



Sector Futures

Transport: Which direction?

Continuing growth in transport demand

Business as usual

Other scenarios

Conclusions

References



European Monitoring Centre on Change

Sector Futures is available in electronic format only.

This second article explores the future of the transport sector in Europe, by examining different potential scenarios. First it looks at the sector from a 'business as usual' perspective assuming that past trends will continue, before exploring some of the implications of this scenario. Forecasts based on this assumption predict continuing growth in transport demand for both goods and people. However, there are a number of factors that challenge this view of the future and the continuation of past trends is not necessarily inevitable. In particular, the potential impact of changing attitudes to environmental sustainability is significant and is examined in this article in two further scenarios. The article ends with a number of conclusions, which will be explored in further detail in the third and final article of this series on policy options.

Continuing growth in transport demand

The **EU15 Energy and transport outlook to 2030**¹ (European Commission, 2003, p. 61) forecasts almost 50% growth in passenger transport and over 80% growth in freight transport in the EU15 between 2000 and 2030. This forecast is based on an annual average increase of 1.4% in passenger transport activity and a 2.1% increase in freight transport. The majority of this transport will be by road. It is predicted that by 2030, 72.3% of passenger transport will be by private car, and that the average EU citizen will drive over 14,000 kilometres a year, compared with 10,000 kilometres in 2000. The share of road transport in the movement of freight will, it is further anticipated, grow from 70.9% to 77.7% over this period, as rail and waterways continue to lose market share.

These forecasts are based on a number of assumptions, in particular on a doubling of the EU15's gross domestic product (GDP) between 2000 and 2030. Economic growth has been a major driver in the expansion of transport demand and this is expected to continue in the future. Other factors, however, are expected to moderate the level of growth in transport, associated, in the past, with a growing economy. A lower growth rate for passenger transport, for example, is predicted, as the more stable EU population and the eventual saturation of individual demand for travel that is foreseen, are expected to reduce the rate of increase. Although freight transport is predicted to grow more rapidly, this forecast is also affected by anticipated structural shifts in the economy, particularly towards services and high value-added manufacturing which are less freight intensive than traditional manufacturing. GDP growth is therefore expected to create a lower rate of increase in the demand for freight transport than in the past. This forecast also assumes oil prices below the 2000 level of \$28 a barrel throughout the period, although it is forecasted that they will rise slowly towards 2030.

Similar scenarios are explored in other studies of the future of transport. The final report of the **Foresight for transport project**², *A foresight exercise to help forward thinking in transport and sectoral integration*, outlines a reference scenario (ICCR, 2004, p. 58) that is also based on the assumed continuation of past trends. The report anticipates a future in which the demand for transport, mainly by road, will continue to increase. This is based on a scenario with a slowly growing economy in which *laissez-faire* attitudes prevail, together with an ageing population and limited developments in technology and sustainability.

¹ http://europa.eu.int/comm/dgs/energy_transport/figures/trends_2030/3_chap2_en.pdf

² <http://www.iccr-international.org/publications/researchreports-tea.html>

Business as usual

The final report of the **Forecasting and assessment of new technologies and transport systems and their impacts on the environment (FANTASIE) project**³ includes two scenarios: 'Unrestricted growth' and 'Business as usual'. Each of these scenarios are based on varying assumptions about continuing trends. In the 'Unrestricted growth' (UG) scenario,

society is characterised by high economic dynamism. This is accompanied by rapid technological progress. However, there is little public support for the excessive promotion of a sustainable society. Everyone is in favour of the open market philosophy: the individual holds centre stage. The maximisation of income is the guiding principle for the whole of society;

whereas in the 'Business as usual' (BAU) scenario,

society is characterised by medium economic dynamism. This is accompanied by comparable technological progress. Further, there is little public support for the excessive promotion of a sustainable society.
(Helmreich and Leiss, 2000, p. 39)⁴

Both scenarios anticipate continued dominance of passenger transport by the private car, which in each case accounts for 72% of all passenger-kilometres, although UG predicts nearly 25% more kilometres travelled. In the UG scenario, air travel is estimated over four times the 1995 level, and three times the level in the BAU model. Freight tonne-kilometres are predicted at two-and-a-half, and one-and-a-half, times the 1995 level, respectively.

In the following paragraphs, road transport and aviation – the two forms of transport explored in the BAU scenario – will be considered. This will be followed by a reflection of the implications of this scenario for employment, airline consolidation, railways, outsourcing and road congestion.

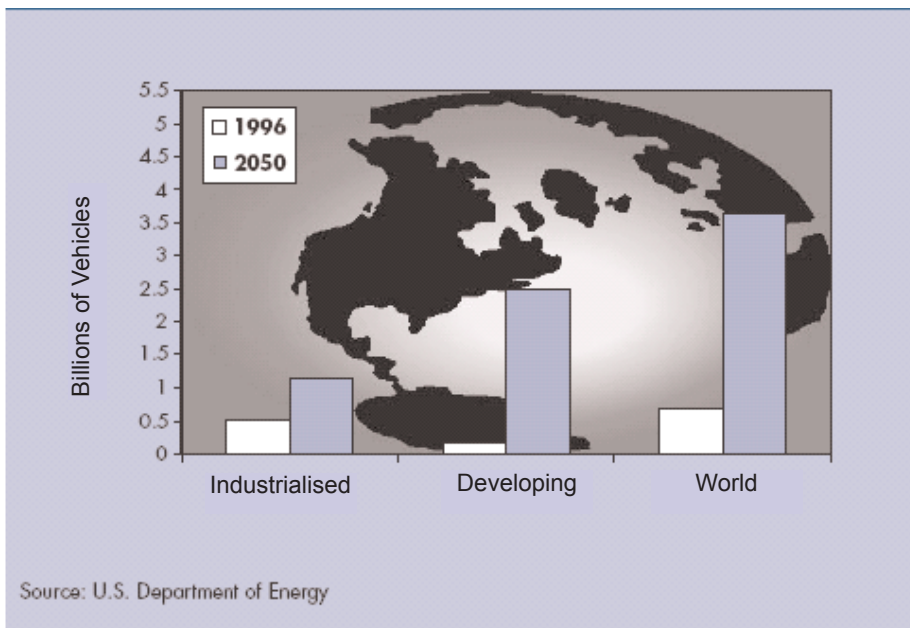
Road transport

The anticipated continuing growth of road transport is reflected in growth forecasts by the US Department of Energy, of the world vehicle fleet of cars and trucks. From a total of 670 million vehicles in 1996, the number is projected to reach 3.5 billion by 2050. Although registrations in industrialised countries, including Europe, are expected to double, the major growth is likely to be in developing countries.

³ http://www.etsu.com/fantasie/FinRep_www.zip

⁴ See Tables 3 to 5 below for further details on these scenarios.

Figure 1: *World vehicle registrations*



Source: *Office of Technology Policy, 2003, p. 18*

Some indication of the possible growth in vehicle numbers, in selected developing countries, is given by Chanaron.

Table 1: *The art of forecasting: Small exercise of fiction!*

Country	Registrations '000 vehicles 2003	Registrations '000 vehicles 2010	Average annual growth %
Brazil	1,120	2,640	7.6
China	2,037	19,600	36.8
India	700	12,200	35.9
Indonesia	357	2,210	19.9
South Africa	336	710	8.0

Source: *Chanaron, 2004*

If, as anticipated, production shifts in order to locate itself close to the market, the implications for European based manufacturing are considerable.

Aviation

In recent years, air transport has been the fastest growing mode of transport, and most forecasts expect this growth to continue. The **EU15 Energy and transport outlook to 2030** (European Commission, 2003) predicts a growth rate of 3.8% a year to 2030. This continuing growth of air transport is also reflected in European air traffic and market forecasts, prepared by the major manufacturers of commercial aircraft, Airbus and Boeing. Furthermore, the total European

passenger traffic, forecasted by the International Air Transport Association Consultancy Services for the **Air Transport Action Group**⁵ (1999, p. 9), is predicted at an average annual growth rate of 4.3%, between 1998 and 2015. It also forecasts that the total number of passengers will double in 17 years.

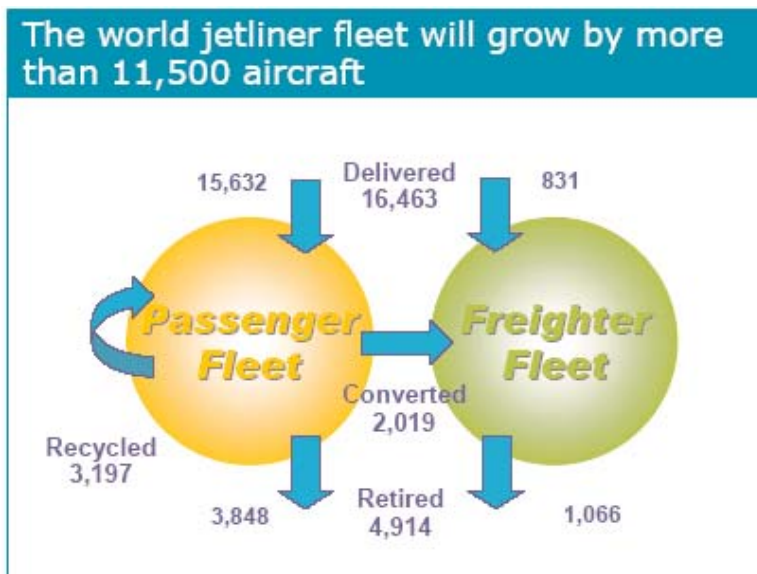
Table 2: Total European passenger traffic

1998	541.7 million
2005	750.8 million
2010	913.2 million
2015	1,100.6 million

Source: *Air Transport Action Group, 1999, p. 9*

In its 2003 **Global market forecast**⁶, Airbus also predicts strong growth in worldwide demand for air transport, with passenger kilometres revenue growing by an average of 4.7% over the next 20 years. By 2020, it predicts, global passenger traffic will be two-and-a-half times its current volume, while freight tonne-kilometres will triple, growing at an even more rapid average annual rate of 5.5% (*ibid*, p. 4). This projected growth will require an 86% increase in departures and, when replacements are considered, over 16,000 new aircraft.

Figure 2: Airbus forecast of demand for airliners



Source: *Airbus, 2003, p.5*

Based on the assumption that worldwide economic growth will average at 3% over the 2003–2023 period, **Boeing**⁷ predicts even higher average passenger traffic growth of 5.2% per year, and freight growth of 6.2%. This is despite the short-term downturn in 2003, caused by the Iraq war and the SARS epidemic. Moreover, the company estimates total market potential, during the same period, at 18,596 aircraft.

⁵ <http://www.atag.org/files/europAirTrafficForecastsP1.pdf>

⁶ <http://www.airbus.com/pdf/media/gmf2003.pdf>

⁷ <http://boeing.com/commercial/cmo/flash.html>

Some implications

Employment

These projections suggest a healthy future for the manufacturers of road freight vehicles and aircraft, with potential for increased employment. Despite continued growth in the overall use of cars, increases in manufacturing employment seems unlikely in the EU15, where concern about overcapacity is leading to further consolidation and the closure of some plants. Indeed, the EMCC scenarios, **Trends and drivers of change in the European automotive industry: Four scenarios**⁸ (European Foundation for the Improvement of Living and Working Conditions, 2004), suggest a decline of between 5% and 20% in automotive sector employment, depending on the level of demand and the amount of consolidation in the industry. With major demand growth expected in developing countries, particularly in China and India, there may be opportunities for European manufacturers to invest in new plants, but this is most likely to occur in those countries rather than in the EU15. Considerable investment in road, rail and airport infrastructure will also be needed if this growth is to be facilitated. This would also provide potential for increasing employment in manufacturing, construction, operation and maintenance, although efforts to increase productivity may be expected to limit growth in some areas.

Airline consolidation

The liberalisation of markets has already led to changes in the structure of the transport industry. In aviation, the merger of Air France and KLM (Royal Dutch Airlines) was the first case of the long-anticipated consolidation of European airlines. Similar developments may be expected, as nationally based airlines cooperate more closely, or start to merge in an increasingly competitive market. Although Swissair and Sabena have both been replaced by nationally based airlines, the days of the national airline in Europe may be numbered. Indeed, some commentators anticipate the emergence of 'three "mega-carriers", probably based around Air France, British Airways and Lufthansa' (Airports Council International, 2002). The low cost airlines that use innovative business models, such as Easyjet and Ryanair, have played a major role in recent growth, by bringing cheap air travel to new markets. Both of these companies are beginning to emerge as authentic European airlines, with centres in several Member States. The Open Skies negotiations, particularly with the US, are expected to give a further boost to consolidation and to the emergence of European based intercontinental airlines.

Railways

Railways in most Member States remain state-owned and subject to national regulation, although they vary from franchised private operating companies in the UK to nationalised integrated systems in Austria, Belgium and France. In a number of reports, the European Commission has recommended the development of an integrated European railway system that would help overcome national restrictions, which limit interoperability, and particularly, international freight movement. Open access in domestic freight markets is to be introduced in 2007, and competition in international passenger markets is under discussion. Proposals for compulsory competitive tendering for all subsidised services have, however, been opposed by both the European Parliament and the Council of Ministers. Restructuring of European railways is therefore likely to be a slow process, thus limiting its capacity to offer an effective alternative, particularly to freight transport by road.

Although the majority of forecasts, including the **EU15 Energy and transport outlook to 2030**, anticipate the share of rail transport to decline from 7.1% to 6.1% for passengers and from 13.3% to 9.3% for freight by 2030, the **European Association for the Railway Supply Industry (UNIFE)**⁹ (2002) envisages in its railway business scenario 2020 a

⁸ <http://www.eurofound.eu.int/publications/2004/ef0427en.pdf>

⁹ http://www.unife.org/docs/errac/ERRAC_SRRRA_Official.pdf

greater share. It suggests that rail transport could double its market share, accounting for 15% of freight and 12% of passenger traffic, as long as moves are made towards a more sustainable transport system.

Outsourcing

Since the 1980s, there has been a trend for companies to outsource transport and supply chain functions, to companies specialising in the provision of logistics services.

By 1999, the value of the European contract logistics market was estimated to be in excess of US \$150 billion.
(Waller, 2004)

Moreover, the International Data Corporation forecasts a global logistics market of \$1 trillion by 2006 (TRX, 2004). This is expected to continue increasing, as corporate consolidation is anticipated to result in a core of key players, offering pan-European logistics services, in order to meet the demands of a European-wide market.

Although the travel and tourism industry has traditionally been reluctant to outsource, since 2002 the number of contracts awarded by transport operators, particularly for outsourcing of information technology (IT) services, has increased rapidly.

In the travel industry, airlines have the longest history of engaging in outsourcing relationships, utilizing outside entities to handle catering, janitorial, and plane maintenance functions for years. Other segments of the travel industry, while slower to warm to alternate sourcing arrangements, are starting to recognize the strategic, financial, and operational advantages outsourcing provides them.

The Perfect Storm – the war in Iraq, a depressed economy, SARS, and the terrorist events of September 11th – accelerated significant changes in the travel industry, introducing new distribution channels, pricing models, commission structures, service fees, contract negotiations, and business models. In this business environment, travel companies have not been able to remain complacent, maintaining all activities "in house".
(TRX, 2004)

For example, in order to reduce costs to compete with budget carriers, a number of full-service airlines are outsourcing a range of IT functions – including inventory, departure control, check-in and reservations – to logistics service providers. As a result, employees may be transferred to the provider or re-deployed with the company (Yap 2004). The 2004 **Aerospace and defense industry survey**¹⁰ (Inskeep, 2004) reports that industry sources view business outsourcing as the third most important force which is expected to influence the sector over the next two years.

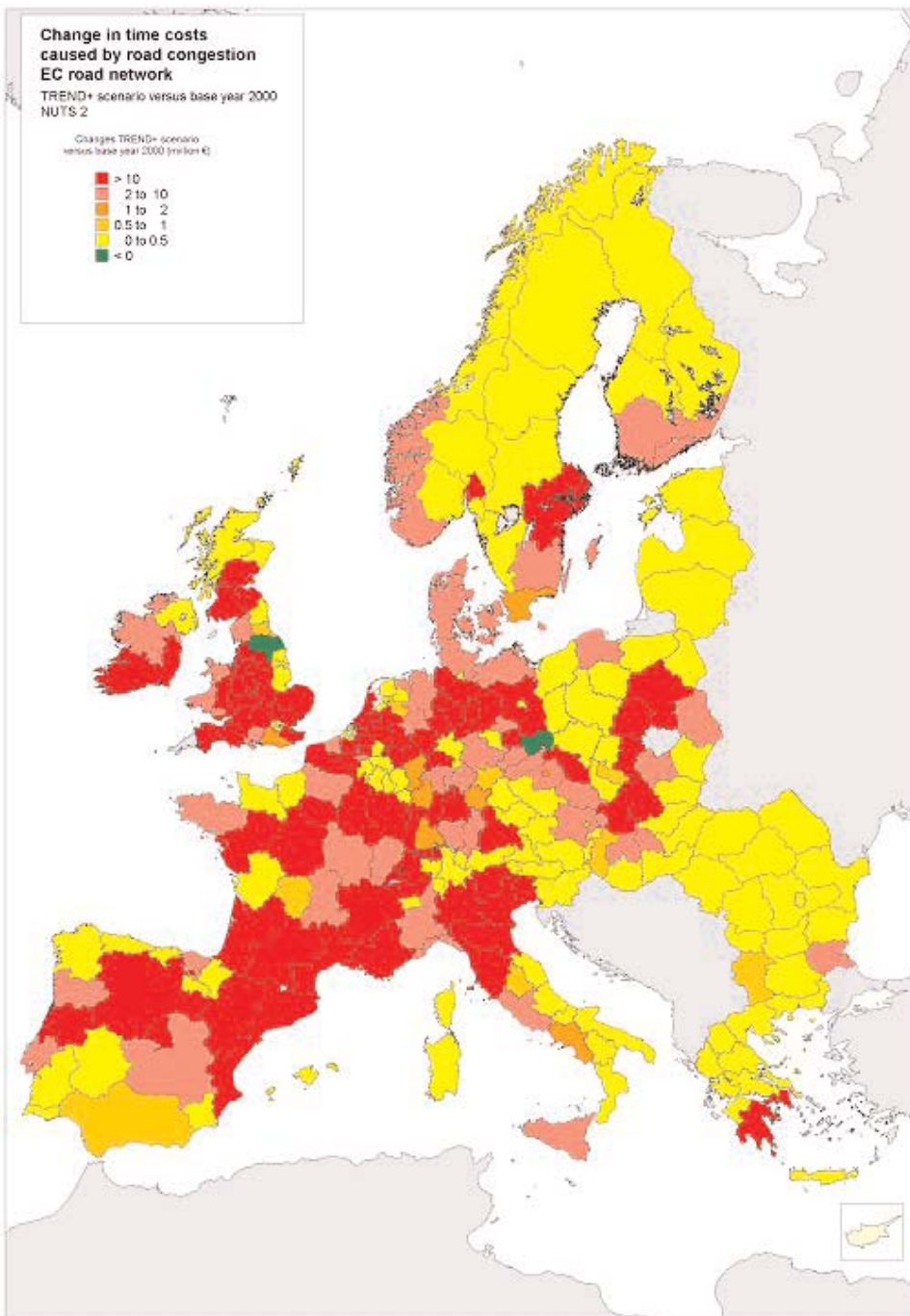
Road congestion

One of the more problematic implications of the ‘business as usual’ future scenario was outlined by the **Trans-European network scenarios, traffic forecasts and analyses of corridors**¹¹ (TEN-STAC) project (NEA, 2003). The study outlines the effects of different ranges of policy measures and of infrastructure development in relation to growing transport demand. It concluded that Europe’s current infrastructure is inadequate to facilitate the anticipated growth, and that, as a result, congestion and delay are likely to worsen.

¹⁰ <http://www.csc.com/industries/aerospacedefense/knowledgelibrary/1671.shtml>

¹¹ <http://www.nea.nl/ten-stac>

Figure 3: Forecast of increasing road congestion in Europe



Source: NEA¹², 2003

¹² <http://www.nea.nl/ten-stac/Image4.jpg>

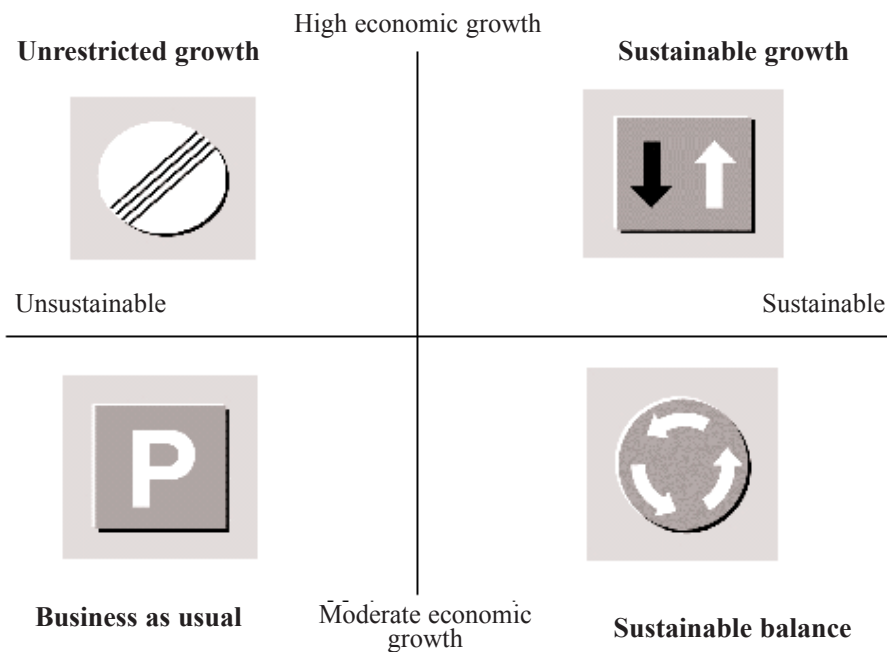
Other scenarios

The ‘business as usual’ scenario is not the only future envisaged in studies of transport in Europe. Two EU funded studies of the future of European transport explored other scenarios, particularly those focusing on the environmental impact of transport:

- the final report of the **Forecasting and assessment of new technologies and transport systems and their impacts on the environment (FANTASIE)** project; and
- the final report of **Foresight for transport**¹³.

The FANTASIE project explored new technologies that could potentially affect European transport systems, in line with the objectives of the Common Transport Policy. As part of the project, four exogenous scenarios were developed, to assess potential developments. The scenarios were constructed around two dimensions, relating to the rate of economic growth and to the extent of public support for sustainability.

Figure 4: *The FANTASIE scenarios*



Source: Helmreich and Leiss, 2000, p. 40

The assumptions on which the ‘Unrestricted growth’ and ‘Business as usual’ scenarios are based, are highlighted above. The remaining two scenarios, ‘Sustainable growth’ and ‘Sustainable balance’, are based on the following assumptions:

In the ‘Sustainable growth’ (SG) scenario,

society is characterised by high economic dynamism. This is accompanied by rapid technological progress. However, there is a great deal of public support for the strong promotion of a sustainable society. Everyone is in favour of the open market philosophy: the individual holds centre stage. Yet, this does not lead to the unrestrained maximisation of income. Thanks to the introduction of a series of market-based policy measures, and the general acceptance of these, the traffic & transport system’s environmental and energy impact can be significantly reduced;

¹³ <http://www.iccr-international.org/publications/researchreports-tea.html>

whereas in the ‘Sustainable balance’ (SB) scenario,

society is characterised by low economic dynamism. This is accompanied by slow technological progress. However, there is a great deal of public support for the promotion of a sustainable society.

(Helmreich and Leiss, 2000, p. 39)

Table 3: Key variables of the FANTASIE scenarios

Variable	Unrestricted growth	Sustainable growth	Business as usual	Sustainable balance
Economic aspects				
Average growth GNP	3.0%	2.75%	1.5%	1.0%
Income level (2030) 1995=100	281	258	168	142
Income distribution	not equal	fairly equal	not equal	very equal
Energy sources	oil and natural gas	oil, electricity, hydrogen	oil	oil, bio-fuels, electricity
Energy price level ¹ 1995=100	120	105	100	95
General energy taxes	no	yes	no	yes
Spatial development				
Urbanisation	low densities	high densities	low densities	high densities
Spatial policies	no government influence	large and strict government influence	small government influence (same as today)	very large and strict government influence
Social cultural elements				
Lifestyle	egocentric	solidarity	egocentric	solidarity
Environmental consciousness (compared to 1995)	higher	much higher	same	much higher
Technology				
General technology development	high	high	medium	medium
Internet connections (2020)	almost everybody, except small group of have-nots (app. 10%)	everybody (base use is free)	50%	60%
Transport policies				
Management road infrastructure	private companies	private companies	government	government
Speed limits	limited speed restrictions	30 km within urban areas and 90/120 km at motorway network	limited speed restr ictions	30 km within urban areas and 90 km at motorway network
Subsidies public transport	none	halving compared to 1995	limited	same level as 1995
Fuel taxes (compared to 1995)	lower	much higher	same	much higher
Parking policies	free market philosophy: no intervention	very strict: low fares for small vehicles	same as today	very strict: low fares for clean v ehicles
Parking fares ² (compared to 1995)	much higher in business districts, low in suburbs	much higher, both in areas with high and low densities	a little bit higher	a little bit higher

Note: ¹ Energy price is the price level on the free market, without energy taxes and so on.

² Parking fees are not only determined by government policy, but also by demand and supply factors. In a scenario with high economic growth and limited parking places, higher land rents will lead to higher parking prices.

Source: Helmreich and Leiss, 2000, p. 41

Transport: Which direction?

Table 3 above outlines the characteristics of each of the four FANTASIE scenarios. The assumptions on which these scenarios are based relates to a range of issues which influence the level of demand for transport. Of particular note are the varying assumptions about economic growth, social cultural elements and the role of government. Any move towards sustainability would require, not only a change in social attitudes, but also a considerably increased role for government in taxation, urban policy and traffic regulation.

Tables 4 and 5 illustrate the forecast impact of the scenarios on freight and passenger transport. Although road freight transport maintains a similar percentage of the market in each scenario, the total tonne-kilometres in the SB scenario are about half that of the UG scenario, while the BAU and SG models fall in between. Rail is more important in the SB scenario, while new technologies – including automated vehicle guidance and underground systems – are developed more quickly in the UG and SG models. Air freight transport grows to a similar share of the market in all scenarios, but carries twice as much in tonne-kilometres in the UG than in the SB scenario.

Table 4: *Forecast of freight transport in tonne-kilometres, 2030*

Mode of transport	1995	Unrestricted growth (UG)	Sustainable growth (SG)	Business as usual (BAU)	Sustainable balance (SB)
Road	1,018	2,451	1,830	1,642	1,262
%	70	67	62	68	69
Rail	155	166	249	162	203
%	11	4	8	7	11
Ship	250	460	419	325	284
%	17	13	14	13	16
Air	16	142	108	112	76
%	1	4	4	5	4
Other	0	484	340	139	8
%	0	13	11	6	0
TOTAL	1,439	3,703	2,947	2,378	1,831

Note: 'Ship' includes both inland and sea; 'other' includes new technologies of automated vehicle guidance and underground transport.

Source: *Adapted from Helmreich and Leiss, 2000, p. 49*

In each scenario, the private car remains the main mode of passenger transport, although the overall share is much lower in the sustainable scenarios, 'Sustainable growth' and 'Sustainable balance'. The type of vehicle is also different in the sustainable scenarios, and includes smaller or dedicated urban cars. Moreover, the distance travelled in the SB model is half that of the UG model, and there is a notable shift to other modes of transport. Although there is some shift towards rail transport in these scenarios, a sense of inertia in the system, and the time needed to develop new systems, could limit change. Air passenger transport increases significantly in each scenario, even in the SB scenario, but the distance travelled is again halved in UG model.

Table 5: Forecast of passenger-kilometres, 2030

Mode of transport	1995	Unrestricted growth (UG)	Sustainable growth (SG)	Business as usual (BAU)	Sustainable balance (SB)
Car	3,005	7,486	5,146	6,089	3,405
%	69	72	64	72	59
Bus	289	371	342	274	298
%	7	4	4	4	5
Human-powered	171	235	255	374	390
%	4	2	3	4	7
Powered two-wheeler	71	145	344	102	290
%	2	1	4	1	5
Rail	480	917	1,073	788	763
%	11	10	13	9	13
Air	314	1,310	952	871	615
%	7	12	11	10	10
TOTAL	4,330	10,464	8,111	8,499	5,761

Source: Adapted from Helmreich and Leiss, 2000, p. 47

The potential impact of strong sustainability attitudes and policies is clear. The SB scenario envisages about half the amount of both freight and passenger transport than in UG. Although the SG scenario does not vary greatly from BAU, in relation to total demand, there is a marked shift away from road to other modes.

The final report of **Foresight for transport** also offers three contrasting scenarios that again indicate the significance of attitudes to sustainability:

- a reference (most likely) that is based on the continuation of past trends, and that is similar to BAU;
- an ideal (most desirable) or visionary model of a sustainable Europe, reflecting the strong environmental concerns of participants;
- a negative future state (most feared) that focuses on the inability of governments to deal with negative environmental developments.

The reference scenario envisages continuing growth in transport demand, but also foresees high levels of congestion and external negative effects – including an increasing trend towards motorisation and, associated with this, a high level of injuries and fatalities (ICCR, 2004, p. 61).

The ideal scenario would require a paradigm shift in values and the perception of life quality towards environmental sustainability where ecological concerns and objectives determine economic goals and strategies.

As a result, a significant decrease of transport demand can be observed and both for international and national transport as well as for passenger and freight transport, with technology substituting for mobility (through e-commerce and e-work). There is an increase in the demand for short-distance local mobility, both for work and leisure. This is, however, primarily met through non-motorised transport. Non-motorised transport as well as shared modes of transport are explicitly supported through policy [...] Social inclusion as well as punctuality and reliability rather than speed are high on the transport policy agenda.

(*ibid*, p. 82)

The negative future state is, in some respects, similar to the reference scenario; however, it assumes economic decline and political polarisation, which would aggravate current transport problems, in terms of congestion and environmental degradation.

Although these scenarios do not include any indication of their likely implications for employment or for the structure of the sector, lower economic growth would most likely reduce any growth in employment, and possibly increase the pressures for consolidation. The 'ideal scenario' of the Foresight for transport project and the FANTASIE 'sustainable growth' scenario both suggest the substitution of mobility by electronic communication. Such a development would probably encourage home-working, as well as increasing the potential for outsourcing to remote locations. These scenarios also envisage a shift away from road transport to other modes, which would imply a similar shift in employment opportunities.

Conclusions

In the developed economies of the EU15, greater mobility and continuing growth in transport demand have become commonplace. Increasingly, people travel greater distances, mainly by car, and by air for longer distances. Moreover, they now expect goods from a global market place to be available in local shops. This has necessitated the growth of freight transport, locally by road, and internationally by ship and air. Most forecasts anticipate that this trend will continue, and that both passenger and freight transport will continue to grow.

The other scenarios outlined in this article suggest, however, that this future might be derailed by a number of developments. Most significant would be the failure of the economy to grow at the expected rate, as transport demand remains closely tied to economic expansion. Concern about the impact of high oil prices – at around \$50 a barrel at the end of 2004, which is much higher than assumed in any of the scenarios outlined – is raising questions about the ability of the world economy, particularly that of the US and the EU, to continue to grow at the expected rate. Most of the growth scenarios assume an oil price well below \$50. Although it is claimed that greater energy efficiency, particularly in Europe, will lessen the future impact of high prices, slower expansion of the economy could lead to a reduction in the growth of transport demand.

The second major issue is the environment, especially global warming and public attitudes to sustainability and to infrastructure investment. Opposition to major infrastructure projects, such as airports and new roads or railways, may prevent, or at least delay, investment required to enable the level of growth assumed in the BAU scenario. It is clear that new infrastructure tends to facilitate increased traffic; if these facilities are not built, therefore, predicted growth may be hampered by congestion, thus leading to higher costs and delay. Concern about global warming and the need to reduce carbon dioxide emissions could also discourage the construction of new infrastructure, therefore leading to increased measures to reduce transport demand, or to encourage a switch to more environmentally friendly alternatives. Technological developments may also help to reduce the environmental impact of transport.

The structure of the European transport industry, and of its constituent parts, is a third issue. Some changes have already taken place, despite regulatory and commercial pressures. Attempts by the European Commission to encourage the emergence of a European market in transport have had limited success, with considerable variation between sectors. Attempts to increase the market share of rail freight, in particular, are limited by the nationally based operational and regulatory structure of the industry.

Clearly, there are several important issues for policymakers to consider – this will be the focus of the next article.

References ¹⁴

Airbus, *Global market forecast 2001–2020* (online), Airbus SAS, Blagnac, 2003, available at:

<http://www.airbus.com/pdf/media/gmf2003.pdf>

Airports Council International, 'The age of the mega-airline', *Airport Business*, March/April 2002, pp. 19 and 21, available at: http://www.aci-europe.org/upload/mar_apr%2002%20all%20policy.pdf

Air Transport Action Group, *European air traffic forecasts 1985–2015* (online), Air Transport Action Group, Geneva, 1999, available at: <http://www.atag.org/files/EuropAirTrafficForecastsP1.pdf>

Boeing, *Current market outlook 2004* (online), Boeing Aircraft, Seattle, 2004, available at:

<http://boeing.com/commercial/cmo/2-1.html>

Chanaron, J.J., European Foundation for the Improvement of Living and Working Conditions, *Anticipating change in the European automobile industry*, Key note address to the EMCC Anticipation Workshop 'Driving forward', Warsaw, 23 September 2004.

European Commission, *EU-15 Energy and transport outlook to 2030: Part II*, Luxembourg, Office for Official Publications of the European Communities, 2003, available at:

http://europa.eu.int/comm/dgs/energy_transport/figures/trends_2030/3_chap2_en.pdf

European Monitoring Centre on Change, *Trends and drivers of change in the European automotive industry: Four scenarios*, European Foundation for the Improvement of Living and Working Conditions, Dublin, 2004, available at:

<http://www.emcc.eurofound.eu.int/publications/2004/ef0487en.pdf>

Helmreich, W. and Leiss, U., *Forecasting and assessment of new technologies and transport systems and their impacts on the environment (FANTASIE) project: Final Report* (online), IABG, Ottobrun, 2000, available at:

http://www.etsu.com/fantasie/FinRep_www.zip

Inskeep, T., *The 2004 aerospace and defense industry survey*, Computer Services Corporation, El Segundo, CA, 2004, available at: <http://www.csc.com/industries/aerospacedefense/knowledgelibrary/1671.shtml>

Interdisciplinary Centre for Comparative Research in the Social Sciences (ICCR), *Foresight for transport – A foresight exercise to help forward thinking in transport and sectoral integration*, Foresight for Transport project, ICCR, May 2004, available at: <http://www.iccr-international.org/publications/researchreports-tea.html>

NEA, 'Traffic flows in Europe', *NEA News*, No. 15, NEA Transport Research and Training, Rijswijk, November 2003, available at: <http://www.nea.nl/english/news/newsframe.html>

¹⁴ All links accessed on 17 February 2005.

Transport: Which direction?

Office of Technology Policy, *Fuel cell vehicles: Race to a new automotive future*, Technology Administration, US Department of Commerce, Washington DC, 2003.

TRX, *Travel process outsourcing: Why outsource*, Atlanta, 2004, available at: <http://www.trx.com/tpo/tpo.html>

Union of the European Railway Industries (UNIFE), *A turning point for European rail research: Strategic rail research agenda 2020*, First report of the European rail research advisory council (ERRAC), Brussels, September 2002, available at: http://www.unife.org/docs/errac/ERRAC_SRRR_Official.pdf

Waller, A., 'Supply chain management and logistics outsourcing – trends in the UK', *Business briefing: Global purchasing and supply chain strategies: Transport and logistics*, 2004.

Yap, J., 'Transport: Flag carriers fight back', *Sydney Morning Herald*, 15 October 2004.