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Transport and the Environment:

Barriers to the Take up of Environmental Technologies in the Transport Sector

Summary

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1 Introduction

The workshop "Transport and the Environment: Barriers to the Take up of Environmental Technologies in the Transport Sector" is part of the ETTAR (Environmental Technologies Training and Awareness Raising) project, funded by the European Commission under the 6th Framework Programme, and took place in Gothenburg, Sweden, on 25/26 October 2007. The workshop assembled about forty participants representing mainly the transport and logistics industry including all transport modes (road, rail, air, sea), car and truck manufacturers and other businesses as well as academics.

The workshop focussed on identifying the barriers to and drivers for the uptake of environmental technologies in the freight transport sector. Moreover, the workshop was intended to identify important initiatives that could be taken by the logistics companies and/or their customers as a model to improve the environmental quality of their transports without waiting for any political incentives or legislation to support the take-up of these technologies.[1] Thus, the discussions centred on the capacity and motivation of industry itself to contribute to an environmental improvement in their sector.

The discussions encompassed all modes of freight transport: road, sea, rail and air transport.

This summary will convey the trends of the discussions and will not reproduce the presentations given by the experts, which can be downloaded at: http://www.ettar.eu/events/workshop1/presentations.html .

2 Taking up environmental technologies along the supply chain: Responsibilities and Procedures

The backbone of the discussions was the **supply chain** of product distribution comprising the relations between producers of goods (raw materials, intermediary products and final products), the transport companies transporting these goods, retailers and final consumers.

2.1 Who is responsible for taking up environmental technologies?

The hypothesis formulated by the workshop facilitator Mr. Frank Sprenger from the consultancy Sustainable said that there was currently no business case for the take-up of environmental technologies as companies (companies selling and buying transport services) in general do not see any business advantages connected thereto and rather concentrate on minimising prices.[2]

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[1] Yet, possible political actions to support the take-up of environmental technologies were also discussed.

[2] From the point of view of the final consumer, it was said that transport costs generally constitute only a small part of overall costs, evidently depending on the commodity transported, and do not reflect externalities. Thus, political measures such as an increase in fuel prices or higher taxation of fuels will in general not have much influence on the part of the final price which pays the transport costs The comparison was made between a product produced in a country with low social and environmental standards, which is far away from the country of consumption (lower production costs, higher transport

Besides, final consumers normally pay little attention to how the product they are about to buy was transported. Exceptions apply in the field of food miles but customers normally only make the distinction between - in their view - environmentally "good" regional products and environmentally "bad" products imported over a long distance. Labelling of products taking into account the sustainability of their transport is at present only practised in rare cases. Therefore, "relying" on consumers to demand certain environmental improvements cannot be considered as an effective method to foster the uptake of environmental technologies.

Thus, the responsibility and discretion of implementing environmental technologies rather lies with the individuals in the respective companies, often on a voluntary basis. This requires personal convictions of the individual within the company and his/her ability to convince the strategy department and the Corporate Executive Board of the company to adopt environmentally friendly business options. Thus, informal relations are not to be underestimated to influence the company's decision making process. This seems all the more true as there is apparently no trade association focusing on climate change in the logistics industry.

As a common start-off point for the logistics industry to gradually improve their environmental performance, it was suggested that logistics enterprises and vehicle constructors include environmental technologies/products in their product portfolios via mixed calculations. For example, a certain environmental brand could be offered next to other more conventional ones, which would then allow customers to make their choice.

Some participants assumed that the logistics sector in its current state might stifle small radical innovators based on the impression that the sector is dominated by a rather conservative approach to technology. Other participants, however, warned that the industry alone cannot realise the structural changes needed to promote environmental technologies. Many participants agreed that the issue of environmentally friendly transport technologies would be given much more attention if society at large, including financial markets, were more interested in it, leading to the assumption that the issue of public interest in environmental technologies would be a mirror of the respective "Zeitgeist" ("trend", "public opinion at large").

2.2 Technologies exist

There was a consensus that technologies (vehicle technologies and environmental fuels) which can contribute to reducing environmental impacts, most importantly the reduction of air emissions, already exist and do not present a bottleneck to environmental progress in most cases.[3] Yet, most of these "alternative" technologies are not well integrated into the market.

Thus, the participants in general advocated the application of these existing technologies in a step-by-step manner instead of waiting for the "best" technologies to be developed. Yet, a primary barrier identified was the lack of reliable assessment tools to judge the real environmental benefits of the different technologies over their lifecycle. This aspect was

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costs) and a product produced in a country with high social and environmental standards, e.g. a country within the EU, (higher production costs and lower transport costs). Longer transport distances and thus higher transport costs are of little importance compared to the fraction of lower production costs. The tipping point for changing this cost structure in a decisive manner is reported to be very high, meaning that transport prices would have to increase hugely in order to outweigh production costs. Therefore, the issue of transport is of little economic interest for consumers.

[3] The issues of lacking availability of fuels and infrastructure bottlenecks, however, are barriers, described below in the section 3.2 .

especially emphasized when the issue of biofuels was debated. Many participants expected that first generation biofuels would phase out soon and that research would make better environmental solutions available with second-generation or third-generation[4] biofuels.[5] **"Second" generation biofuels** are not based on crops, but on e.g., cellulose from forest residues or energy forests. These have a higher energy yield per hectare than other crops and are therefore preferable. Currently there are research activities focused on gasifying biomass to "syngas" (CO and H_2) which in the next step of the Fischer -Tropsch process can be formed into different kinds of hydrocarbons, e.g., synthetic diesel (F-T diesel) or petrol, DME, Methanol or Methane. The process is well known when the raw material is coal or natural gas. The challenge is to develop a process that is robust enough to work efficiently also on more complex raw materials like biomass that contains material (e.g., Sulphur) that can obstruct the production process. The F-T process from fossil raw material is well known and used in large scale. Production from biomass exists today in pilot plants and is rather in a research phase. **"Third" generation biofuels** usually signify hydrogen, solar cells, and other forms of completely renewable energy carriers or fuels.

3 Barriers to the take-up of environmental technologies

3.1 Costliness of environmental technologies

One of the main barriers to the take-up of environmental technologies was said to be the fear of transport sellers/buyers that the employment of these technologies might be accompanied with higher costs/prices for the transport seller and the transport buyer. However, in the long term, the take-up of environmental technologies might also trigger a reduction of costs due to enhanced energy efficiency, etc. Yet, the logistics sector rather focuses on short-term market perspectives.

Furthermore, the persons responsible for deciding on the take-up of environmental technologies in logistics firms are often not aware of any long-term cost benefits or do not trust any calculations corroborating them. Thus, the – at times very abstract – fear of cost and price rises prevents firms (logistic firms and their customers) from taking up or demanding the take-up of environmental technologies.

3.2 Current availability of fuels - Infrastructure bottlenecks

Even though environmental options exist, the aspect of **availability**, especially of alternative fuels (biofuels, hydrogen, etc.) needed for an extensive substitution of traditional fuels, still constitutes an important barrier to the take-up of these technologies.

Apart from the lacking availability of some alternative fuels, also **the current fuel supply infrastructure** is adapted to traditional fuels (gasoline and diesel). Modifications of this

[4] What is meant by "third" generation biofuels in this context is: hydrogen, solar cells, and other forms of completely renewable energy carriers or fuels.

[5] According to Dr. Magnus Blinge of VINNOVA, second generation fuels from Fischer-Tropsch plants for biodiesel or Dimethyl ether (DME) fuel could soon achieve a 70% CO2 reduction over fossil fuel refining. With this technology, Europe could be up to 20 % self-sufficient in clean fuels for the transport sector. Furthermore, a stronger link between agricultural policy and energy policy was advocated.

infrastructure are at times costly (for example with regard to hydrogen) and need to be considered in the overall assessment of environmental alternatives.

Another problem is the storage of alternative fuels as they often cannot be stored for very long, require certain storage conditions, and cannot be mixed with other fuel types (e.g. the mixture of different blends of biofuels and traditional fuels). As a consequence, extra tanks for the storage of alternative fuels have to be rented by the fuel supplying companies.

As a result, the main barrier does not lie in the technology itself but in production capacities and logistics. What follows from this is the reluctance of customers to buy these technologies as they are not fully convinced of their practicability and chance of survival and fear that these technologies might deprive them of flexibility. The issue of environmental technologies and alternative fuels seems to be overwhelmingly complex, which has the effect that many users prefer to rely on traditional technologies and fuels instead of taking up new ones. The mentioned mistrust of customers (e.g. logistics companies when they buy new trucks) with regard to these technologies is one of the most important psychological barriers to the take-up of new technologies.

3.3 Long investment periods

Long investment periods, especially for rail- and ship-based transports, were cited as a barrier to the replacement of traditional technologies with more environmentally friendly ones. For example, the different rail control systems and the different legal requirements for train transport in the different countries constitute a decisive impediment for increasing international goods rail transport – in general advantageous in environmental terms when compared to trucks and planes. Here the new European Train Control System (ETCS) might provide a promising solution. However, the investment loops in the rail industry are approximately 30 years, which is why the latest technology is not always implemented directly or existing technology is not adapted in short-enough intervals to facilitate inter-European compatibility.

3.4 Abating all emissions at the same time

As for the shipping sector, one of the most important barriers to the take-up of environmental technologies was the lacking political framework and the sector-based political approaches towards emission reduction. For example, the EU approach is based on the reduction of SO_x. However, there is no holistic approach to promote environmentally friendly technologies in the shipping sector which takes into account and optimises SO_x, NO_x and CO_2 emissions at the same time. The attempts to use other fuels than heavy oil have been limited, and they include biofuels, natural gas and hydrogen. The current tendency is that ships are required to increase speed to remain competitive. This counteracts sustainable objectives.

The aviation industry is also confronted with the problem of combating all air emissions at the same time, including CO_2, NO_x and noise. In order to reduce CO_2 and noise, the ACARE project has been created by the European Commission. Alternative fuels are being tested but as for biofuels, the 2nd and 3rd generation still need to be developed.

3.5 Administrative barriers

Projects can also meet resistance from the public administration. Different administrative requirements for railway operations in different countries were cited as a barrier for further promotion of international rail-based freight transport and the shift to rail transport from other

transport modes. The combination of road and rail transport via truck-carrying rail-wagons can also be rendered difficult by general rail standards. Furthermore, different administrative regulations at the national level impede the smooth running of international rail transport (e.g. the example of different materials to be and not to be used in fire extinguishers).

4 Drivers and Possible solutions

Small scale projects **can and shall** be implemented with willing partners, with the potential of contributing to large-scale change. Promising examples of such innovative projects were given in the workshop. The examples discussed were mainly focussed on actions that can be developed within the industry (transport sellers and buyers) and without the help of policy initiatives. Additionally, solutions supported by policy makers were discussed.

4.1 Small scale projects adapted to the local infrastructure and the transport mode

Given that there is no universally applicable solution, participants agreed that each company still needs to try to identify their own possibilities to improve the environmental performance of the transport they cause. Possible projects should be adapted to the circumstances of the respective local infrastructure. Some countries, such as Scandinavian countries, have for example a far more dense hydrogen supply infrastructure than other countries.

Projects also have to be adapted to the respective transport mode. It was mentioned that environmentally friendly technical solutions are more abundantly available for city transports than for long-haul transports where reliable technical alternatives still need to be identified and extensively tested.

An “environmentally friendly” solution does not need to concern only alternative fuels or vehicle design. A presentation was given by Mr. Jehle from Thermo King in which he explained how the diesel consumption of trucks transporting cooled and frozen material could be reduced by means of a cooling mode using liquid carbon dioxide instead of diesel fuel. This does not add CO_2 to the atmosphere as recycled CO_2 from chemical processes is used.

"Commercial CO_2" is recovered from existing industrial processes, e.g.:

- Ammonia production/Steam reforming (69% of recovered European CO_2)
- Fermentation (22% of recovered European CO_2)
- Ethylene oxide production (4% of recovered European CO_2)
- Natural wells, where suitable geological prevail.

Therefore all commercial CO_2 is also an environmentally beneficial product. Non-purified CO_2, which for example is recovered for enhanced oil recovery, is not covered.

Another example was given by Mr. Stribek from Flexiwaggon who presented a train wagon with possibilities for fast loading and unloading of trucks. This wagon facilitates the moving of large numbers of trucks over large distances by rail. The low position of the wagon makes it possible to load and unload on gravelled areas so that no specific terminal is needed.

4.2 Policy-based solutions

4.2.1 Obligatory performance-related targets for car/lorry manufacturers

Many participants favoured performance-related, legally binding targets for manufacturers of freight vehicles. Manufacturers of vehicles should be able to choose among different technologies for the construction of vehicles, etc. as long as the required environmental performance (emission limits, fuel consumption, etc.) is achieved. Such obligatory requirements would also thwart the economic strategy of competitors in freight transport, which consists of adopting the cheapest (and thus often the most environmentally unfriendly technology) to lower the transport price.

4.2.2 Emissions Trading Scheme (ETS)

An alternative or additional measure to command-and-control measures are emissions trading schemes, which leave even more leeway to the manufacturers and users of transport vehicles to reduce their emissions and are based on market mechanisms. As for the air-transport sector, the emission trading scheme was favoured by participants as a means to reduce CO_2, especially when it could be introduced on a world-wide scale. Also the Association of European Airlines (AEA), International Association of Charter Airlines (IACA) and others, are in favour of a well designed emission trading system for CO2.

For NO_x, charges may be a viable alternative to ETS. These charges can be dedicated to a fund to provide capital for specific NOx-reducing projects/technologies, i.e. a company can get money from this fund to partially finance NOx reduction. This system is implemented today for Norway.

4.2.3 Creation of market

Where markets do not exist, policy makers could take measures to create markets for certain technical options and subsidise the entrance of certain products into the market (e.g. subsidies).

5 Outlook

The basic conclusions of the final discussion were that each company and the individual responsible for the purchase/development of technologies, public procurement, etc. should and could develop solutions and consider concrete steps to take up environmental transport technologies which fit into the company's portfolio. Even though these steps may be small steps, they are important as they may lead to knowledge and experience that can stimulate new projects and approaches. Furthermore, more contacts should be set up between companies and institutions having a stake in the development, use and spread of environmental technologies, such as companies buying and selling transports, universities, technology developers/sellers, and policy makers.

The workshop was intended to be one step in bringing these different stakeholders together. Various participants were saying that they could identify with some of the technological solutions presented during the two days and would consider taking up similar solutions.

The 2nd workshop of the ETTAR series "Barriers to the implementation of new models for transport operations" planned to take place in Prague on 24/25 January 2008, will deal with

optimised logistics and traffic planning processes. The contacts formed in the first workshop are intended to be intensified and enlarged in the second workshop.