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Opportunities to improve the sustainability of the transport system

Making the transport sector more sustainable may be the single greatest challenge we will face over the next several decades, on account of this industry's substantial contribution to climate change and oil consumption. As it turns out, electric transport encompasses both opportunities and threats. Pricing policy can likewise help improve the sustainability of transport, for example in the aviation industry, and in addition there are opportunities for increasing sustainability in transport logistics and for policies aimed at facilitating a shift from car usage to public transport use.

Air quality in urban areas has markedly improved in recent decades, while the role of cars has been reduced, particularly in central urban areas. Despite these positive changes, efforts to reduce global greenhouse gas emissions have been relatively unsuccessful to date. Transport is the only major industry in which carbon emissions are increasing rapidly worldwide: personal mobility – particularly car and air travel – and cargo transport (notably by truck and ship) are growing much faster than fuel consumption is declining on account of technical improvements. An additional factor is that the transport industry, more than any other major industry, is highly dependent on oil.

There is a general consensus among economists that saving energy in the transport industry is relatively costly (Peake, 1997). Nevertheless, there

are cost-effective options available for lighter vehicles such as cars and delivery vans, which make it possible to reduce carbon emissions by roughly 30 to 50 per cent over the next ten to twenty years using economical methods (International Energy Agency, 2009). There are fewer cost-effective options available for other modes of transport, including trucks and aircraft. The bulk of the proposed emission reduction will need to be driven by technology; however, technological options do not create themselves and tend to require an effective policy, partly because they present various barriers, including acceptance by consumers and other parties, and financial and legal-institutional barriers (Geerlings, 1998). Advances in technology tend to be impacted by international policies, such as EU policy aimed at vehicle technology (e.g. emission regulations) and fuel. This article details how various Dutch stakeholders, including policymakers, can contribute to making the transport system more sustainable. We will focus mainly on the non-technological aspects of electric cars and on the logistics industry, the aviation industry and modal shift policy – all in the wider context of traffic and sustainability.

The electric car: a popular mode of transport

The electric car is generally regarded as a key opportunity for reducing both carbon emissions from passenger cars and the dependence of the transport system on oil. The environmental gains of electric vehicles depend to a large extent on the method used to generate electric power (for example, solar energy or wind energy versus coal). In the current Dutch electricity mix, carbon emissions – calculated from the energy source up to and including the mobile vehicle on the road – are approximately 60 per cent lower than for comparable non-electric vehicles (Verbeek & Kampman, 2012). Another substantial benefit of electric vehicles is that the polluting emissions occur at the power plant, relatively far from people, who could potentially breathe in hazardous substances (Marshall et al., 2003). In the Dutch Randstad conurbation, in particular, with its higher concentrations of air pollutants, use of electric vehicles improves air quality, particularly compared with diesel vehicles. In addition, many journeys made within the Randstad conurbation fall within driving range of the current generation of electric cars, which makes them a relatively appealing mode of transport.
Plug-in electric vehicles have also been available on the market for several years. A wide variety of stakeholders in both the public and private sectors (including the electricity and manufacturing

industries) have been amenable to the idea of electric vehicles and play a key role in the current launch stage. Contrary to predictions made prior to the launch, there are no signs of “old interests” throwing up barriers. However, it is likely that such signs will emerge over the longer term, particularly in the oil industry, at major automobile manufacturers and, possibly, grid operators, due to the more complex situation relating to the supply of and demand for electricity and the implications this will have for the power grid (Bakker et al., 2012). Many stakeholders currently have high expectations of electric vehicles, particularly in relation to the greatest bottleneck: battery packages, Which remain relatively expensive and heavy, while the driving range of electric vehicles is limited. However, these high expectations may never be realised, because technological advances are not occurring at a fast enough pace, which will lead to disappointment and will reduce the market share of electric vehicles (Bakker, 2013). Support by various stakeholders for electric vehicles may diminish in that case, and the government will have to choose to either implement additional policies or accept that the market share of the electric vehicle will remain modest.

Amending acquisition policies

Current sales of electric vehicles are driven almost exclusively by tax benefits, as consumers essentially feel these vehicles are too expensive compared to similar models of combustion-engine vehicles. An electric car would need to be approximately two-thousand euros less expensive than a comparable traditional vehicle for consumers to decide to purchase this type of vehicle, particularly given the limited driving range and the long waiting times for charging/express charging. Consumers are willing, however, to spend extra money (more than nine hundred euros) on hybrid vehicles such as the Toyota Prius. This eliminates the need for tax incentives for these cars; it is preferable to provide incentives only for fully electric vehicles. Potential buyers currently do not regard electric cars as in any way competitive in the market. In order to make them more competitive, a subsidy of between 900 and 2,750 euros a year – depending on the segment – would be required or, upon purchase, between 4,500 and 13,750 euros (Bockarjova et al., 2013).

The question is, however, whether long-term tax incentives are sustainable in the long term, particularly if sales were to pick up. Tax incentives should preferably be adaptive, i.e. by adjusting policy to price trends and sales figures. The cost of tax incentives per tonne of carbon not emitted is relatively high, amounting to several hundred euros

per tonne, which is significantly higher than the cost of other options to reduce carbon emissions, including heat generation from industrial waste streams. In fact, the latter option even generates profit (Smekens et al., 2011). Incentives can be justified for a limited period of time which must be bridged in order to boost sales of electric vehicles, after which these cars will be able to compete in their own right. Besides policy aimed at individual consumers, the use of electric vehicles in specific fleets (i.e. fleet cars) by government and private individuals is relatively appealing, particularly vehicles with a high urban mileage, including buses, taxis and vehicles for urban freight distribution. In those cases, local environmental benefits are relatively large, and specific charging policies can easily be implemented.

Management of charging infrastructure

Charging facilities are vital to fully electric vehicles, and for plug-in hybrids, electric mileage depends to a large extent on the availability of such facilities. However, these charging stations obviously need to be installed first, particularly in public spaces (i.e. locations other than private homes). Supra-local policy to install more charging facilities is currently at a very early stage and is limited to the standardisation of charging plugs. The majority of charging-related policies, however, is created at a local level. Some automobile manufacturers provide home-charging stations to consumers purchasing electric vehicles. The majority of electric car owners are already able to charge their vehicles at home, and in addition their employers can provide access to charging facilities. Another option is to install charging stations in public spaces. However, there are a number of potential conflicts of interest relating to the financing of the public charging infrastructure: who should shoulder the cost of installation and possibly of the electric power required? To what extent, and within what time scale, are parking privileges for electric vehicles, combined with charging facilities, sustainable? (See Bakker & Trip, 2013). What are the implications of a public charging infrastructure for the power grid? On the other hand, electric vehicles also provide opportunities for grid energy storage which can be made available in the event of, for example, a power outage at a hospital. The use of electric vehicles requires the development of what is known as a “smart grid”: that is to say, (future) technologies to manage the power grid, which are particularly important if a growing number of devices – including electric vehicles – are installed which creates a strong local demand for, or supply of, electricity. (Verzijlbergh, 2013).

Option of pricing policy in aviation industry

Of all modes of passenger transport, aviation has been the fastest-growing for many decades now – significantly faster than, for example, urban transport. The international aviation industry does not impose any fuel charges and passengers do not pay VAT on airline tickets. Since flying is relatively damaging to the environment compared to other modes of transport – particularly as expressed in terms of the amount of time consumers spend on plane journeys – introducing a pricing policy would appear to be an an obvious choice. However, will this not end up making air travel significantly more expensive for tourists? Not necessarily, as price is the determining factor for consumers choosing a holiday; the actual destination itself (domestic or international) plays a much less significant role (Grigolon, 2013). Since the holiday destination is not the main consideration for people choosing a holiday, an increase in the price of plane tickets (which is proportionate to the distance) will drive consumers to choose less expensive destinations closer to home. How effective is such a policy? A simulation study has demonstrated that, if the price of airline tickets were to increase by 50 per cent (either as a result of policy or through external factors), this would result in a 10 to 30 per cent increase in the market share of domestic holidays. Although this may increase pressure on the road network somewhat, congestion will not necessarily increase. The related reduction in carbon emissions is estimated at between 14 and 47 per cent (Van Cranenburgh, 2012). Pricing measures – such as an environmental tax on international flights – are therefore an effective method of reducing carbon emissions in the aviation industry. Since the destination itself is of relatively limited importance, the economic loss as a result of a pricing measure would appear comparatively small, which may be why there is little resistance to such policies among the general public.

Other logistics

It is not only passenger traffic which causes environmental problems: cargo transport is a culprit as well. New concepts in transport logistics can potentially increase efficiency by an average of 20 per cent and thereby contribute to improving the sustainability of the transport system. The spatial concentration of business parks/industrial estates and distribution centres, for example, improves opportunities for cooperation between shipping companies and, in the process, reduces the frequency of trucks driving around with only a half-load. This improvement in efficiency results in cost savings and reduced carbon emissions. Spatial concentration also has a positive effect on the use of the railway network and inland

waterways; however, coordination and incentives provided by central and provincial government will be needed in order to achieve this goal. This is because businesses and local governments tend not to be motivated enough to cooperate across boundaries, which means the economies of scale required to develop efficient systems are often not available. These economies of scale can be achieved, however, if the parties concerned are supported by the government on issues involving joint investments and profit-sharing (Council of the Ministry of Housing, Spatial Planning and the Environment [VROM], 2009). Additionally, central and provincial government can make income distributed among individual stakeholders (including a reduction in the environmental tax) explicit and, if necessary, translate it into policy to ensure that businesses receive the "right" kind of incentives.

Another way to improve the efficiency of logistics systems is urban freight distribution. Although this provides a number of theoretical benefits in terms of stocking shops, it does call for effective cooperation and coordination. Little progress has been made to date in establishing efficient urban freight-distribution systems, and individual suppliers all continue to drive around busy cities using their own trucks and delivery vans. A public stocking system – based on the example of urban public transport – could potentially provide an opportunity to improve the efficiency of urban freight distribution (Van Duin, 2012; Anand, forthcoming publication). The use of electric vehicles for urban freight distribution can increase the environmental benefits even further.

The contribution of public transport

One of the options for reducing the environmental impact of traffic and transport in the Randstad conurbation, while at the same time improving accessibility, is to shift from car usage to public transport use. Concentrating all future urban-planning projects in the vicinity of railway stations would achieve a carbon reduction of 2 per cent, based on model calculations. This figure is somewhat underwhelming, since, in the absence of supporting policies (such as parking policies or price per kilometre), consumers will continue to enjoy freedom of choice, which means car usage will remain widespread. What would happen if we were to make every effort to discourage car usage? If public transport became more efficient (i.e. faster), driving a car became significantly more expensive, and road capacity were to be reduced, carbon emissions would be reduced by a maximum of 35 per cent. In that case, however, radical measures would be necessary, which may not be realistic from a political and economic perspective. In reality,

therefore, the effect will be significantly smaller. A European Task Force including all stakeholders in sustainable mobility concluded that curbing mobility growth, more efficient logistics, and modal shift, coupled with a reduction in carbon emissions, could collectively reduce carbon emissions by 10 to 30 per cent (Centre for European Policy Studies, 2013).

Technology and policy

The EU has set a number of ambitious goals and intends to reduce carbon emissions by 70 per cent from the current level by 2050. The European Task Force mentioned above estimates that clean technology will account for two-thirds to three-quarters of the required emission reduction. The technical facilities required to manufacture cars that generate more than 50 per cent lower carbon emissions than the current generation of new vehicles (International Energy Agency, 2009) are already largely available. However, motorists will only opt for highly efficient vehicles and low-carbon fuels if policies provide strong incentives to purchase such vehicles and fuel. The main policy instrument is to gradually tighten the European carbon emission standards for passenger vehicles (Centre for European Policy Studies, 2013). In addition, the Netherlands and other countries will need to use their vehicle taxes to their full potential in order to boost sales of low-carbon vehicles. The combination of increasingly stringent environmental requirements and strong tax incentives makes it possible to substantially reduce traffic carbon emissions.

Government policy plays a significant role in all mobility-related aspects, including the introduction of electric vehicles, facilitating more efficient logistics through spatial concentration, the shift to “greener” modes of transport, highly energy-efficient vehicles, or any other new technology. The key to making our modes of transport more sustainable, then, is implementing policy measures. Due to the urgency of the climate crisis and the relatively long time it takes for the measures implemented to have an affect, quick and consistent policies are required. However, since there remains a great deal of uncertainty about the future – including the cost of clean technologies – policies will also need to be adaptive (Council for Transport and Water Management et al., 2009). It should be noted that “adaptive” here does not refer to working on an ad hoc basis; rather, adaptive policy involves thinking ahead about what needs to be achieved, which uncertainties are crucial to policy and how this policy can be changed, depending on various events and new insights. By way of illustration: policy relating to electric vehicles can be amended on an adaptive basis,

depending on trends in technology such as driving range and price, purchasing behaviour and usage, vehicle charging facilities in non-public spaces, and policymakers can indicate in advance how the policy is to be amended, depending on these and other developments.

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