat van. They will be sold with a monthly battery lease option costing €72-€79 per month. In all cases, the price of the BEV excluding batteries is more than the ICE alternative, i.e. diesel models based on the same chassis and offering broadly similar amenity. France, like many other countries, offers a purchase subsidy for BEVs (€5000) which narrows the gap for the sedan and the compact car and surpasses it for the van, i.e. with the purchase subsidy the electric van is less expensive than the diesel van.

Assuming typical usage levels for each model type (35 km/day and 365 days per year for the sedan, 30 km/day and 365 days per year for the compact and 90 km/day and 260 days per year for the van), we calculate the extra cost of the BEV compared to the ICE over the lifetime of the vehicle from consumer and societal perspective. For consumers, we also provide an estimate of the added cost of a BEV over the first three years of ownership, arguably in line with consumer calculations when purchasing a new vehicle. The costs calculated for the consumer include taxes and subsidies and exclude CO_2 and local pollution costs. The costs calculated for society exclude taxes (which from this point of view are simply a transfer), include the subsidy and include CO_2 and local pollution costs.

Comparison of three electric and internal combustion engine vehicle pairs.

4-door Sedan 35km/day	Purchase cost (€) with subsidy	Battery cost (€79/month)	Electricity cost (€)	Electricity taxes (€)	Electric vehicle subsidy (€)	CO_2 intensity of electricity (g/kWh)	**Total lifetime useage cost (€)**	**Additional cost to consumer (veh. life)**	**Additional cost to consumer (3 yrs)***	**Additional cost to society (veh. life)**	**CO_2 reduction (Tonnes)**	**CO_2 mitigation cost (€/t)**
Electric 22g CO2/km	21300	10540	2990	1115	5000	90	**35945**	**4666**	**2064**	**12008**	**17.3**	**693**
	Purchase cost (€)		Pre-tax cost of diesel (€)	Fuel taxes (€)	Additional repair cost (€)	Local pollution costs (€)						
Diesel 117g CO2/km	20500		5910	4091	778	634	**31280**					
5-door Compact 30km/day	Purchase cost (€) with subsidy	Battery cost (€72/month)	Electricity cost (€)	Electricity taxes (€)	Electric vehicle subsidy (€)	CO_2 intensity of electricity (g/kWh)	**Total lifetime useage cost (€)**	**Additional cost to consumer (veh. life)**	**Additional cost to consumer (3 yrs)***	**Additional cost to society (veh. life)**	**CO_2 reduction (Tonnes)**	**CO_2 mitigation cost (€/t)**
Electric 19g CO2/km	16417	9606	2278	850	5000	90	**29151**	**4952**	**1927**	**11677**	**13.2**	**885**
	Purchase cost (€)		Pre-tax cost of diesel (€)	Fuel taxes (€)	Additional repair cost (€)	Local pollution costs (€)						
Diesel 104g CO2/km	15800		4503	3117	778	543	**24199**					
Compact Van 90km/day	Purchase cost (€) with subsidy	Battery cost (€72/month)	Electricity cost (€)	Electricity taxes (€)	Electric vehicle subsidy (€)	CO_2 intensity of electricity (g/kWh)	**Total lifetime useage cost (€)**	**Additional cost to consumer (veh. life)**	**Additional cost to consumer (3 yrs)***	**Additional cost to society (veh. life)**	**CO_2 reduction (Tonnes)**	**CO_2 mitigation cost (€/t)**
Electric 25g CO2/km	16200	9606	6450	2406	5000	90	**34662**	**-4093**	**-525**	**6167**	**37.4**	**165**
	Purchase cost (€)		Pre-tax cost of diesel (€)	Fuel taxes (€)	Additional repair cost (€)	Local pollution costs (€)						
Diesel 138g CO2/km	16400		12750	8827	778	1161	**38755**					

* Excluding consideration of resale value.

Source: ITF analysis based on ITF and IEA data.

As can be seen in the table, under baseline assumptions including low carbon electricity typical of France, the BEV configurations examined here emit 13 to 40 tonnes less CO_2 than their ICE counterparts over their lifetime. However, they cost society €5 000 to €12 000. This amounts to a marginal abatement cost of approximately €150 to €850 per tonne of CO_2, which is at the

© OECD/ITF 2011

high end of the costs of measures to reduce CO_2 emissions in the transport sector.

Results are more nuanced for consumers. A consumer will pay between €4 500 and €5 000 more for a BEV over the vehicle lifetime in the case of a sedan or a compact car. But because of higher mileage (and thus avoided diesel costs), a BEV van will cost the user nearly €4 000 *less* than an equivalent ICE over the lifetime of the vehicle, or €700 less over the three-year consumer perspective period. Under these conditions, one might expect that a market already exists for BEV vans if potential buyers have confidence in the advertised driving ranges and dealer support for these vehicles. A niche market also likely exists for "early adopters" of green technology who are willing to pay more for a BEV sedan or compact car with less range than a comparable ICE.

Sensitivity tests indicate that these results are robust to most plausible changes in parameter values, including strong decreases in battery costs. Two parameters stand out however; the carbon intensity of electricity production and the daily travel distance.

Most regions do not have as much low-carbon base-load or marginal electricity generation capacity as France. Taking a value of 300g CO_2/kWh, more consistent with natural gas plants, and a more extreme value of 850 g CO_2/kWh, typical of an EU coal plant, we find the following results:

	Emissions from electricity (g CO2/kWh)	Tailpipe emissions (g CO2/km)	CO2 emissions avoided [or added]	Cost per ton CO2 avoided [or added]	Subsidy per ton CO2 avoided [or added]
ICE Sedan	-	117	-	-	-
BEV Sedan	300	68	10 t	€ 1221	€ 500
	850	191	[11 t]	[€ 1065]	[€ 455]

What stands out is not only that high carbon electricity switches the CO_2 balance of the comparison in favour of the ICE but that under our assumptions society actually pays for additional CO_2 emissions. In many regions considering the deployment of BEVs coal-based electricity generation is the norm. The rationale for subsidising or otherwise promoting EVs in these instances is not for direct CO_2 mitigation but developing a market for electric vehicles in anticipation of more low-carbon electricity production. In Europe, where there is a CO_2 emissions permit trading system, any excess emissions from generating electricity for cars will also be offset by reductions in emissions from other plants subject to emissions trading.

As seen in the case of the BEV van, increasing annual mileage has a significant effect on overall costs. We can simulate using the BEV sedan as a taxi, travelling 150 kilometres a day on average for 365 days per year. For current batteries this would require a battery switching service, the cost of which has not been accounted for here. Otherwise the additional lifetime costs of the BEV from consumer and societal perspectives are -€15 000 and -€713, respectively – i.e. the BEV saves money in comparison to the ICE for both the owner of the taxi and society as a whole. In this instance, there is still a case for BEV use even without a subsidy.

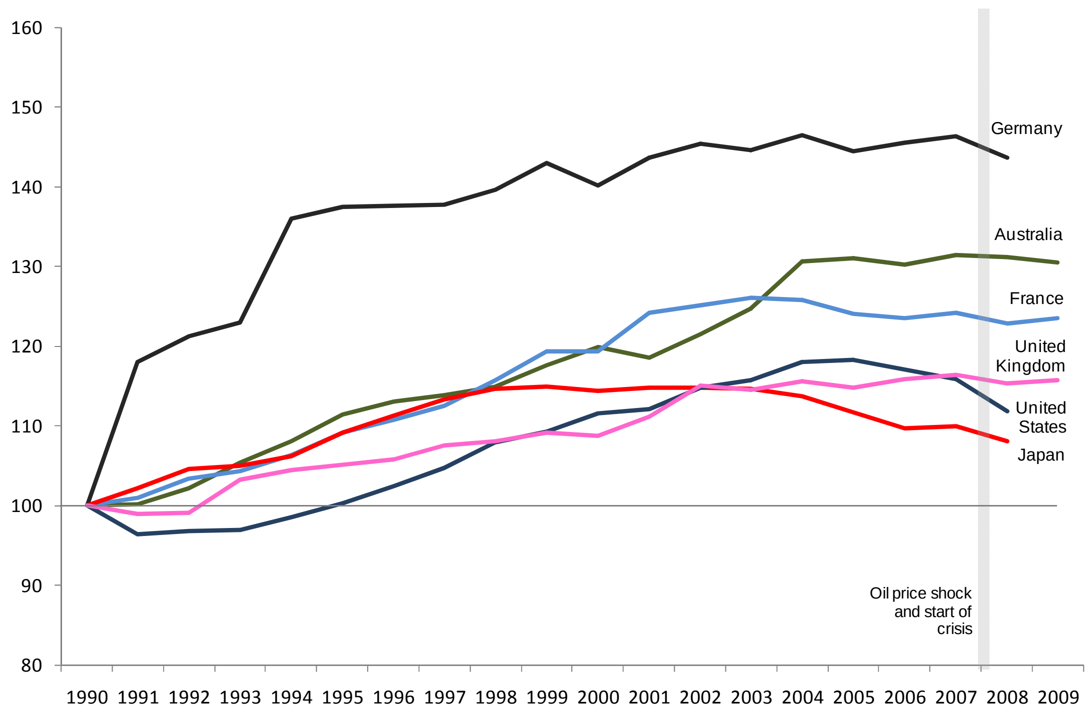
These findings suggest that costs for BEVs remain high for consumers and even more so for society under typical use scenarios. It also suggests that in those cases where BEVs do already compare favourably to ICEs, non financial incentives and partnerships might make more sense than subsidies.

3. PEAK CAR TRAVEL IN ADVANCED ECONOMIES?

As mentioned in Section 2, the car travel demand scenarios used in the projections assume that the per capita demand for car travel increases with income, but when incomes are very high this effect becomes smaller and in the limit it reduces to zero. If car travel demand does not increase with income any longer, then per capita demand can be expected to remain more or less constant if the economy continues to grow and other factors remain unchanged. Aggregate car travel demand then mainly is a function of changes in the size and structure of the population. The macroscopic approach used in Section 2 is highly stylized and simplified. In this Section, we take a brief look at evidence and debates on the changing relation between incomes and car travel demand.

Figure 11 shows how car and light truck activity (passenger-kilometre) has evolved from 1990 through 2009 in a number of advanced economies. As can be seen, growth rates decline over time and reduce to zero or even negative values in some cases and years. Levelling-off precedes the crisis as well as the most recent oil price spikes. Since aggregate incomes mostly increase over time, the time series suggests a weakening response of car and light truck travel demand to increasing incomes.

Figure 11. **Passenger-kilometres by private car and light trucks, 1970 – 2009, index (1990 = 100)**



Source: International Transport Forum statistics.

© OECD/ITF 2011

Millard-Ball and Schipper[4] present evidence for eight advanced economies that the rate at which motorized travel (pkm by all motorized modes) increases with per capita GDP declines over time and has levelled off in the years leading up to the crisis of 2008. For most countries this levelling off occurs at a per capita GDP between $25,000 and $30,000 (prices of 2000 at PPP); for the USA the turning point is at $37,000. The picture for per capita car and light truck use (vkm) is similar, except that it shows declines of car and light truck use in the last years before the crisis. Car ownership exhibits a similar pattern. These observed patterns can be the result of a range of explanatory factors including saturation, higher fuel prices, declining rates of transport infrastructure expansion, ageing, urbanization, macroeconomic shocks, income inequality, the advent of the online economy, etc. Millard-Ball and Schipper are careful to point out that the evidence does not allow them to draw definitive conclusions but nevertheless they see saturation as a plausible and important factor. It also bears reminding that international air travel is excluded from the analysis, even though air travel is growing fast and is no longer insignificant on a per capita basis.

Saturation of car travel is defined here as a situation in which additional car travel does not generate additional benefits for users and therefore travel will no longer increase even if higher time and money budgets allow it. The concept makes sense, but whether the observed patterns are (mainly) the result of saturation is far less clear. The issue is of obvious importance for future projections, as even small deviations from the saturation hypothesis have large impacts on aggregate demand patterns in the long run (see Section 2). For example, the UK Department for Transport expects a 30% increase in car traffic between 2010 and 2030.[5] The increase is driven to a large extent by population growth (+16% in the same period) but other factors, including higher incomes and lower real costs of driving, matter as well and this means there is no saturation but just declining responsiveness of travel demand to rising incomes. As another example, the Dutch mid-term projections[6] expect that car mobility will grow faster than GDP between 2011 and 2015 (whereas it had grown more slowly than GDP between 2006 and 2010), if assumptions regarding fuel prices and network management hold true. Furthermore, it is emphasized that small changes in volumes can have large consequences, notably in terms of congestion. The limited reduction in travel (about 1%) because of the economic crisis in 2009 reduced congestion on the main network by about 10%. The limited increase in travel expected for the medium term can have equally disproportional effects on congestion levels.

The discussion of peak travel on a per capita basis often takes place at the aggregate or average driver level. It is useful of course to consider more microscopic evidence, at the household level, as that is where behavioural changes are most accurately observed. Figure 12 shows the evolution over time (1970 through 2009) of an average household's spending on transport, for the USA. Figure 13 shows similar information for France, on the basis of total household spending. In the USA, household vehicle-kilometres travelled decline as of 2004. Total spending on transport falls in 2007-8, and is much more pronounced for spending on vehicles than for usage-related expenditures. This is consistent with the aggregate pattern of reduced spending on durables when consumer confidence falls and expectations are revised downward.

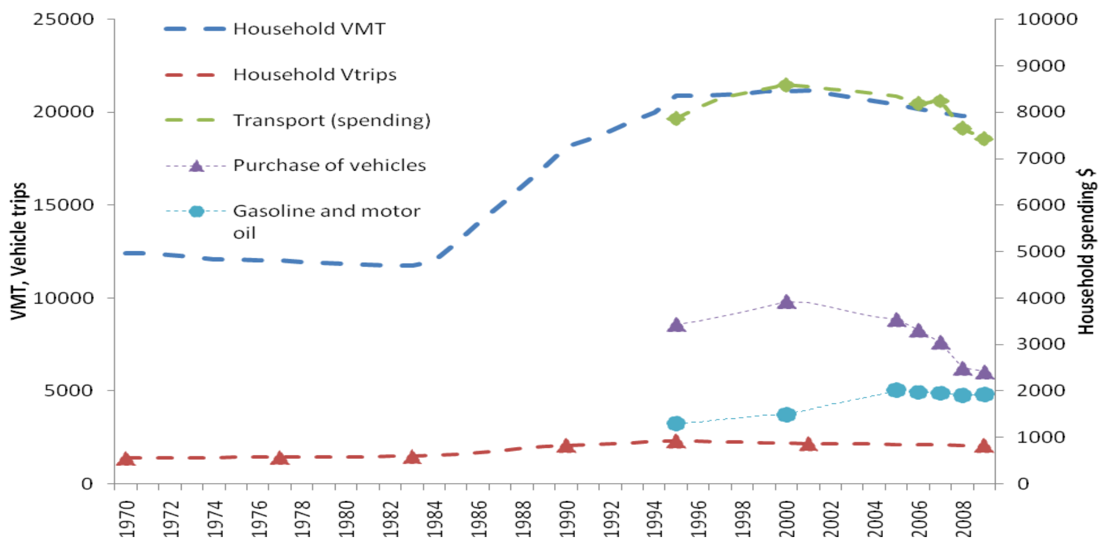
---

4. Millard-Ball A. and L. Schipper, *Are we reaching peak travel? Trends in passenger transport in eight industrialized countries*, Transport Reviews, 1-22, 2010.

5. Transport Statistics Great Britain, DfT, National Travel Survey, and the National Transport Model.

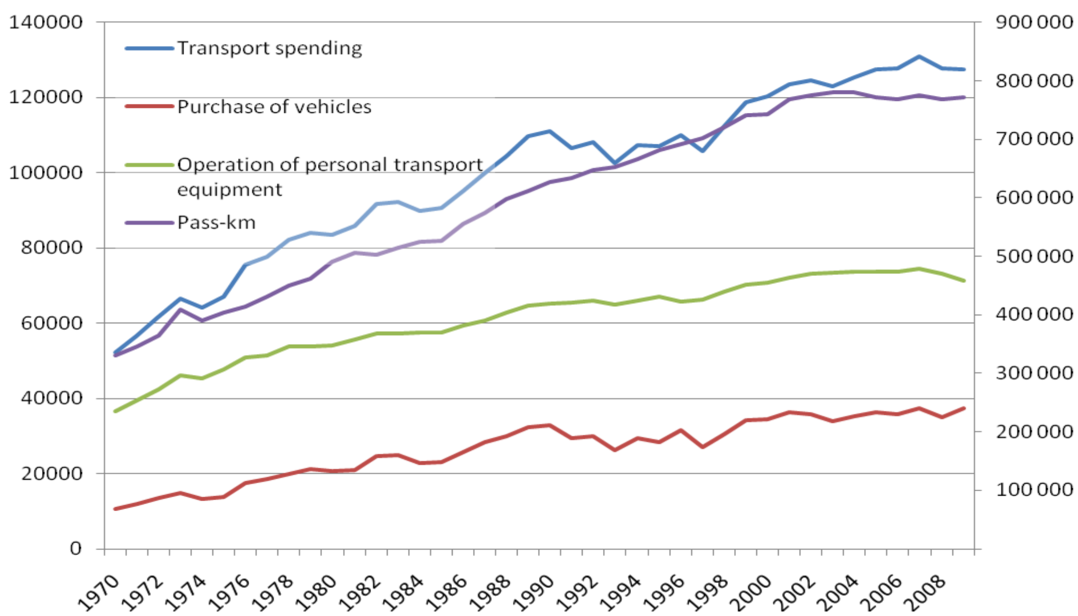
6. KiM, *Verkenning mobiliteit en bereikbaarheid 2011–2015*, Ministerie van Verkeer en Waterstaat, October 2010.

Figure 12. **Household spending on transport (at constant prices; right axis) and car travel (left axis) in the United States 1970-2008**



Source: International Transport Forum calculations on US National Household Travel Survey, available at **http://nhts.ornl.gov**

Figure 13. **Household spending on transport (at constant prices; left axis) and pass-km (right axis) in France 1970-2009**



Source: Pass-km from International Transport Forum; Spending from OECD Annual National Accounts.

The pattern for vehicle trips is flat since the mid 1990s whereas vehicle miles travelled first kept rising for a constant number of trips (so average distances increased) and only fell in the most recent period, perhaps because discretionary trips were made shorter in response to

© OECD/ITF 2011

higher fuel prices and/or reduced incomes or income expectations. The pattern for France is similar overall, except that spending on vehicles, total transport spending, and passenger-kilometre do not exhibit the same precipitous drop as in the USA in the most recent years recorded. The average pattern is thus equally suggestive of saturation as the aggregate data discussed before. It is also equally inconclusive, in the sense that it is fairly safe to say that the rate at which car transport demand and transport expenditures increase with income is on the decline in the richest countries, but not at all obvious that continued income growth will no longer lead to more car transport.

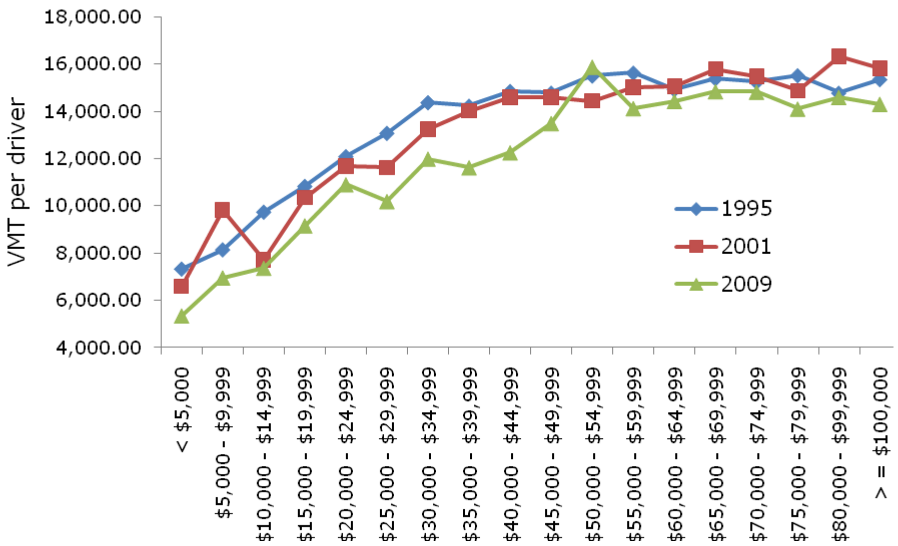
Figures 14 and 15 use travel survey information for the US to shed further light on the interaction between household income and vehicle use. Figure 14 plots vehicle use against household income, for vehicle surveys from 1995, 2001 and 2009. The vehicle use pattern is similar in the three survey years, and shows a gradual decline and levelling off of vehicle use with income. On the one hand, this can be taken to suggest that the aggregate pattern observed in the previous figures is not time specific, so not driven by other factors changing at that time, but that the pattern truly reflects levelling off because of increased average and aggregate income levels. On the other hand, it suggests that as income levels grow at the lower end of the income distribution, this will still translate into increased travel for these households and therefore in the aggregate, as these households clearly have not yet reached the saturation point. These two competing interpretations are potentially consistent: if average income growth is distributed very unevenly, with high growth at the high end and limited, zero or negative growth at the low end (a pattern for which there is some evidence[7], and one which is suggested by the increasing share of rich households' in total travel that is apparent from Figure 15), then average income growth does not lead to more travel as the growth accrues only or mainly to those income classes that have already reached the saturation point. But then, of course, future growth in car use is contingent on how the proceeds of overall economic growth are distributed. This highlights that aggregate trends may have little direct bearing on specific effects and therefore do not necessarily give precise guidance on future transport policy, including the appeal of transport infrastructure investment and management.

Income is just one of many determinants of the amount of driving. Age is another and the changing age structure of the population expected for the next decades (an increase in the share of the elderly in many countries), can be expected to translate into changes in the aggregate amount of driving. Specifically, as Figure 16 shows, driving falls as of age 50, declining rapidly and continuously thereafter. All else being equal, an older population of the same size means less driving, a tendency reinforced by an expected decline in the total population in some countries. But not all is equal, as Figure 16 shows: the reduction in driving with age is observed in all three survey years, but the reduction is smaller in more recent surveys. In other words, the age effect becomes smaller as more recent cohorts are considered. This trend will weaken the downward pressure of ageing on the demand for driving, without eliminating it. On the other hand, drivers up to the age of 30 travelled markedly less in 2009 than in the other survey years. It is as yet unclear whether this is because of changing circumstances or changing preferences, but in the latter case the impact on total future driving may be important.

---

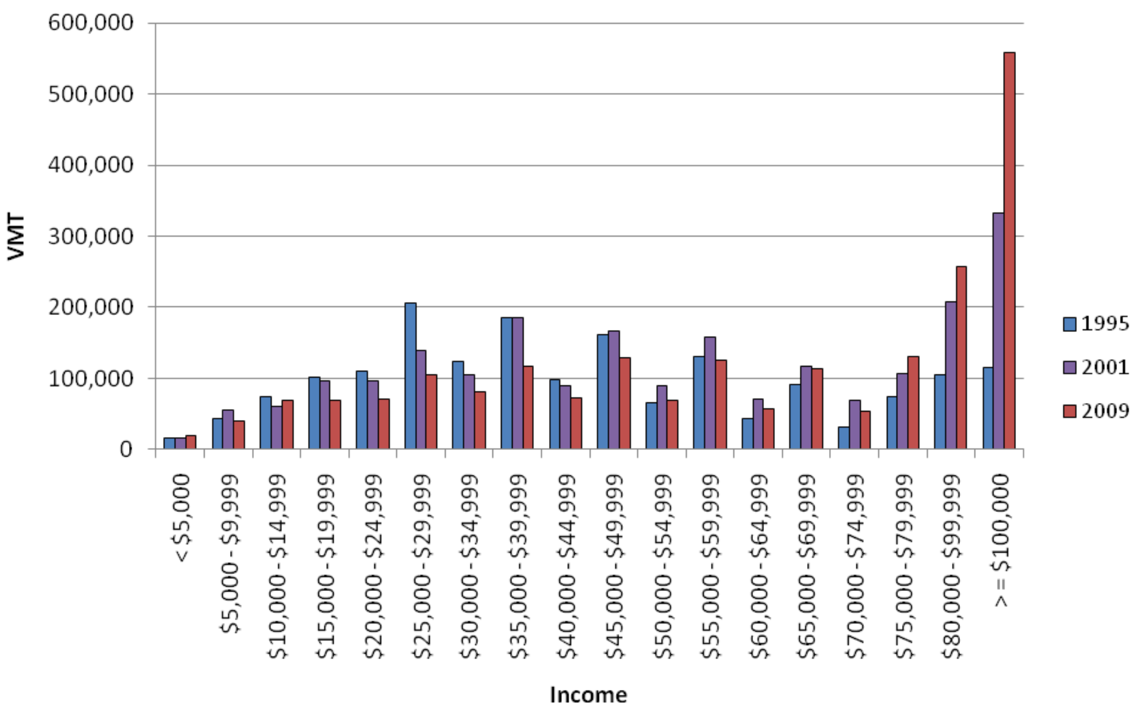
7. See, for example: *Growing income inequality in OECD countries: what drives it and how can policy tackle it?*, OECD Forum on tackling inequality, Paris, May 2, 2011; *Transport for Society,* ITF Secretariat Background Paper for the 2011 Summit; Collet R., E. Boucq, J-L. Madre, L. Hivert, *Long term automobile ownership and mileage trends by income class in France, 1975-2008*, paper presented at the 12th WCTR, Lisbon, 2010.

Figure 14. **Average annual vehicle miles per driver by total household income**



Source: International Transport Forum calculations on US National Household Travel Survey, available at **http://nhts.ornl.gov**

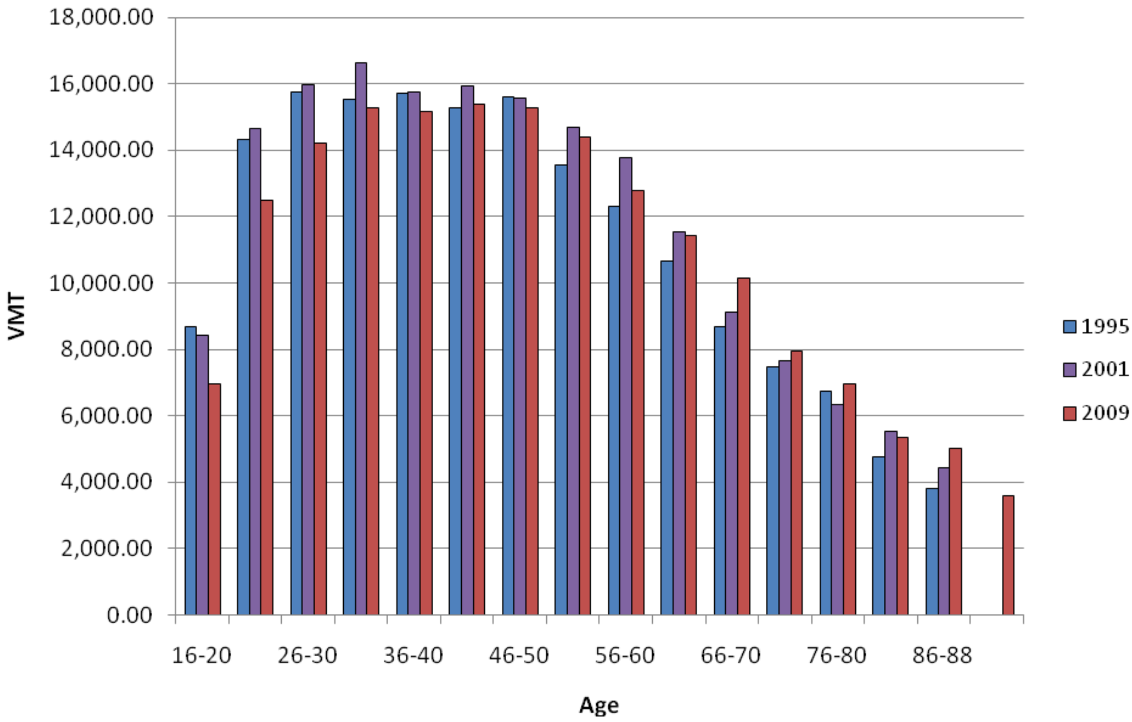
Figure 15. **Total annual vehicle miles by household income, USA, 1995, 2001, 2009**



Source: International Transport Forum calculations on US National Household Travel Survey, available at **http://nhts.ornl.gov**

© OECD/ITF 2011

Figure 16. **Annual vehicle miles per driver by age, USA, 1995, 2001, 2009**



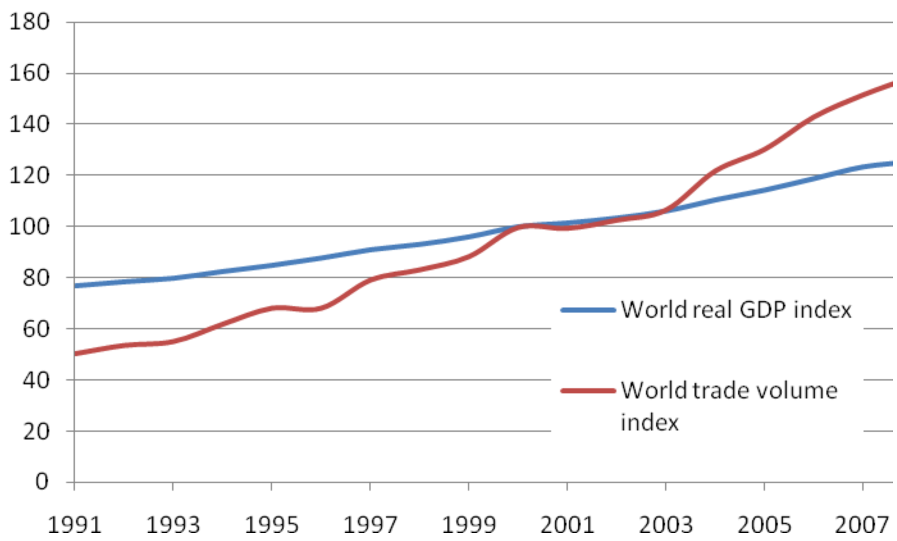
Source: International Transport Forum calculations on US National Household Travel Survey, available at **http://nhts.ornl.gov**

To summarize, the household and driver-level evidence confirms there are reasons to expect a continued decline in the extent to which higher incomes mean more car travel. At the same time, it is clear that income growth for lower incomes groups in both high income and developing countries can lead to a further increase of overall car and total travel demand. Population growth can be expected to translate into more travel growth as well. "Peak travel" therefore is a plausible hypothesis but far from a certainty. It seems excessively risky to base projections in rich countries on an assumption of saturation alone.

4. TRADE AND FREIGHT TRANSPORT BY SEA AND AIR

The high growth episode of the world economy that came to an at least temporary end with the economic crisis of 2008 was characterized by high trade-intensity, with trade growing considerably faster than output (see Figure 17). Several emerging economies adopted export-lead growth strategies and key developed economies maintained policy frameworks that allowed consumption and imports to grow quickly. Growth was high and trade developed fast but in an unbalanced way, with some major economies running large deficits (e.g. the USA and a number of European countries) and others accumulating big surpluses (e.g. China and Germany). The shock of 2008 revealed that some aspects of the global growth dynamic were unsustainable: some of the wealth in developed economies turned out to be virtual, and the reliance of export-economies on non-domestic demand induced some of them to turn to heavily investment-oriented domestic spending models once export demand faltered, a strategy that seems difficult to maintain in the longer run.

Figure 17. **Index of world trade volumes and world real GDP, 1991 – 2008, 2000=100**



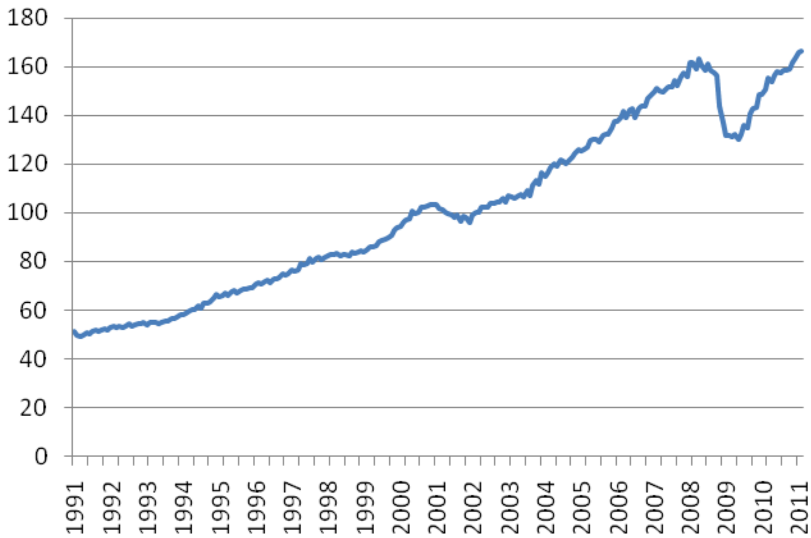
Sources: The Netherlands Central Planning Bureau Trade Monitor; IMF

In the wake of the crisis, recovery is weak and uncertain. It is weak particularly in advanced economies, where the desire to limit the expansion of public debt and/or concerns about abilities to repay it lead to low confidence, slow growth and high unemployment. Growth is stronger in emerging economies, but the sustainability of export and investment-orientated growth strategies is questionable, and transformation to growth driven by domestic household demand is proving to be difficult. These sources of uncertainty are compounded by concerns about rising energy costs as well as by geopolitical events and the consequences of natural disasters.

© OECD/ITF 2011

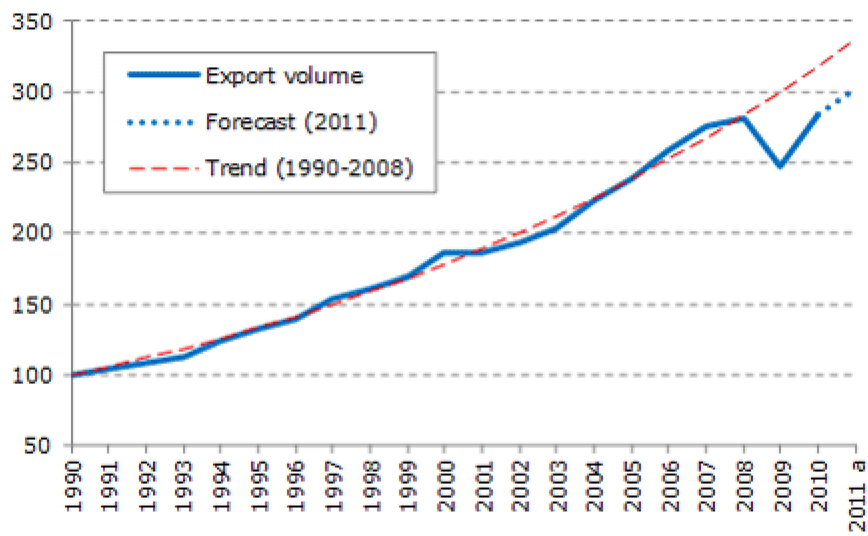
Despite these uncertainties, however, global trade volumes have now surpassed pre-crisis levels according to the Trade Monitor published by The Netherlands Central Planning Bureau, see Figure 18. The post-crisis growth of trade initially was very fast, suggesting a rebound after the collapse in 2008 and 2009, moderating more recently and conceivably in line with the pre-crisis trend. The same picture emerges from WTO data and expectations for world export growth, see Figure 19, which after a post-crisis rebound is expected to align with pre-crisis trend rates, so that the long run effect of the crisis is a downward shift of the export curve. While this reconnection with "business as usual" is a reasonable expectation, on the basis of the uncertainties listed above the downside risks appear to outweigh the upside opportunities.

Figure 18. **Index of world trade volumes, January 1991 – February 2011, 2000=100**



Source: The Netherlands Central Planning Bureau, Trade Monitor.

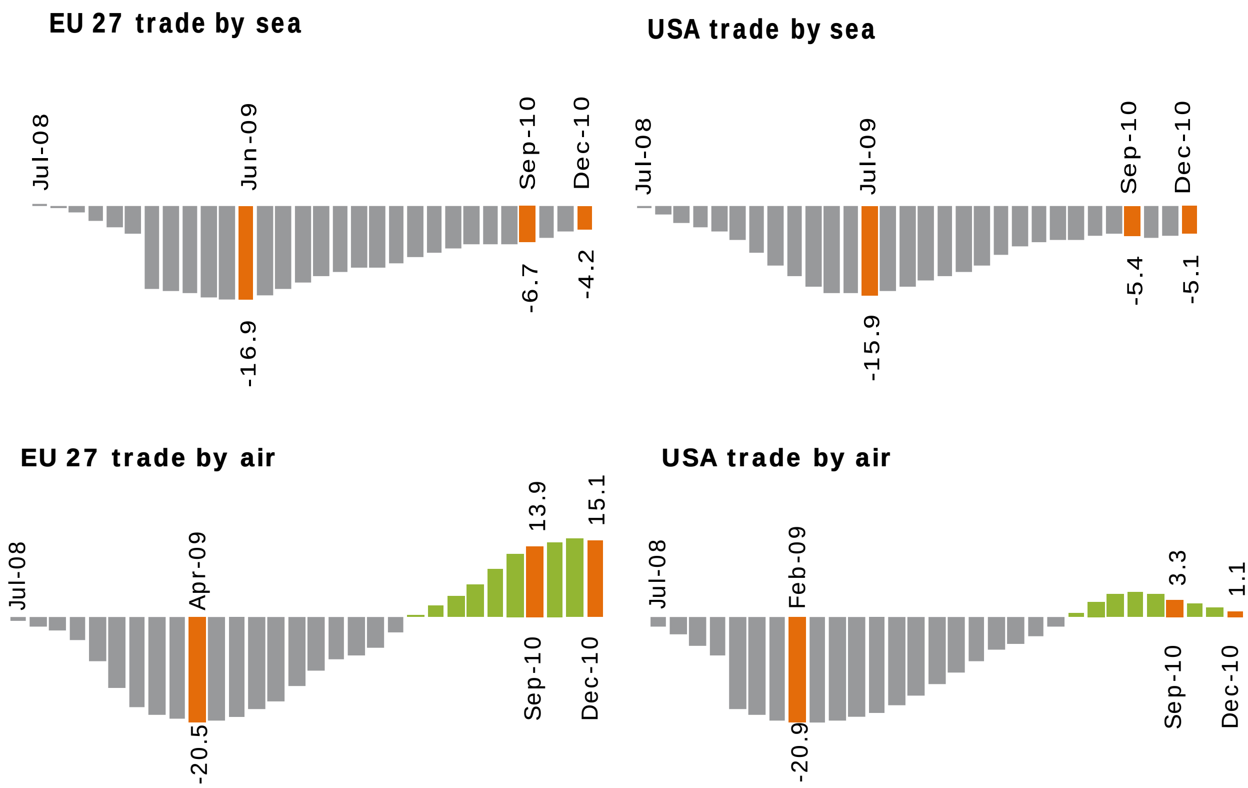
Figure 19. **Index of world export volumes, 1990 – 2001, 1990 = 100**



Source: WTO Secretariat, **http://www.wto.org/english/news_e/pres11_e/pr628_e.htm**

Trade-intensive growth means transport-intensive growth. The macroeconomic growth strategies and firms' efforts to benefit from the lowest factor-prices through geographic dispersion in their supply chains – which together can be said to constitute globalization – lead to fast growth of transport volumes within and between the world's major regions. In order to follow the evolution of trade and in particular transport patterns in the short and medium run, the International Transport Forum has launched a new database, assembling data from a range of existing sources. These data lend further support to the view that the recovery is weak, particularly in advanced economies, and uncertain. Figure 20 shows that maritime cargo volumes to and from the EU and the USA, measured in tonnes, had not reached pre-crisis levels by the end of 2010. Air cargo volumes had more than recovered, but they show an appreciable slowdown in growth near the end of 2010, particularly in the USA.

Figure 20. **External trade by sea, percentage change from pre-crisis peak Jun-08 (Tonnes, monthly trend, seasonally adjusted)**



Source: International Transport Forum Global Trade and Transport database, IATA.

The remainder of this section reports on the regional structure of trade and transport flows, focussing on trade between large regional aggregates in 2005, 2007 and 2010.[8] It shows how economic mass and trade flows are growing as well as being redistributed over the globe.

8. Specifically, the database describes EU and USA imports and exports. For the EU the following regions are considered: Africa, Asia-Pacific, Europe, Latin America, Middle East, and North America. For the USA, the regions are Africa, Asia-Pacific, Europe, Latin America, Middle East, North America, and EU27.

© OECD/ITF 2011

As indicated above, the 2008 crisis has by and large been overcome, but it can be seen as a marker event for the relative decline of the EU and the USA and the rise of emerging economies, in particular in the Asia-Pacific region. However, the highly unbalanced growth pattern observed before and even more so after the crisis seems unsustainable in the long run. The question for the short and medium run is whether rebalancing will take place gradually, i.e. accommodated by policy to the extent possible, or through further shocks to the global economic system. Changing relative costs of production, triggered by changing wages, capital costs, and energy prices, can affect trade and transport patterns, with most factors now pointing in the direction of shorter supply chains rather than continued fragmentation and dispersion.

Table 5 shows how aggregate import and export volumes from and to the EU and the USA have evolved since 2005. Values are measured in current prices so do not correct for inflation, but this was low over the observed period. The value figures indicate that exports from the EU and the US exceeded pre-crisis levels in 2010. This is consistent with the maintained strength and growth of import demand in emerging economies. Growth is stronger in the USA than in Europe, at least partly as a consequence of the lower cost of the US dollar on international currency markets.

The picture for imports is different: the 2010 indexes are below the 2005 level for weight, and in terms of value imports are markedly below exports for the USA. The financial shock in 2008 marks the beginning of a global economic crisis, but the slowdown had begun earlier in the USA, which by December 2007 had already entered a recession. What cannot be seen from the table, and is well-known from other sources, is that the value and the weight of imports to the EU and the USA is higher than the value and weight of exports from these regions in 2005, 2007, and 2010. The difference becomes smaller in 2010, however, reflecting the larger impact of the crisis and the weaker recovery in the EU and the USA compared to the emerging economies.

Table 5. **Index of the value (current prices) and weight of imports to and exports from the EU and the USA, 2005, 2007, 2010 (2005 = 100)**

	2005	2007	2010
Export			
EU, value	100	117	131
EU, weight	100	109	125
US, Value	100	134	153
US, weight	100	121	148
Import			
EU, value	100	126	135
EU, weight	100	109	99
US, Value	100	118	117
US, weight	100	96	79

Source: International Transport Forum global trade and transport database.

Air cargo represents a large share of the total value of exports (up to 40% in the EU and up to 55% in the USA), but this share declined after the crisis, probably as a consequence of the reduced willingness-to-pay for speed of transportation and a stronger price decline in sea cargo (given the quicker adaptation of capacity to demand in aviation). The share of air cargo in EU and USA import values is a bit lower (around 28% and 33%, respectively) and has declined in the EU after the crisis but not in the USA. The share of air cargo in weight moved is much lower of course, around 1% in exports and even less in imports.

The following tends are noteworthy for the EU.

- In the regional composition of trade and transport volumes, *exports* measured in *value from the EU* mainly go to Asia-Pacific and to North America. Concretely, the value of exports by air to Asia-Pacific and North America represents 72% of the total value of exports from the EU in 2005 as well as in 2007 and 2010. But the composition of this constant share changes, in line with the rising importance of the Asia-Pacific region: the share of Asia-Pacific in the total increases from 34% in 2005 to 39% in 2010, while that of North America declines by 5%-point to reach 33% in 2010. The regional concentration of maritime exports is weaker than that of exports by air: Asia-Pacific and North America dominate maritime exports from the EU but represent only about 55% of the total, a share that appears to be declining somewhat in the period considered, and in which the relative importance of the Asia-Pacific region increases.
- Looking *at tonnes exported from the EU*, air exports are dominated by the same two regions, but for maritime weights, Africa is ranked highest in 2010. The regional concentration of weight exported by sea is notably lower than that of weight moved by air and that of values moved by either mode. The weight-measures confirm the overall picture of the value-measures, except that they show an absolute decline of tonnes exported from the EU to the USA, in the sense that 2010 weights are below 2005 weights for both transport modes.
- *Imports to the EU* by air measured in *value* come mainly from Asia-Pacific and North America: the share of those regions combined is about 83% in the three years considered, a level of concentration considerably higher than found in air exports. As in other markets, the Asia-Pacific region gains while North America declines. The regional concentration of imports by sea in value is much weaker and in fact different in the sense that North America shows a quite small share (between 9 and 10%). Instead, the value of EU imports by sea is dominated by Asia-Pacific and by non-EU European countries.
- *Imports to the EU* measured in *weight* come mainly from Asia-Pacific where air cargo is concerned, with a share rising from 48.6% in 2005 to 54.4% in 2010. North America comes second with a share that has declined to 18.6% in 2010. For maritime weight imported, the regional pattern differs somewhat, with the highest share coming from other European countries.

Overall, the figures for the EU show a close connection between transport flows and the changing distribution of economic mass over the world. But the strength of the connection differs between modes, between value and weight, and to some extent between imports and exports. For air transport, the regional concentration and its evolution over time are very closely tied to the global distribution of economic mass. For maritime transport, the concentration is weaker, especially where weights and imports to the EU are concerned.

For the USA the picture is as follows.

- The *value of exports from the USA* is dominated by Europe and Asia Pacific, which together account for about 79% of air export values and 63% of sea export values. Contrary to what is observed for the EU, the share of Asia-Pacific does not rise very strongly between 2005 and 2010, although its share is a bit higher in 2010 than it is in 2005.
- *Exports in tonnes* go mainly to the same two regions, with shares and evolutions closely resembling the value shares.

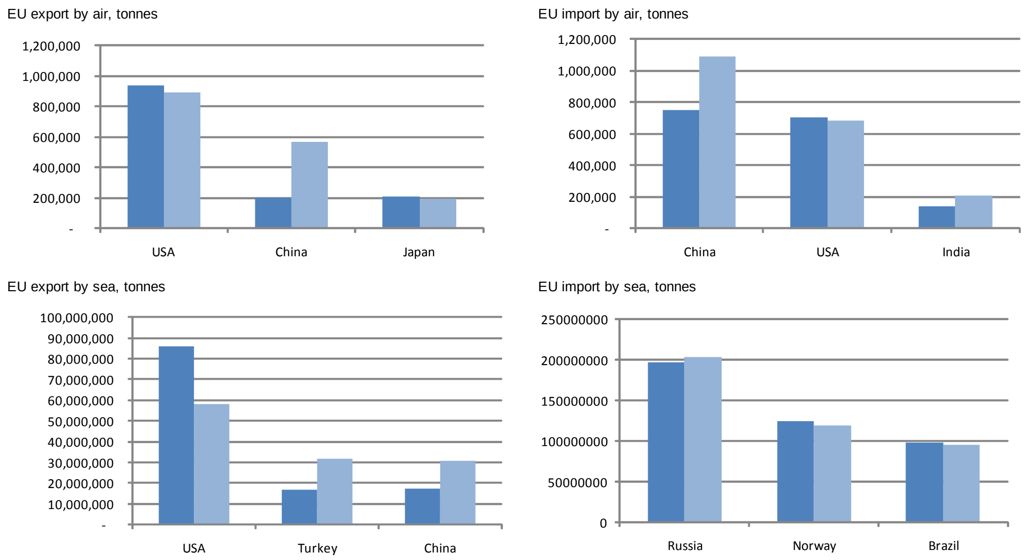
 © OECD/ITF 2011

- *Imports to the USA in value* terms are dominated by Asia Pacific and Europe as well. About 51% of imports in value moved by air come from Asia Pacific, and 36% from Europe. The value of maritime imports comes from Asia Pacific for 49%, a share increasing somewhat over time, and for 20% from Europe, a share that seems to be declining slightly.
- The *weight* shares reflect the value shares, except for a higher share of imports coming from Latin America where weight is considered, in particular weight moved by sea.

The USA figures reflect the large share that Europe and the Asia-Pacific region represent of global trade flows (together with the USA itself, of course). One difference with the EU trends is that the EU shows a clear shift of trade mass towards the Asia-Pacific region between 2005 and 2010, while the change in trade by region is small for the USA. The main observation for the USA is that weights imported by sea in 2010 are considerably lower than weights imported in 2005, and this holds for all regions; for imports by air, there are slight increases for some markets. Tonnes exported increase for nearly all destinations. This pattern suggest a considerable degree of rebalancing between 2005 and 2010, an adaptation that may reflect the severity of the initial imbalances as much as the speed of rebalancing. The EU shows a more mixed picture, with declining weights imported from some regions and increasing weights from others (notably maritime imports from the USA, an outcome for which the dollar exchange rate probably is an explanatory factor, especially since exports to the USA show an opposite trend).

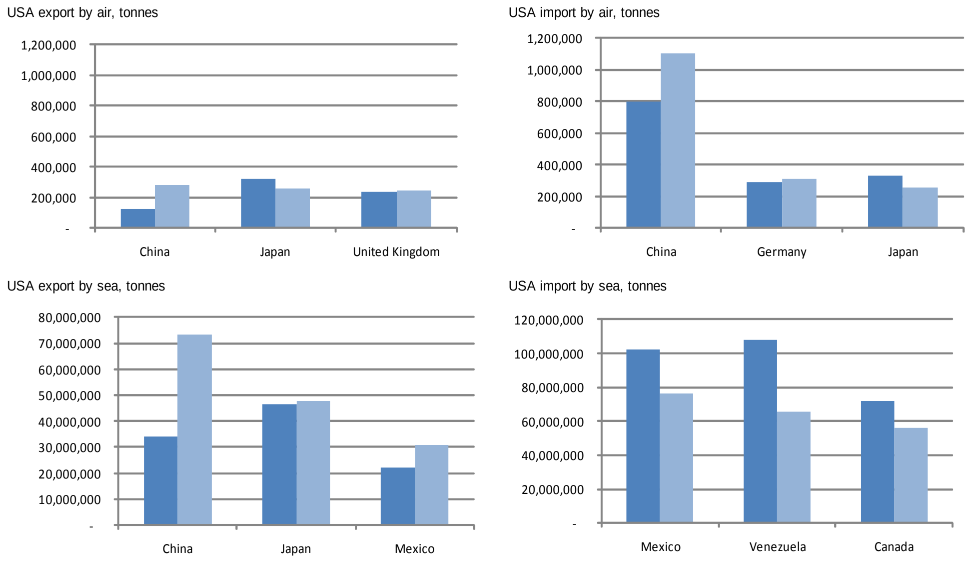
Figures 21 and 22 provide further information on the regional composition of trade flows in weight (tonnes) in 2005 and 2010. Figure 21 shows exports and imports by mode for the EU's three main trading partner countries (according to the 2010 ranking); Figure 22 does the same for the USA.

Figure 21. **Exports and imports with the EU's three main trading countries (2010 ranking), 2005 and 2010, tonnes**



Source: International Transport Forum Global Trade and Transport database.

Figure 22. **Exports and imports with the USA's three main trading countries (2010 ranking), 2005 and 2010 (tonnes)**



Source: International Transport Forum Global Trade and Transport database.

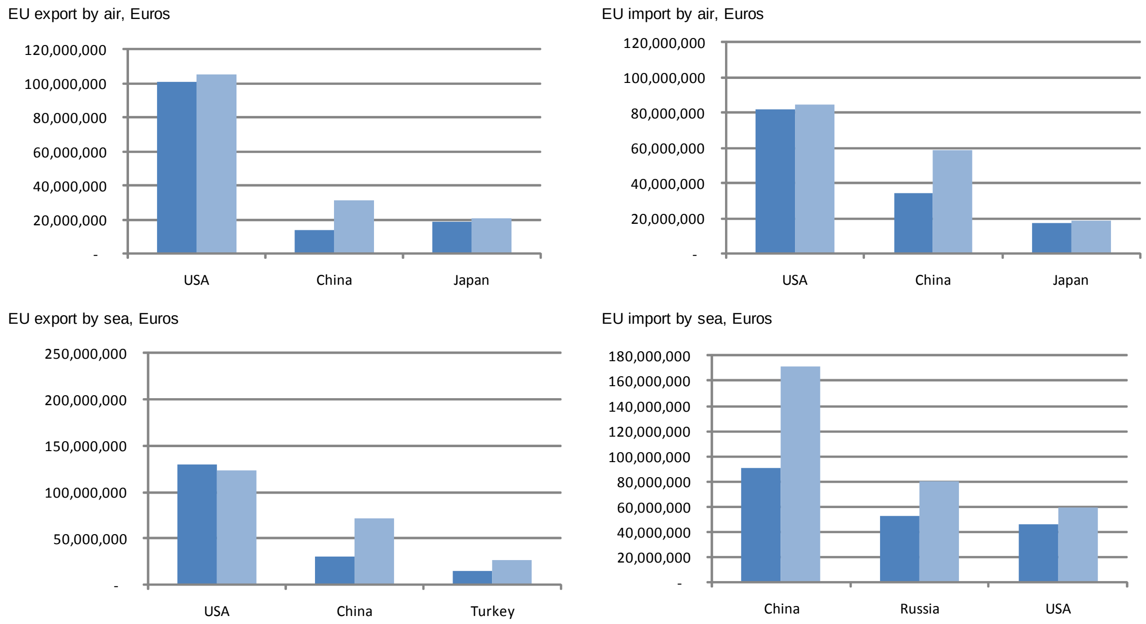
For the EU, the USA remains the main export market in terms of tonnes moved, either by sea or by air. But total weights are lower in 2010 than in 2005 for both modes, and exports to China are rising very quickly, particularly by air. Note that Turkey is the EU's second destination in terms of weight moved by sea. Imports by air mainly come from China, and its dominance has increased sharply between 2005 and 2010. Total weight imported by air from the USA has declined slightly despite the depreciation of the US dollar versus the Euro. Weights imported by sea come from a different set of countries, determined by oil and raw material flows.

The picture for the USA shows a large deficit in weight moved by air, with export weights much lower than import weights. The difference does not change strongly between 2005 and 2010, in particular where China is concerned, suggesting that rebalancing in weight terms is slow at best. China clearly is the US's main trading partner by sea and air in weight terms (imports by sea reflect oil and raw material imports).

Figures 23 and 24 repeat the information of Figures 21 and 22, but this time in values terms. By and large the countries appearing in the top three are the same as in the weight-based rankings, except for imports by sea where weights and values differ strongly. As Figure 23 shows, the main trading partner for the EU in value terms is the USA, although China dominates in terms of the value of maritime imports. The relative importance of China clearly increases in all markets as well. The value of EU exports to the USA exceeds the value of imports, but with China there is a large deficit. The difference between the value of exports and imports to China is much more pronounced for the US (see Figure 24). More generally, the value of both sea and air exports to the three main trading partners is much lower than the value of imports from the three main partners. The difference is smaller in 2010 than in 2005, as export values increase and import values decline in most markets, but like the weight-based data the values do not indicate a major step towards balanced trade flows.

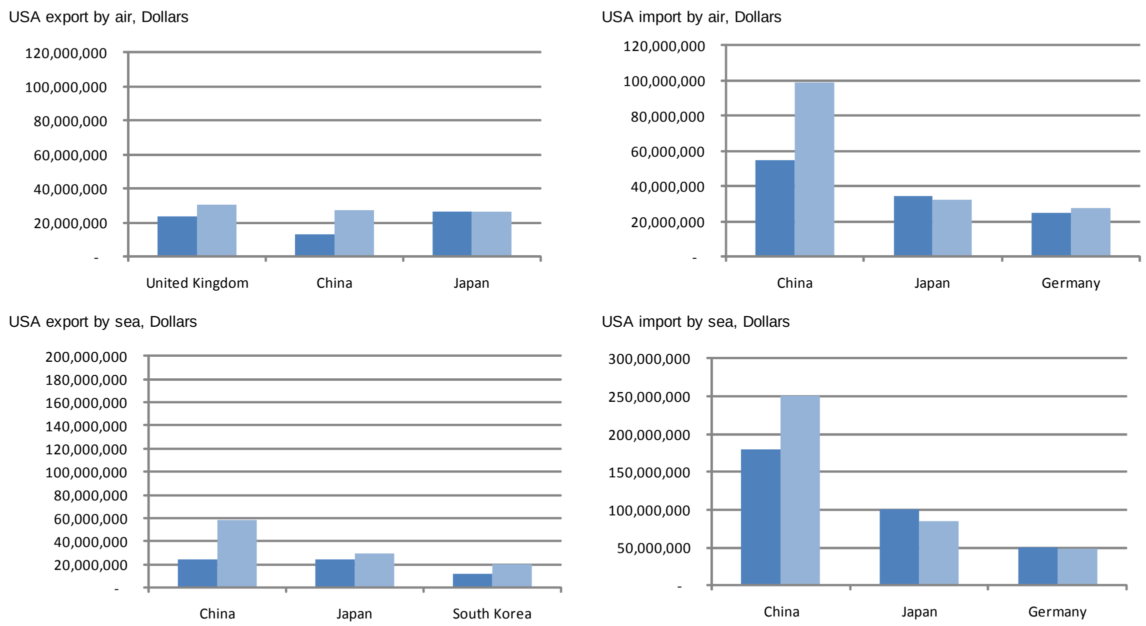
 © OECD/ITF 2011

Figure 23. **Exports and imports with the EU's three main trading countries by sea and air (2010 ranking), 2005 and 2010, current values (thousands of Euros)**



Source: International Transport Forum Global Trade and Transport database.

Figure 24. **Exports and imports with the USA's three main trading countries by sea and air (2010 ranking), 2005 and 2010, current values (thousands of US dollars)**



Source: International Transport Forum Global Trade and Transport database.

Summing up, the trade and transport data indicate a fairly rapid rebound of trade and transport levels after the crisis, but toward the end of 2010 the pace of recovery seems to have slowed down. Such a slowdown should not come as a surprise given the various downside risks that threaten the world economy and that limit improvements in confidence and in aggregate demand. The crisis accentuates a shift of economic mass from the advanced to the emerging economies, in particular toward China. The rising importance of China and its region is clearly reflected in the changing geographical composition of trade and transport flows. This process can be expected to continue over the long run. In the years after the crisis, the strong Chinese economy has been the locomotive of recovery, and this new role can be expected to gain prominence in the future. That is why uncertainties concerning the sustainability of the Chinese growth model, which relies heavily on exports and on domestic investment demand, are a concern not only for China region but for the world economy as a whole.

© OECD/ITF 2011

ANNEX: THE INTERNATIONAL TRANSPORT FORUM'S GLOBAL TRADE 4AND TRANSPORT DATABASE – SHORT DESCRIPTION AND SUMMARY TABLES

The International Transport Forum's Global Trade and Transport Database compiles directional region and country level information on trade volumes (import/export; values/tonnes) transported by sea and by air. Data sources include Eurostat, the US Census, The Japanese Ministry of Finance and the IMF. The database is in Excel format and it is built to allow easy manipulation, e.g. geographical aggregation and data extraction and to be updated on a monthly basis.

The Database consists of two parts:

The "Total Trade Flows Database", which summarizes trade volumes in monetary value between major regions and countries. This database provides summary tables on trade flows volumes in USD between major countries and regions. Global country pairs level data is available should users have particular interests in specific markets. For data consistency reason among reporting countries, only IMPORT CIF data is recorded. Data come from the International Monetary Fund's Direction of Trade.

The "Origin-Destination Trade and Transport Database" which has detailed country-pair level directional trade volume statistics by modes of transport reported in monetary units and weight (tones). Three datasets form this part of the database. Each of them is sourced differently. The European dataset, from Eurostat, tracks directional volumes of trade (import/export) from EU27 to partner countries in monetary value and weight. Goods transported were recorded by sea and air. In addition to EU27 external trade data, the database also contains country level data for Germany, France, United Kingdom, the Netherlands and Belgium. The United States dataset, from the US Census Bureau, tracks directional volumes of trade (import/export) from the United States to partner countries in monetary value and weight. Goods transported were recorded by sea, air and total. The Japan dataset, from Japan Customs, Ministry of Finance, contains directional trade statistics transported by sea and by air between Japan and partner countries. Historical data dates back to year 2000. The dataset contains monthly data from year 2009 onwards while historical data from year 2000 to 2008 are quarterly data. The unit is in value (Japanese Yen) only.

The Global Trade and Transport Database complements existing databases by adding directional trade data on origin-destination level transported by air and by sea in value and weight tonne. It includes data for all countries worldwide. In addition, there are regions and sub-regions functions which allow users to easily extract aggregated time series data. The database was built in such a way that users can easily "reassign" the regions/sub-regions to suit specific projects.

Thus, this database allows users to examine the relation between international trade and modes of transport on the origin-destination level and the relationship between the values of goods transported and its weight. This database allows users to easily track market trends and performance, identify trade imbalances and market shifts. Updated with the latest available monthly data and seasonally adjusted, it also allows users to identify possible turning points and make short term projections.

Table A1. **EU and US exports and imports, current values (' 000s) and weight, 2005, 2007 and 2010**

EU EXPORT	EURO €						TONNE					
	2005		2007				2005		2007		2010	
	Air	Sea	Air	Sea	Air	Sea	Air	Sea	Air	Sea	Air	Sea
Africa	15,079,957	54,768,180	17,967,398	73,189,694	19,805,550	94,438,546	303,836	57,691,825	419,340	67,769,658	445,474	99,187,688
Asia Pacific	98,969,116	121,587,765	111,950,485	152,511,127	137,637,360	196,012,323	1,101,930	61,303,082	1,428,454	66,342,787	1,704,579	86,761,317
Europe	21,752,446	53,081,875	25,107,469	67,846,764	27,909,238	71,977,809	476,426	51,566,145	452,330	65,682,287	469,995	74,446,533
LATAM	13,949,276	38,133,481	16,580,723	52,501,310	20,970,860	62,352,822	252,199	22,917,037	301,502	29,618,887	366,701	34,007,269
Middle East	31,051,728	43,167,279	29,309,002	55,688,373	31,636,646	60,344,622	380,413	32,609,771	409,656	35,525,055	541,178	39,823,674
North America	109,114,233	142,798,180	114,349,764	150,958,563	114,366,298	139,709,941	1,032,025	95,392,222	1,165,859	85,794,123	986,050	66,130,387
Total	**289,916,757**	**453,536,760**	**315,264,840**	**552,695,832**	**352,325,952**	**624,836,063**	**3,546,828**	**321,480,082**	**4,177,140**	**350,732,796**	**4,513,975**	**400,356,868**
EU IMPORT												
Africa	10,650,677	72,368,572	11,309,414	90,170,440	10,837,688	97,975,738	296,194	247,401,072	341,709	247,000,322	445,555	211,225,066
Asia Pacific	111,509,156	203,691,560	130,401,485	285,668,369	145,225,554	314,931,029	1,732,481	138,023,640	2,276,768	186,514,749	2,161,463	135,554,648
Europe	12,375,237	128,201,705	13,386,004	168,683,807	13,766,889	182,315,273	369,570	387,690,652	316,985	419,363,520	205,959	407,715,005
LATAM	7,416,162	50,192,007	7,563,460	70,991,592	12,024,204	72,988,691	260,964	189,027,462	242,412	219,163,659	335,387	193,568,251
Middle East	11,069,155	44,166,719	8,286,047	50,033,316	7,718,068	53,004,245	148,612	133,174,048	148,882	119,177,254	84,926	115,607,686
North America	88,660,078	53,539,932	91,819,186	71,389,062	90,815,487	70,953,084	758,648	77,144,486	816,181	89,501,336	737,660	98,563,700
Total	**241,680,467**	**552,160,495**	**262,765,596**	**736,936,586**	**280,387,891**	**792,168,060**	**3,566,467**	**1,172,461,360**	**4,142,938**	**1,280,720,840**	**3,970,950**	**1,162,234,356**

USA EXPORT	USD $						Tonne					
	2005		2007		2010		2005		2007		2010	
	Air	Sea	Air	Sea	Air	Sea	Air	Sea	Air	Sea	Air	Sea
Africa	3,278,560	10,445,080	4,584,780	17,405,850	5,357,160	20,557,550	43,730	20,088,140	66,340	30,859,180	68,290	28,990,890
Asia Pacific	119,133,610	102,709,670	142,346,540	138,876,520	157,236,350	181,777,560	1,037,160	139,285,790	1,220,990	155,260,280	1,403,050	213,573,940
Europe	116,566,730	72,530,540	149,595,170	106,714,690	153,149,120	106,048,100	996,730	67,100,180	1,238,920	89,833,210	1,108,340	103,878,760
LATAM	27,135,030	56,860,170	35,605,880	82,910,760	42,216,630	113,624,890	362,890	79,948,640	444,540	101,134,270	481,380	132,452,970
Middle East	12,584,420	14,497,330	16,877,770	23,406,270	16,704,280	26,092,930	101,150	10,371,030	170,580	15,750,960	159,080	14,444,710
North America	14,264,310	4,249,460	16,956,840	5,422,060	17,299,120	6,086,070	193,760	35,452,100	220,070	31,715,380	181,730	26,963,400
EU27	104,073,640	63,244,580	129,002,420	91,410,800	128,802,440	89,080,240	924,040	56,267,990	1,136,980	73,707,570	997,230	81,017,830
Total	**292,962,660**	**261,292,250**	**365,966,980**	**374,736,150**	**391,962,660**	**454,187,100**	**2,735,420**	**352,245,880**	**3,361,440**	**424,553,280**	**3,401,870**	**520,304,670**
USA IMPORT												
Africa	3,915,480	60,607,930	6,390,510	83,963,230	4,937,450	79,590,090	23,430	146,417,780	29,060	156,927,740	25,730	130,499,410
Asia Pacific	180,668,030	409,615,590	205,711,880	489,624,320	225,965,980	480,438,720	1,971,980	129,888,580	2,098,640	145,522,760	2,073,210	113,998,580
Europe	136,891,970	189,218,280	161,773,080	214,233,130	160,864,950	191,337,480	1,167,150	147,987,660	1,312,820	129,006,820	1,187,020	117,825,900
LATAM	14,686,320	139,347,120	14,394,570	159,510,280	27,032,760	149,605,260	664,800	377,499,940	694,830	338,709,290	615,290	271,261,380
Middle East	14,476,630	46,618,810	17,853,040	57,235,830	16,082,640	57,028,770	65,950	121,541,280	82,020	110,934,660	65,950	93,469,610
North America	8,470,980	13,997,160	9,129,980	19,208,040	9,428,930	20,796,690	68,340	71,803,110	85,150	69,429,730	43,860	56,194,530
EU27	124,228,750	158,776,860	146,803,880	177,853,060	142,269,330	149,188,530	1,079,620	93,364,480	1,214,410	78,212,880	1,054,680	60,876,610
Total	**359,109,410**	**859,404,890**	**415,253,060**	**1,023,774,830**	**444,312,710**	**978,797,010**	**3,961,650**	**995,138,350**	**4,302,520**	**950,531,000**	**4,011,060**	**783,249,410**

Source: ITF Global Trade and Transport database.

Table A2. **The EU's 10 main trading partners in terms of tones moved by mode, 2005 and 2010**

Directional Trade Rankings in tonne - Reporting country : EU

		2005			2010
	Export by air				
1	USA	938,427	1	USA	890,420
2	Japan	206,746	2	China	568,843
3	China	199,854	3	Japan	191,902
4	Russia	132,403	4	India	175,107
5	Norway	121,743	5	UAE	160,143
6	UAE	116,605	6	South Korea	153,792
7	Hong Kong	107,937	7	Russia	137,170
8	South Korea	101,829	8	Brazil	127,286
9	India	94,166	9	Hong Kong	121,247
10	Canada	93,570	10	Israel	111,504
	Export by sea				
1	USA	86,207,209	1	USA	57,864,184
2	China	17,262,778	2	Turkey	31,583,825
3	Turkey	16,658,924	3	China	30,848,847
4	Norway	15,760,193	4	Algeria	15,633,255
5	Canada	9,179,725	5	Egypt	14,207,282
6	Saudi Arabia	8,717,137	6	Norway	13,751,890
7	Morocco	8,426,878	7	Saudi Arabia	12,009,206
8	Algeria	8,066,795	8	Nigeria	11,587,159
9	Egypt	6,881,381	9	Brazil	11,413,270
10	Japan	6,772,935	10	Morocco	11,371,101
	Import by air				
1	China	752,101	1	China	1,088,224
2	USA	703,880	2	USA	685,087
3	Russia	254,178	3	India	205,523
4	Japan	184,480	4	Japan	186,793
5	India	138,528	5	Kenya	147,345
6	South Korea	109,345	6	South Korea	137,168
7	Hong Kong	98,531	7	Switzerland	100,205
8	Taiwan	87,143	8	Taiwan	92,436
9	Thailand	68,192	9	Brazil	80,276
10	Kenya	66,777	10	Thailand	69,422
	Import by sea				
1	Russia	196,554,070	1	Russia	203,086,905
2	Norway	124,720,587	2	Norway	119,138,129
3	Brazil	98,416,060	3	Brazil	96,353,762
4	South Africa	61,031,911	4	USA	68,912,730
5	Saudi Arabia	57,038,705	5	Libya	50,296,133
6	USA	51,849,199	6	China	47,563,634
7	Libya	48,963,229	7	Nigeria	31,532,528
8	Algeria	44,068,450	8	Colombia	31,355,027
9	Australia	40,615,076	9	Canada	29,650,657
10	China	38,417,871	10	Algeria	28,239,838

Source: International Transport Forum Global Trade and Transport database.

Table A3. **The EU's 10 main trading partners in terms of (thousands of) Euros moved by mode, 2005 and 2010**

Directional Trade Rankings in Euro - Reporting country : EU

	2005		2010
Export by air			
1 USA	100,661,524	1 USA	105,390,526
2 Japan	18,913,593	2 China	31,571,464
3 China	13,767,735	3 Japan	20,673,620
4 UAE	12,796,531	4 Hong Kong	16,181,414
5 Hong Kong	11,424,826	5 India	15,222,939
6 India	11,067,587	6 South Korea	10,954,253
7 Singapore	8,786,012	7 UAE	10,781,815
8 Canada	8,450,146	8 Singapore	10,167,199
9 South Korea	8,264,873	9 Switzerland	9,355,808
10 Switzerland	7,735,997	10 Canada	8,972,583
Export by sea			
1 USA	129,596,845	1 USA	123,452,244
2 China	30,763,842	2 China	72,043,421
3 Japan	21,455,446	3 Turkey	26,257,696
4 Turkey	15,717,728	4 Brazil	21,431,685
5 Canada	13,182,854	5 Japan	21,061,181
6 Norway	12,010,086	6 India	17,429,706
7 Australia	11,630,470	7 Canada	16,232,204
8 Mexico	10,676,066	8 Australia	15,969,669
9 Brazil	10,077,069	9 South Korea	15,652,770
10 South Africa	10,036,197	10 Russia	14,586,188
Import by air			
1 USA	82,033,427	1 USA	84,365,235
2 China	34,426,950	2 China	58,956,125
3 Japan	17,390,356	3 Japan	18,940,807
4 South Korea	11,966,080	4 South Korea	11,773,553
5 Singapore	11,875,137	5 Singapore	10,930,424
6 Taiwan	7,568,093	6 Taiwan	9,294,876
7 Canada	6,626,183	7 Malaysia	8,815,541
8 Switzerland	6,421,496	8 India	7,977,763
9 Malaysia	5,827,049	9 Switzerland	7,507,441
10 India	5,115,948	10 South Africa	6,560,777
Import by sea			
1 China	90,315,266	1 China	171,113,340
2 Russia	52,491,860	2 Russia	80,664,262
3 USA	45,843,462	3 USA	59,622,968
4 Norway	40,836,199	4 Norway	47,345,228
5 Japan	33,816,013	5 Japan	31,335,452
6 Saudi Arabia	18,224,136	6 Brazil	27,405,286
7 Brazil	17,993,872	7 Libya	23,024,093
8 Turkey	16,091,547	8 India	20,776,833
9 Libya	15,712,626	9 Turkey	19,835,220
10 Algeria	13,890,936	10 South Korea	16,805,662

Source: ITF Global Trade and Transport database.

Table A4. **The USA's 10 main trading partners in terms of tonnes moved by mode, 2005 and 2010**

Directional Trade Rankings in tonne - Reporting country : USA

	2005			2010	
	Export by air				
1	Japan	324,070	1	China	276,530
2	United Kingdom	238,260	2	Japan	258,160
3	Canada	193,760	3	United Kingdom	240,870
4	Germany	175,100	4	Germany	214,280
5	China	122,810	5	Canada	181,730
6	France	108,690	6	South Korea	165,540
7	Netherlands	106,860	7	Hong Kong	145,360
8	South Korea	100,950	8	Brazil	135,940
9	Taiwan	94,190	9	Singapore	127,310
10	Singapore	87,830	10	France	118,860
	Export by sea				
1	Japan	46,315,920	1	China	73,347,280
2	Canada	35,451,470	2	Japan	47,568,490
3	China	34,119,880	3	Mexico	30,830,420
4	Mexico	21,988,610	4	South Korea	27,102,170
5	South Korea	16,288,370	5	Canada	26,963,400
6	Taiwan	12,430,160	6	Brazil	23,735,400
7	Brazil	9,737,080	7	Netherlands	19,271,820
8	Netherlands	8,618,610	8	Turkey	13,432,120
9	Spain	7,875,610	9	Taiwan	12,655,180
10	Italy	7,723,750	10	India	12,421,180
	Import by air				
1	China	798,680	1	China	1,105,960
2	Japan	328,660	2	Germany	309,190
3	Germany	289,730	3	Japan	253,220
4	United Kingdom	185,250	4	United Kingdom	172,940
5	Italy	145,780	5	Colombia	142,880
6	Colombia	133,730	6	France	132,780
7	France	129,490	7	Italy	122,200
8	Malaysia	121,300	8	India	113,070
9	Chile	116,650	9	Taiwan	104,650
10	Taiwan	116,300	10	South Korea	93,640
	Import by sea				
1	Venezuela	107,860,090	1	Mexico	76,140,210
2	Mexico	101,958,730	2	Venezuela	65,557,830
3	Saudi Arabia	76,312,460	3	Canada	56,194,530
4	Canada	71,803,110	4	Saudi Arabia	54,648,270
5	Nigeria	58,555,580	5	China	53,892,260
6	China	57,966,270	6	Nigeria	50,698,420
7	Brazil	35,472,010	7	Russia	39,956,330
8	Colombia	34,310,250	8	Colombia	34,168,260
9	Russia	28,303,770	9	Brazil	28,767,030
10	Trinidad and Tobago	26,505,600	10	Algeria	23,566,800

Source: ITF Global Trade and Transport database.

Table A5. **The USA's 10 main trading partners in terms of (thousands of) USD by mode, 2005 and2010**

Directional Trade Rankings in USD - Reporting country : USA

	2005			2010	
	Export by air				
1	Japan	26,490,790	1	United Kingdom	30,513,790
2	United Kingdom	23,387,260	2	China	27,331,670
3	Germany	19,882,440	3	Japan	26,386,740
4	Netherlands	15,964,560	4	Germany	25,643,500
5	France	14,721,690	5	Switzerland	18,587,790
6	Canada	14,264,310	6	France	17,531,280
7	South Korea	14,162,960	7	Canada	17,299,120
8	China	13,068,070	8	Hong Kong	17,282,260
9	Singapore	12,819,670	9	Netherlands	16,857,320
10	Taiwan	12,089,880	10	Singapore	16,281,230
	Export by sea				
1	China	24,288,130	1	China	58,066,400
2	Japan	24,046,510	2	Japan	30,005,070
3	South Korea	11,843,870	3	South Korea	20,560,380
4	Germany	11,619,230	4	Brazil	19,676,490
5	United Kingdom	10,814,000	5	Germany	17,288,840
6	Mexico	9,333,150	6	Mexico	16,894,130
7	Netherlands	9,268,990	7	Netherlands	16,445,220
8	Belgium	8,946,810	8	United Kingdom	13,252,040
9	Australia	8,617,140	9	Belgium	13,044,350
10	Taiwan	7,958,010	10	Australia	12,109,260
	Import by air				
1	China	54,842,770	1	China	98,893,810
2	Japan	34,540,060	2	Japan	32,241,440
3	Germany	24,795,350	3	Germany	27,342,340
4	Ireland	23,885,470	4	Ireland	26,670,920
5	Malaysia	23,588,660	5	United Kingdom	23,278,230
6	United Kingdom	20,018,340	6	South Korea	17,823,150
7	France	15,395,730	7	France	17,663,730
8	South Korea	14,697,110	8	Malaysia	15,266,440
9	Israel	13,149,620	9	Israel	15,257,160
10	Taiwan	12,480,140	10	Taiwan	15,234,840
	Import by sea				
1	China	180,354,890	1	China	250,729,200
2	Japan	100,205,840	2	Japan	84,704,330
3	Germany	50,342,000	3	Germany	47,891,730
4	Venezuela	33,763,790	4	Mexico	37,457,660
5	Mexico	30,894,230	5	Venezuela	32,706,920
6	South Korea	28,312,350	6	Saudi Arabia	30,752,210
7	Saudi Arabia	27,048,450	7	Nigeria	30,462,720
8	United Kingdom	26,989,720	8	South Korea	29,998,060
9	Nigeria	24,008,540	9	Russia	24,399,300
10	Taiwan	21,204,340	10	United Kingdom	22,669,430

Source: ITF Global Trade and Transport database.

International Transport Forum

Transport Outlook

Meeting the Needs of 9 Billion People

The world's population will reach 9 billion by 2050. Meeting their transport demands will be challenging. As both population and incomes rise, global passenger mobility and global freight transport volumes may triple by 2050. The International Transport Forum's 2011 Outlook examines these trends, exploring the factors that may drive demand even higher and the limits imposed by infrastructure capacity, fuel prices and policies to accommodate or limit potentially expolosive growth of car use in rapidly developing countries.

The Outlook traces scenarios for emissions of CO_2 from transport and the impact of policies to improve the fuel economy of conventional vehicles and promote the use of electric cars, including implications for fuel tax revenues. Trends in passenger car traffic are given particular attention, examining evidence for saturation of demand in high income countries.

The report also focuses on future directions for trade, as suggested by trends in the current economic recovery. A global rebalancing in the wake of the financial crisis may already be over, with trade returning to pre-crisis patterns ahead of any longer term restructuring for economic sustainability.

International Transport Forum

2 rue André Pascal
75775 Paris Cedex 16
itf.contact@oecd.org
www.internationaltransportforum.org