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EDITORIAL

Foreword of the special issue co-editors

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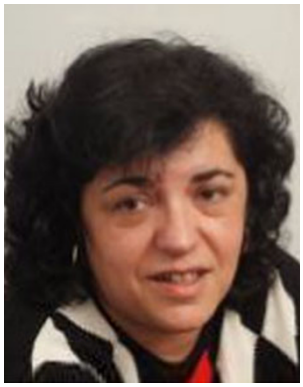

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Logistics and freight transport show a rapid growth in the last two decades, driven by globalisation of production, distribution and sourcing and parallel to the growth of trade, which was almost double of the growth of production. The value added by this economic sector has increased accordingly and is estimated at about 10% of the total gross domestic product of the EU. As logistics and transport are not clustered as one sector in the statistics of national account this estimation is rough but it gives a good impression of the relevance for economic growth and prosperity. In recent years, the importance of big logistics hubs has been increasingly recognised such that they have become an intrinsic element of Transeuropean Networks according to the recently published guidelines. The efficient use of links, hubs and nodes has been a traditional field of logistics research. In a long-term view, dynamic efficiency of logistic systems implies not only individual cost minimisation but also a significant reduction in energy consumption and environmental costs. Therefore, the main issue of this volume is the combination of green and efficient logistics to guide this sector to a sustainable path.

Transport's share of total GHG emissions in the EU was 19% in 2009, and the contribution of freight transport to this figure is about one-third. This seems to be a modest share but one has to recognise that after a suitable disaggregation of GHG producers every sector appears to be small, such that "being a small contributor" cannot be used as a general argument to exclude a sector from contributing to the GHG reduction targets. These targets have been set rather ambitiously in the EU. In the medium term (until 2020), about 20–30% of CO_2 emissions should be reduced, and in the long run (until 2050), this target is set at 80%, based on the 1990 level. For the transport sector, the target is slightly more modest at 60% until 2050 (see the EC White Paper 2011, Roadmap to a Single European Transport Area—Towards a competitive and resource efficient transport system). But compared with the trend development which points to a further increase in CO_2 emissions of more than 50% until 2050, this appears most challenging and implies that freight transport and logistics need to converge to a zero-carbon world within less than 40 years.

The instruments for achieving such a radical change are manifold: energy efficient technology, alternative fuels, increased use of environmentally friendly transport modes, organisational adjustment or redesigning the interfaces

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between logistics and manufacturing. This might imply a considerable cost increase for freight transport such that the question arises whether it is economic to include this sector in the very ambitious reduction scheme. Two general arguments are put forward to exempt this sector from the general target. First of all, the sector is growing at high speed, contrasting with other sectors like energy production. Secondly, the mitigation costs per unit of reduction appear to be rather high compared with other sectors such that the economic principle would suggest to start with the latter.

Such counterarguments are based on a static view of people's behaviour and technological potential. Starting from a more dynamic view of economic systems, one can argue that the sector should be sufficiently challenged to achieve big reduction steps through major changes in technology and organisation. If incentives and expectations are set correctly, then the climate challenge will become an element of individual decision-making. As soon as the market mechanisms are working in the right direction, a much bigger leapfrog is possible when contrasted with the decision environment of the past. The problem with such a dynamic approach is that the knowledge of future adjustment potentials is limited, i.e. a part of alternative technologies and behavioural changes is known and can be described and eventually assessed with respect to their costs and impacts while the long-term potential is unknown or at least highly speculative.

From the present state of knowledge, the technological potential to reduce CO_2 in freight transport appears to be limited, compared with other sectors. Some progress can be achieved through more efficient propulsion technology, aerodynamics or tyres. A change to e-mobility is highly speculative (e.g. with fuel cell technology). This means that the major contribution to CO_2 reduction in the freight transport sector is expected to stem from alternative fuels. But the bio-fuel of the first generation included new risk for deforestation and crowding out of agricultural food and is therefore counterproductive. The second generation of bio-fuels made from waste, straw and oil seeds grown on areas not used for food production does not yield sufficient quantities needed for road freight and air transport. Therefore, a third generation of bio-fuel production is needed, for which the prospects are most speculative from the present point of view. For instance, algae-farming is in the stage of experimental research and could be an option.

A third measure of adjustment is the use of alternative, environmentally more friendly transport modes such as rail and waterway transport. Shifting transport from road to rail or waterways is an old challenge, which until now has been hampered through the inability to fulfil logistic requirements of just-in-time or just-in-sequence transport. Inland waterway transport is always exposed to the risk of high or low water. While this may be acceptable for bulk cargo, it is increasingly unacceptable for unitised and container transport. As the market structure is changing towards the latter, the possibility of inland waterway transport to contribute to the GHG reduction issue will be limited. The railways have the technological potential to compete with road in the market of synchronised freight transport; however, the organisational performance of the railway companies is still limited because of missing commercial orientation. Furthermore, some important parts of the infrastructure are over-aged and need major investments to allow for a substantial revival of the railways.

As an interim conclusion, we can state that the classical means of green logistics, which are alternative propulsion technology, alternative fuels and shifts from road to rail/IWW, cannot be implemented in the short run. Therefore, it is necessary to give clear signals to the market players that changes towards this direction will be needed to make freight transport more sustainable. However, big steps forward stemming from alternative propulsion and fuels can only be expected in the long run. Modal shifts are possible already in the short and medium run, but they can be only implemented in particular market segments such that the contribution to the reduction target should not be overrated.

The remaining ways to achieve carbon reduction focus on organisational changes, which have the charm that most of them can be introduced already in the short and medium term. There seems to exist a high unexplored potential for collaborative and reverse logistics as well as for a target conforming re-organisation of the world-wide supply chains. Collaborative logistics can mean different things: collaboration of haulage companies, of forwarders or of shippers, either within the group or between agents of different groups. If companies form alliances for their logistics systems and operations or open co-ordination platforms—for instance an electronic freight exchange or bourse—then additional possibilities of bundling transport consignments become apparent. Presently, the small- and medium-sized enterprises often have insufficient information, and the big players have little interest in cooperation because of monopolistic strategies, fear of loss of competitiveness and privacy issues. Academic case studies and practical pilot activities (e.g. for the collaborative logistic organisation of big manufacturers with their suppliers) show that after overcoming such barriers and optimal bundling of logistic activities, the companies participating could save truck kilometres in an order of magnitude of 20–30%.

Reverse logistics denotes an organisational principle, which inverts the conventional supply chain and checks the possibilities of recycling in every part of the supply chain. Recycling of used products might reduce the demand for

scarce resources needed for new production and the associated transport activities. In particular, the electronics industry but also the automotive industry (in particular for reducing pollutant emissions) have increasing demand for rare metal such that recycling processes will play an increasing role in the future.

The development of world-wide supply chains has been pushed by the globalisation of industrial exchange, of sourcing and of distribution. The differentials of wages were the main drivers of this development, and well-organised global logistic supply chains could make it happen. For the future, one can imagine that in the course of increasing transport and energy costs, the process of global off-shoring of production is decelerating and more near- or even on-shoring is preferred. The increase in wages in China gives rise to the assumption that low-wage industries will start to move to other countries with lower wages or to countries which may show a smaller distance to the centre of the European mainland and are integrated in the regional supply networks, e.g. Turkey for West European industry or Mexico for US industry. Such processes can be accompanied by a change in interfaces between logistics and manufacturing in a sense that for instance an automobile part supplier delivers a complete dashboard instead of many suppliers delivering the single instruments and the frame for this particular spare part.

Some of these organisational measures can be undertaken in the short run, together with other strategies (e.g. multimodal supply chains) to improve short-run efficiency. Others need more lead time and would require new technologies or investments in suitable facilities for new hub concepts. For the long run, the challenge should be that the contribution of the transport sector will be comparable to other industries. The actors which are needed for a change are the state which has to set the framework for an incentive compatible decision environment in which better sustainability for technology and behaviour pays for the agents and the private entrepreneurs who find a new field of competition if the state has set the competitive framework correctly.

Against the background of the many options noted above, the present special issue has refrained from being complete and tackling all aspects. Instead, some specific aspects are presented which address the area of organisational changes, only. The idea behind focusing on a few areas is to give very concrete indications for win-win changes, i.e. changes, which are beneficial to the companies and the social community as well and therefore can be considered as green and efficient.

The paper of Johannes Igl and Florian Kellner focuses on Fast Moving Consumer Goods distribution, i.e. goods that are sold quickly such as food, drinks, toiletries or grocery items. The paper analyses the distribution network for this product category and the associated GHG footprint. Three options for reducing GHG are identified: the number of distribution centres, the performance of the engaged logistics service providers and the shipment structure. The empirical analysis is based on a case study, which includes the logistic system and operation practices of a big market player.

José Holquin-Veras presents an approximation model to estimate the joint carrier-receiver response to off-hour delivery policies. The model's main intent is to bypass the need to use more complex approaches that require expensive data for model calibration. Having access to such approximation models would make it easier for transportation agencies and metropolitan planning organisations to analyse and design off-hour delivery programs and policies. The proposed model estimates the joint market share in off-hour deliveries by computing the joint probability that all receivers in a typical tour agree to off-hour deliveries, the probability that the carrier operation is profitable and finally the joint market share. The model's inputs are the probability that a typical receiver would participate in off-hour deliveries, the statistical distribution of tour lengths, and the probability that the carrier operation is profitable for a given number of receivers. The results indicate that the model provides the same results than other more complex methodologies for the practical range of values of receiver participation.

The paper of Gernot Liedtke focuses on the estimation of benefits of shippers from a multimodal transport network. This paper gives some results from a big research project under participation of shippers and forwarders called LOGOTAKT, which was to design, analyse and assess a synchronised logistic supply system for palletised consignments using a multimodal transport network. A behavioural model is developed to estimate the shippers' reactions according to the expected economic benefits from the multimodal transport network. The model starts from the assumption that the players on the market for freight and logistics try to minimise cost, such that the construction of appropriate cost function is in the forefront of the analysis. This includes the modelling of economies of scale in transportation, which is a driver for the choice of multimodal supply chains. Simulations show that the developed intermodal transportation system has a significant impact on shipment size distributions changing them in favour of smaller shipments. This leads especially to significant reductions in warehouse costs. As on the main runs the railways can be the preferred mode on busy corridors, the approach shows that the idea of green logistics can stem from endogenous optimisation calculus of the market players. Nevertheless, some public support will be needed in the initial phase to help set up the freight hubs, which are needed for intermodal trans-shipments and consolidation of pallets.

Sönke Peters' paper follows similar ideas with analysing the effect of transhipment costs on the performance of intermodal line-trains. Intermodal line-trains with intermediate stops between start and end terminals are regularly advocated by intermodal transport researchers as a means to compete with all-road transport on small volumes and short distance markets. A prerequisite for such services is innovative transhipment technologies facilitating fast and efficient transhipments, which in turn is likely to increase the terminal costs. The major implementation barrier of line-trains is the uncertainty regarding the costs of these innovative terminals and their network benefits. The paper analyses the effect of terminal costs on the network performance of intermodal line-trains. The paper is based on a case study, which assesses the potential modal share for an intermodal line-train on a corridor in Sweden. The results confirm that in theory intermodal line-trains can provide competitive services on short and medium transport distances providing that transhipment costs are kept low. Naturally, lower transhipment costs reduce the total service costs, but of even greater importance is the ability to achieve higher load factors, which decreases the door-to-door transport costs per load-unit. This opens business opportunities for operators and cost saving potential for shippers in a market segment, which is currently dominated by road transport.

The paper of Deepak Baindur and José Viégas suggests that success factors for developing viable motorways of the sea (MoS) projects in Europe go much beyond the performance of organisation of the sea link. The European Commission (EC) has introduced the concept of motorways of the sea in their guidelines for Transeuropean Networks in 2004. It aims at diverting road freight transport to the waterways and to use the potential of coastal shipping. However, in spite of strong political backing and favourable policy initiatives, MoS projects had limited success. The paper attempts to identify critical factors for establishing viable MoS projects. It reviews the development of the MoS concept to understand the expectations of the EC and the concerns of the important stakeholders. The present status of these policy actions is reviewed and their possible effect on the performance of MoS projects is estimated. Case studies of Short Sea Shipping initiatives in different parts of Europe and the world are reviewed to learn from their successes and failures. This knowledge is applied to find critical factors for the success of MoS projects in the European context.

The final paper of Wendelin Gross, Christina Hayden and Christian Butz explores the influence of the oil price on the optimal degree of centralisation of logistic networks and evaluates the impacts of centralisation on greenhouse gas emissions. The investigations are performed by applying a comprehensive model consisting of a logistic network, logistic cost functions, carbon dioxide emissions and inserting the empirically measured relationships between oil price, fuel price and transportation costs. The results underline that relatively high oil prices of above 150 US$/barrel are necessary to change the logistic structures substantially towards a lower centralisation (more depots), which is associated with lower freight transport activity and diminishing CO_2 emissions.

The brief description of the contents of the papers shows that they all of them address particular fields of greening logistics by organisational improvements. Contrasting the manifold publications on the full host of instruments to improve the logistics' sector carbon performance, this special issue illuminates some cases for specific changes, which are necessary and possible on the level of individual decision-making. It underlines the economic philosophy that big changes are only possible by wakening the market forces in the small through setting the incentives correctly.

Four out of the six papers of this special issue have been presented to the World Conference on Transport Research at Lisbon, 2010. The Co-editors signing below have been responsible for organising the session streams and for selecting papers on logistics and freight transport suitable for publication in international journals. Two further papers have been suggested by the editor in chief, Prof. Peter Klaus, because they are complementary and fit well with the storyline of this special issue. We are convinced that the choices made have led to an outcome of high quality, which will find good resonance by readers with a special interest on the field of green and efficient logistics.


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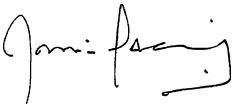
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