

Routes to Sustainable Transport

Summary

EPTA Conference, Copenhagen, 3 November 2010

Opening address

Lars Klüver, Director, Danish Board of Technology (DBT)

The consumption of energy for transportation is incredibly difficult to manage. It's a kind of problem over which everybody and nobody are the masters. Without doing something serious about it, it will not be possible to fulfil the greenhouse gas reduction commitments made by the European Union. However, we do not have the political targets needed, we do not have all the technical solutions necessary, nor do we have the broad political backup needed to reach the goal. It seems like everybody are waiting for everybody. Meanwhile time is passing.

Technology in itself is not enough to solve the problems. On the other hand, they cannot be solved without important contributions from technology. For example in the long term high speed ground transportation is a viable alternative to much of the present aviation, but in the short term the growing emissions from airplanes has to be mitigated by means of alternative fuels. So the vision is closely tied to research and development.

The watch is ticking and the time lag is closely connected to economy because enormous investments are needed.

1 Challenges and perspectives

Routes to 2050 – how transport can meet European climate target bis

Huib van Essen, Director, CE Delft, The Netherlands

In a study commissioned by the European Commission General Directorate CLIMA we have assessed the long term reduction options, policies, strategies and tools for the European transport sector. We also conducted extensive stakeholder consultations to make full use of existing knowledge. We found that the potentials for improving the energy efficiency of vehicles and reducing the carbon content of fuels are very high. Technical measures such as efficiency standards and strategies to de-

carbonise energy carriers are likely to reduce future emissions from transport – compared to 1990 levels. Novel integrated approaches to combined vehicle-fuel-regulations will be needed.

The technical options however are not sufficient to achieve the 80–95 percent reduction of greenhouse gas emissions envisioned by 2050. It will be necessary to improve load factors and the utilization of capacity, promote shifts to more efficient transport modes and integrate climate change policies in spatial planning and infrastructural development. Even if the potential technical improvements are fully deployed, it will be necessary to curb the ever growing demand for more transportation. Demand side policies such as differentiation of taxes and charges will be needed to ensure dissemination of efficient low carbon vehicles.

Price instruments such as carbon taxes or extended emissions trading schemes are efficient means to stimulate technical as well as non-technical options. Road pricing and pricing of infrastructure for other transport modes, reflecting real external costs, can help increase load factors and decrease demand. Congestion charges are effective means to optimize the use of cars and infrastructures. All kinds of subsidies to fossil fuel use, currently amounting to 54 billion €, should be abolished.

Spatial planning should integrate climate change policy at all levels. Compact cities with a good mix of housing, jobs, shopping and leisure, and easy access to public transportation can help reducing transport demand and make public transportation more attractive and cost effective. Attractive opportunities for cycling will help reducing car traffic. Long term climate impacts should be an integrated part of Environmental Assessments. Freight transportation growth is closely linked to economic development. Redefining GDP could help making wealth less carbon-dependent.

Some major risks and problems are:

- 1) Delay: It takes a decade or more for emission standards to reach their full impact. For aviation, sea transport and spatial planning the time frame is even larger. Least technical options are available for transport modes with the highest growth (aircrafts, ships, heavy duty vehicles).
- 2) Complexity: Electric cars for example help solving the climate problem only if sufficient electric power from non fossil sources is available. Biofuels may have adverse effects on food production and global emissions.
- 3) Rebound effects: Increasing capacity (including high speed rails) tend to increase total demand. Improved efficiency makes the use of transport vehicles cheaper. Higher fuel costs will counteract this trend only partially.

On the other hand, strong policies to decarbonise transport yield additional benefits: Less pollution, noise and congestion, less dependence on imported fossil fuels, stimulation of innovation.

Sustainable transport from an economic perspective

Niels Buus Kristensen, Head of Department, DTU Transport, Technical University of Denmark.

The Danish Government's Climate Commission has studied how Denmark can become independent of fossil fuels by 2050. It found that it can be done, using wind turbines as a key energy source and biomass as a scarce supplement. The loss of economic wealth is negligible, additional costs amounting to only 0.5 percent of GDP. The main reason is that much of the high investments needed to transform the energy system are balanced by lower expenses to purchase conventional fuels, the price of which in any scenario are expected to rise substantially.

The transport sector is a particular challenge, by far the most expensive part of the scenario. The Climate Commission envisages extended use of electric cars and plug-in-hybrid cars, with batteries

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loaded mainly by wind generated power. More biofuels and biogas has to be used for aviation, shipping and heavy vehicles.

The Commission suggests a tax on fossil fuels. It's an efficient instrument, sending clear signals to consumers and investors. Starting at DKK 5 (€ 0.67) per GJ in 2011 the tax should be raised to DKK 20 (€ 2.68) by 2020 and steadily increased thereafter. The risk that cross border trading undermines the effect can be prevented by shifting the tax burden to road pricing. At present purchase of electric cars is exempt of taxation. The commission proposes to extend this strong incentive to the first 100.000 electric cars (and hybrids) sold, making buyers compete to benefit from the subsidy. A master plan for setting up charging facilities has to be implemented.

Mobility management – a new route to sustainable transport

Christer Ljungberg, Managing Director, Trivector (a traffic consultancy firm based in Sweden).

Most of the policies, plans and speeches about improved mobility have got it all wrong. It's not about mobility, it's about accessibility. Often mobility is seen as a goal in itself. In the real world, however, you have sprawled cities with a lot of mobility but low accessibility – and dense cities with high accessibility in spite of low mobility. Mobility is a cost, accessibility is a benefit. We should start looking at transport as a derived demand.

Least cost per access-planning means planning for dense cities and societies, putting activities that generate much transport in places where they can be easily and comfortably reached by means of public transportation and curbing the demand for additional transport. Strict regulations and economic incentives are efficient means, but politicians often don't dare to use them. Instead mobility management, meaning 'soft measures to influence travelling before it starts', can be used to change behaviour. Mobility management can begin today and it can deliver fast solutions. Planning and implementation of new technologies will still be necessary in the long run.

Soft measures can be communication, information and organisation of activities with different partners. They are becoming rather mainstream in Sweden, the UK and the Netherlands. Among the examples are campaigns, public transport marketing, car sharing and car pooling schemes, travel plans for schools and companies, promotion of teleworking, congestion charges and local transport plans combining campaigns, information and upgrading of bus lines and bike lanes.

Discussion

Answering a question from Paul Rübige, the European Parliament, Niels Buus Kristensen made clear that the calculated extra costs of a non fossil fuel pathway is a *total* of only 0.5 percent of GDP. In response to Jan Stamann of the Rathenau Institute, Christer Ljungberg and others Niels Buus Kristensen noted that there is an extremely strong willingness to pay for transport. Strong economic measures are indispensable to reach the goals which politicians have committed to, he said. The challenge is that the politicians are not willing to use the strong measures. He was very sceptical on how much can be accomplished by focusing on accessibility and using 'soft measures'.

Philipp Murmann, German Bundestag, asked if labelling of the 'ecological footprint' could make the impact of transport more transparent and spur behavioural change by emotionalizing the choices. Huib van Essen answered that some companies are working at it, but in his opinion it is mostly about 'window dressing', without huge effects. He found it more important to highlight the opportunities to do things in smarter ways, such as teleconferencing instead of having participants travelling all the way to Copenhagen to join a conference on routes to sustainable transport. He also said that to make the most out of energy efficiency gains they must be accompanied by policies to com-

compensate for rebound effects, such as road pricing, congestion charges and higher parking fees. Experience shows that improving energy efficiency in the transport sector leads to growing demand rather than net savings. Once purchased the cost of driving an electric car is low. People will think: I paid a lot of money for my new car – I better use it now!

In a reply to [Paul Rübige](#) and others [Christer Ljungberg](#) strongly recommended to measure accessibility. Every city administration knows how many cars are on each street every hour, day or year, but they know very little about how easy it is to go from one place to another by way of car, bike, walk or public transport, he said. Tools like GIS today make it rather easy to gather information about accessibility. On ecological footprint labelling he said that it might make people feel guilt, which, according to some sociologists is the only way to make people behave more sustainable. He readily admitted that 'hard measures' are necessary. But 'soft measures' are better than 'no measures' and mobility management is a readily available tool. The biggest innovation is to use all the measures, we really know of, he concluded.

[Harri Jaskari](#), Finnish Parliament, asked what people living in remote areas are supposed to do. [Christer Ljungberg](#) answered that rural areas are not the problem. Most of the climate change problem related to transport is directly connected to urban areas. [Willy Raimund](#), Austrian Energy Agency, wondered about the impact of the trend found in several surveys that young people under 30 years don't care about owning a car but about using whatever mode of transport suiting them. Unfortunately many of them take a drivers licence and purchase a car when they get 30–40 years old and have kids, [Christer Ljungberg](#) replied.

[Niels Buus Kristensen](#) warned against confusion. We should address each problem with the means best suited to solve it, he said. Climate change problems are to be solved by means of zero emissions, congestion problems by means of road pricing and urban environment problems by means of planning and pollution control. The fundamental problem is political will, he added: Politicians don't dare to use hard measures because they hurt. Soft measures are popular because they hurt less. But they hurt less, because they are less efficient.

[Bart van Malderen](#), Flemish Parliament, asked how to prevent that increasing prices, intended to internalise external costs, could deprive the poorest and weakest part of the population from access to transportation. [Niels Buus Kristensen](#) answered that in the future everybody will spend a minor part of their total income on transportation than they do today, so affordability will hardly be the problem if changes are made gradually. [Huib van Essen](#) answered the same question by saying that social problems of income differences should be solved by other means than transport measures. On the other hand providing alternatives to the use of cars have positive impacts on social balance within urban areas, thus constituting a win-win possibility. The co-benefits of climate change policies such as reduced noise, pollution and congestion can help increase public support.

2 Energy use for transport

Transportation and the future energy supply

Anders Kofoed-Wiuff, EA Energy Analyses, Denmark

The transport and energy sectors are interrelated. They are collaborating on the use of electricity for transport purposes, but competing for limited resources of biomass. Today the use of oil for transportation amount to 14,000 PJ of the gross EU energy consumption which is 74,000 PJ. The restruc-

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turing of the energy systems necessary to meet the 2050 climate policy targets is a demanding, capital intensive task. Even if all potential efficiency gains are realized, the demand for biomass is likely to grow with 6,000 PJ in power production and 6,000 PJ in the manufacturing industries while remaining at 1,500 PJ for heating purposes.

Combined this is more than total bioenergy potential in the EU, which is in the order of 12,000 PJ a year, half of which from energy crops. Because of huge conversion losses it would require approximately another 25,000 PJ of biomass to substitute the entire consumption of oil for transport use with second generation biofuels. This is hardly realistic. A more realistic scenario is to cover two thirds of transport demand by electricity and one third with biofuels and perhaps hydrogen. Such a scenario would require an import of 7,500 PJ biomass or biofuels. The import potentials are uncertain, depending on future world demand, technological and economic development. These 'back-of-an-envelope' calculations are uncertain, but they illustrate that the EU post 2020 in any case will have to make tough decisions on how to use scarce biomass in a sustainable manner.

Biofuels and hydrogen in Flanders

Marian Deblonde and Donaat Cosaert, Flemish parliamentary technology assessment institute (IST)

Future use of biodiesel in Flanders and in Belgium as a whole will be almost entirely based on imports, whereas potentials for local production of first generation bioethanol exist. For both fuels questions are raised on the sustainability of land use, food security etc. At the EU level it is recommended to establish sustainability criteria to make unequivocal monitoring of the manufacturing and use of biofuels possible. The criteria should be a well-balanced whole of the ecological, the social and the macro-economic dimension of sustainability. It is recommended that a diversity of different biofuels are studied, developed and monitored. At the level of Flemish authorities IST recommends long term visions aiming at energy frugality and efficiency, optimal use of local resources and flexibility allowing for adjustments. Research should be stimulated with respect to the diversity of energy sources and the impacts of different fuels and modes of use. Public debate on the relation between living styles, mobility and energy needs should be stimulated. A mix of support measures for the introduction of biofuels can be useful on the condition that the sustainability impacts are positive.

Flanders has the world's largest underground pipeline grid for hydrogen, which is an important element in its chemical industry. Still for transport use, hydrogen at most is a complement to other energy carriers. Many questions on energy efficiency, emissions and safety remain. To compete with other energy carriers the full chain of vehicles and infrastructure, including filling stations, must be complete. The Flemish authorities should develop a long term vision on energy policy and strategy constituted by a variety of sources and technologies. Research and development to keep pace internationally in the field of hydrogen and fuel cell technology should be supported.

Future perspectives of second generation biofuels

Dr. Rainer Zah, TA-SWISS, Switzerland

The sustainability of second generation biofuels mainly depends on the choice of feedstock. The use of manure, biowaste and residual wood is clearly more sustainable than the use of sugar cane and palm oil. However, if additional feedstock for second generation biofuels has to be cultivated, pressure on natural areas and biodiversity will increase. A TA-SWISS assessment concludes that sustainable bioenergy-based mobility in Switzerland is restricted to less than 8 percent of present individual mobility, assuming constant mobility and fleet efficiency. If average efficiency of internal combustion engines is doubled, the share of biofuels could reach 15 percent by 2030 in a high growth/high

oil price scenario with limited food access and policies aiming at emission reductions and sustainable use of biofuels. Most of the emission reductions would stem from electric vehicles and efficiency gains. Biofuels will be a complement especially in long distance transport and aviation.

Reducing oil dependency and CO₂ emissions – a future for European transport

Jarka Chloupková, administrator, Scientific Technology Options Assessment (STOA), European Parliament

A STOA study of European long distance transport shows that reducing oil dependency by 80 percent and CO₂ emissions by 60 percent by year 2047 is within reach. There is no silver bullet, many measures has to be cleverly combined: Land use and spatial planning, optimised use of vehicle capacities, pricing policies and investments in rail infrastructure to encourage modal shift and intermodality, concentration of aviation in few big airports combined with high speed rail etc. The development of vehicle and fuel technologies will have to include hybrid trucks and the use of hydrogen, electricity (dependent on the development of battery capacities), biogas and other biofuels. In aviation it seems unlikely that kerosene for gas turbines will be substituted by other fuels in the foreseeable future.

Discussion

Parliamentarians were worried about conflicting interest in the use of land and biomass. Paul Rübige, European Parliament, wondered if rising demand for biofuels will hamper food and feed production and water supply around the world – and/or make biofuels unaffordable. Hydrogen might be a more secure and sustainable alternative. Bart van Malderen, Flemish Parliament, asked if growing demand for biomass from China, India and Brazil is included when calculating the potential EU-imports. Already, he said, the Belgian wood material industry can no longer buy second hand wood at adequate prices because of competition with the power industry. Andrea Lulli, Italian Parliament, noticed that import of biofuels requires much energy for its transportation. He wondered how the tendency to buy larger and heavier cars, thus neutralising efficiency gains, can be reversed. Martin Neumann, German Parliament, noted that the use of nuclear power was underexposed in the presentations. Per Dalgaard, Danish Parliament, asked about the share of EU emissions from the transport sector compared to global emissions.

The international food crisis two years ago was not directly connected to biofuel production, which at that time was rather low, Dr. Rainer Zah said. Some major droughts and increasing demand for grain especially in China played a role too. However, through the stock exchange the biofuel hype was amplified – making a real impact. Biofuels can cover only about 10 percent of transportation fuel needs if competing for land use shall be avoided. If China and other emerging economies start to import biofuels, the potential overseas supplies for Europe will be smaller than foreseen in the Swiss study. The environmental impact of long distance fuel transportation is rather small, he said, but it doesn't make much sense to move biofuels around the world because fossil fuels are used in exporting countries too.

Donaat Cosaert warned against being too optimistic about the use of hydrogen for transportation purposes. All the elements are there, but they are all stationary, he said. The conditions are totally different in the automotive industries. Further, the reliability of fuel cells for cars is not yet competitive with older transport modes. Several years of research and development are required before the full chain of hydrogen technology for the automotive industry is complete.

Jarka Chloupková clarified the IPCC-figures on European and Global emissions: Greenhouse gas emissions from transport are 14 percent of global emissions. In the EU the share of the transport sector is 21 percent.

3 Technology options and emerging technologies

Emerging technologies

Jens Schippl, Project Manager, Karlsruhe Institute of Technology (KIT), Germany

Development of new transport technologies is a necessary but not a sufficient condition for sustainable transport. In the field of propulsion and fuel technologies focus has changed dramatically during the latest 3-4 years – towards promotion of electric vehicles. In the field of Information and Communication Technologies (ICT) a lot of progress is observed – and there seems to be huge potentials for further improvements. It is important to support research and demonstration projects in these fields.

Innovative business models are emerging in areas such as bike sharing, car sharing and eMobility. Such models can be seen as ‘enablers’ for sustainable transport. The use of ICT is crucial to their success. Online information, handy ticketing, tele-working, video-conferencing, smart logistics, smart trucks and other ICT’s have the potential to reduce fuel consumption and CO₂-emission by up to 25 percent. The idea of sharing or renting cars and leasing batteries has the potential to circumvent the barriers of range, loading time and price for electric vehicles.

Electric vehicles in the UK

Rosie Robison, EPSRC Fellow, Parliamentary Office of Science and Technology (POST), UK

At the moment only a few thousand electric cars are on the road in the UK, mainly in London where they are exempt from congestion charge. The picture, however, is going to change very soon, as several car manufactures launch electric vehicles in 2011. The business opportunities are there right now if the market is developed, and the UK government supports trials and installation of charging points. £ 5,000 is lifted off the price of new electric cars from January 2011 until March 2012.

It’s important to know, though, that even if electric vehicles took off in a big way, it wouldn’t make much difference to CO₂ emissions in the short term, because it takes a lot of time before a significant number of people have replaced their cars. Moreover, whether electric vehicles actually reduce emissions depends on where the electricity is coming from. In the UK 80 percent of electricity is generated using fossil fuels. An electric vehicle in these conditions is better than the average car, but you could get the same savings of CO₂-emissions by using the most effective diesel car. If you want electric vehicles to reduce transport emissions, you have to change the way the grid is powered. Whether emissions are reduced also depends on consumer demands, which is unknown at this stage. One trial showed that many misconceptions are removed when people test drive an electric vehicle.

GPS-based road pricing

Jon Fixdal, Project Manager, Norwegian Board of Technology (NBT)

In Norway about 10 percent of CO₂-emissions come from privately owned cars. Present car taxation is a powerful tool to reduce emissions. At least 30 percent of the price of new cars is a sales tax on heighth, the motor effect and the emissions per kilometre. The emission component has been pro-

gressively raised – reducing the emission from new cars from an average of 177 grams per kilometre in 2007 to 145 grams in the first half of 2010. Government intends to continue raising this part of the sales tax. However a successful use of this instrument paradoxically diminishes general tax revenues, jeopardizing public finance for other purposes. Furthermore, taxation based on fuel efficiency does not address problems such as congestion, noise and traffic accidents.

GPS-based road pricing could be a feasible alternative: Onboard units register the whereabouts of the car. Every second week or every month the owner receives a bill, charging the number of kilometres driven plus an additional charge on using certain roads in rush hours. The system and its charge rates can be flexibly adapted to local community patterns, geographic conditions, the size of cars and their emissions. Furthermore, this technology is readily available, and it is quite cheap.

There are concerns about privacy, but this problem may not be so serious after all. There is no real time surveillance of the car use. The information on where each car is driving is gathered on board and subsequently sent to the institutions making the bill to the car owner. The GPS based road pricing proposed in the Netherlands was approved by the Dutch data protection organisation before the present government put it on hold. At least the specific technologies should be thoroughly analysed before rejecting a systems on the basis of privacy concerns.

Discussion

Yildiz Akdogan, Danish Parliament, asked what could make electric vehicles more popular. She also said that in fact people are sceptical about GPS-based road pricing because of the privacy issue.

Sergio Bellucci, TA-SWISS, asked why we discuss new technologies but don't make use of technologies since long time available: Interoperability of European trains was decided twenty years ago, but nothing has happened, to the disadvantage of rail freight through Switzerland.

Tore Tennøe, Norwegian Board of Technology, asked why the UK doesn't wait and let other nations do the development, if electric vehicles do not substantially reduce UK-emissions until the share of fossil fuels in power production has been lowered. He questioned if car sharing really will reduce emissions, while people are still driving cars.

Electric cars have deficiencies compared to conventional cars, and more resources are required to produce them, said Philip Murmann, German Bundestag. Promoting public transport would be more appropriate, he argued. He questioned whether any country with a substantial car manufacturing industry has car sales taxes comparable to those mentioned by Jon Fixdal as efficient means to reduce emissions. On car sharing he asked if the concept could be made better and emotionally more attractive. If not he doubted that car sharing will have major impact in the coming ten years.

Harri Jaskari, Finnish Parliament, asked if present competition among countries on electric vehicles could be avoided by some kind of European level common tax and incentive system. He wondered whether the present system really makes car makers develop the best and cheapest alternatives.

Jens Schippl answered the questions on car sharing saying that nevertheless all of a sudden everybody seems to be discussing new business models implying car sharing. Because of information- and communications technologies the schemes are working smarter now than they did before. Recently, car sharing projects have been initiated by car manufactures like Daimler in Ulm and Peugeot in Paris. Car sharing seems to appeal to people generally using public transport as an extra possibility from time to time, but also to those who appreciate the flexibility such as being able to choose certain cars for each trip.

Rosie Robison said that in the end the popularity of electric vehicles probably comes down to costs. In the initial phase the electric vehicles may mostly be purchased by people who like new technologies and families who want a second car for short trips. At the mass market people probably will not switch to electric vehicles unless the price is at least comparable to that of petrol vehicles. At the question on why already available technologies are not utilised, she said that while governments may focus on energy savings, companies focus on technologies saving them money. Train interoperability and modal shift may not be among them. The reason why the British Government does not wait for others to make the mistakes probably is, that 2 million British jobs in car manufacturing are at stake. Also, the British government is legally bound to reduce emissions by 80 percent by 2050. In transport electric vehicles is one of the main options for meeting this challenge. It is known that 15 percent of emissions from petrol cars come from making them, 85 percent from using them. To produce an electric car and its batteries, more resources and more energy is required. More work is needed to quantify the proportion, Rosie Robison said. According to Susanne Krawack the figures are 25:75.

Jon Fixdal agreed that high taxation of vehicle purchase is not very likely to be introduced in car producing countries. That makes GPS-based taxation even more relevant, he said, putting the tax burden on the use of cars instead of the car itself. He also agreed that many people are reticent because of privacy concerns – but he insisted that this challenge is manageable.

4 Transport crossing borders

The Öresund transport corridor connecting Sweden and Denmark with Europe

Henrik Sylvan, Project Manager, IBU (Infrastructure and Urban Development) Öresund

The Öresund-Femarn Corridor consists of the coming Femarn Belt fixed connection, a proposed new Öresund link (rail and road tunnels) and a combined highway and rail bypass project around Copenhagen.

Cross border traffic has grown rapidly since the existing Öresund Bridge (combined rail and road) opened ten years ago. The link has now reached 70,000 daily trips of which 38 percent by rail and 62 by car. The goal is a fifty-fifty distribution. Figures indicate that it will take 17 years to pay the 3.5 billion € invested in the project. According to Henrik Sylvan consumer surplus is high, due to time savings, environmental benefits and the dynamic effects of increased interaction on regional economics and labour markets. The new project is expected to have similar effects. It will strengthen the regional rail connections around Öresund. Rail freight between Sweden and Germany will avoid a 160 km. detour. Interregional and long distance trains can be operated at relatively high speed although the project does not include separate high speed traces.

Taking away the ferries saves much energy. It can also be argued that the project is sustainable because a lot of detours and a lot of hours otherwise lost in congestion will be saved, he said.

Transport crossing Austrian borders

Willy Raimund, Austrian Energy Agency

Transport crossing borders is a challenge and a chance. Sheer unlimited possibilities of transporting persons and goods is a challenge because it tends to destroy existing economic structures (while benefitting others), leads to social disparities and threatens the environment. On the other hand,

chances are to increase know-how transfer and interaction, to develop common standards for rail-traffic, e-mobility, taxation etc. and to look at transport as a whole, from source to destination.

In goods transit, “road is eating rail”. Austria skipped its eco-point system when entering the EU. The new ‘EuroVignette’-directive allows slightly elevated road pricing for sensitive areas such as the Alpine, but not enough to force goods from road to rail. Nevertheless it would bear enormous emission reduction potentials to get to Austrian or Swiss standards in the EU: The share of rail in goods transport is 31 percent in Austria, compared to an EU25-average of 18 percent. In Switzerland the road pricing for heavy duty vehicles is much higher than in Austria, and the St. Gotthard railway tunnel to be opened in 2017 is intended to lift further goods from road to rail. In Austria the equivalent Brenner Tunnel has just been postponed – again.

In tourism high speed trains are sustainable alternatives to air and car traffic only for city destination. 30 percent of international tourists arrive to Vienna by plane, but this is the case for only 2 percent of the tourists heading for alpine destinations such as skiing resorts. Shift from car to rail would save CO₂-emissions, but mostly (80 percent) in other countries. The approach has to be twofold: One is arrival and departure without cars – the other being carless mobility on the spot.

The Austrian klima:aktiv mobil programme is working on it, with considerable success. The European Platform on Mobility Management, EPOMM, is the central know-how platform for soft measures. The Austrian Action Program for climate protection in transport, klima:aktiv mobil is part of EPOMM. It serves as a ‘role model’ in other countries and it has achieved good results by using soft measures to change behaviour, frameworks and demand. 850 partners have saved about 370,000 tons CO₂ per year.

Discussion

Robby Berloznik, Institute Society & Technology, Flanders: What about ‘rail eating rail’ or ‘large scale eating small scale’? In Belgium the high speed train (TGV) connecting Aachen and London meant that all other rail projects were put at hold. We have given up a lot of local mobility for long distance mobility.

Kathy Riklin, Swiss Parliament: The Trans European Rail Networks, supposed to bring all European countries together, are not being prioritised. We have difficulties with Germany and Italy. The trains are blocked in Chiasso at the Italian border. There are no more night trains.

Harri Jaskari, Finnish Parliament, said that railway connections would have to be very fast and very cheap indeed to compete with air tickets Helsinki-Milan sold at € 30. He asked Henrik Sylvan: “Why do you want to build a motorway if you want to promote rail?”

Michael Nentwich, Institute of Technology Assessment, Austria, agreed: Given that rail is more sustainable than road transport it is not obvious that the Öresund Corridor should be a combined rail-road-solution. He asked Willy Raimund if soft measures are enough to accomplish sustainable transport cross the Austrian borders.

Henrik Sylvan answered the question on the combined rail-road-solution by saying that originally only a highway solution was envisaged. The rail cannot take over all of the expected transport growth, he said. 40-50,000 rail passengers are expected, but the highway will have 80,000 people travelling in cars each day. They will save a lot of hours and detours. The present pricing system for

air- and rail-tickets is wrong, he said. Though not an expert he was quite sure that the external costs of connecting Scandinavia to the European networks by aviation are very high compared to the rail and road combination.

Willy Raimund joked that yes, soft measures can solve all the emission problems – on the condition that everybody stays at home. In reality hard measures are necessary. Change of framework conditions, taxation, regulations and new technologies will be needed. But mobility management is an easy way to start. He agreed that the tendency for large scale projects to dominate small scale improvements is a major problem in urban areas.

Paul Rübige, European Parliament, noticed that civil society is fighting railway projects in Austria as well as other places such as Stuttgart. Do we know what the social background is, he asked. Another question was raised on the concept of time savings. Experience suggests that once a new highway is built, people stop looking for alternatives. Five years later the new road like the former one will be exposed to congestion problems.

Henrik Sylvan agreed that new infrastructure tends to induce new traffic. It takes five to eight years to fill up a highway, he said. To avoid excessive traffic growth you have to do something more than building the highway, such as introducing road pricing and tightening it gradually, he said. Willy Raimund said that wherever you have infrastructure works, you will have protests from people living in the area, even if total future impact of the project is less traffic.

5 Alternative policy approaches

Decoupling car culture and social life

Lise Drewes Nielsen, professor, Roskilde University, Denmark

Cars, vans, trucks, busses and taxis are integrated elements of daily practices. When cars became part of social life, they opened an array of new opportunities and loosened dependence on time and place. On the other hand, the car culture profoundly alters communities, social relations, the sense of time and the way of sharing. The adverse effects on environment, health and safety are well known.

Conflicting attitudes towards car use, the ambivalences of automobility, are living in all of us, individually and as members of society. We have divided opinions, but the mobility has become part of everyday life, shaping individual biography and daily time passing. We all know about the negative consequences, but we often do not even reflect about them in our daily routines. Our imagination is dominated by the existing car culture. Criticism of existing mobility patterns is often perceived as a personal attack on acquired individual rights. These issues are great challenges when trying to find pathways towards a post-car future.

Sustainability has for long been an issue in transport and urban planning. Climate change has accentuated the discussion on how to achieve a win-win solution gaining sustainable development and emissions reductions at the same time. In compact cities where everyday life is unfolded in surroundings with shorter distances, non-car accessibility to work, leisure, shopping could be provided by multi-modal systems integrating walking, biking and public transport. Auto-logical transport would still be part of the system, but at lower priority.

Present planning is dominated by predict-and-provide thinking. The idea is that infrastructure is a precondition for economic growth. New highways and bridges are provided to fulfil demands, based on figures predicting future needs and growth. But, as we know from research, when more

infrastructures are provided, the transport flows exceed predictions. More highways induce more traffic. To plan for a post-car future and to break the curves, we need another way of thinking. Visionary ideas and utopian scenario building can help finding pathways towards the post-car future.

Many cities have introduced restrictions and regulations of car use. The integration of car use in multi-modal systems may be furthered by means of tools like mobility management, car sharing and car pooling. And perhaps urban planning will succeed in diminishing transport demand.

Transport policies in compliance with European citizens?

Peder Jensen, Acting Head of Programme, European Environment Agency

Most policy makers don't want to tell their voters to get out of their cars. And the stakeholders usually consulted are nongovernmental organisations and organisations defending their own businesses. To explore the views of ordinary transport users the European Environment Agency has presented key messages from different scenarios of future sustainable transport systems to users across Europe. During two times two days, facilitated discussions were conducted on how the changes would affect their daily lives.

We ended up having very sophisticated discussions, and we found that many participants, given a bit of time, had surprisingly consistent views on how to manage changes, Peter Jensen said. To many of them the equity concern was decisive: Who is going to pay the costs, whatever they are? Can pricing or other mechanisms be used to ensure an equitable distribution of costs and benefits?

Another recurring theme of the sessions was governance and predictability. We need policy makers to drive changes for a long time, citizens said. If direction is altered in each election period, no real change will be accomplished. Each industry needs to know what they can depend on in the future.

A third issue was the need for complementary measures such as working time regulations and new types of information technology. Without using the word, mobility management was drawn into the discussion.

We found that people are willing to change where they can imagine moving into new habits in their daily life. To foster change, local action is needed. You have to make changes happen where people are commuting. At the EU level this may mean that regulations may be less important than setting standards and creating frameworks for environmental zones, taxation systems and the like.

In the area of long distance transport most participating citizens found it impossible to imagine a Europe 2050 without aviation – linked only by high speed rails. Unfortunately next morning most airplanes were grounded because of the volcano eruption in Iceland, and they found themselves living in an aviation free Europe, prevented from returning home...

The need for performance governance

Henrik Gudmundsson, Senior Researcher, DTU-transport, Technical University of Denmark

Sustainable transport policies have been around for 20 years, but bold words and bright policies are not very useful if not implemented. By the end of 2009 Eurostat stated that since year 2000 only minor progress has been made in decoupling transport volumes and energy consumption from economic growth. The share of investments in environmental friendly transport modes such as rail and ports grew in the early years of the decade, but now the pattern has been turned into favouring growth.

We have a governance problem, and we need a new approach: performance governance. Politicians often focus on single projects and short term targets – incompatible with the persistent nature of sustainability problems. Performance governance means focusing at key outcomes instead of single projects. First you define what your transport system should deliver in terms of goals for accessibility, mobility, safety, environmental protection etc. Then you choose the appropriate measures. And then you follow up whether the intended changes take place or not. Performance information has to be systematically incorporated into policies and management to improve decision making, results and accountability.

Indicators can be used to provide focus, description, assessment, diagnosis and accountability. I don't think we need more indicators. The problem is their quality and their relevance and how we use them. As an example in the UK local transport plans are funded by the central government, which allocate funding according to the performance measured by a number of targets and indicators. If local authorities do not meet their targets, the next round of funding will be scaled down according to results. Money is not allocated for specific projects but for certain outcomes. As a result many local authorities have started to think more about their goals and the information they need. Actually many of them have pushed themselves towards more ambitious policies.

A performance approach is increasingly needed. Define what your transport system should do, what to provide and what to prevent. Indicators, decided by policy makers and backed by research, can help define the goals, monitor the performance, improve decision making and keep the implementation on track.

Discussion

Lars Klüver, Danish Board of Technology, asked what it would take to achieve a goal of multimodal transport or even a 'post-car future'. What institutional change should be implemented? Which kind of regulation would be needed? Is it realistic in the European context? Could it be harmonized at the European level?

Helene Limén, The Evaluation and Research Unit, Swedish Parliament: Should living styles and habits which affect our way to conceive transport and accessibility be included in the indicators?

Michael Nentwich, Austrian Institute of Technology Assessment: Multi-modal combination of transport modes is probably the future way, but what about ownership? Are there any hints in sociology about the idea of owning one's transport means? We don't own trains. On performance governance he said: If we aim for multimodality then how do we set targets applying to the diverse group of actors for cars, trains, roads etc., which are not institutionalised in a combined sense?

Nicolas van Larebeke-Arschodt, Institute Society & Technology and University of Gent, said that air pollution costs Belgians 1 year and 1 month of lifetime on average. He advocated a phase-out of 'irrational cars', meaning 4 wheel drive cars consuming 12 litres of petrol per 100 kilometres or so. For decades the petroleum industry has inhibited the development of non-petrol engines, he said.

Lise Drewes: Usually the different modes and the actors handling them are considered one by one. We need a new approach. Much can be learned from the urban planning concept of 'complexities in relational planning'. When building new towns and cities a complex group of actors are acting together. We need to look at the whole transport chain and the entire transport system. For instance we should look at the Öresund Corridor as a total multimodal system with actors handling rail systems in Sweden, Denmark and Germany. The same approach should be used when looking at multimodality in our daily transport. On private ownership she said that there seems to be a change

towards shared transport modes, which is very important from a sociological point of view. Shared access to resources is a new aspect of sustainability thinking. To share cars instead of owning them could make users reflect on what they are going to do and which footprints they make.

Henrik Gudmundsson very much agreed that the objectives should be defined outside the transport sector itself. That's the whole point, he said. Transport is there to provide services to other sectors and to society at large. We need to define the performance criteria exactly to serve those needs – not as commonly done, to act almost as if transport was a purpose in itself.

Actually it's a bit of a problem that our institutions are focused on modes, he added. They compete with each other instead of complementing each other. Recently in Sweden the rail and road administrations were merged, because the idea is not to have more roads or more rails. He wouldn't be the judge of what to do with 'irrational cars'. But he would recommend regarding the whole life cycle of them instead of just taking them out and – who knows – exporting them to some African country.

Peder Jensen stressed the importance of long term planning and long term stable frameworks. Policy makers need a common long term vision. If direction shifts each time government is changed, as has been the case in most European countries for 50 years, we end up with planning getting us nowhere, he said. On the issue of air pollution he said that health impacts were the main driver of emission standards in the 1980s and 1990s. Just because climate change is becoming a main driver, we should not forget about health, but electric vehicles have the advantage of positive impact in both fields.

During the final round of debate the private ownership was touched upon again: The vehicles may be privately owned, but they do occupy public space when driven and parked.

Peder Jensen: Parking policy indeed is a very effective tool to reduce the use of cars in the cities. My work place, the European Environment Agency is located in the centre of Copenhagen, where parking places are scarce and expensive, 4 € per hour. It is very nice for me to just take my bike instead. But if I had lived somewhere, where it is normal to use the car, I probably would hate it. It also means you have to live in a place close to your workplace.

The advantages of modal shift should not be exaggerated, one participant said. In the Netherlands, traffic safety and air pollution control are success stories. Since the early 1970s fatalities and pathogenic substances are largely reduced. Policy makers should focus on the remaining problems: climate change and congestion. Others argued that in the same time double as many people died because of air pollution, and eight times as many people died by not moving...

Lise Drewes: Auto-logic is still alive. In the Örestad, a recently developed urban area relatively close to the centre of Copenhagen, lots of space could have been reserved for social activities, gardens and playgrounds instead of free parking. Also urban sprawl is still an issue. Actually the new highway, part of the Öresund Corridor presented earlier, if build will create tremendous urban sprawl in the northern part of Sealand. It will be very difficult to handle with public transport, which has been a low priority for several years. Answering the comment on modal shifts she stuck to her previous conclusions: The car is mono-modal, all other ways of handling everyday transport in the community inevitably will be multimodal, combining walking, biking and the use of public transport. All the shifts, when not using a car, are the main problem. That's one of the main reasons why mobility management has been successful.

Endnote

An overview of status and policy strategies in each country can be found at www.tekno.dk, along with the conference program, podcast from the conference, abstracts, slides and a list of participants.